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Among Bark Beetles, Humans and Spruce Trees.

A Multi-Species Political Ecology of Bark Beetle Outbreaks in Upper Austrian Forests

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There is turmoil in and around Austria's forests. On the one hand, the escalating climate crisis; on the other, increasing biotic disturbances such as insect pests. In the midst of these upheavals: A European spruce bark beetle (*Ips typographus*). An insect with the power to make humans despair, spruce trees die, and forest landscapes change; a creature responsible for 4 million cubic meters of damaged wood in 2023 in Austria, one fifth of the annual timber harvest; a natural disturbance agent that has challenged human forest management to an unprecedented extent, that has shaken the Austrian forest sector with its fixation on Norway spruce (*Picea abies*). That epidemic bark beetle outbreaks occur is nothing new, and forest ecology has come a long way in identifying the drivers and conditions of such outbreaks. However, a closer look at the dominant approaches to bark beetle research and management also reveals a dangerous anthropocentrism (of problematizing bark beetles only when they threaten managed forests), and a depoliticizing reductionism (of explaining outbreaks by the actions of a single creature). As a result, bark beetle outbreaks are seen as inevitable *natural disturbances*, ahistorical *disasters*, and apolitical *management problems*.

In contrast to such perspectives, this dissertation applies a more-than-human political-ecological perspective to approach bark beetle outbreaks as cosmopolitical Muli-Species gatherings, arguing that it is a historically contingent constellation of actors, relationships, practices, histories, and ecologies that makes bark beetles proliferate, spruce trees susceptible, and humans economically vulnerable. Rejecting an apolitical perspective, I will show that bark beetle outbreaks are political; political not only in the sense that outbreaks have political consequences and implications (for humans), but also that they lead to and/or exacerbate (world-making) conflicts between different beings, that they disrupt *how species assemble* in and through forests. Based on multi-sited ethnographic research on bark beetle outbreaks in the federal province of Upper Austria, and bringing together approaches from Multi-Species studies, political ecology and forest ecology, the dissertation explores the question of *how spruce trees, humans, bark beetles and other beings assemble through bark beetle outbreaks and how these outbreaks trigger and/or exacerbate conflicts across, between and among these assemblages in and beyond (selected) Upper Austrian forests*. As I will show, Multi-Species conflicts related to bark beetle outbreaks are rooted in and feed into a complex politics of world-making, belonging, (bio)security, responsibility, and conservation. Be it in the Sauwald where bark beetles spark a blame game and disrupt the region's moral economy, in the Kalkalpen National Park, where conservation divides proponents and opponents of bark beetles, or in the Upper Austrian Bohemian Forest, where bark beetle outbreaks re-securitize a charged post-borderland borderscape – in all of these places, bark beetle outbreaks function as a proxy, pretext and driver of struggles over the question of whose forest-making interests, strategies, coalitions, practices, and projects prevail, repoliticizing the question of what to do with forests; whether to use them for provisional purposes, or to place them under strict(er) protection.

Keywords: Bark beetle outbreaks, European spruce bark beetle, Multi-Species Political Ecology, Multi-Species ethnography, Upper Austria, Conflict, Forests, Forestry

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List of Abbreviations

ANT	Actor-Network Theory
BBBG	Bark Beetle Blame Game (see chapter 8)
BFW	Bundesforschungszentrum für Wald (eng.: Austrian Research Centre for Forests)
BML	Bundesministerium für Land- und Forstwirtschaft, Regionen und Wasserwirtschaft (eng.: Federal Ministry of Agriculture, Forestry, Regions and Water Management)
ESBB	European spruce bark beetle (*Ips typographus*)
LK	Landwirtschaftskammer (eng.: Chamber of Agriculture)
LFW/LFD	Land- und Forstwirtschaft/OÖ. Landesforstdienst (eng.: federal province forestry administration of Upper Austria)
MSE	Multi-Species ethnography
MSPE	Multi-Species Political Ecology
NP	National Park
KA NP	Kalkalpen National Park (German: Nationalpark Kalkalpen)
ÖBf	Österreichische Bundesforste (eng. Austrian Federal Forests)
PES	Payment for Ecosystem Services

I. Why It Matters When Species Assemble: An Introduction to Bark Beetle Outbreaks as a Matter of Political Ecology

Fig. 1: Author in the former family-owned forest. Removal of dead trees after bark beetle infestations in the summer © Author, 2019.

There is sweat on my forehead, my back hurts from bending over, blisters are forming under my gloves. Like many Saturdays before, I am in our family forest, surrounded by spruce trees, some still standing, some already felled. Trees that my grandparents and their ancestors planted, trees that appear to be suffering. Trees that ooze resin, trees with brown needles, trees on the verge of death. I restart the chainsaw. Grown for 50 years, killed in about 5 minutes. The whooshing sound of a falling tree piercing through the forest air. I feel guilty. In other contexts, I would be one of the first to protect trees, here I am killing them. To wipe away the feeling, I tell myself that I am redeeming doomed trees; that what the tree would have experienced in the weeks to come, namely the collapse of its vascular system, would have been crueler than the quick death that I have inflicted. With heavy steps, I make my way along the victim, moving from the base of the trunk to the crown. A few chainsaw strokes later, the branches are removed, I divide the trunk into four-meter-long pieces. Once a tree, an assembled member of the forest, now a dismembered piece of roundwood, ready to be transported, ready to be processed into whatever humans want to make of it. I start the next cut. The chain tears open a piece of bark. A whole microcosm appears, tunnels filled with the strangest creatures, above all the writhing white larvae of the creature I believe to be the cause of all our troubles. Larvae of the European spruce bark beetle, when fully grown a cylindrical and dark brown *beetle that lives in and feeds on the inner bark tissue of a tree. A secondary pest that has made itself at home in our spruce forest, living up to its reputation as the most destructive forest insect in Central Europe. How strange it is that big humans chase little brown beetles. How indicative of the incompleteness of human control that in a short moment of carelessness, a small beetle has taken over our forest, has kept us on tenterhooks, has forced us to cut down trees. How strange that such a small creature should make me so angry and fascinated at the same time...*

(Vignette by author, based on work in the former family forest in 2019, Upper Austria)

When I was a forester, I always thought I knew what mass proliferations, or epidemic outbreaks[2] of the European spruce bark beetle (ESBB; *Ips typographus*) were, namely: a forest disturbance[3], an economic burden, a management problem, a *natural* phenomenon with silvicultural reasons and forest-ecological consequences. The existing forest-ecological and -entomological literature was clear on that. It never occured to me that bark beetle outbreaks would be more than that, that only a specific constellation of actors, assemblages, relationships, practices, histories, and ecologies enables bark beetles to alter forest ecosystems, to shake the foundations of spruce-dominated forestry in Austria, to plunge an entire economic sector into a considerable crisis[4]. In other words, I regarded outbreaks as an inevitable, because *natural* phenomenon, as the proliferation of one single creature. At the time, I was unable to imagine how many different beings and processes must play together for a bark beetle to (become able to) infest a spruce tree, for a spruce tree to become susceptible to infestation, and for a forester to be affected, and angered by that process.

[2] Although I will continue to use the term "outbreak" to refer to rapid increases in bark beetle populations and population densities, simply because most people I have talked to in the field use this term, the term "outbreak" has inherently biased and negative connotations, it is ultimately an anthropocentric term in that it reduces beetle outbreaks to their negative effects and impacts on humans.

[3] The term "forest insect disturbance" is used to describe a specific kind of forest disturbance in which insects are the main disturbance agent (van Lierop *et al.* 2015). According to the FAO, "a disturbance is defined as an environmental fluctuation and destructive event that disturb forest health, structure, and/or change resources or physical environment at any given spatial or temporal scale" (FAO 2005, 173).

[4] Forests are not only economically important, contributing 3% to Austria's GDP. They also cover 48% of the country's territory (BFW 2023). According to the BFW (2023), 81% of these forests are held by private owners with an average forest size of 9.2 ha per owner, indicating a high rate of private small-scale ownership. A mere 15% of Austria's forests, amounting to 580,000 hectares, are under federal management by the Austrian Federal (or State) Forests (ÖBf). The remaining 3% are predominantly held by parishes and federal states.

Given the many lessons I have learned since realizing that bark beetle outbreaks are not a "one-species show" or a politically inert one-time catastrophe, but a *conflict-laden* phenomenon rooted in the relationships between different beings, this dissertation is a biographically inspired coming to terms with the question of why bark beetles cause (and have caused me and my family) so much trouble, why millimeter-sized beetles have become so powerful as to transform forests and with them entire networks of relationships, why short-lived insects exacerbate and/or lead to conflicts that go far beyond forests. The assumption that bark beetles cause unrest, and not just among humans, is both premise and starting point of this dissertation – a starting point that expresses how this project differs from "conventional" approaches in bark beetle research, that marks the difference between an *apolitical* and a *political ecology*. Although apolitical ecologies are only analytically a counterpart to political ecologies, because every apolitical account of environmental change is "implicitly political" (Robbins 2012, 19) in reproducing particular standpoints, biases, and power structures, apolitical accounts "tend to ignore the significant influence of political economic forces" (ibid.), they *depoliticize* environmental problems by suggesting that those would be either "purely" *natural*, or an inevitable outcome of human mismanagement (Blaikie and Brookfield 1987). Apolitical accounts also posit that environmental problems can be *solved* by technical, legal and managerial means, or, as in terms of research, can be studied objectively without consideration of power relations, questions of (in-)justice and the unequal distribution of resources, risks and benefits. If this dissertation is to convey one message, it is that bark beetle outbreaks are political; political not only in the sense that outbreaks have political consequences and implications (for humans), but that they unfold through and lead to tensions between different beings, that they disrupt *how species assemble* in and through forests.

I.A From a *Single-Species Apolitical* to a *Multi-Species Political* Ecology: About the Research Topic, Problem, Questions, and Relevance

I.A.1 Research Topic

That epidemic bark beetle outbreaks happen is neither new nor limited to certain tree species. From historical records we know that bark beetles – in the strict sense those weevils of the *Scolytinae* subfamily "whose larvae and adults live in and consume phloem of trees and other woody plants" (Hulcr *et al.* 2015, 42) – have shaped forest landscapes for over 150 million years (Cognato and Grimaldi 2009). Shaped insofar as bark beetles act as *natural* disturbance agents; as *secondary* pests they infest damaged, physiologically stressed or dying trees, contributing to forest health, wood decomposition, forest succession, changes in tree species composition and forest structure, nutrient cycling, vectoring of symbiotic microorganisms, and more generally to biodiversity (Raffa *et al.* 2008; Seidl *et al.* 2016; Morris *et al.* 2018; Davis *et al.* 2020). What is novel is the recent extent and frequency of these outbreaks in Central European forests and their catastrophic impact on the forest sector (Hoch *et al.* 2019; Hlásny *et al.* 2021; appendices A1). In forest ecology, increases in bark beetle outbreaks are typically associated with two sets of interrelated factors (Biedermann *et al.* 2019; appendices A2). On the one hand, we have climate change, whereby higher temperatures expand bark beetle habitats, accelerate their reproduction, and enhance their hibernation success, while more frequent/severe extreme weather events (such as storms), longer dry periods and heat waves impair tree health, and increase the tree's susceptibility to bark beetle infestations[5] (Allen *et al.* 2010; Seidl *et al.* 2011; Bentz and Jönsson 2015; Albrich *et al.* 2020; Netherer *et al.* 2021;). On the other hand, bark beetles, with their relatively limited dispersal radius, benefit from the massive availability of their feeding substrate, i.e., from anthropogenic forest stand structures

[5] Current simulations for Central Europe indicate that "even a moderate warming of +2.4°C could lead to a three- to five-fold increase in the amount of timber damages by bark beetles by the end of the 21st century, compared to the period 1990–2004" (Hlásny *et al.* 2019, 12).

(in our case: dense, even-aged and secondary[6] pure spruce stands) and specific (yield-oriented) forest management systems (Pasztor *et al.* 2014; Biedermann *et al.* 2019; Dobor *et al.* 2020). The fact that bark beetles like the ESBB exist, that they infest damaged and/or dying trees, and force foresters to harvest those infested trees, that they are under certain conditions capable of mass-attacking healthy trees is one part of the problem (Schebeck *et al.* 2023). Another part is that the ESBB targets the sacred cow, "the bread tree" (BFW 2013) of (Upper) Austrian forestry, namely the native conifer Norway spruce (*Picea abies* L. KARST.) – the economically most important and most abundant tree species in (Upper) Austria (Jandl 2020). Given that spruce alone has an area share of 49% in Upper Austrian forests (BFW 2022) and given that an estimated quarter of spruce forests are considered anthropogenic and thus particularly susceptible to disturbances (Leitgeb *et al.* 2013), bark beetle outbreaks represent a considerable threat, not only to the economic wellbeing of foresters and the spruce-fixated wood industry, but also to forest ecosystems and specific forest inhabitants, above all to spruce itself. How serious this threat is becomes clear when we look at the quantities of damaged wood. Even though bark-beetle-related damages in the federal province of Upper Austria have declined from over one million cubic meters (and a third of total annual logging) at their peak in 2018 and 2019 to around 300.000 cubic meters in 2023, the Austria-wide bark beetle damages of 4 million cubic meters in 2023[7] still represent the third highest value ever measured (BFW 2024; appendices A3). More important than how high the numbers are is the question of what they mean for forests and forest economies, of what impacts bark beetles have. Epidemic outbreaks result in changes in the form and structure of forest landscapes, in economic losses for foresters,

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[6] Secondary spruce stands are stands established in areas in which spruce would *not* or *not to that extent* occur *naturally* (Leitgeb *et al.* 2013). Such stands are particularly susceptible to disturbances as trees are not (sufficiently) adapted to the site (conditions), translating into reduced vitality, increased physiological stress and less efficient defense mechanisms (Netherer *et al.* 2019).

[7] To get an idea of the extent of these damages, this amount corresponds to around 20% of the total cut in Austria in that year, or to a 3.200-kilometer-long convoy of over 160.000 well-loaded timber trucks. From a historical perspective, the current annual damages are more than triple the amount of average annual damage suffered between 1958 and 2001 (Schelhaas *et al.* 2003).

in reductions of forest stocks (and sequestrated carbon), as well as in impairments of forest ecosystem services such as a reduced protective function of impacted forests against erosion and avalanches (Raffa *et al.* 2008; Lindner *et al.* 2010; Mikkelson *et al.* 2013; Seidl *et al.* 2014; Stritih *et al.* 2024). Given the many functions that spruce fulfills for society, given the economic importance of spruce for the Austrian timber industry, bark beetles hit a sensitive spot, and it is not surprising that their short-term control is usually the first priority. However, reducing outbreaks to an apolitical management problem, to the mass proliferation of one single species has its pitfalls.

I.A.2 Research Problem(s) and Research Gap(s)

Approaching bark beetle outbreaks as a matter of *bark beetles threatening human foresters* points to the *first aspect* of my research problem, which is the anthropocentric character of forestry, and how this anthropocentrism manifests itself in 1) how bark beetles are dealt with, and 2) how they are commonly studied in relation to other forest beings. Although forestry and (conventional) forest science(s) are by definition concerned with more-than-human beings, their importance is often restricted to their (economic) usefulness or, as in the case of bark beetles, when they threaten humans and their forest *properties*. In line with this utilitarian and reductionist perspective, bark beetle outbreaks appear as *disturbances* (to the status quo), as *disasters/calamities/catastrophes* (to owned forests), as problems for forest management plans; in short, as events resulting from the malevolent actions of a single creature, here a demonized "insect pest". That bark beetles are agentic forest-makers, that bark beetles have reasons for appearing and disappearing, that bark beetles have (symbiotic) relationships with many others, that bark beetles are politically powerful because they disrupt and question the status quo, is largely neglected. Particularly by those with vested interests in the business-as-usual, by those who subscribe to an intensive/extractivist forest management paradigm (Dobor *et al.* 2020), not by those who only see humans and their *needs*, when life emerges right in front of them as a "shifting assemblage of agentive beings" (Ogden *et al.* 2013, 6). As I argue, there is a collective inability (and unwillingness) to see and acknowledge the sociality and agency of bark beetles, spruce trees and others, and, related to that, a tendency to reduce bark beetle outbreaks to an ahistoric and apolitical Single-Species population eruption, when outbreaks are *instead* historically contingent Multi-Species gatherings rooted in and enabled by the entanglement of human *and* more-than-human actors, practices and histories. It is this reduction that is exemplary of a what I call, for the lack of a better name, a *Single-Species apolitical ecology* perspective; a perspective in which practical necessities determine how we think of bark beetle outbreaks; a perspective in which outbreaks must be prevented or brought under control, just as *nature* as the *essentialized other* must be brought under control. Given this dualist scheme and its expression in treating and studying bark beetles as *natural* and humans as *political beings*, there is little consideration of the interdependence and co-constitution of bark beetles, humans, spruce trees and others. Relationships as they unfold over time and different from context to context play a limited role. When considering how such a way of looking at the world falls short of *ecology's* meaning as "the science of multiplicities, disparate causalities, and unintentional creation of meaning" (Stengers 2010, 34), a look at the research landscape shows us the predominance of fragmented perspectives, it shows that too little has been done so far to address the *equally* ecological, political, historical and social relationships *between*, *among* and *across* humans, spruce trees, bark beetles and others (for exceptions see f.ex. Wolfe and Whiteman 2016; Blavascunas 2020). Do not get me wrong. Being dissatisfied with the ways in which outbreaks are commonly approached is neither a reproach to the natural science research on bark beetle outbreaks, nor is it a criticism of the pioneering work of forest-specialized social scientists. What I criticize, and what I attempt to do in this dissertation is to unsettle the "piecemeal approach" that has for too long dominated how we deal with, think about and study bark beetle outbreaks (in and beyond the social sciences), namely as Single-Species events without a history, social ramifications, and power implications.

Related to the first point, i.e., to the absence of a more-than-human perspective on how species *assemble* through and due to bark beetle outbreaks, *a second aspect* of my research problem revolves around the lack of Central European studies on the "human dimensions of forest disturbance by insects[i]" (Flint *et al.* 2009), and accordingly around the lack of knowledge on the links between outbreaks, forest management narratives, affected local communities, historical legacies, public attitudes, and political institutions (Qin and Flint 2010; Prentice *et al.* 2018). Given that the sociological and anthropological research on how people think about, respond to and act in the face of outbreaks is still in its infancy in Central Europe, there is a particular need for a "better understanding of how public attitudes and values toward bark beetle outbreaks interface with associated management actions and policies" (Morris *et al.* 2018, S41). More than a research gap and a job opportunity for social scientists, the lack of knowledge of the social, cultural, and political implications and ramifications of bark beetle outbreaks is also a problem for forest owners, forest managers, and forest politicians. This is because neglecting the societal context within which bark beetle outbreaks happen constrains the development of socially-accepted *and* ecologically-sensitive forest policies and bark-beetle-related response strategies (Pasztor *et al.* 2014, 350). In other words, not knowing what role different human groups play in/for outbreaks, how they make sense of and act in the face of proliferating bark beetles and collapsing spruce forests may lead to poorly-designed forest policies, poorly-applied-for subsidies, conflicts of interest, and ecologically-problematic forestry outcomes. It is this background that requires an in-depth ethnographic consideration of people's life realities as foresters, particularly if we want to understand how people's attitudes on forestry, bark beetles, nature conservation etc. enable, hinder, and/or intersect with forest management practices and policies (Marzano and Urquhart 2018; Hlásny *et al.* 2019).

The third dimension, or rather the third manifestation of my research problem brings us back to political ecology and its focus on the "politicization of the environment via conflicts" (LeBillon 2015, 598), insofar as we see that bark beetle outbreaks lead to and/or exacerbate conflicts, not only among human forestry stakeholders over the form, function and aesthetics of forests, over the "right" way of dealing with and responding to bark beetles (Müller 2011; Müller and Job 2009), but also in the form of conflicts between, across and among what I conceptualize in this dissertation as *Multi-Species assemblages*. That bark beetle outbreaks are contested, that they are (and need to be explored as) a matter of political ecology has a number of reasons and implications. First, outbreaks not only happen in, but also produce "political forests" (Vandergeest and Peluso 2015), they have the potential to *re-politicize* the question of how to practice forestry in times of multiple crises, thus serving as a bone of contention, a proxy, and sometimes a pretext for multiple conflicts of interest. Second, bark beetle outbreaks reveal (and alter) power relations as they unfold through the web of life, pointing to the role of political economy in the uneven distribution of costs and benefits of outbreaks (Parkins and MacKendrick 2007; Flint and Luloff 2007; Abbott *et al.* 2009; Petersen and Stuart 2014). Related to that, outbreaks produce winners and losers, not only among humans, but in the entire network of beings that constitute outbreaks. As we will see, "who benefits, cui bono, when species meet" (Kirksey *et al.* 2014, 2) depends on the relationships between, among and across different beings, on how different beings assemble through outbreaks.

I.A.3 Research Questions

To address the different layers of my research problem, but particularly the problem that outbreaks are not considered in their ecological, social, historical and political totality, I am working with three main research questions. Aimed at an understanding of outbreaks as a conflict-laden constellation of actors, assemblages, practices and histories, my most important research question reads as follows:

1. How do spruce trees, humans, bark beetles and other beings assemble through bark beetle outbreaks and how do these outbreaks trigger and/or exacerbate conflicts across, between and among these assemblages in and beyond (selected) Upper Austrian forests?

While the first part of this question represents a more descriptive endeavor of looking through so-called "entry point" (Nightingale 2016) actors such as spruce trees, bark beetles and humans at who makes forests livable for what purpose, and at how the entanglement of these beings' practices paves the way for the emergence of outbreaks (chapters 4–6), the second part of the question aims at an analysis of what I refer to as "bark-beetle-related Multi-Species conflicts", of conflicts that come from and relate to this assembling of different beings (chapter 7–10). Given the variability in the ways in which conflicts unfold across different places, contexts and assemblage constellations, the analysis of bark-beetle-related Multi-Species conflicts is based on three purposefully selected forest areas in Upper Austria (Sauwald – Kalkalpen National Park – Upper Austrian Bohemian Forest[8]), each of which illustrates a distinct manifestation and scope of these conflicts – from local neighborhood struggles over the question of responsibility for outbreaks (chapter 8) over regional Multi-Species conservation conflicts (chapter 9) to historically-charged international border disputes over belonging and (bio-)security (chapter 10).

[8] By focusing on these three areas and acknowledging their microclimatic, topographic, cultural-historical, and ecological peculiarities and differences, it is not my intention to present a representative picture of "all" forests in Upper Austria. Rather, I try to identify some general trends within Upper Austrian forests by pointing out the diversity of different situations, and by that the importance of context when looking at how bark beetle outbreaks come with conflicts between different beings (for details on research site specifics and selection, see 3.2.4).

While the first research question expresses my primary research interest, the two subsequent research questions aim 1) at a historical and political-economic contextualization on the one hand and, on the other hand, 2) a better understanding of the discursive negotiation of bark beetle outbreaks, spruce silviculture and the “right” forest management:

2. How have certain historical and political-economic trajectories in and outside of Upper Austria contributed to the emergence and configuration of these assemblages?
3. How do human forestry stakeholders negotiate bark beetle outbreaks and outbreak participants in and beyond Upper Austria, and how is this connected to broader conflicts over the use and protection of forests?

The latter research question is arguably the most accessible one for a trained social scientist, with interviews, discourse analysis, and participant observations, allowing to grasp the social construction and discursive negotiation of bark beetle outbreaks. The second research question seeks to elucidate those historical (here including socio-metabolic[9]) and political-economic[10] trajectories that have contributed to today’s conflictual configuration of assemblages, actors, practices and histories. In other words, the second research question is dedicated to the *radical contingency*[11] of bark beetle outbreaks, and thus to the contingency of Multi-Species relationships (Dillon 2007; Van Dooren *et al.* 2016).

[9] In the following, the term "socio-metabolic trajectories" will be used to refer to (past and current) biophysical processes that shape and enable the social metabolism, that is to say, those material flows and stocks that ensure (and have ensured) the reproduction of socionatural systems (Haberl *et al.* 2019). Given that humans have long met their needs for energy and construction material with wood, the historical transition to an industrial socio-metabolic regime based on fossil fuels has not only led to a partial reduction in the societal pressure on forests in Austria (and to an increase in total forest cover), but also to a change in the tree species composition, away from versatile hardwoods towards the softwood spruce (see particularly chapter 4).
[10] Political-economic developments, in turn, relate to the question of what influence the interplay of powerful actors, international markets, and capital interests had on the emergence of and vulnerabilities to bark beetle outbreaks, and what role capitalism plays and has played in the creation of disturbance-susceptible monocultures.
[11] As a counterpart to “necessity”, to events being pre-determined as part of a cause-effect-chain, “contingency indicates, very roughly, that things, spaces, and places could always be otherwise, but also *elsewhere* or *elsewhen*” (Landau-Donnelly and Pohl 2023, 488; italics by author).

I.A.4 Research Approach, Purpose and Relevance

Entomologists study bark beetles, botanists study trees, and anthropologists study humans. Three different subjects, three different disciplines, three different approaches. So far so good. But what do we do if we are interested in the co-constitutive relationships between these beings, if we want to understand how these beings *become with* each other and assemble through what humans call outbreaks? I argue that when existing scientific disciplines and their disciplinary views prevent us from seeing the big picture, we need to shift our perspective, we need to bring our research to the intersections, overlaps, tensions, and silences of disciplinary research. Only there, where it is possible to challenge and move beyond the dichotomy of *social* and *natural*, *cultural* and *ecological*, *human* and *non-human*, we can attempt what Anna Tsing (2013, 28) calls the "critical description[12]" of "how humans and other species come into ways of life through webs of social relations". Such a critical description is needed, not because it is theoretically timely and academically trending, not because it creates yet another research field for the expanding postmodern humanities, but because it represents the best available approach to a problem that requires the linking of biology, ecology, ethnography, history, and political economy (Escobar 1999). A problem that, as in the case of outbreaks of the ESBB in the federal province of Upper Austria[13], relates both to the practical significance of these outbreaks for forests and forestry, *and* to the way in which those outbreaks are commonly studied; in other

[12] "I'll call that work 'critical description': critical, because it asks urgent questions; and description, because it extends and disciplines curiosity about life. At the intersection of ethnography and natural history, we have a lot to learn about how humans and other species come into ways of life through webs of social relations. Now that we are beginning to imagine an anthropogenic Earth in which humans are everywhere, involved in shaping everything, we need to know what more-than-human socialities are being made, with or despite clearly formulated human intentions" (Tsing 2013, 28).

[13] Why Upper Austria? Even though bark beetle calamities have recently shifted to Tyrol and Carinthia, Upper Austria has for a long time been and continues to be under pressure from bark beetle outbreaks (Jandl 2020). There are several reasons for the province's high predisposition to and affectedness by such outbreaks. First, temperatures in forest areas north of the Austrian Alps have disproportionately risen compared to areas south of them in the last years. Second, Upper Austria is characterized by a high area share of spruce, and that in regions where spruce would not be the naturally dominant tree species, thus making spruce particularly susceptible to droughts, heat waves, extreme weather events and subsequent bark beetle infestations. Third, Upper Austria has a reputation as a region with a role model forest economy, and with bark beetle outbreaks having the potential to threaten that reputation, Upper Austria is an interesting case for observing conflicts over the question of how forests and forestry ought to look like in the face of disturbances.

words, it consists of a “real-world problem” of how to approach and deal with outbreaks, *and* a “scientific problem” of how to (not) study them.

Through approaching bark beetle outbreaks as *cosmopolitical Multi-Species gatherings* (and not as Single-Species events), the goal of this research is to explore and *critically describe* the relationships between, across, and among human and more-than-human actors involved in and affected by bark beetle outbreaks. To do so, I will work with an ethnographically grounded Multi-Species Political Ecology (MSPE) perspective that addresses “complex webs of multispecies interactions along with political ecology’s concern with social matters“ (Karlsson 2018, 22), that analyzes bark-beetle-related Multi-Species conflicts as an outcome of the interactions of different beings, that asks the question of “who benefits, cui bono, when species meet” (Kirksey *et al.* 2014, 2), in our case: when outbreaks happen.

Since there is to no coherent body of social science research on the cultural, social, and political dimension of forest disturbances in Central Europe to this day (as compared to the research in Northern America: Flint 2006; Flint *et al.* 2009; Qin and Flint 2010; McFarlane *et al.* 2012; Qin *et al.* 2015 etc.), my research project moves in relatively uncharted territory. But what is not, can still become, and it is one purpose of this dissertation to sketch a role that the social sciences “can play in better understanding the social, economic and environmental impacts of […] tree disease and pest outbreaks” (Urquhart *et al.* 2018, 6[14]). In addition to bringing the social sciences into the game, merging political ecology (PE) and Multi-Species ethnography (MSE) into a Multi-Species Political Ecology is intended to contribute to the body of Multi-Species ethnographies by considering the importance of (more-than-human) power relations on the one hand (Büscher 2022), and to the field of political ecology by emphasizing the need to integrate more-than-human beings into an analysis of conflicts in and over forest

[14] In the introductory chapter to their edited volume *The Human Dimensions of Forest and Tree Health,* Urquhart and colleagues (2018, 3p.) show on basis of an Elsevier Scopus desk research that from over 25.000 articles found with the search terms “tree OR forest AND pest OR disease OR pathogen” in 2017 less than 2% are classified as social science, and even less than 0.5% come from journals in economics, humanities or the arts.

landscapes on the other. More than an academic subtlety, I argue that acknowledging the practices, socialities and histories of more-than-human actors helps to build capacities for thinking about and dealing with Multi-Species conflicts, capacities for finding compromises in how to share common worlds. It helps to know the particularities and needs of other beings, to be familiar with their behaviors and practices, to get a sense of their positions and functions in Multi-Species assemblages for knowing when it makes ecological and economic sense for humans to intervene. Understanding bark beetle outbreaks as Multi-Species phenomena can also contribute to the design and development of more ecologically sensitive forest policies – policies that do not seek to control the population development of one single species, but that consider the totality of assembled beings and relationships. Beyond, approaching bark beetle outbreaks as Multi-Species gatherings can contribute to a storytelling in which forestry is more than the harvesting of trees for human purposes, in which humans are *only one among many* forest users with “rights to the forest”. In line with that, my Multi-Species Political Ecology perspective advocates for a "more mindful silviculture" (Simard 2013), a “convivial conservation” (Büscher and Fletcher 2019), and what Wienhues (2020) calls *ecological justice* in and through the attentive coexistence of human and more-than-human beings. The dissertation at hand will be of relevance to anyone with a practical and scientific interest in bark beetles, forests, and forestry in and beyond Upper Austria. It is dedicated to political ecologists who (want to) study the contestedness of forest insect disturbances, to forest owners who are seeking a different way of thinking about and living with forests and forest inhabitants, and to forest policy makers who are convinced that an alternative to the status quo of managing and protecting forests is needed. The present study challenges the conventional understanding of bark beetle outbreaks as *natural* Single-Species events, demonstrating that a multitude of actors, practices and histories must converge for an outbreak to occur and to be regarded as a problem.

I.B A Note on Concepts and Terminology

Although we will discuss the main concepts of an MSPE in the next chapter, I would like to explain some of the terms that will be used most frequently in this dissertation. It starts with "more-than-human" and "Multi-Species", what does that even mean, and why the hyphenated and (partly) capitalized spelling? My preference of the term "more-than-human" over the term "non-human" for delineating what is referred to as plants, animals, fungi, microorganisms and non-living entities, is based on a number of considerations. First, to speak of "non-humans" is problematic in that it reproduces a dualism that defines everything in relation to the category of "the human", a dualism that reduces all kinds of beings to beings that are *lacking* "what it needs to be human", that are "not-human-enough" (Wolfe 2010). As I argue, this is not a positive definition, but a definition based on a totalizing negation, and if we look at how "humans" have treated, devalued and exploited those that have been classified as "non-/not-humans" or "less-than-humans" (Büscher 2022), at the hierarchy between humans and "the rest" (Latour 1993), "non-human" is a concept that we should better avoid (Abram 1996). Second, I like the qualifier "more-than-human" as it marks a category that *unsettles* and *transcends* the "human condition", it implies that living beings that have been classified as inferior for centuries could be something *more than* humans. In the words of Chamel and Dansac (2023, 1), "the expression 'more-than-humans' provides a framework that accommodates a broader definition of animated being by recognizing the possibility of liveliness, or at least agency or personality, to any entities with whom humans interact". More-than-humans or more-than-human beings are thus entities that evolve in co-constitution with humans, that help us to rethink what being "human means" through setting "the human as a register of difference that emerges through […] relations with other agentive beings" (Ogden *et al.* 2013, 7). In alignment with these observations, an examination of the literature reveals that the term "more-than-human" is also the more commonly used designation in comparison to "non-" or "other-than-human". Another term that requires clarification is the capitalized prefix "Multi-Species", for example in “Multi-Species Political Ecology”, “Multi-Species conflict” or in “Multi-Species assemblages”. A merger of the Anglo-American “multispecies ethnography” (Kirksey and Helmreich 2010) and the German “Multispezies-Ethnographie” (Gesing *et al.* 2019; Ameli 2021), I speak of *Multi-Species* communities, assemblages, political ecology etc. when entanglements of human and more-than-human actors and practices are constitutive for understanding a phenomenon, when something is transcending the categories of human and more-than-human in how it works and unfolds. In the case of “Multi-Species Political Ecology”, the hyphenated and capitalized spelling 1) marks the deviation from the human geography variant of a “more-than-human political ecology” (Whatmore 2013), and 2) points to my merger of “political ecology” and a “Multi-Species ethnography”, stressing through the specific spelling that “Multi” and “Species” are each to be treated with caution, with the anthropocentric category of “Species” becoming questionable when meaning a self-replicating, independent organism (Kirksey 2015), and with “Multi” referring to relationships that cannot be narrowed down to clearly identifiable relationships and countable relationship partners. As an alternative (and partly as a supplement) to the monolithic category species, I use Tsing's (2015) concept of the “lifeway” as an already-assembled entity, as an arrangement of species, partners, practices and environments – a concept that corresponds to what Bateson (1972) called the unity of “the organism-in-its-environment” and Lynn Margulis the “holobiont” (Margulis and Kratz 1991).

Another term that is crucial for this dissertation is (Multi-Species) “assemblage” (or a bit tautological: “Multi-Species assemblage”); a term that describes the processes and outcomes of “open-ended gatherings” (Tsing 2013, 31) of living and non-living beings. A term that is used throughout the dissertation as a synonym for “gathering(s)” and “Multi-Species communities”, that sometimes comes in the form of “forest assemblages” when I want to emphasize that gatherings mainly happen in and because of forests. When assemblages *assemble*, i.e., when they form ("second-order") "assemblages of assemblages" (DeLanda 2016), I do not speak of gatherings, but of "Multi-Species happenings", and it is these happenings that come with "Multi-Species conflicts". Closely related to the concept of assemblage is the concept of "world-making", which I use in this thesis in various forms, sometimes as world-making *practices*, sometimes as world-making *projects* (when I speak of a set of coordinated world-making practices), in other cases as world-making *interests*, *possibilities*, *opportunities* etc. In a nutshell, and I will speak about that later, world-making is the *praxis* dimension of assemblages, it entails all the things (through place-, sense- and time-making) that assembled beings *do* to continue living, to make a place habitable, to achieve a good life for themselves and their assemblages (see chapter 2.2.2).Whenever I speak of world-making in the context of forests, I specify the former as "forest-making", here explicitly tying world-making to the *places* and *landscapes* that it produces and in which it unfolds.

Speaking of forest-making as carried out by humans, we come to concepts such as forests, forestry, forest management and silviculture. The usual FAO (1998) definition of a forest as a type of „land with tree crown cover (or equivalent stocking level) of more than 10 percent and area of more than 0.5 hectares (ha)" is a starting point, but too narrow and technical for a Multi-Species Political Ecology. We will see later that forests are more than just an area with tree cover; that they are complex adaptive systems (Simard *et al.* 2013), Multi-Species landscapes, ecological constellations, manifestations of the coming together of human and more-than-human practices, histories and actors. Given the complexity of forests and the diversity of human forest interventions, *forestry* and its implementation through *forest management* and *silviculture* can mean and translate into different things. While I grasp forest management as the "designation and application of forest management practices […] in order to meet certain predetermined goals and objectives" (Grebner *et al.* 2022, 466) and silviculture as the "theory and practice of controlling forest establishment, composition, and growth" (Britannica n.d.)

forestry is an umbrella term for both, it is “the science or practice of planting, managing, and caring for forests to meet human goals and environmental benefits” (Round 2022, 486). Expressed in the language of world-making, forestry is a system of human forest-making practices aimed at *making forests useable* for specific purposes[15]. In what follows, I will call all those who are directly involved in making forests usable “foresters” and subsume all those actors under said term who are as forest owners, forest workers, forest managers, forestry advisors, forest wardens and forestry officials practically involved in the management and governance of forests, who are in charge of forests professionally. Those human actors who do not fall under the term forester, but still have a crucial influence on what happens in and around forests, are in this work referred to as “forestry-” or "forest-related stakeholders". As I will show later, this includes a wide range of different actors – from forest scientists, timber freighters and traders over environmental bureaucrats and members of NGOs to forestry-related interest groups and employees of the extended wood (i.e., timber, sawmill, paper and pulp) industry. While it is obvious that the given list of definitions is not exhaustive, we have taken a first step towards a better understanding of the most commonly used terms and concepts. Now it is time to look ahead and see what role these concepts play in my research project.

[15] I deliberately speak of “usable” instead of “livable” here as I assume that the majority of human forest makers do not depend on a certain state of the forest for their survival, simply because they do not directly *live in* (or *off*) the forest.

I.C A Note on the Structure of the Dissertation

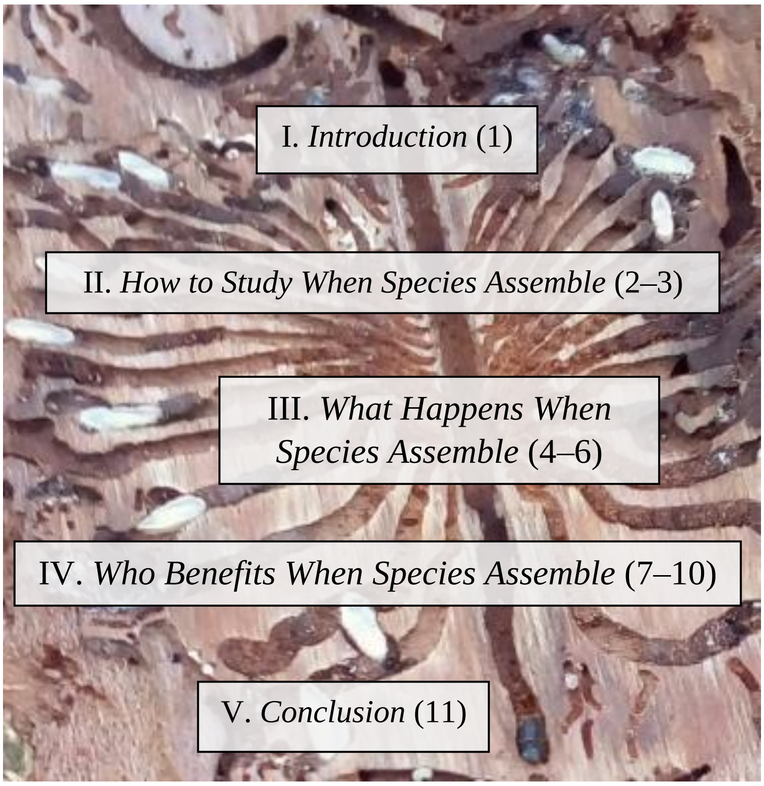


Fig. 2: My dissertation structure as a bark beetle breeding system. © Author, 2024.

To visualize the structure of the dissertation, I would like the reader to imagine the breeding system of a European spruce bark beetle, with its elongated maternal gallery and the branching larval tunnels (see figure 2). Just as bark beetles use certain visual and olfactory cues to identify and bore into suitable trees, my search for an appropriate research topic was driven by instinct, experience, and representations of the research landscape; it was guided by a nose for what might be interesting, by what I already knew about bark beetle outbreaks, and, last but not least, by cues and clues from the existing literature[16].

Combining literature review and theoretical chapter, ***chapter 2*** presents my Multi-Species Political Ecology perspective, that is a reassembled political ecology that accounts for the power- and conflict-laden processes by and through which different beings assemble. To this end, I will show where political ecology comes from, and why both structuralist and post-structuralist political ecology are unable (or unwilling) to include more-than-human actors in

[16] Given the lack of a political ecology literature on bark beetle outbreaks, the literature review that informed this dissertation included four (thematic) areas: 1) forest ecology and forest entomology, 2) social science-oriented studies on the "human dimensions of forest disturbances by insect" (Flint *et al.* 2009), 3) (forest) political ecology, and 4) insect-related Multi-species studies. The goal of the review was to get a sense of what bark beetles and spruce trees are capable of, what needs to be considered when talking about the role of humans in and for outbreaks, and from there, to develop a Multi-Species Political Ecology (MSPE) framework.

their analyses (2.1). I will then present a number of approaches, concepts and ideas that a non-dualist and anti-essentialist Multi-Species Political Ecology must incorporate – approaches that allow a more symmetrical perspective on the entangled world-making, mutual dependencies, and intimate relationships between human and more-than-human beings (2.2). Finally, I will present what it takes to work with an MSPE system, including the identification of "analytical entry points" (Nightingale 2016, 41p.), and translating into an operationalization of the framework through a multi-scalar "field of conflict" analytics (Dietz and Engels 2018).

In analogy to the mandibles of a bark beetle, scientific methods are the mouthparts with which I chew my way through the research, through which I attempt to carve out a picture of human and more-than-human life realities in the face of bark beetle outbreaks. C***hapter 3*** is devoted to these "methodological chewing tools", describing the onto-epistemological grounding of the research (3.1), my overall methodological approach and research design (3.2), as well as my role and positionality in the field (3.3). In general, my methodological approach takes the form of a *multi-sited, mixed-method Multi-Species forest ethnography*, based on a combination of qualitative and quantitative methods, and applied in the course of recurring field research in the years 2021 to 2024.

What we have done so far is to enter the tree (i.e., our research topic), familiarize ourselves with our (research) substrate, and equip ourselves with a theoretical and methodological toolkit (part II). This is where the real work begins. What follows in the case of the bark beetle is the construction of the nuptial chamber, the mating process, and the excavation of the maternal gallery, while our task is to make sense of the complexity and contingency of bark beetle outbreaks, of the "multitude of lively agents that bring one another [and outbreaks] into being through entangled relations" (Van Dooren *et al.* 2016, 3). Since there is no way to consider everything at once, I have limited my inquiry to those "entry point assemblages" and "entry point actors" of which I know for certain that they are constitutive for outbreaks, in our case:

Norway spruce, Human and Bark Beetle. Just as the maternal gallery is the starting point for the emergence of (new) bark beetle life, the description of the entanglement of spruce, human and bark beetle forest-making in chapter 4–6 (part III) is a central step on the way towards a site-specific analysis of Multi-Species conflicts. Differently put, said chapters are dedicated to finding answers to the descriptive part of my first research question (*how do different beings assemble),* while chapters 7–10 (part IV) are driven by the question of *how these outbreaks trigger and/or exacerbate conflicts.*

In ***chapter 4***, I will tell the story of bark beetle outbreaks from the vantage point of Norway spruce. To do so, I will introduce Norway spruce as a biological, ecological and agentic actor, describe how Norway spruce gathers with others, and what this means for spruce's susceptibility and resistance to bark beetle infestations (4.1). Albeit the rise of spruce to become Upper Austria's most needed tree species appears to be a typical story of the *Plantationocene*, of humans transforming multifunctional forests into single-purpose plantations, we will see that spruce is much more than a passive plaything, much more than a mere resource or a doomed victim (4.2).

Chapter 5 is dedicated to spruce's most important ally, *Homo Sapiens*, and applies a combined environmental-historical and political-economic lens to shed light on the historical and current role of human forest-making for and in the face of bark beetle outbreaks. While the first part of the chapter is historical in that it describes the transformation of humans from "forest users" to "wood producers" (5.1), the second part discusses the ambiguous relationship that foresters have to their forests, oscillating between joy and despair, between a strong emotional attachment and an increasing overburdening. This entails a description of central forest-making practices, looking at selected modes and strategies of making *forests usable* and what impacts these have on other forest-makers (5.2). Ultimately, I discuss human forest-making in the context of the *Capitalocene,* looking at how human forest-making is a producer and a product of political economy.

Having spoken about *plantationo-* and *capitalocenic* (spruce) forestry, about the unequal, but profitable relationship between humans and spruce trees, ***chapter 6*** deals with the European spruce bark beetle, a creature that threatens the easiness and "naturalness" of the human-spruce relationship. Examining and "thinking through" its life cycle, its assemblage positions (6.1), and looking at outbreaks from a political entomology perspective (6.2), I will show how the ESBB draws a big part of its power from the *Proliferationocene,* from emerging as a feral proliferation.

In the third section of this dissertation (part IV) – we are now in the larval tunnel sections where daylight is close –, we will move from an analysis of bark beetle outbreaks as a proxy for broader societal conflicts over forests (chapter 7) to a site-specific analysis of bark-beetle-related Multi-Species conflicts in Upper Austrian forests (chapter 8–10). As the three case study chapters exemplify conflicts at different scales (local – regional – international), and address different aspects of a common phenomenon, they provide different, but complementary accounts on how bark-beetle-related Multi-Species conflicts unfold.

As an introduction to some of the broader tensions that overshadow all of the three research sites, ***chapter 7*** approaches forests as "political forests", looking at how forests are constitutive for and drawn into broader conflicts over human land use. Given that bark beetle outbreaks (re-)politicize the question of what society wants from forests, the chapter will elucidate how forestry stakeholders negotiate bark beetles (7.1) and spruce-based silviculture (7.2), and how this negotiation is shaped by larger tensions between forest *use* and forest *protection,* between *intensive* and *extensive* forest management, between *right* and *wrong silviculture.*

Particularly relating to the field of tension between right and wrong forest management, between local and non-local forest ownership, ***chapter 8*** uses the case of the rural *Sauwald* region with its small-scale farm forestry enterprises and its anthropogenic spruce stands to approach bark beetle outbreaks as happenings that impact the social fabric and moral economy of local communities. Here, I will show how bark-beetle-related conflicts in the Sauwald are rooted in a discourse that produces and allocates responsibility for the extent and emergence of outbreaks, that creates and instrumentalizes (both new and already-existing) fault lines between, among and across different interest groups – a discourse that I discuss as the "bark beetle blame game" (BBBG).

Related to Upper Austria's only national park, the Kalkalpen National Park (***chapter 9***), the contestedness of bark beetle outbreaks expresses itself in what I will introduce as "Multi-Species conservation conflicts". Taking up the question of who is being protected from (and by) whom and for what purpose, I will analyze those conflicts by distinguishing between two larger Multi-Species interest coalitions and their diverging world-making interests, projects and strategies – coalitions that fall into proponents and beneficiaries of the "conservationist status quo" on the one hand, and opponents and (alleged) "victims" of the latter on the other.

In my last research area, a specific part of the Upper Austrian *Bohemian Forest* (***chapter 10***), I will turn to the question of how bark beetle outbreaks contribute qua the establishment of a "bark beetle buffer zone" in the national park Šumava to a re-bordering and re-securitization of a "post-borderland borderscape".

II. How to Study *When Species Assemble*: Theoretical and Methodological Framework

2. Reassembling Political Ecology: The Theoretical Framework of a Multi-Species Political Ecology[17]

If there is one thing that frustrates me when talking to Marxian political ecologists, it is that – despite their brilliant analyses of the class and power character of human-environment relations – most of them maintain that to understand the appropriation of *nature*, one must treat humans as if they were not a part of *nature*, as if capitalism were a monolithic project preying on an external and passive *nature*. It is the same political ecologists that on the one hand criticize the dichotomy of humans(/society) and *nature*, and on the other argue that distinguishing the "social" from the "natural" would be necessary for analyzing capitalism (Hornborg 2017), some of them claiming that "the more-than-turn" with its decentering of the human and its redistribution of agency would be nothing but a fetish talk of a small group of alienated Global North scientists (Büscher 2022; Greco 2022). Whatever one may think of this criticism, it seems that some of these colleagues have overlooked that there are other ways of looking at capitalism than by clinging to the orthodox distinction between *nature* and (human) society (e.g., Moore 2011; 2015; 2016; Tsing 2015 etc.). And as Donna Haraway (2016, 12) has observed, even if distinctions are "only analytical", they *matter*[ii], they are ontological in that they create, reproduce und justify particular realities – realities such as the century-long exploitation and destruction of more-than-human worlds, centuries of unspeakable violence towards those who were needed for, or stood in the way of "human progress". What might have been a simple distinction at some point (of "us" and "them", *humans* and *the rest*) after all became the basis for the tale of *human exemptionalism*, for the idea that "man_kind" would be more intelligent,

[17] Parts of this chapter come from and are based on an earlier work on a Multi-Species Political Ecology perspective (Thalhammer 2023), my comprehensive exam and my dissertation prospectus. For those interested in a more detailed theoretical-historical development of political ecology, please refer to Paulson *et al.* (2005) or Robbins (2012).

more valuable etc. than the tree to be felled, the pig to be slaughtered, the bestial enemy to be killed, the woman to be raped (Merchant 1989; Plumwood 1993 etc.). I argue that by keeping the *human-nature* divide alive, political ecologists reproduce a narrative in which *humans* are the only beings with history, sociality and politics. To move beyond this narrative is not to neglect all that is “distinctively human”, it is not to banish the political from political ecology. On the contrary, where could power and politics play a greater role than in the becoming and gathering of different beings?

The following chapter outlines a path for those political ecologists who – like me – are convinced that a more just, less exploitative and less speciesist coexistence between different beings requires a different way of setting up political-ecological research, a different way of thinking about conflicts and power relations in the making of Multi-Species communities. A different way that I term in reference to more-than-human political ecologists before me a *Multi-Species* or *more-than-human political ecology* (Whatmore 2013; Ogden *et al.* 2013) – an analytical perspective that scrutinizes the power dimensions of Multi-Species relationships, that explores the conflicts related to, carried out by and inscribed into Multi-Species assemblages.

In the context of this chapter, sketching the contours of such an MSPE first requires talking about its theoretical and conceptual foundations in structuralist (neo-Marxist) and poststructuralist (post-Marxist) political ecology. This will help to better understand where the “political ecology element” in an MSPE comes from (chapter 2.1). In the next step (chapter 2.2), I will describe the conceptual cornerstones and focal points of that MSPE framework, followed by an elaboration of how to apply the framework to the study of bark beetle outbreaks as Multi-Species gatherings (chapter 2.3).

2.1 Beyond Structuralist and Poststructuralist Political Ecology: The Emergence of Multi-Species Political Ecology as a "Third Generation Political Ecology"

Since its emergence in the 1980s at the intersection of (human) geography and (social) anthropology[iii], the field of political ecology[iv] – famously defined as the combination of "concerns of ecology and a broadly defined political economy" (Blaikie and Brookfield 1987, 17) – has developed into many different directions (Robbins 2012; Bryant 2015; Gottschlich *et al.* 2022; Schmidt *et al.* 2023). According to social anthropologist Aletta Biersack (2006) there are at least two generations of political ecology[18], that is an early structuralist phase in the 1980s followed by a poststructuralist turn in the late 1990s leading to a differentiation of the field into an *anti-essentialist* (Escobar 1999), *feminist* (Rocheleau *et al.* 1996), *critical* (Forsyth 2008) and *urban political ecology* (Heynen *et al.* 2006)[v].

Whereas said first phase was dominated by Neo-Marxist authors inspired by world-system and dependency theory focusing through a *chains of explanation* approach on the local socio-ecological consequences of the Global South's integration into the capitalist world-system[vi] (Wolf 1982; Watts 1983; Blaikie 1985), poststructuralist (and Post-Marxist) political ecologists replenished the Neo-Marxist focus on capital and class with a stronger emphasis on language, discourse, knowledge and the intersectionality of class, gender, race and ethnicity (Rocheleau *et al.* 1996; Escobar 1996; 1999; Stott and Sullivan 2000). What authors from both "traditions" share is the assumption that "power relations mediate human-environment relations" (Biersack 2006, 3), that the (benefits gained from the) uneven access to, appropriation and distribution of natural resources as well as the uneven exposition and vulnerability to environmental pollution/hazards is entwined with and dependent on inequality structures such as class, race and gender (Bullard 1990; Cutter 1995; Wisner *et al.* 2003; Neumann 2005; Pichler 2014). Or

[18] Whenever I speak in the following of political ecology, I refer to it not as a coherent theory, but as a „research agenda" (Bryant 1992), a power-critical „approach" (Warren *et al.* 2001), a "community of practice" (Robbins 2012, 5) that stands in sharp contrast to what was meant by "political ecology" in the 1960 and 70s (endnote IV).

as Michael Watts (2000, 257) puts it, political ecology aims "to understand the complex relations between nature and society through a careful analysis of what one might call the forms of access and control over resources […]", it shows how "politics is inevitably ecological and ecology is inherently political" (Robbins 2012, 3).

As important political ecology's thrust as the study of "ecological distribution conflicts" (Martínez-Alier 2002) has been, as common has it been until recently to mistake *nature* for natural resources, to regard *nature* as something external to be appropriated by human beings, as something monolithic devoid of heterogeneity and agency (Tsing 2015, vii). In the words of Bengt Karlsson (2018, 22), "political ecology approaches tend to reduce nature to a matter of resources […] and in doing so, fail to account for the more dynamic and complex aspects of the multitude of life that constitutes nature". This is not to say that political ecologists would assume the existence of a pristine and innocent nature free from anthropogenic influence (Cronon 1996; Bryant and Bailey 1997). On the contrary, political ecologists have ever since Marx pointed to the societal "production of nature" (Smith 1984), emphasizing that "nature" comes in the form of a socially-mediated "second", i.e., hybrid "socionature" (Lefebvre 1991; Swyngedouw 1996) that every "environment" is necessarily a "politicized environment" (Bryant and Bailey 1997). However, the *black box* of "nature" as the counterpart to "society", as an inanimate battleground in which human groups fight over resources (Keucheyan 2016) perseveres in large parts of the research community – and with it the same-old "logic of dualism" (Plumwood 1993). This is because Marxian and critical theory-inspired scholars continue to insist on the (analytical) distinction, on the "non-identity" of "social" and "natural"[vii], and as a matter of that confine sociality, politics and agency to the sphere of the "social", i.e., to human actors (Görg 2003; Hornborg 2017; 2021).

Only recently, this has begun to change. In the face of the ruptures of the *Anthropocene*, in the face of the pending climate crisis, in the face of what some see as the "end of history" (and actually mean the end of modernity), as David Chandler (2018) analyzes, the division of "social" and "natural" (if it had ever existed, Latour 1993), the division of an inanimate, stable and predictable nature and a progressing "humanity" in control collapses before our very eyes (Morton 2013; Ghosh 2017). Moreover, the post- and decolonial recognition of indigenous cosmologies and *radically different* ontologies (Viveiros de Castro 1998; Escobar 2008; Descola 2013; Kohn 2013; De La Cadena 2015 etc.), along with a series of paradigmatic turns (*relational*, *more-than-human*, *neomaterialist*, *ontological* turn etc.) and the emergence of the environmental humanities, have inspired political ecologists to turn to a "postdualist" (Escobar 2017), to a *more symmetrical* study of the entanglement, companionship and intimacies of human and more-than-human actors (Whatmore 2002; Haraway 2003; Kirksey and Helmreich 2010; Candea 2010 etc.). This includes the study of *humans* as "participants in lively ecologies of meaning and value" (Rose *et al.* 2012, 1), the study of how human and more-than-human actors "become with" (Haraway 2008) one another through jointly-knit *webs of power* (Barua 2014b; Tsing 2015; Rocheleau 2015). Albeit the *environmental humanities* as a field are a successor of poststructuralist and postmodern thought, sympathizing with relativist and constructivist ontological and epistemological stances, its scholars[19] share the assumption that however fluid, plural, relational, situated and emergent *realities* are, they exist *beyond* being a mere human social construction, they exist through and for more-than-human entities as well (Escobar 2008; Kohn 2013; Ogden *et al.* 2013; see chapter 3.1). Precisely because more-than-human actors play a role in the production of realities, because they are *agentic* in being able to *affect* and be *affected* (Latour 2005; Bennett 2010), in having the "ability to make world" (Tsing 2013) without needing human-like intentionality and self-reflexivity (Kohn 2013), political ecologists have started to focus on the "multitude of lively agents that bring one

[19] May they come from *Multispecies Ethnography/Multispecies Studies* (Kirksey and Helmreich 2010; Van Dooren *et al.* 2016), *Critical Posthumanism* (Braidotti 2019; Wolfe 2010), *New Materialism* (Bennett 2010), *Actor-Network-Theory* (ANT; Latour 2005), *Assemblage Theory* (DeLanda 2016) or *Object-Oriented Ontologies* (OOO; Stengers 2010).

another into being through entangled relations" (Van Dooren *et al.* 2016, 3). Bringing one another into being applies to human beings as well, and Multispecies scholars do not tire to emphasize that "human nature is an interspecies relationship" (Tsing 2012, 141), that "being human" is neither a stable nor an exceptional category, but something that "emerges through all kinds of multispecies relations" (Ogden *et al.* 2013, 9).

In addition to the commonly-considered formative philosophical figures of assemblage, post-/non-dualist, anti-anthropocentric, relational or posthumanist perspectives such as Deleuze and Guattari (2019 [1972]), Callon (1984), Latour (1993), Mol (1999), or Haraway (2003; 2008), one central impetus for today's "multispecies political ecology (Ogden *et al.* 2013, 16) as a "third-generation Political Ecology" (Blaser and Escobar 2016) came from "more-than-human/animal geographers" like Wolch and Emel (1998), Plumwood (1998) or Whatmore (2002). Questioning humanistic ethics with its naturalization of "the human species as the reference point for measuring other kinds of life" (Whatmore 2002, 156) and showing how "hybridity disturbs the habits that reiterate the cumulative fault-line between human/subjects and non-human/objects" (ibid., 161), Sarah Whatmore was a pioneer in considering how the entanglement of human and more-than-human actors produces hybrid (or *multinatural*) geographies and with it landscapes "in which people are situated through their practical engagements and affective relations with heterogeneous others" (Whatmore and Hinchliffe 2010 quoted after Fry 2023, 2497). With her essay on the onto-politics of natural hazards (Whatmore 2013), she was also the first to connect the terms "more-than-human" and "political ecology", laying out an approach for exploring the role of human and more-than-human powers in the distribution of risks in uneven socionatural geographies (Gesing 2022). Upon closer examination, that perspective was not totally new. Several years before the coinage of a "more-than-human political ecology", scholars of ANT-inspired *political animal geography* had already started to conceptualize animals as powerful *political actors* (Hobson 2007), with the goal to “re-place and re-politicize the nonhuman” (Johnston 2008, 635), to focus on the politics and political effects of “creatures previously appearing on the margins of anthropology as part of the landscape, as food for humans, as symbols” (Kirksey and Helmreich 2010, 545). One of the main assumptions in that context is that more-than-human entities’ political agency is just like *humans’* political agency *distributed*, i.e., the property of a network of relationships (Bennett 2010). In other words, the ability to act (in specific ways) comes from and is shaped by one’s relationships with others, by one’s position in a contingent network (Latour 2005). Even if the network, or assemblage as I prefer to call it, unfolds on a horizontal basis, representing a “flat ontology”[20] (Stengers 2010), networks are never neutral nor politically innocent, not to speak of the positions and relationships within that network (Bryant 2011). Even though the environmental humanities are repeatedly (and all too often unjustifiably) accused of ignoring power relations by “lumping together” different actors and allegedly blurring responsibilities and accountability (Hornborg 2017; 2021; Komi and Nygren 2023), it seems to me that focusing on struggles and contestations that arise when networks form, when different beings and their *vital materialities* (Bennett 2010) come together, is a good starting point for thinking *politics* beyond the “human sphere” (Braun and Whatmore 2010), for opening up politics “to the possibility of divergence among collectives composed of humans *and* nonhumans” (Blaser and De La Cadena 2018, 12; italics by author). In doing so, we come to a different understanding of “politics”, one in which politics points to the emergence of previously *unrecognized* or *unnamed* political subjects (be they *humans* or more-than-humans), to the “ontological” (Mol 1999) or “pluriversal politics” (Escobar 2020) of different beings’ reality-making in the face of agonistic ontologies (Blok 2011; De La Cadena 2015; Hinchliffe and Whatmore 2017). It is such an understanding of politics as a matter of conflicting ontologies

[20] According to Bryant a flat ontology implies „that all entities are on equal ontological footing and that no entity, whether artificial or natural, symbolic or physical, possesses greater ontological dignity than other objects. While indeed some objects might influence the collectives to which they belong to a greater extent than others, it does not follow from this that these objects are more real than others“ (Bryant 2011, 246).

that informs what Ogden and colleagues (2013, 16) have first termed a "*multispecies political ecology*", that characterizes what I continue to develop in a different spelling as a "Multi-Species Political Ecology" (MSPE): A power-critical approach that engages "complex webs of multispecies interactions along with political ecology's concern with social matters" (Karlsson 2018, 22), that merges political ecology and more-than-human perspectives to explore power relations and conflicts in the assembling of different beings. As I argue, extending political ecology "beyond the human" must not contradict the critical tradition of political ecology. By accounting for how human and other-than-human beings "become with" one another in and through the *Capitalocene* (Malm and Hornborg 2014), an MSPE adds to political ecology's critique of capitalism, provided we understand capitalism not as a counterpart to society, but "as a multispecies, situated, capitalist world-ecology" (Moore 2016, 6) emerging "through the messy and contingent relations of humans with the rest of nature" (Moore 2011, 111).

2.2 From Assemblages over World-Making to Ecological Justice: Conceptual Building Blocks of a Multi-Species Political Ecology

2.2.1 Assemblage(s)

Long before scholars in the humanities have discovered the concept of *assemblage* (f.ex. as an alternative to the all-too-stable sociological notion of the "group"), ecologists have thought in categories of relational groupings, Multi-Species communities and assembled beings since Haeckel and Darwin (Pepper 1996; Morton 2010). While Darwin still made the mistake, as Gregory Bateson (1972, 579pp.) argues in his *Ecology of Mind*, to assume that the central evolutionary unit would be the self-reproducing *organism* or *species*, natural philosopher and anarchist Pjotr Kropotkin (1902) was one of the first to stress the importance of "mutual aid" between different beings, i.e., of cooperation and not competition as the driver of evolution. In what would become known as the *endosymbiotic theory*, evolutionary theorist Lynn Margulis (1970) finally proved what Kropotkin anticipated, namely that the organelles of an *eucaryotic* plant cell evolved from *procaryotic* cells, or differently: that complex life evolved from the *symbiotic*, i.e., mutually beneficial "becoming with" (Haraway 2008, 3pp.; 2016, 58pp.) of different entities, and *not* from the self-sustaining, independent and competitive individual. Based on that, Margulis declared *symbiogenesis* – the fusion of genomes in symbioses – the driving force of evolution, and cooperation as the key to (joint) survival[viii] (Margulis and Sagan 1997). As a consequence of that, Margulis, Haraway and others question the notion of bounded, self-replicating units called *species*, but instead use the term *holobionts* or *lifeways* as a designation for assembled beings, for "knots of diverse intra-active relatings in dynamic complex systems" (Haraway 2016, 60)[ix]. Another impetus for thinking about assemblages came from the work of Estonian biologist Jakob von Uexküll (1992 [1957]). Famous for introducing the term *Umwelt* (environment) as a unity of living beings with their surroundings, as a "reality *for*" (Ingold 2000, 193), Uexküll anticipated much of today's thinking on symbiosis, coexistence (Morton 2010) and biosemiotics (Hoffmeyer 2008).

Within the humanities, the concept of assemblage is particularly associated with French philosophers Gilles Deleuze and Félix Guattari and their works *Anti-Oedipus* (2019 [1972]) and *A Thousand Plateaus* (2007 [1987]). The original French term for the English translation “assemblage” is *agencement*, a “term that refers to the action of matching or fitting together a set of components (*agencer*), as well as to the result of such an action: an ensemble of parts that mesh together well” (DeLanda 2016, 1). In this sense, an assemblage is both *process* and *outcome*. One of the most common definitions of what an assemblage is can be found in the famous dialogues of Claire Parnet and Gilles Deleuze, defining an assemblage as

> a multiplicity which is made up of many heterogeneous terms and which establishes liaisons, relations between them, across ages, sexes, and reigns – different natures. Thus, the assemblage’s only unity is that of co-functioning: it is a symbiosis, a ‘sympathy’ […] (Deleuze and Parnet 1987, 69).

There are important implications to this definition. First, an assemblage comes as a *complex contingent non-reducible whole* that enmeshes heterogeneous parts and second, it binds these parts together through the establishment of relations (DeLanda 2016, 2-3; Escobar 2008, 287). Further, the properties of the assemblage *emerge* from the interactions between the assembled entities. For Deleuze and Guattari (2019 [1972]), an assemblage spreads *rhizomatically*[x], an assemblage is always connected to and enmeshed with other (larger) assemblages, it has a contingent historical identity, it does not presuppose essential identities of the entities involved, its multiple parts are replaceable, and it implies what I introduced above as a flat ontology in which all assemblages and entities have the same ontological status.

One scholar that has attempted to systematize and rethink Deleuze’s and Guattari’s conceptualization of assemblage in favor of an “assemblage theory” is Mexican philosopher Manuel DeLanda (2016). While DeLanda mostly adopts Deleuze’s and Guattari’s notion of what an assemblage entails[21], he reformulates their concepts in favor of a coherent theoretical framework – one that enriches the concept of assemblage with parameters such as *deterritorialisation* and *territorialisation, coding* and *decoding*[xi] (DeLanda 2016, 22pp.). In his book *Assemblage Theory,* DeLanda (2016, 3) claims to go beyond Deleuze and Guattari by developing a "materialist social ontology", one that enables to analyze communities, cities and countries as assemblages (in extension of Deleuze whose social ontology only encompassed the levels of the *individual,* the *group* and the *social field*; DeLanda 2016, 39). What makes DeLanda's "assemblage theory" interesting is that for him assemblages exist as *real* and *material* entities ("*independent of the content of our minds"* (ibid., 138), as "unique historical individuals" (140). This last point considered, approaching assemblages requires studying the "historical processes which produced or brought [the assemblage] into being" (ibid.)[xii].

Another way of thinking about and through assemblages can be found in the neomaterialism of political theorist Jane Bennett. In her seminal work *Vibrant Matter: A Political Ecology of Things* Bennett (2010) reworks ideas like Spinoza's "conatus" into the notion of a "thing-power", a relational power that lies in the energetic vitality and material recalcitrance of things, that, as she (2004, 365) puts it in another work, is "immanent in collectives that include humans, the beings best able to recount the experience of the force of things". For Bennett (2010, 23p.) "assemblages are ad hoc groupings of diverse elements, of vibrant materials of all sorts. Assemblages are living, throbbing confederations that are able to function despite the persistent presence of energies that confound them from within". From a political-ecological perspective Bennett's way of thinking through assemblages is particularly promising as for her "assemblages have uneven topographies, because some of the points at which the various

[21] DeLanda (2016, 19-21) outlines assemblages on basis of four principles: 1) "Assemblages have a fully contingent historical identity, and each of them is therefore an *individual entity*", 2) "Assemblages are always composed of heterogeneous components [including persons, symbolic and material artifacts, technologies etc.]", 3) "Assemblages can become component parts of larger assemblages" and 4) "Assemblages emerge from the interactions between their parts, but once an assemblage is in place it immediately starts acting as a source of limitations and opportunities for its components".

affects and bodies cross paths are more heavily trafficked than others, and so power is not distributed equally across its surface" (Bennett 2010, 24). In other words, assemblages are shaped and permeated by power relations, hence working with and through assemblages is worthy of political ecology as a power-sensitive and -critical approach.

One way of conceptualizing assemblages and assembling that is particularly useful for an MSPE is Anna Tsing's notion of assemblage(s) as laid out in her *Mushroom at the End of the World* (Tsing 2015). Promising insofar as Tsing relates assemblages to (more-than-human) world-making practices and (more-than-human) landscapes, exploring how assemblages gather *and* re-make *lifeways* (Tsing 2015, 22p.), and how world-making is always a property of assemblages (and not of individuals or single species). For Tsing (ibid.), "assemblages are open-ended gatherings. They allow us to ask about communal effects without assuming them. They show us potential histories in the making." Already in an earlier work, Tsing sketched out two ways of studying the social worlds and histories of more-than-human beings: "attention to assemblages and attention to form" (Tsing 2013, 31). What makes Tsing's "attention to assemblages" special is that she stresses the importance of "watching the interplay of temporal rhythms and scales in the divergent lifeways that gather" (Tsing 2015, 23). If these gathering lifeways "drag political economy inside them", but there is no teleology or single historical trajectory to which all beings are subjected, studying assemblages is all about looking at "what comes together" (ibid.) through world-making, that is through different beings' joint "performances of livability" (ibid., 157-158). On a landscape level, this translates into studying the "landscape's polyrhythms, that is, its enactment of multiple conjoined histories" (Tsing 2013, 34). It is these polyrhythms that make Tsing speak of "polyphonic assemblages", i.e., the gathering and multiplying of "rhythms as they result from world-making projects, human and not human" (Tsing 2015, 24).

My own conceptualization of what an assemblage can be and how to use it for an MSPE comes as a *bricolage* of some of the above-mentioned concepts and elements. As said, I am most inspired by Tsing's notion of assemblages as *open-ended gatherings*, but I also find DeLanda's approach to study assemblages as historically contingent real entities, and Bennett's take on assemblages as having an agentic capacity based on the vital materialities of the constituents promising. In my own research, I focus on assemblages (in an analytical plural) as *Multi-Species assemblages,* as place-, time-, context-specific and situated gatherings of different beings (B) that (for analytical reasons) are *centered* around one specific "focal being" (f.ex. Norway spruce; see figure 3) – a being that gives the assemblage its (analytical) identity and is particularly involved in and affected by bark beetle outbreaks, while the assemblage's actual properties and world-making capacities come from the interactions between the assembled actors (f.ex. bark beetle's infestation success from its symbiosis with fungi). As we can imagine, being involved in and affected by bark beetle outbreaks applies to a great, if not infinite number of beings (just think of all the bacteria, viruses, fungi, mammals, trees and others affected by and involved in a "simple act" like a bark beetle infesting a tree), and all of those beings are in turn part of infinite other assemblages. We might consider bark beetle outbreaks in this sense as a specific constellation of assemblages, as a (second order) gathering of gatherings (of gatherings etc.), or differently: as the *world-making-related* coming together of different assemblages, in our

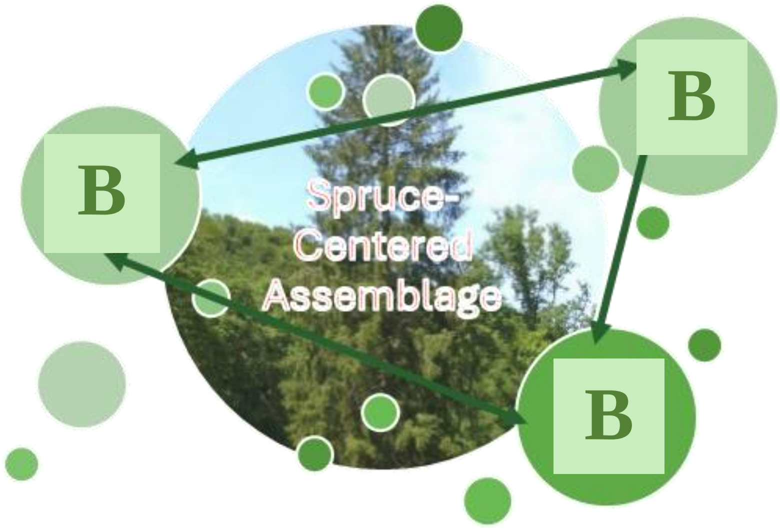


Fig. 3: Spruce-centered Multi-Species assemblage. © Author, 2024.

case (and for the sake of simplicity): bark-beetle-, spruce- and human-centered Multi-Species assemblages (see chapter 2.3 and introduction to part III).

Studying outbreaks as a constellation of assemblages, as a Multi-Species gathering, implies focusing on the historicity and politics of that constellation, on how the constellation unfolds in the light of (larger) socio-ecological, political-economic and historical processes. In other words, thinking through assemblages requires to study the "historical processes which produced or brought into being any given assemblage" (and the interactions that have made it emerge) (DeLanda 2016, 140), as well as to analyze how assemblages and processes of assembling have social, cultural, political and environmental implications and impacts. This is doable when working with Tsing's concept of assemblages as *lifeways that gather in* (the form of) Multi-Species landscapes, especially because it gives us a *where* and a *what* that we can focus on. In line with that, assemblages are *temporal and spatial formations*, they unfold in time, space and on different scales, through world-making they constitute Multi-Species landscapes.

2.2.2 World-/Forest-Making

If assemblages stand both for process and outcome, for "actors" and "structures" (in the sense of dynamic patterns) – as every established assemblage acts "as a source of limitations and opportunities for its components" (DeLanda 2016, 21) – the practices that emanate from, that are carried out by assemblages are what I term "world-making (practices)". To put it more simply: Assemblages make worlds, world-making is what assemblages or assembled actors do. Once again, starting point is Anna Tsing's (2015, 22) way of thinking about world-making as emerging "from practical activities of making lives", as *practices of making worlds livable,* as "performances of livability" (ibid. 157-158). That said and given what some might find a caveat, namely that everything is world-making, I find it important to make the concept more specific. To do so, I will approach world-making through three dimensions or modes of world-making, that is *place-making, sense-/significance-making* and *time-making* (see figure 4). As I argue, world-making as performed by assemblages and assembled beings is always all three of those dimensions: 1) world-making always has a locus, materiality and spatiality,

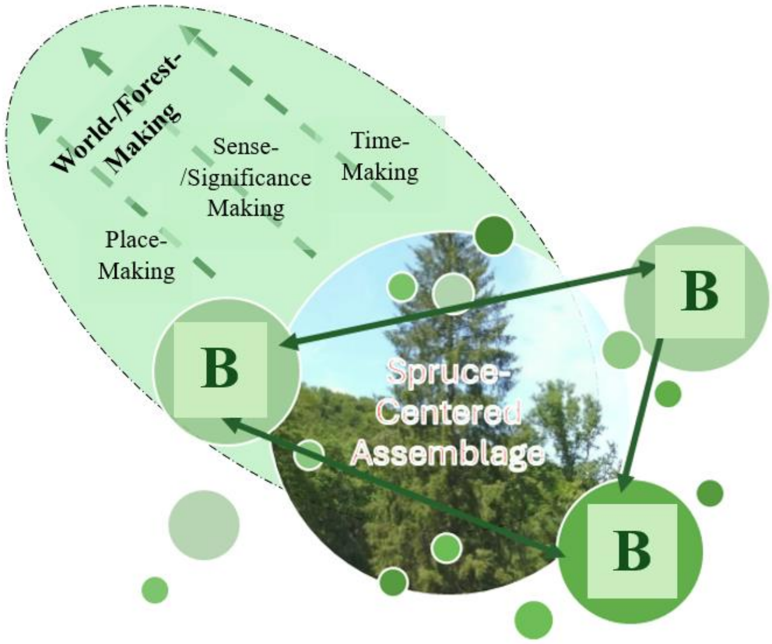


Fig. 4: Three dimensions of world-/forest-making (WM/FM). © Author, 2024.

making and reconfiguring the (physical) properties and meanings of *places* and *landscapes*, 2) world-making is always a semiotic practice of either producing or acting upon “vectors of significance” (Ireland and Cobley 2022, 188), of representing and making sense of the world (Kohn 2013), and 3) world-making always has a temporal dimension, not only coming with a certain duration, rhythm and temporal horizon, but also affecting the timescapes and world-making rhythms of other beings. In stressing these three dimensions, I try to relate world-making to earlier, similar or sometimes largely synonymous concepts like “dwelling” (Ingold 2000), “human world-making” (Goodman 1978; Rapport 2007) or “worlding” (Escobar 2016), and explicitly link world-making practices to biosemiotics (Kohn 2013) or the enactive approach of understanding all living beings as “sense-making beings” (E. Thompson 2011)[xiii]. Given that every being makes worlds livable for itself (and for its many partners), world-making is an ideal concept for bridging social and natural sciences, for finding a common ground on what to focus on. Even if forest entomologists and social anthropologists may have different ideas about the scope, form and implications of world-making, they can both agree on the fact that bark beetles and humans *do* concrete things in, for and through forests, that they re-make forests[22]. Moreover, both creatures are (through being assembled) capable of affecting others and their surroundings (Latour 2005), of having a “more-than-human sociality” and by that a certain “freedom to act” (Tsing 2013, 31). It is the *relationally-grounded[23] ability to make worlds* (*without* needing “agency thresholds” like intentionality, self-reflexivity and symbolic language use; Callon and Law 1995, 491; Whatmore 1999, 29) that is for me the common denominator of *agency*[xiv]. Albeit many may find that definition too obvious or even trivial, it helps stressing the similarities between human and more-than-human beings (Jones and Cloke 2002, 50), it does not “seek to attribute action to a small number of powers [i.e., human powers], leaving the rest of the world with nothing but simple mute forces” (Latour 1993, 138). Following that, I consider world-making to be the central condition, manifestation and consequence of agency. However, world-making does not mean that every being can do as it pleases, that the process of making worlds is a random undertaking without struggles, structural confines, inequalities and power disparities. An MSPE would not deserve to be called political-ecological[xv] if it would not look at structural dimensions, historical legacies and “topographies of power” (Bennett 2010) in and through which world-making takes place.

[22] This is where *world-making* becomes *forest-making*, describing a kind of world-making that takes place in the *places* and *landscapes* that it produces. So albeit world-making is in its practical effects not limited to any single sphere, place or process (as we never know what world-making ultimately leads to), speaking of forest-making is the attempt to make world-making more specific in that it describes practices of *making forestworlds livable*. In line with that logic, we could say that forest management is composed of forest-making practices, that forestry is an entire system of forest-making practices.

[23] In accordance with relational and object-oriented ontologies the ability to make worlds derives from relations, and not from the individual isolated entities themselves. In line with that, many Multi-Species scholars are inspired by feminist philosopher Karen Barad and her onto-epistemological *agential realism*. Here, Barad coins the concept of “intra-action” which points to phenomena being constituted through the interplay of never-fully-consolidated subjects and their “agencies of observation” (Barad 2003, 815).

2.2.2.1 World-Making as Place-Making: On Dwelling, Belonging and (Bio-)Security

Coming back to the three dimensions of world-making in my framework, *world-making as place-making* is the one dimension that is most easily visible at the form and composition of certain *places* and *landscapes* (Tsing 2013; Mathews 2018), that manifests itself in changes of living arrangements, no matter how small they are. When I speak of *place*, I consider the latter with Doreen Massey (1994) not as a mere spatial or physical reference size, but as a multi-scalar and multi-temporal *network of social relations*, as "politicized, culturally relative, historically specific, local and multiple constructions" (Rodman 2003, 205). In other words, *places* are fluid and relational, they are sites of multiple histories and identities, they are subject to negotiation, entrenched with stories, narratives and meanings (making them "places of…" or "…-places"; Jones and Cloke 2002), and given the co-constitutedness of life they are always a joint human and more-than-human project (Casey 1997; Raffles 2002). Differently, places are manifestations of what Tim Ingold (2000, 185pp.) calls "dwelling", that is practices of *making oneself at home in the world* and "in a place" (Antonsich 2010, 645), practices that come from "being in the world", that unfold from "within the current of [humans' and more-than-humans'] involved activity, in the specific relational contexts of their practical engagement with their surroundings" (ibid., 186). Dwelling is world-making, and as "dwellers", living beings make worlds *from within* their relational networks, *from within* their webs of significance, *from within* their inhabited and co-produced environments. In line with that, world-making as place-making is inextricably tied to *belonging*, it is making oneself and others *belong in and through a place* (Srinivasan 2013) – here: through (re-)making places in ways that include some and exclude others, pointing to what Fry (2023, 2495) calls the "socio-spatial politics of belonging". Precisely because world-making means turning places into "places of...", it happens that those who are not allowed to dwell in these places are stylized as a threat – biopolitically spoken, as a (bio-)security issue (Hinchliffe and Bingham 2008). In other words, there are *those who* *belong* (because they can establish themselves as belonging, as appearing to belong), and *those who do not* (because they are believed to endanger the place and its place-makers), i.e., those who are deemed undesirable, dangerous, and thus "killable" (Braun 2007; Clark 2013; Emerson 2021). As we will see in later chapters (8–10), the bark beetle is due to its mobile and highly eruptive place-making a particular trouble-maker. Although only a few forest owners would claim that the bark beetle does not belong in the forest at all, most of them do not want to have it in *their forest* (i.e., in their "backyard"), and this in turn feeds into a conflict-laden politics of bark beetle management, (forest-)place-making, belonging, and (bio)security.

With dwelling being the practical side of what human and more-than-human actors do in and through places, *landscape* comes into focus as a "taskscape made visible" (Ingold 2000, 203), as the knotting-together of different beings' dwelling practices, as the movement of different beings travelling "from place to place". In other words, landscapes are created, shaped and reconfigured by different beings' world-making practices, they have a specific temporality coming from overlapping (Multi-Species) trajectories (Ingold 1993). It is these trajectories, the past and current "performative achievement of heterogenous actors in relational spatial/temporal settings" (Jones and Cloke 2002, 51) that manifest in what Tsing and colleagues (2019, S187) call "landscape structures", that is "patterns of human and nonhuman assemblages as these emerge historically", patterns that come from and point to the entanglement of human and more-than-human world-making, to the coming-together of human and more-than-human histories (Tsing 2013, 2015). Be it a beaver changing the course of a river, a spruce tree making places livable for itself and its offspring, a bark beetle changing the forest structure by producing gaps in the canopy, or a human afforesting an agricultural area with trees – world-making is the collaborative effort of making *workable living arrangements,* arrangements that have impacts on and consequences for everyone else.

2.2.2.2 World-Making as Sense-Making: On Significance and Responsibility

With regards to the second dimension of world-making, that is *world-making as sense-* or *significance-making,* we see that world-making is more than just shaping and changing the physical properties of a given place including the material living arrangements of others, but always happens under the guidance and through the (re-)production of signs, in our case on basis of representations that different beings have of others, themselves, their surroundings and their world-making purposes, interests and possibilities (Hoffmeyer 2008). In the case of humans (and others, we might want to add) with their particular "webs of significance" (Geertz 1973, 5) comprised of discourses, meaning and symbols, sense-making is an important means and precondition of world-making, and albeit *humans*, as Sayer (1992, 34) puts it, "neither live on bread […] nor on ideas and symbols alone", they are often ready to die for these ideas and symbols, not to mention let those become and/or structure their realities. The assumption that world-making entails sense-making and sense-making goes beyond humans is indebted to insights from biosemiotics (Hoffmeyer 2008) and particularly to Eduardo Kohn's (2013, 9) thinking about "life as constitutively semiotic", of life as an "ecology of selves". For Kohn, all living creatures live "with and through signs" (ibid.), with signs defined "as forces which […] direct an organism's engagement with its environment" (Ireland and Cobley 2022, 187). A sign *informs*, it helps a certain being to observe and "meaningfully interpret [what is going on around and because of it] to ensure its survival and welfare" (Hoffmeyer 2008, 184), through representations (of where to move/grow, of what to eat, of who to mate with, of who to fight, and who to better avoid), signs enable, drive, direct and inhibit the spatiality, time and form of a being's world-making, of what to *do* in a certain situation (Thrift 2005). That said, world-making as making worlds *significant,* as making worlds *meaningful* (Sebeok and Danesi 2012) is not the task of an individual, but a "matter of relations and forms established through vectors of *significance*" (Ireland and Cobley 2022, 188; italics by author), and these vectors of significance are in turn produced and enacted by a being's engagement and entanglement with others. In line with Nigel Thrift (2005), we might say that being able to make sense of one's environment (and thus of oneself as one is always part of "the environment"; Lewontin and Levins 1997) is the prime form of intelligence, with intelligence coming as the property of an *extended organism*/assemblage, and not as the mere result of certain cognitive capabilities[24]. With intelligence comes the ability to be affected by and to respond to others, bringing us to a concept that is helpful when approaching world-making as sense-making – to responsibility, or better: "response-ability" (Haraway 2016). Making sense of what others do and how that affects one's own world-making is a central feature of living within human and more-than-human worlds and webs of significance. As Trundle (2023, 281) puts it,

> "to speak about responsibility is to speak of our diverse attempts to live within relational worlds, and our commonplace failure to live up to the ethical dilemmas that emerge from the sociality of life, be they in families, friendships, communities and nation states, or in relation to non-human worlds".

That said, responsibility in the sense of being or holding someone accountable for one's or this someone's world-making "is not concentrated in the hands of a single human-savior figure, [but] it is diffused across a spectrum of human, nonhuman, and more-than-human elements" (Chua 2023, 26). As Komi and Nygren (2023) put it (insisting on the distinction between intentional human and non-intentional more-than-human agency), we might better speak of an entire "political ecology of responsibility". As we will see, looking at how specific actors such as bark beetles, new forest owners (chapter 8), conservationists (chapter 9), or foreigners

[24] As we will see at the example of spruce, a tree is insofar intelligent as it is able to (non-consciously, but still purposefully; Marder 2013) explore resource gradients, assess dangers, discern and respond to chemical signals, environmental changes and the world-making of others, in short: it is able to make sense of the world and its position in it, it has a certain representation of how to make that world livable, not only for itself, but also for its offspring and symbiotic partners (Simard 2021). Of course, a spruce tree cannot do everything (neither do humans), and there are certain physiological, biological, ecological and social limits to what a tree (or a human) can accomplish; limits that guide and structure the world- and sense-making of spruce, making spruce have a distinct "perspective" or "point of view" (Viveiros de Castro 1998; Kohn 2013), and accordingly a life with distinct "tendencies", as Thompson (2011) calls it. It is this situatedness and distinctiveness of world-making and its manifestation in "'*worlds-for*'" (Thrift 2005, 465) that makes it so difficult to imagine what world-making for more-than-humans must be like.

(chapter 10) are held responsible for forest-related risks and damages, i.e., how they are *scapegoated*, tells us more about material, discursive, ideological, and institutional relations than about the "actual" world-making practices of said actors.

2.2.2.3 World-Making as Time-Making: On Rhythms and Legacies

Ultimately, this brings us to the third and last dimension of world-making, that is *world-making as time-making.* As Anna Tsing (2015, 21; italics by author) brilliantly puts it, "each living thing remakes the world through seasonal pulses of growth, lifetime reproductive patterns, and geographies of expansion. Within a given species, too, there are multiple *time-making projects*, as organisms enlist each other and coordinate in making landscapes". Time-making plays an important role not only in the context of world-making as *legacy-making*[25] (i.e., as producing legacies with lasting effects on other beings and assemblages), but also because world-making is inherently about timing and timespans, about producing, following and eventually changing the world-making rhythms of oneself and others (Tsing 2015, 24p.). In the words of Gan and Tsing (2018, 103), human and more-than-human communities "align with each other through timing to make living in common possible". That there are indeed different world-making rhythms is not only explained by the fact that living beings "live in different times, in terms of metabolic rates, reaction times and forms of foresight, lifespans and memories" (Thrift 2005, 465), but also means that "polyphonic assemblages" (Tsing 2015, 24) impose their respective world-making rhythms on one another, that they sometimes force each other to adjust the timing and pace of world-making (Adam 1998), f.ex. to accelerate, decelerate or abruptly stop world-making (as in the case of being killed). An example: A tree like spruce *needs a certain time* (less and less with climate change, in itself a mismatch of historical and

[25] When I speak of *legacies* I situate this concept in an environmental-historical context, grasping legacies as long-term manifestations and consequences of (Multi-Species) living arrangements, as the tangible aftereffects of so-called *socio-natural sites*, to quote the environmental historians Winiwarter and Schmid (2020; cf. Winiwarter *et al.* 2016) at this point.

geological time; Chakrabarty 2009) to grow large enough to be considered harvestable by human foresters (usually after 80-100 years, that is the temporality of planning, i.e., "the time it takes"; Abram 2014). During that time, the human who has initially planted the tree dies (i.e., its world-making capacities end, albeit its world-making projects live on), leaving the tree harvest to subsequent generations, themselves acting based on multiple world-making rhythms and temporalities, multiple "regimes of time" as Guyer (2007) once called it. When the "third generation" forester finally starts to think about harvesting the tree (having expectations about the *future*), the *now* happens in the form of a bark beetle outbreak abruptly ending the world-making of our spruce tree, happening too fast for our forester to react in a way that would save the tree from dying. Next year, the forester promises to him-/herself to be faster, to cut down an infested tree immediately after it has been infested, adjusting one's world-making rhythm, the temporal horizon and timing of management interventions to the reproductive timespan, to the phenology of the bark beetle (Bastian and Bayliss Hawitt 2023).

As I have said at the beginning when referring to the "politics of world-making", world-making is inherently political. Given that lives are "lived collectively within fields of power" (Ingold 2005, 503), world-making always happens at someone's expense. This is because world-making practices, or what we could call on a more aggregated level world-making *projects* – an array of WM practices with a common purpose – *overlap*. Through overlapping world-making practices we see, feel and become affected by the presence of others, overlapping world-making is fundamental for the emergence of life through encounters. Yet as formative and beneficial world-making overlaps might be, as much as they open up possibilities for collaboration and co-constitution, overlapping world-making projects also lead to (world-making) disadvantages and damages for involved world-makers, to (spatial and temporal) incompatibilities in the assembling of different beings. Consequently, world-making comes with power moves, conflicts and interests, concepts that we will look at in what follows.

2.2.3 Power, Conflict and Interest Coalitions

When an MSPE approach looks at assemblages and their world-making, it does so through the prism of *power* and *conflict* – two concepts that are formative for political ecology. Above, I have mentioned that agency as the ability to affect, as the ability to make worlds (in terms of places, meanings and temporalities) is enabled by and rooted in Multi-Species relationships. So is *power*. Yet, an MPSE reading of power is different from the predominantly human-centered power theories in political ecology, according to Svarstad and colleagues (2018, 352pp.) circling around three major perspectives: 1) „actor-oriented power perspectives“, 2) „neo-Marxist power perspectives“ and 3) „discursive power perspectives“[xvi]. Whereas actor-oriented perspectives revolve around the Weberian understanding of a certain actor making someone do something against this person’s will, neo-Marxist power perspectives understand power as linked to class relations, the distribution of resources/means of production and the structural dynamics of the capitalist mode of production. Discursive power perspectives circle around the Foucauldian notion of *discursive power,* that is power as producing and structuring “the possible field of action of others” (Foucault 1982, 790), a power “that is exercised when actors such as corporations, government agencies or NGOs, produce discourses and manage to get other groups to adopt and contribute to the reproduction of their discourses” (Svarstad *et al.* 2018, 356). Partly building on these existing approaches, but mostly reconfiguring them, third generation, more-than-human or Multi-Species political ecologists take a slightly different path. Not only do they assume that power expresses itself “in relational, performative moments“ (Ahlborg and Nightingale 2018, 387), but also that power relations go beyond the “human realm”, that power is not “held” by individuals, but (re-)produced by and located in the entanglement of human and more-than-human actors, operating in, from and through “rooted networks” (Rocheleau 2015). They would also say that power is more than just “a social relation [among humans] built on an asymmetrical distribution of resources and risks“ (Hornborg 2001,

1) inherent to and (re-)produced by capitalism, but a relation that is built on the ability of putting Multi-Species relations and “the web of life” to work (Moore 2011, 2016), and by that also on the non-recognition, disavowal and exploitation of more-than-human world-making. Insisting on the power-critical and political-economic agenda in Anna Tsing’s *Mushroom at the End of the World*, Tsing shows how the Matsutake’s *agentic power*, its *relational* force to rearrange, influence and build personal ties along its global network, comes not merely from the mushroom’s exchange value, from terms of trade, but from the mushroom’s qualities developed from its entanglement with others. Looking at capitalism as a mode of using and rearranging Multi-Species relations/assemblages “turns out to be a method that might revitalize political economy as well as environmental studies. Assemblages drag political economy inside them, and not just for humans. […] Assemblages cannot hide from capital and the state; they are sites for watching how political economy works” (Tsing 2015, 23). This quote shows why Tsing’s approach is a reworking and extension of Marxian thought and not a break with it. Tsing is well aware of the (temporally and spatially specific) influence of political economy on the formation of assemblages (Tsing *et al.* 2019), she is aware that capitalism “has directed long-distance destruction of landscapes and ecologies” (Tsing 2015, 19), but – contrary to orthodox critical political economists – she breaks with the assumption of an all-encompassing, unidirectional and stable character of capitalism (as external to *nature*), arguing that capitalism has always operated from within nature, it has always been relying on more-than-humans, on the exploitation of what Jason Moore (2011; 2016[xvii]) calls an unreproducible “Cheap Nature”.

When considering power, we often think about *politics*, particularly when operating with a definition of politics as „practices and processes through which *power*, in its multiple forms, is wielded and negotiated“ (Paulson *et al.* 2005, 28; italics by author). Accordingly, with a different understanding of power comes a different understanding of politics, namely of politics as going beyond humans and their institutions, but encompassing “the agency of objects and other beings in producing social collectives, collective action, citizens, and subjects" (Ogden *et al.* 2023, 16). Grasping politics from an MSPE perspective is thus about looking at how "collectives composed of humans and nonhumans" (Blaser and De La Cadena 2018, 12) form *cosmopolitical* assemblies (Latour 2004a; Stengers 2005a; 2010), assemblies in which those become *political subjects* that are able to force themselves qua world-making[26] into the political fray, in Rancière's (1999) words that are able to *disrupt* the existing order, to make themselves considered (Swyngedouw 2014). In this sense, political agency comes from world-making, "politicalness" is a matter of world-making capacities (of world-making *powers* if we want), here: in terms of being able to affect others, to change other beings' world making or the structural settings in which these others make worlds (cf. Meijer 2019). From that follows my definition of power in an MSPE context, namely power as the *distributed ability to affect the world-making of other beings, and the ability to alter and orchestrate the structural settings in which world-making plays out.* Power is thus a matter of concrete relationships (between, among and across assemblages in time and space), a matter of how much one is able to affect others and their world-making. Affecting others can go so far that it becomes difficult, problematic or impossible for these others (to continue) to make worlds. Rendering world-making (permanently) impossible such as by killing the world-makers or destroying their living arrangements points to the *biopolitical dimension* of power, of being able to structure other world-makers' fields of action in a way that decides over who gets to live and who gets to die (Foucault 2003; Emerson 2021).

That affecting others in a way like that may lead to suffering, resistance, tensions and struggles is not surprising, and with that we come to another central concept of an MSPE: *conflict*. In a political-ecological context usually defined as "a contested incompatibility

[26] Fittingly, recent scholars have started to approach politics as an everyday practice, and that through the conceptual lens of world-making. In line with that, Postero and Elinoff (2019, 3) have recently defined politics as "practices of world-making that proceed through the formulation of constellations of critique, disagreement, difference, and conflict."

between groups in relation to ecological systems“ (LeBillon and Duffy 2018, 242), conflicts do not just happen between human actor groups, but relate to, stem from and are driven by power relations and (world-making) disparities among, across and between Multi-Species assemblages, making them so-called "Multi-Species" or "world-making conflicts". Multi-Species conflicts happen in the "contact zones" of human and more-than-human actors, they emerge *when species meet* (Haraway 2008), when world-making practices/projects overlap in ways that are disadvantageous for some of the involved world-makers, that is when world-making practices thwart, challenge or exclude one another, when (someone's) world-making acts out as *incompatible* (with the world-making of someone else) (Tsing 2015, FN 7, 292). Of course, what incompatibility means and for whom it occurs depends on various factors. One could say that the matter of why the gathering of bark beetles, humans and spruces comes with world-making conflicts is easily explained. Greedy forest owners established spruce plantations for making money. Enhanced by climate change and susceptible monocultures, bark beetles feast on those spruce plantations; their populations explode, spruce trees lose out, and humans pay the price. Only at second glance we see that the matter is more complicated, not only because it is a *contingent constellation of assemblages and actors* that makes world-making projects overlap and "compete", but also because there are many more actors involved than humans (can) *recognize* and *account for* (O'Gorman 2021), not to speak of the instability and internal heterogeneity of all the mentioned actor groups. Apart from that, we cannot be satisfied with the explanation that conflicts are simply the outcome of "a contested incompatibility between groups in relation to ecological systems“ (LeBillon and Duffy 2018, 242). Besides the limitation that the "classical" environmental conflict perspective excludes the agency of more-than-humans altogether, the common framing of Multi-Species conflicts as "human-wildlife conflicts" can be similarly problematic (Lamarque *et al.* 2009; Dickman 2010; König *et al.* 2020). This is because grasping Multi-Species conflicts as conflicts that "occur when the *needs* and behavior of wildlife impact negatively on the *goals* of humans […]" (Madden 2004, 248; italics by author) rectifies the human-nature divide by dichotomizing human interests as (rational) "goals" and more-than-human interests as (instinctual) "needs", and in doing so relegates interests to the domain of intentional and self-reflexive humans (for a more-than-human approach of studying "human-wildlife conflicts" (see Margulies and Karanth 2018). Differently, approaching conflicts as conflicts *for* humans[27] does not help us to understand who benefits when species assemble. For doing so we need to start from the assumption that conflicts unfold between, among and across assemblages, that conflicts emerge through Multi-Species relations, involving more than one or two "distinct" monolithic beings (Suryawanshi *et al.* 2013). Based on these considerations, I consider Multi-Species conflicts to be world-making conflicts, that is *contingent site-specific processes of overlapping and incompatible world-making practices and projects*[xviii]. Related to and in tandem with that conceptualization of conflict, I correspondingly argue for a rethinking of the concept of *interests*, namely not as something that a species *has* and *pursues* qua its biological species membership, but as goals, practices and representations that beings *collaboratively* pursue for making worlds livable[xix]. Given that lives are lived collectively, that worlds are (and need to be) *shared* (Hinchliffe and Bingham 2008), interests are shared as well, they go beyond orthodox group categories, species boundaries and biological kingdoms. It is these *shared world-making interests* that make gatherings „encounter-based collaborations" (Tsing 2015, 27), that constitute what I frame here as „Multi-Species interest coalitions", i.e., Multi-Species assemblages that – on basis what Stengers (2010) calls "symbiotic agreements" – confederate for common world-making causes (and mutually beneficial world-making outcomes).

[27] I do not deny that, as Komi and Nygren (2023, 1242) stress, "conflicts regarding wild-life conservation have more to do with prevalent legislation, institutional rules, power relations, political-economic conditions, and differences in values and priorities between different people, than between humans and wildlife". I just want to stress that we miss the point if we say that Multi-Species conflicts are ultimately all about humans, only because the latter are the ones to be held *responsible* in "classic" political terms.

2.2.4 Ecological Justice and the "Politics of Conservation"

Having spoken about assemblages, overlapping forest-making practices and related Multi-Species conflicts, and thus having so far only focused on violence and power disparities in the gatherings of different beings, the question arises whether there is a concept that outlines/proposes a way of keeping conflicts to a minimum, of reflecting, fighting and reducing (structural) environmental injustices, of moving towards a more *just* life *for all*. One approach that seems useful both conceptually and on a normative level is the idea of "ecological" or alternatively "interspecies justice", an idea picked up and advanced by environmental philosopher Anna Wienhues (2020) in her book *Ecological Justice and the Extinction Crisis: Giving Living Beings Their Due.* Picked up insofar as the term and notion of "ecological justice" (as a synonym, extension of or a counter concept to the more anthropocentric "environmental justice" concept) has been around for a long time (Low and Gleeson 1998; Plumwood 2002; Baxter 2005). Advanced insofar as Wienhues has managed to develop a much more inclusive, i.e., biocentric "account of justice that includes nonhuman living beings as holders of [justice] entitlements" (Wienhues 2020, 2). In doing so, Wienhues suggests "ecological space" as the currency of *distributive* ecological justice, that is she makes the im-/possibilities of "sharing of habitat on a shared planet" the reference point whether something is just or not (Wilson 2016). In the language of world-making, this means that human world-making is only then ecologically just if "wild"/non-domesticated more-than-human actors have enough space and opportunities to realize their own world-making, if habitats are shared and not exclusively used by humans, their artifacts, infrastructures and livestock (Wienhues 2018). In line with this conceptualization of ecological justice, Wienhues then envisions what it could mean to practice a form of "just conservation" (Vucetich *et al.* 2018; Treves *et al.* 2019), that is a conservation that strives for "a *compromise* between demands of ecological and environmental justice on the question of distribution of space in terms of habitat" (Wienhues 2020, 22). In doing so, Wienhues recognizes the nexus of environmental and ecological justice, for her it is clear that

> "no account of ecological justice will be able to provide much meaningful normative guidance if it is not possible to easily understand its interactions with other global justice demands *within the human realm*, such as particularly in the environmental context the demands of environmental justice" (ibid., 4; italics by author).

As we will see later, conflicts around and due to bark beetle outbreaks, and here particularly bark-beetle-related "forest conservation conflicts" (see chapter 9 and 10), often revolve around how much ecological space is left to different living beings, around the "politics of conservation" (Saberwal and Rangarajan 2003), that is around the question "of what is to be protected, for, by and from whom" (Saberwal 2000, 166). Acknowledging that (whatever the answer to the latter question is) there are winners and losers of conservation, i.e., that conservation is a contested cosmopolitical endeavor (Lorimer 2015), there are recent approaches under the header of "convivial"[28] or "just conservation" (Büscher and Fletcher 2019; Massarella *et al.* 2022) that explicitly link conservation to the question of justice; that attempt to envision a different kind of conservation that is not based on enclosure, exclusion, displacement, militarization and (epistemic) violence (Duffy 2010; Duffy *et al.* 2019; Vucetich *et al.* 2018), but on preserving or establishing conditions for the *joint* flourishing of human *and* more-than-human communities (beyond commodification and capitalist accumulation), for making *shared* environments *safe* for the overlapping of the world-making projects of different beings

[28] Inspired by philosopher Ivan Illich's plea for "conviviality", Büscher and Fletcher (2019, 282) define "convivial conservation [as] a vision, a politics and a set of governance principles that realistically respond to the core pressures of our time. […], it proposes a post-capitalist approach to conservation that promotes radical equity, structural transformation and environmental justice and so contributes to an overarching movement to create a more equal and sustainable world". Designed as a counter concept to (capitalist) "mainstream conservation" and its rootedness in commodifying a "wild" and "untouched" nature into a marketable *natural capital*, convivial conservation builds upon the ideas of changing enclosed parks into "promoted areas", "voyeuristic tourism" into "engaged visitation", as well as paying reparations and a *conservation basic income* to conservation-affected residential communities (ibid.).

2.3 Putting the Framework to Work: Bark Beetle Outbreaks through the Prism of a Multi-Species Political Ecology

I have so far only spoken of political ecology in an abstract theoretical sense, but neither have I mentioned political ecology's tradition in studying contested forests nor have I provided a workable operationalization of the concepts and thoughts that I have so far presented. To do the former first, we have to delve into the literature to see what political ecology offers us to account for the contested nature of forests, as well as for the scalar dynamics through which that contestedness unfolds. This is followed by a specification of my analytical framework, and how this framework is put to work in the different chapters of this dissertation, or differently: where I will focus on which political-ecological scale(s) and how this resembles a progression from the (rather) general to the (rather) specific. In line with that, I will 1) explain how I approach the actors and relationships that shape bark beetle outbreaks (chapter 4-6), namely through "analytical entry points", and 2) present the conflict field analytics that helps to explore the site-specific Multi-Species conflicts in chapter 8–10.

2.3.1 Political-Ecological Scales: From *Local* Outbreaks over *Glocal* "Political Forests" to the *Global* Plantationo-/Capitalo-/Proliferationocene

Struggles over forest resources, forest management and forest landscapes have always been a central issue in political ecology, especially in the context of political ecology's early critique of the colonial/imperialist origin and persistence of forest administrations and forest management in the Global South (Guha 1990; Peluso 1992; Bryant 1997; Fairhead and Leach 2003; Rajan 2006). Political ecologists have considered forest landscapes as sites of domination and resistance (Scott 1985; Rocheleau and Ross 1995), as arenas of identity politics, of contested (national) belonging (West 2006; Berglund 2006; Biermann 2016), as well as emblematic of the exploitation of ecosystems under the hegemony of capitalism (Bridge and McManus 2000; Pichler 2014). Beyond that, the recent quest for carbon sinks and "green assets" has contributed to an increased interest in forest areas, and here too political ecology looks at how said quest is enabled and accompanied by environmental injustices (Leach and Scoones 2015; Asiyanbi and Lund 2020)[29]. What all these works share, is that forests are looked at not as isolated local biophysical entities, but as *glocal*[30] phenomena (Escobar 2001), as "political forests", as forests that "produce and are products of particular political-ecological relations – congealed and convergent in material, ideological, discursive and institutional relations as well as claims by states or other governing bodies" (Vandergeest and Peluso 2015, 162). Emblematic for a political ecology approach, these political-ecological relationships are explored through a *scale*-sensitive lens (Brad 2016), where *scale* is more than just the level of one's inquiry, but something that is actively (re)produced and transformed through a constant "politics of scale" (Swyngedouw 1997) that does not exist as something neutral and given (Tsing 2000). Following that, allegedly "local" phenomena like bark beetle outbreaks are connected to and dependent on supra-local developments, they are part and result of a structural context (Bryant and Bailey 1997, 33pp.), they are embedded in (global) history, political economies, and socio-metabolic processes.

At the example of my own research, an MSPE perspective looks at bark beetle outbreaks through the lens of three merging (and constantly to be re-negotiated) scales (see figure 5, p. 57), namely at outbreaks as 1) *local* (context-dependent and place-specific) Multi-Species gatherings that happen 2) in and through *glocal* "political forests" shaped by institutional, material and discursive relations (manifest in policies, subsidies, laws, narratives etc. that connect the local, regional, national and international level). Ultimately, bark beetle outbreaks

[29] Given the breadth of political-ecological works on forests it is remarkable that a research agenda that studies forests as contested landscapes has not gained a comparable momentum in Central Europe. This may be due to political ecology's until-recent focus on peripheral and rural areas (Peet *et al.* 2011), but possibly also due to the allegation that forestry in (urban) Central Europe is a less controversial/power-laden matter. Fortunately, there is an increasing (but comparatively still little) number of publications tackling this shortcoming by showing that Central European temperate forests are also shaped by unequal power relations (Sandberg *et al.* 2014).

[30] When I speak of "glocal" as a composite concept that was first introduced by Robertson (1992), I use it as a conceptual middle ground that embraces that something is "neither [purely] local nor [purely] global" (Swyngedouw 1997), that there are „complex interactions between local populations and the larger, even global political economies (Greenberg and Park 1994, 7). When I thus speak of *glocal* political forests, I am expressing that forests are situated between local and global (Escobar 2001), that forests are subject to a "politics of scale".

are to be situated in the light of 3) *global(-historical)* processes of planet-making, they are to be understood as phenomena of "inflection points" that "change the name of the 'game' of life on earth for everybody and everything" (Haraway 2015, 159). It is these epoch-making inflection points and the particularities and discontinuities they represent that are outlined with the terms *Plantationo*-, *Capitalo* and *Proliferationocene* – with terms that help to make sense of the drivers, peculiarities and consequences of epidemic bark beetle outbreaks, in a time when biodiversity plummets, cheap nature stumbles, refuges disappear and *anthropos* has become a geological force. With regards to the first two "planet-making-scapes", the *Plantationocene* and the *Capitalocene* are brothers in arms – just think of how "the slave plantation system was the model and motor for the carbon-greedy machine-based factory system" (ibid., FN 5, 162) we associate with capitalism –, and as such they share both purpose and modus operandi, that is "moving material semiotic generativity around the world for capital accumulation and profit" (ibid., 160). While the *Plantationocene* offers a productive frame for understanding the ecological-cultural-biopolitical conditions for outbreaks to become epidemic, namely the humanly-orchestrated transformation of forests into "extractive and enclosed [spruce] plantations" (ibid., FN 5, 162; see chapter 4), the *Capitalocene* reminds us that plantations are established for accumulation purposes, they are part of "a system of power, profit and re/production in the web of life" (Moore 2017, 594; see chapter 5). That said, neither the plantation nor capital is absolute, all-powerful and all-transcending, and as much as the *Anthropocene* is "patchy" and "feral", as Tsing and others (2019) have shown, the *Plantationocene* and *Capitalocene* comes with ruptures, repercussions and unintended consequences as well, with "feral proliferations" as Tsing and colleagues (ibid.) have called it. It is these feral proliferations such as pests, pathogens, viruses and diseases that are the characteristic and dominant actors of what I frame here as the *Proliferationocene*, of a timescape of the unexpected, uncontrollable and unwanted rise of antagonists and byproducts of humans' attempts to dominate, exploit and simplify the web of life, in our case: a timescape of bark beetles shaking *capitalo*- and *plantationocenic* spruce forestry, of bark beetles feasting in collapsing spruce forests (see chapter 6).

Above, I have mentioned three different scales of an MSPE (*local – glocal – global*) and how these come with specific levels of inquiry. Whereas on a *local* level an MSPE needs to address ethnographically how different beings gather, how assemblages relate to one another, how world-making practices overlap, and how local (Multi-Species) communities are differently affected and reconfigured by bark beetle outbreaks (see esp. chapters 8–10), *glocal* or *supralocal* dimensions of outbreaks relate f.ex. to the economic, political and sociocultural implications and consequences of outbreaks, to uneven economic vulnerabilities (Abbott *et al.* 2009) and to diverging forest management narratives and practices (Flint *et al.* 2009), in turn contributing to conflicts over "political forests". To understand the influence of processes on outbreaks at the federal province and national level, an MSPE must look at the role of (federal) *state institutions*, public discourses and other (*structured) power relations,* with "the state" understood as a material condensation of social relations (Poulantzas 2020), as a heterogenous actor with a selectivity in (re-)producing certain narratives and story lines (Jessop 2013). Last but not least, an MSPE looks at the interactions of bark beetle outbreaks with *socio-metabolic developments* (societal use of timber, forests as carbon sinks etc.), *historical trajectories* (explaining the genesis of assemblages, forestry systems and disturbance events) and *political-economic dynamics* (along a global wood value chain characterized by power disparities and an uneven distribution of risks and benefits) (see figure 5, next page).

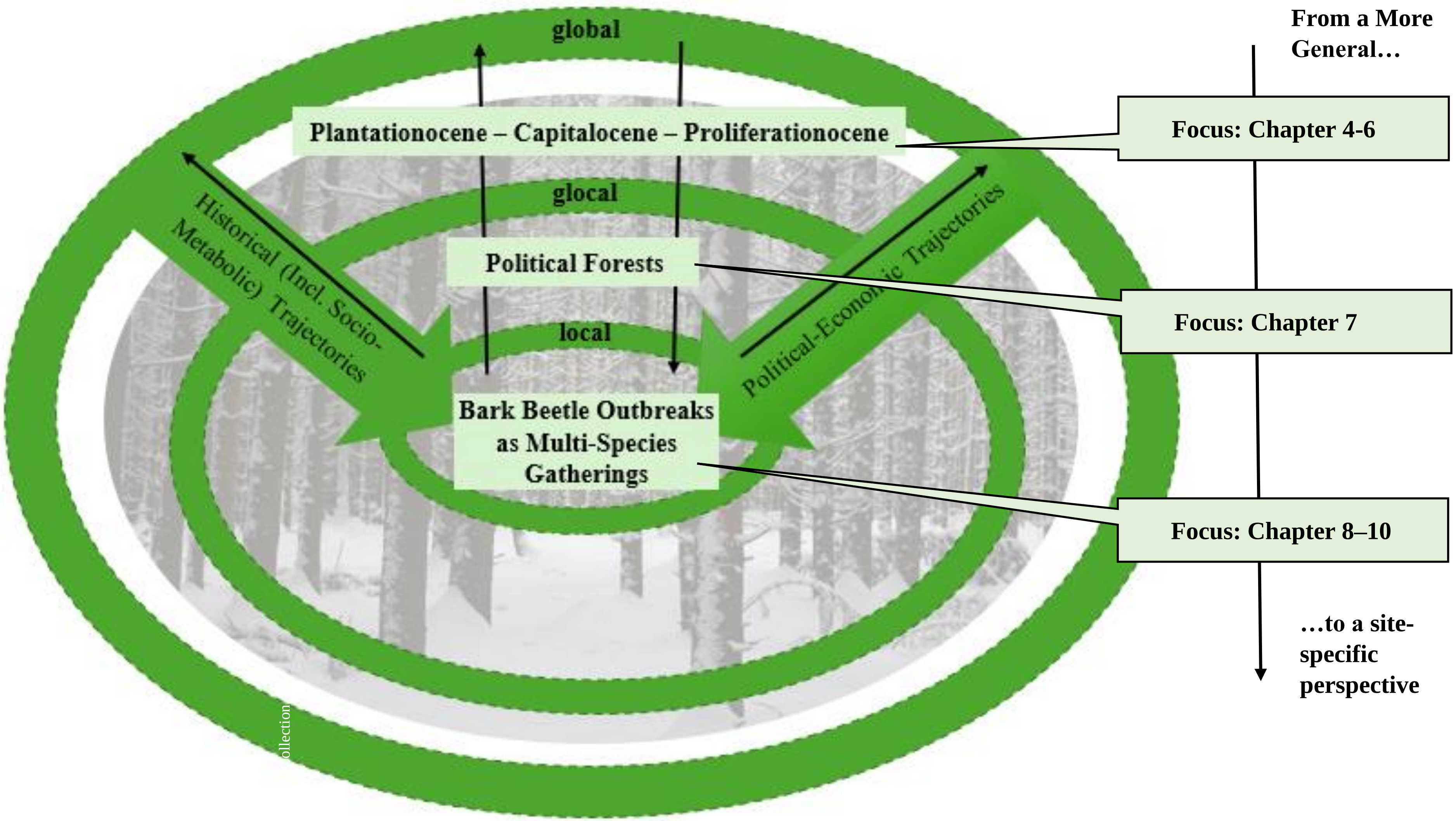


Fig. 5: Scales and “nestedness” of a Multi-Species Political Ecology © Author, 2024.

2.3.2 Entry Points and Conflict Analytics: How to Study Bark Beetle Outbreaks as Multi-Species Gatherings

The question arises of how to study bark beetle outbreaks as Multi-Species gatherings, of how to "critically describe" (Tsing 2013) what happens when beings that we believe to be co-constitutive of bark beetle outbreaks assemble. Assuming that life is an ever-changing process with "a multitude of lively agents that bring one another into being" (Van Dooren *et al.* 2016, 3), and considering that knowledge is partial and situated, i.e., always a "view from somewhere" (Haraway 1988, 590), there is no way of knowing all the different actors, relationships, and processes formative for bark beetle outbreaks. In light of this complexity, I argue that the best we can do as Multi-Species political ecologists is to work with "analytical entry points" (Nightingale 2016, 41p.), here: with a number of *entry point assemblages*, that help us to structure how we think about bark beetle outbreaks, to produce meaningful "situated knowledges" (ibid.), and to provide a certain *symmetry*[31] when taking different perspectives on bark beetle outbreaks (see figure 6, p. 61). Based on Nightingale's proposal of entry points as a way of navigating and operationalizing *epistemologically pluralist* research projects, we will approach bark beetle outbreaks qua a total of three entry point assemblages, each of them analytically organized around one specific "focal being", in our case: Norway spruce, the European spruce bark beetle and "the human". The reason for making these three beings and their assemblage partners entry points, for choosing them (and not others) as *good to think with* lies in these beings' particular world-making roles and powers in the face of bark beetle outbreaks – roles and powers that let me assume that bark beetles, spruce trees and humans are

[31] As we will see later (part III), addressing bark beetles, spruce trees and humans symmetrically is best possible when thinking with and exploring lifeways in a similar way, here manifest in the similar structure of the entry point chapters. Inspired by Latour (1993; 2005), Thrift (2005) and Staddon (2009), the concept of symmetry does not mean to simply study different beings on an equalized footing, to pretend that they would all be equally powerful, to completely ignore the collectives (human-plant-animal) to which these entities are usually ascribed to. Instead thinking symmetrically "means not to impose a priori some spurious asymmetry among human intentional action and a material world of causal relations" (Latour 2005, 76) – it means thinking anti-asymmetrically, that is acknowledging and expressing in one's writing that "the arrows of causality and intentionality can run in all directions" (Staddon 2009, 165), that each of the three entry point lifeways makes world(s) based on contingent articulations of biology, ecology, history and political economy.

more "directly" involved in and affected by outbreaks than others[32]. To make that clear, the three actors groups represent *entry points*, meaning that albeit they will be prominent in my storytelling, the analysis will not be restricted to the three groupings. Not to mention how undeserving it would be for a Multi-Species Political Ecology to speak of Multi-Species gatherings and then only focus on three monolithic biological species, I am well aware that bark beetle outbreaks are much more than just bark beetles, spruce trees and humans mingling, that it is a constellation of assemblages including a multitude of factors and coincidences that determines whether outbreaks happen and whether the world-making projects of involved lifeways appear to be at all "competing".

A valuable analytical framework is more than a bunch of concepts, definitions and entry points, and in what follows I will transfer my general MSPE perspective to a concrete political-ecological conflict analytics, to an analytical scheme that helps to analyze bark-beetle-related Multi-Species conflicts (see chapter 8–10). I have insinuated that a political-ecological analysis of Multi-Species conflicts requires a different reading of interests as *world-making interests*, and a different understanding of conflict as a contingent process of overlapping world-making in ways that are (structurally) disadvantageous for other world-makers involved. Taking that seriously makes us realize that bark beetles, humans and spruce trees are not in themselves the reason for why there are losers and beneficiaries of the gathering of these beings, but that relationships and the asymmetrical distribution of world-making capacities, risks and benefits through those relationships bring beings into positions in which they compete (with), kill or displace each other. So to understand the struggles over which kind of world-making prevails and manifests itself in the face of bark beetle outbreaks, we need to look at who makes worlds, for what purpose, in which institutional and structural setting and in the light of which historical

[32] If we think about the actor groups that are commonly at the heart of scientific studies on bark beetle outbreaks, the selection of these three actor groups is justifiable (Vega and Hofstetter 2015; Hlásny *et al.* 2017; Biedermann *et al.* 2019; Netherer *et al.* 2021 etc.).

and political-economic trajectories. Figure 4 shows my framework, and how this framework reflects my main research questions. To repeat myself, I assume that entangled (forest) beings (B) gather/interact (orange arrows), and through those gatherings/interactions, in turn shaped by political-economic and historical trajectories (large green arrows) form assemblages (A) (even though there are infinitely many of them, I begin this work by focusing on at least three entry point assemblages). These assemblages pursue certain world-/forest-making (WM/FM) practices and projects (composed of and manifested in place-, sense-, and time-making activities), and in the case of a non-beneficial/detrimental overlapping of world-making, we may speak of Multi-Species conflicts, characterized by an uneven distribution of ecological space and respective world-making possibilities/capacities. Given that conflicts (as intersections of world-making practices and interests) are (in their extent, historicity, uniqueness and latency) difficult to grasp, I prefer not to speak of clearly distinguishable conflicts, but – based on the work of political ecologists Dietz and Engels (2018) – of "fields of conflicts" and related "fault lines". Serving as an analytical heuristic, a field of conflict analysis requires to focus on certain constitutive elements of (Multi-Species) conflict fields, here

> 1) on *conflict actors* and their position in the field of conflict, i.e., on selected *Multi-Species assemblages* and their *world-making* (practices, projects and interests),
>
> 2) on (human) *institutions, narratives* and (*structured) power relations* (i.e., laws, policies etc.) that influence the emergence and form, but also the conflict actors and their position in the field of conflict, and
>
> 3) on (larger) *structural changes* that shape the former two elements, initiated and driven by historical and political-economic trajectories.

It is three elements that sometimes explicitly, sometimes implicitly influence how I look at bark-beetle-related Multi-Species conflicts, that structure my conflict analysis in chapter 8–10. But how do I even get to such an analysis? Where does my data come from? And how have I organized my fieldwork to approach these fields of conflict?

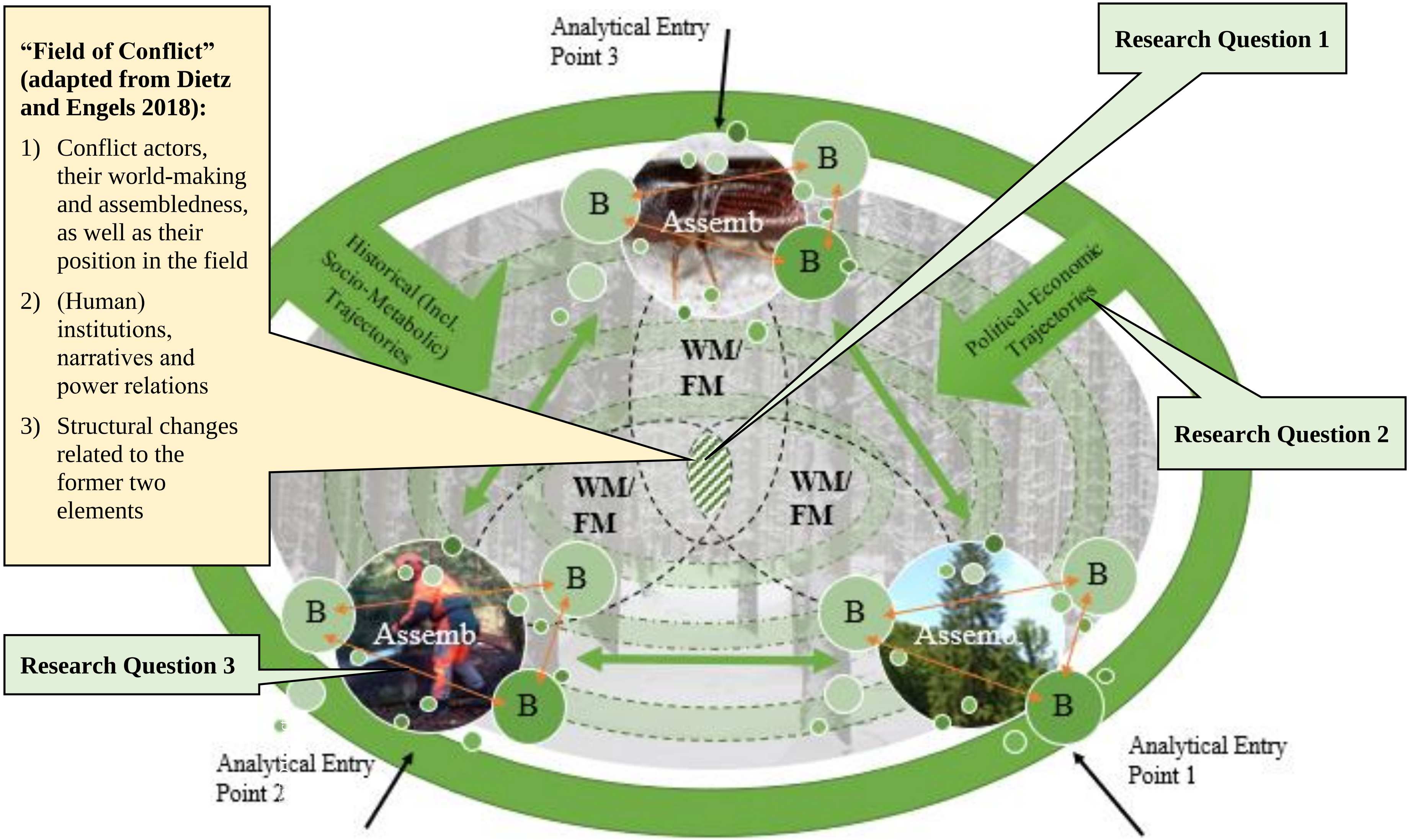


Fig. 6: My MSPE framework, aligned with my research questions. © Author, 2024.

3. Research in the Forest: Onto-Epistemology, Methodology and Methods of a Multi-Species Forest Ethnography

Fig. 7: The Author on one of his forest walks. © Author, 2023.

While the introduced MSPE perspective may seem promising on paper, the question remains of what implications this perspective has for ontology, epistemology, and methodology. Starting from the admission that my research is not an undistorted representation of one single reality "out there", but a constitution of and an approximation to *multiple* human and more-than-human realities in the making, we need to see that choosing research subjects, sites and methods is in itself an act of world-making, of making *worlds researchable* (Law *et al.* 2011). Multi-Species ethnographies are particularly challenging in that regard because they constantly bother us with the question whether "we" as human beings with our partial perspectives will ever be able to grasp more-than-human socialities (Swanson 2017, 83p.). Albeit we may never know what life is like for a bark beetle or a spruce tree, what we can and in fact need to find out is what a bark beetle is able to do given certain conditions and certain relationships with others, how a spruce tree makes worlds livable for itself and its assemblage partners, and how this has beneficial and disadvantageous impacts on the world-making of those beings that gather in the face and because of bark beetle outbreaks.

As I will show in the following chapter, a most promising research approach for finding answers to such questions comes in the form of *Multi-Species forest ethnography*, here: a methodological framework that is directed towards immersing in the world-making realities of forest assemblages, that expands ecological fieldwork to include social anthropological methods like participant observations and qualitative interviews. What sounds like a contradiction, that is to conduct qualitative ecological research, is feasible and productive when making certain onto-epistemological assumptions (3.1), when finding a way to triangulate methods without having to bring them to one common denominator. Particularly suitable for mixed method research is critical geographer Andrea Nightingale's (2016) *triangulation for divergence* approach – an approach that allows plural epistemologies and multiple methodologies to co-exist and challenge one another, that values the gaps and tensions between findings from different methodologies.

In what follows, I will elaborate on my methodological approach and multi-scalar research design, as well as reflect on my positionality and role in the field. With regards to the former, my approach can best be described as a multi-sited mixed method Multi-Species (Forest) Ethnography, an approach that attempts to understand the "becoming with" of human and more-than-human life realities by immersing myself in the field as much as possible and employing a range of data production and analysis strategies on different levels of inquiry (3.2). In terms of my role in the field, my background as a (former) forester presents both advantages and disadvantages. On the one hand, it offers easier access, certain skills and increased credibility. On the other hand, it is challenging to maintain a balanced position and a certain distance in view of the attributions and expectations of my research partners (3.3)

3.1 *Anti-Essentialist Neorealism*: An Onto-Epistemological Grounding

> "Let me begin with a tautology: to speak of nature is to presuppose an ontology. It requires an understanding of being, whether of the earth as a whole, or of the specific entities that compose it. This is an irreducible element of all socio-ecological thought, even if unstated. Moreover, it is shot through with ethical and political significance, for how we conceive of nature relates directly to our environmental practices and eco-politics" (Braun 2006, 193).

I have presented my framework, but have not talked about the onto-epistemological[33] assumptions that shape how I see the world and my research. Generally, what best describes my onto-epistemological stance is what Karen Barad (Barad 2007, 225) has coined as "agential realism", or what Arturo Escobar has introduced as "anti-essentialist neorealism" (Escobar 2008, 126; quoted after Ogden *et al.* 2013, 6). I will quickly explain what the "anti-essentialist" and the "neo" here refers to. First, *neo*realism breaks with the positivist assumption that there is one single reality (and one truth) "out there" that is objectively tangible and explainable through the right methodological and epistemological tools. Rather, neorealism acknowledges that there are multiple realities that emerge through relationships, vary considerably depending on who observes/creates them, and given a "flat ontology" all have the same ontological status – even if they eventually conflict and exclude one another (Stengers 2010; Bryant 2011; De La Cadena 2015). In line with the plural and emerging character of reality, and thus of ontologies and worlds – making Escobar (2017) speak of a "pluriverse" and Blaser and De La Cadena (2018) of "a world of many worlds" –, neorealism is anti-essentialist in abstaining from assuming an unchangeable and pre-existing *essence* of categories, things and beings (Haraway 2008; 2016; Van Dooren *et al.* 2016). Following Ogden and colleagues (2013, 6), anti-essentialist realism is a good basis for Multi-Species ethnographies and their attempts "to understand the world as materially real, partially knowable, multicultured and multinatured,

[33] Fascinated by Alfred North Whitehead's processual philosophy in *Process and Reality* (1978) and by William James' "radical empiricism" with its (anti-foundationalist) equation "being = experiencing = knowing" (Garcia *et al.* 2020), I speak of onto-epistemology as I assume that the distinction between ontology and epistemology is misleading when it comes to understanding the world as an ever-changing gathering of beings that know through experiencing, and that experience through knowing. This corresponds with the "onto-political" works of Escobar, Stengers and De La Cadena, all of them positing that world-making is not only an epistemological practice (of making sense of the world), but also an ontological practice that materially-semiotically produces what exists.

magical, and emergent through the contingent relations of multiple beings and entities". From that follows that instead of ascribing the field of Multi-Species studies to the postmodern constructivist end of the onto-epistemological spectrum, to "an easy relativism" as Van Dooren and colleagues (2016, 12) put it, I would hold that what makes Multi-Species approaches *realist* is their emphasis that living beings exist through material-semiotic *relations*, through physical/bodily *encounters*, that living and non-living beings *matter* and interact beyond human interpretations of them (Bennett 2010). With realities being relative, that is to be only (partially) graspable from a specific/situated (human-mind-dependent) standpoint (Haraway 1988; cf. Moore and Kosut 2014, 525), understanding realities only as realities *for* humans bears the danger of rendering (non-human-language-based) life realities invisible, of neglecting the material dimension of ecologies, of putting humans on a different onto-epistemological plain. I am convinced that through recognizing that semiosis, the ability to *represent* extends beyond the human realm, that all "life is constitutively semiotic" (Kohn 2013, 9), and through acknowledging all beings' abilities to *make* worlds, we can strive towards a more monistic understanding of the interconnectedness of living (and dying) in and on *this world of many worlds*. Put differently, an anti-essentialist neorealist grounding helps to consider environmental processes as both relational and (partially) *extradiscursive*, as biophysical *realities* produced by *and* likewise (becoming) independent from humans (e.g., Castree 2000, 29). In my own work, I do not approach anti-essentialist neorealism as a monolithic philosophical program, but as a pragmatic spectrum of stances that allow to account for language-mediated discourses and "human-made" structures (class, ownership etc.) *together* with more-than-human life realities (Van Dooren *et al.* 2016). Following that, the neorealism that I am working with oscillates between different variants of non-positivist realist thinking, ranging from *critical realism* (Sayer 1992)[xx] to *relational realisms* such as to be found in the works of Kirksey, Tsing, Haraway and others.

3.2 *Multi-Species Forest Ethnography*: Methodology, Methods and Research Design

In a nutshell, I consider my methodological approach to come in the form of a multi-sited (mixed method) *Multi-Species Forest Ethnography* (MSFE). Multi-sited not in the sense of my ethnographic research[34] simply taking place in more than one location (see chapter 3.3), but in terms of my research project attempting to navigate different scales, trace connections between global systems and local life realities and follow the movements and interactions of phenomena, people, things and stories through place, space and time (Marcus 1995; Falzon 2012). While my research approach is a *forest* ethnography due to *where* it takes place, speaking of forest ethnography as a distinct approach is inspired by Ogden and colleagues' (2019, 51) piloting work on conceptualizing forest ethnography as

> "a methodological approach to understanding the emergence, persistence, and transformation of [in their case] urban forests over time, making significant contributions to theories of forest environmental history and the political ecology of [urban] property regimes".

Not limited to urban forests, but also applicable to the study of "non-urban" humanly-managed/-administered forests, my forest ethnographic research thus follows Ogden and colleagues in exploring "the ways ecological and social processes interact to produce our environments and shape the experience of being human in those environments over time" (ibid.), thus conceptualizing forests "not as wilderness devoid of human history, but as landscapes produced by complex and interacting social and ecological processes" (61). On a methodological level, this focus on the interactions of social and ecological processes requires (or at least benefits from) a mixed-method approach (Rocheleau 1995), or differently a triangulation of qualitative and quantitative methods to be able to better understand the ways in which forests emerge as Multi-Species communities, as both social constructions and biophysical entities (Ogden 2011;

[34] Ethnography as the in-depth exploration description of the social and cultural realities of human groups (ethnography, literally "people writing") is the methodological backbone of social anthropology (Pelto and Pelto 1978), it is „knowing from the inside" (Ingold 2013, 5), the attempt to immerse into and to draw conclusions from being close to life realities of „real people in real places at real times" (Geertz 1988, 141).

Rocheleau 2015). As I will show, "typical" qualitative social science research, with its boundedness to human language, is usually insufficient for immersing in the life realities of more-than-human beings, for studying how Multi-Species assemblages make worlds and how that leads to/exacerbates (world-making) conflicts (Moore and Kosut 2014; Swanson 2017). For that, we need to borrow from natural history and the natural sciences, to attempt a "critical description" (Tsing 2013) of the interrelatedness of culture, history, biology and ecology, something that Multi-Species ethnography – "ethnographic research and writing, that is attuned to life's emergence within a shifting assemblage of agentive beings" (Ogden *et al.* 2013, 6) – can offer (Kirksey and Helmreich 2010). Becoming "attuned to life's emergence" (here also pointing to finding methods for becoming attuned) is undoubtedly challenging, particularly for a social scientist trained to work with, observe and talk to humans, and there are some implications that have the potential to unsettle what we think to be formative of the social sciences. *First*, an MSE aims to go beyond the distinction of *human* and *non-human* through speaking of the more open category of the "more-than-human", as a child of posthumanist thinking an MSE reconceptualizes "what it means to be human" (Ogden *et al.* 2013, 7). In doing so, an MSE destabilizes the notion of "the human" as one coherent *knowing* subject, it shifts the ability to *know* from individuals to Multi-Species communities: It is through being entangled with others that we can make sense of the world (Taylor and Hamilton 2014). *Second*, my research project follows Multi-Species scholars like Lestel (2006, 147–49) and Tsing (2013, 29pp.) in their critique of relegating *ethnography* to the social sciences. Not without reason, Multi-Species ethnographers have recently rediscovered "the Greek root of the word ethnos, [namely as] 'a multitude (whether of men or of beasts) associated or living together; a company, troop, or swarm of individuals of the same nature or genus'" (Grimm *et al.* 1887 quoted after Kirksey *et al.* 2014, 1). *Third*, an MSE encourages (and even requires) to blur boundaries between disciplines and methodologies, it depends on new ways of positioning oneself as a researcher, of reiterating (research) worlds through one's choice and creation of methods (Moore and Kosut 2014). As important as it thus is to come up with "attuned" methods to passionately immerse in more-than-human worlds (Van Dooren *et al.* 2016) as aware should we be that in the end it is still humans who study more-than-humans (and read those studies), that there is a power discrepancy between those who *speak for* and those who *are spoken about* (Taylor and Hamilton 2014). Following that, an MSE that takes the notion of *becomings* as the (in principle) non-hierarchical co-constitution of entities seriously has to attempt to include more-than-human entities into the research process, it has to allow more-than-human entities to be involved in the story-telling (Bastian 2023). As I will show, there is an added value in approaching more-than-human beings through qualitative instead of quantitative methods, through in-situ observing Multi-Species gatherings instead of locking up individuals in laboratories – not only because qualitative methods require and facilitate spontaneity, adaptation, reflection and participation, but also because they can bring one closer to what I think is important in Multi-Species studies, namely the *quality*, depth and particularity of Multi-Species relations and not their *quantity* and frequency of occurrence (Van Dooren *et al.* 2016; Swanson 2017). Accordingly, Multi-Species ethnographers work with other scientific quality criteria than most natural scientists (Yilmaz 2013); they make different onto-epistemological assumptions and thus use other methods and other ways of knowing than a quantitatively-working forest ecologist. A challenge that yet applies to both is the inherent "humanness" of our perspectives on more-than-human world-making, and even with the help of the most objective and elaborate observation and measuring devices, what we see and what we think remains inherently biased (Knorr-Cetina 2016), not to mention how limited the human senses and cognitive capacities are to grasp most more-than-human lifeworlds (Swanson 2017). We only have to talk to a forest entomologist to learn that we still know relatively little about bark beetles, that things could be completely different, and we would not even know it. If it is already so difficult for the experts to come to statements about how bark beetles make worlds, how should we as entomologically-unversed social scientists approach beings that many of us would not even notice when strolling through the forest? How do we study the relationships between, among and across different assemblages when for years we have only focused on human relationships?

3.2.1 Entering Forests, Entering Assemblages: Mixing Methods in the Light of My Research Questions and My Analytical Entry Points

Already in my theoretical chapter, I have presented a conceptual approach of dealing with the complexity, multifacetedness and contestedness of bark beetle outbreaks as Multi-Species gatherings, that is to look at the relationships between, among and across entangled actors such as humans, bark beetles, spruce trees (and others) from different, carefully chosen perspectives, from what I have borrowed from Nightingale (2016) as (analytical) entry points. Just like these entry points resemble the different perspectives of a turning kaleidoscope, my three (main) entry points (and their respective focus on one specific being) come with different methods, depending on which being and/or assemblage I am dealing with, and which of my three (main) research questions I am trying to answer (see figure 8, p. 71). Albeit the applied methods do not exhaust themselves in one of the three entry points (with some methods like forest walks and participant observations enabling me to "cover" all entry points at once), some methods are particularly suitable for grasping the "human", some instead for exploring the "bark beetle" or "spruce dimension" of outbreaks as Multi-Species gatherings. So while I approach human (forestry) stakeholder's involvement in Multi-Species conflicts through different qualitative interview forms, a semi-structured survey and participant observations (chapter 3.2.2.3), I become acquainted with the world-making of bark beetles and spruce trees through desk research, expert interviews and field observations (chapter 3.2.2.2). In addition to these methods of *generating* primary data, answering the second research question, that is exploring the role of *historical* and *political-economic developments,* requires a number of secondary data compilation methods, here translating into a collection and selective analysis of economic datasets, land use data and historical/archival sources (chapter 3.2.3).

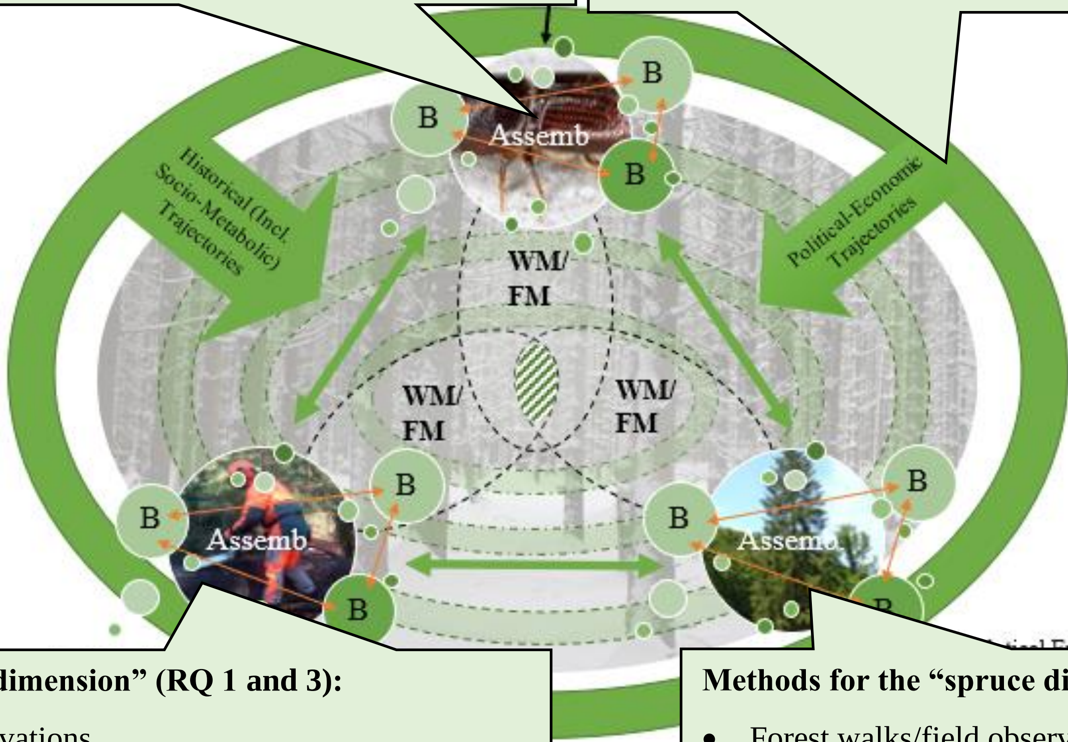
With regards to the methods' different *onto-epistemological* and *methodological premises* as well as to the question of how to work with different data or insights from different methods, I heavily rely on what Andrea Nightingale (2016) calls (next to triangulation for complementarity and convergence) *triangulation for divergence*. Whereas triangulation for "complementarity relies on using epistemologically consistent methods to provide answers to the same question" (such as combining questionnaires and qualitative interviews) and convergence aims at ensuring that insights garnered through different methods "match" each other (such as comparing insights from participant observations and qualitative interviews), triangulation for divergence makes "the silences and gaps between the data from each part of the larger project become interesting objects of analysis in themselves" (Nightingale 2016, 45). In doing so, a triangulation for divergence approach requires to view all epistemologies and methods as equally valuable, to not triangulate the data, but the findings from an already-happened analysis. In other words, triangulation for divergence entails exploring the ways in which insights from different methods *diverge*, and what this tells us both about our methodologies (Nightingale 2016, 44p.). In what follows, I will explain how I made my way through the forest, how I aligned, applied and combined specific research methods to examine the emergence of and relationships between, among and across forest assemblages.

Methods for the "bark beetle dimension" (RQ 1):

- Forest walks/field observations
- Desk research on sociality, biology and ecology of bark beetles and their assemblage partners
- Qualitative semi-structured expert interviews

Methods for the historical and political-economic context (RQ 2):

- Heuristic compilation and analysis of economic datasets, land use statistics, historical sources and other secondary data



Methods for the "human dimension" (RQ 1 and 3):

- Forest walks/field observations
- Participant Observations/Go-Alongs
- Qualitative semi-structured interviews with forestry stakeholders
- Informal interviews
- Semi-structured quantitative survey

Methods for the "spruce dimension" (RQ 1):

- Forest walks/field observations
- Desk research on sociality, biology and ecology of spruce trees and their assemblage partners
- Forest walks/field observations
- Qualitative semi-structured expert interviews

Fig. 8: Methodology of my MSPE Framework. © Author, 2024.

3.2.2 Into the Woods: Primary Data Generation

3.2.2.1 Immersing in Forest Realities

> "To engage with the forest on its own terms, to enter its relational logic, to think its thoughts, one must become attuned to these" (Kohn 2013, 20).

Following Kohn into the woods, I have spent most of my time in the field to find ways of immersing in forests as Multi-Species landscapes, of getting acquainted with the different forest sites, their forest-ecological characteristics and their specific Multi-Species histories. My main method for doing so is *field observations* in the form of repeatable *forest walks* based on a checklist-like observation scheme (see appendices A4; figure 9). Not so different from a forest inventory, I use the day-long walks (spanning over the entire research area and usually between 5 to 20 km in length) to observe and take notes on tree species composition, forestry practices, silvicultural systems, plant communities, stand structure (including age, density etc.), vitality/health of trees, signs of past and current bark beetle infestations, and on encounters with specific lifeways and their assemblage partners.

Fig. 9: The Author as Observer. © Author, 2023.

The lion's share of walks are pre-planned (to make sure to get a balanced picture of the entire forest area), photographically documented, accompanied by taking notes and making sketches, (occasionally) repeated (to compensate for seasonal effects or to observe changes over time), and (in case of reception) recorded with the mobile route planning app Komoot, the latter allowing me to assign GPS points to where the pictures/notes have been taken. Undoubtedly, my prior knowledge of botany and forest ecology, as well as my previous experience as a lay forester, helped me to make more "informed" observations, and I would even hold that a Multi-Species ethnography benefits from (if not depends on) a certain biological and ecological knowledge. As arbitrary as it may sound to stroll through the forest and record what one notices, forest walks are my most important method for coming across and spending time with different beings (Candea 2010), “for cultivating proximities rather than distances” (Barua 2022, 899), for directing my attention to Multi-Species forms and Multi-Species assemblages (Tsing 2013), for cultivating an “intra-species mindfulness that works to reveal our intra-species relationships of co-constitution whereby we become human through our engagement with non-human animals” (Moore and Kosut 2014, 21). Walking through the forest thus helps me to get a sense of Multi-Species relations/histories and how those are imprinted into and visible in forest landscapes (for a similar approach see Mathews 2018). Following Sarah Pink’s (2009) criticism of ethnography’s overemphasis of visual impressions, I enrich my observation protocols and species lists with notes on sensations from tasting, hearing, smelling, and feeling (Tsing 2015, 46pp.). It is these sensations that bring me closer to the beauty and peculiarity of more-than-human world-making, that make me aware of the presence and power of more-than-human beings beyond what is visually visible. In line with Nightingale's triangulation strategies, I also use the forest walks to expand on and critically examine the perspectives and insights from the interviews and the survey. By spending a lot of time in the forest, I try not only to develop a certain sense of "being there", but also to see if the realities on the ground reflect what was said/stated in the interviews and in the survey. Overall, I took 25 *recorded* day-long forest walks (some of them conducted as “go-alongs”, see 3.2.2.3), more specifically 13 in the Sauwald, 6 in the Kalkalpen NP, and 6 in the Bohemian Forest (see appendices A5).

In addition to field notes, filled-out observation protocols, species lists, maps, photographs, sketches and drawings (Kuschnir 2016) produced on basis of the forest walks, I complement and compare my descriptions with findings from the literature and with insights derived from other methods such as interviews and (participant) observations – with the overall goal to draw a naturalistic and comprehensive picture of the respective forest area.

3.2.2.2 Immersing in More-than-Human Realities

I have spoken about ways of immersing into forests as Multi-Species landscapes, but not about how to become acquainted with more-than-human forest inhabitants (bark beetles, spruce trees etc.), their world-making projects and their *becoming with* other beings. The first method that I here rely on is a critical rereading of the natural scientific literature on the biology and ecology of bark beetles, spruce trees and other relevant outbreak participants (cf. Despret 2013), here coming in the form of a non-systematic review of impactful forest-entomological and forest-ecological studies dealing with the preconditions, drivers, dynamics and impacts of epidemic bark beetle outbreaks (Vega and Hofstetter 2015; Hlásny *et al.* 2019; Netherer *et al.* 2021 etc.). This step is complemented by (a total of 8) *semi-structured expert interviews* (Meuser and Nagel 1991) with forest ecologists, entomologists etc. (i.e., with institutionalized *human spokespersons* of specific beings; cf. Latour 2004b), *visits of research institutes/sites* (practicing an ethology of entomologists, as Despret (2016) would put it), and other kinds of *field observations*. In tandem with conversations with scientists and tailored to findings from the literature (helping me to find sites on which spruce trees prosper, or to determine the "right" time for witnessing the swarming and breeding of bark beetles), forest walks offer a very immediate way to *passionately immerse* into the life worlds of more-than-human beings (Van Dooren *et al.* 2016), to in-situ observe the dynamics of spruce and bark beetle world-making, they allow me to draw site-specific conclusions on the time, form, conditions and interactional character of outbreaks. Among other things, being on site is so important as bark beetles, spruce trees and their partners do not always act as described in the literature, making it necessary to investigate why outbreaks occur on site (despite non-ideal conditions or at surprising times of the year), why certain spruce trees survive a bark beetle mass attack despite being injured or drought-stressed. Where direct (natural-historical) observations of spruces, bark beetles and other forest inhabitants fall short, other (more experimental) methods step in (Dyke *et al.* 2018).

Here, I am inspired by suggestions from animal geographers Hodgetts and Lorimer (2015, 285) who speak of capturing Multi-Species histories by using "(i) techniques for tracking the spatialities of animal culture; (ii) scientific and artistic engagements in inter-species communication; and (iii) geographic tools afforded by genetic analyses". Not being skilled to implement the first and the third option, I am fascinated by the suggestion of "engagements in inter-species communication". It is approaches such as working with scents and sounds that can make us aware of how bark beetles communicate, of how bark beetles perceive the world around them (Dunn and Crutchfield 2009). Conversely, the combination of creative speculation, personal reflection and sound forest science can help us to imagine tree stories and approach the social life of trees as powerful place- and world-makers (Jones and Cloke 2008). Taken the limitations of observations and interviews with human experts seriously, I also work with what Bastian and colleagues (Bastian *et al.* 2016) call "speculative experiments", dedicated to the creation of affective "contact zones" between otherwise less immediately interacting/communicating species (Haraway 2003; Candea 2010). In the case of bark beetles, I do this by holding a pheromone ampule and waiting for bark beetles and others to be attracted to my "new" scent and to land on me (figure 10). It is this opportunity to "speak the language" of bark beetles and to feel a different kind of proximity and "togetherness" that I then document and reflect upon throughout the dissertation.

Fig. 10: Posing/Smelling like a bark beetle. © Author, 2024.

3.2.2.3 Immersing in Human Realities

What I have called the "human entry point", the human perspective on bark beetle outbreaks means looking at the broad spectrum of human forest-making practices and projects in the face of bark beetle outbreaks, in line with my tripartite definition of world-making, at place-, sense- and time-making practices/projects of human foresters and forestry-related stakeholders. This not only entails looking at how different forestry stakeholders deal with and make sense of bark beetles, bark beetle outbreaks, forests and forestry in Upper Austria, but also to account for the social, cultural, and political conditions and dimensions of these dealings. Particularly aimed at this sense-making dimension, I work with *semi-structured problem-centred interviews* (Kaufmann 1999; Witzel 2000) with important forestry stakeholders (operating on different scales; see 3.2.5), the latter determined through a combination of a *purposive (group) quota* and *a snowball sampling strategy* (amounting to a total of 23 interview partners). The two latter strategies mean that I first select my interview partners *strategically*, that is on basis of their bark-beetle-affectedness and their belonging to a specific interest group (Mason 2002, 123p.), and then *within these groups* approach potential interlocutors randomly, trying to represent a diversity of voices and forest ownership/management types (for the scalar dimension of my sampling strategy see figure 14, p. 86). When I speak of forestry stakeholders in a broad sense, I refer here to individuals, (interest) groups, (administrative) bodies, and companies involved in the ownership, administration and management of forests/forest resources in and beyond Upper Austria such as ministry and forestry directorate representatives, forest scientists, NGO conservationists, small-scale/large-scale forest-owners (the largest group among my interviewees), forest enterprise managers/employees, forest wardens, sawmill owners and hunters (for a full list of interview partners see appendices A6). Generally, interviews are based on a loose guideline comprising of questions ranging from one's personal relationship to forests, over an assessment of the status quo of forestry/forests in the respective region to the perception and experienced impact of bark beetles/bark beetle outbreaks (see appendices A7)[35]. In addition, several, though fewer than expected[36], interviewees agreed to supplement the interview with a "go-along" through their managed/owned forests. In the course of these go-alongs (of which I have carried out 10 in total; see appendices A5), interlocutors presented their forest and forest-making practices, elaborated on their forest's (emotional, economic, ecological etc.) significance, and were invited to show me interesting parts of their forests. Combining semi-structed interviews with go-alongs and informal interviews is insofar promising as it offers me an in-depth perspective of people's world-making activities, their position on and within Multi-Species assemblages, and their relationships to bark beetles, spruce trees and others.

Next to interviews and go-alongs, I work with an "Office Forms" *semi-structured survey* based on a combination of structured and open questions, answerable both online and in print[37] (see appendices A8), targeting people with a *direct* and *indirect relationship* to forests in Upper Austria, that is 1) foresters in Upper Austria and 2) forestry-related stakeholders with a professional, but not ownership-/management-related relationship to forests (such as forest scientists, NGO representatives etc.). Advertised and distributed personally (in the course of

[35] All interviews (both recorded and non-recorded) as well as all other research steps involving human participants were based on prior informed consent, meaning that research subjects' statements were only then noted, recorded and used after they had agreed to being part of this research, and had been informed about what this entails. At the beginning of each interview, the question was asked whether recording and use of the interview for the dissertation was permitted (with the answer being secured on tape in most cases). In addition, it was determined whether the person wanted to be anonymized, and whether people wanted to see the transcripts before the latter were used in the thesis (see research ethics in appendices A9). Where I quote directly from the transcripts, I indicate the place of citation either with a "L." (= line in the transcript) or the respective time marker. Even though most interviewees agreed to have their names published, I have anonymized them because almost all of them made statements that were controversial or that could harm them, or expose them to critique from people in their surroundings, and that is not something I want to risk.

[36] It turned out that participant observations in the sense of joining/assisting people during forest work were mostly not possible for insurance reasons, and even where these concerns were not in the foreground, it was (surprisingly) difficult to convince people to show me their forest. On the one hand, this may be due to the fact that showing off one's forest, that having one's forest management "assessed" by an external person, and not enough: by a researcher, may appear intimidating. On the other hand, and related to that first point, letting a researcher into one's forest and not knowing whether that researcher is (despite all his assurances) not allied with forestry actors with which one is at enmity, is another reason for not fully cooperating with, for not fully trusting said researcher

[37] To attract people with limited time, the survey was also made available in an abridged version (reduced from 40 to 14 questions), with the long version filled out by 60, the short one by 22 persons.

my bike-based "tours de forest" (see figure 11, next page), or by mail and email), but also through newsletters and mailing lists of forest associations, the lion's share of respondents were bark-beetle-affected forest owners or forest managers (82%), followed by forest wardens, forest authority representatives and forest scientists (for a short description of the sample see appendices A10). In short, the purpose of the survey was to capture people's perceptions of and experiences with bark beetles and to raise insights from the interviews and forest walks onto a "more-generalizable" level. "More-generalizable" in quotation marks as the survey is (with its too small sample size and its misrepresentation of important properties of the total population) *neither statistically significant nor representative* of Upper Austrian forest owners/managers. Acknowledging that statistical representativity is not an aim of my ethnographic research, I still use the survey for showing how a relatively *large* number of forestry stakeholders all over Upper Austria thinks about bark beetles, bark beetle outbreaks and forestry. Last, but not least a (very eclectic) *Critical Discourse Analysis* (CDA, in line with Fairclough 2003) complements the interviews and the survey in shedding light on the nexus of text and context, and here more specifically on the processes through which certain relevant concepts (such as bark beetle "outbreaks", "silvicultural mistakes" etc.) are imbued with specific meanings. Beyond, a CDA looks at how claims and assumptions regarding these concepts are warranted and by whom, and what this tells us about power relations in the (Upper) Austrian forest sector (ibid.). Material/sources for my CDA are newspaper articles, reports, policy documents, advertisements and selected statements made in response to the open questions in the survey[38].

Fig. 11: Survey Distribution by Bike. © Author, 2024.

[38] Given the large number of methods and the necessarily selective way of applying (and using the data produced through) them, I can be justifiably accused of lacking a meticulous methodological approach and of employing the individual methods in a highly opportunistic manner. While other scholars dedicate months to the analysis of individual interviews, I must admit that I am not a fan of page-long code tables and strictly exercised data

3.2.3 Into the Books: Secondary Data Compilation

With regards to finding answers to my second research question, that is to explore how certain historical and political-economic developments have contributed and continue to contribute to the formation and configuration of bark-beetle-related Multi-Species assemblages, I draw from a heuristic, i.e., selective analysis of available datasets and triangulate the findings from this analysis with the findings from my primary data gathering. In this sense, *economic datasets* (e.g., trade statistics, ministry-issued logging reports, price tables and trade reports issued by the FAO, UN Comtrade, the Austrian federal ministry, the Chamber of Agriculture and other forestry-related bodies/interest groups), *land cover* and *forest biomass statistics* and *historical sources* inform and contextualize my empirical findings. Given my emphasis on the historicity of forest landscapes, forest assemblages and forest Multi-Species relations, the historical contextualization obtains priority, and to understand where today's conflicts come from, we need to deal with the question of why and when pure spruce stands and epidemic bark beetle outbreaks have entered the stage in (Upper) Austria, what influence the Forest Act of 1852 had on today's forestry systems etc. (Weigl 2002; Johann 2007; Gingrich *et al.* 2021; Pichler *et al.* 2022). Only through context, we can understand why people say what they say, why forests look the way they do, why humans, bark beetles and spruce trees have such peculiar relationships with one another.

3.2.4 Into the Data: Data Analysis through A *Triangulation for Divergence* Approach

In line with Nightingale's (2016) *triangulation for divergence* approach, I will not attempt to bring the (under different epistemological and methodological premises) collected data to one common denominator from the outset, for instance to quantify statements and codes from the interviews and one-to-one compare them with regularities found in the survey. Rather, I

evaluation procedures, but rather a pragmatist who, inspired by Paul Feyerabend's (1993) suggestion of a "methodological pragmatism", assumes that methods have to be first and foremost practical.

will analyze the data within the method's epistemological paradigm (interviews within an interpretivist paradigm, the survey within a paradigm that acknowledges that there are statistical relationships between variables), and *then* examine the *analyzed* findings for *complementarity, convergence,* and *divergence.* Generally, I conceive my data analysis to be an iterative process with several working stages (see figure 12, p. 82). Stage one will be to analyze the data within the "original" epistemological framework. On the part of qualitative interviews, participant observations and the CDA, this translates into an interpretivist *qualitative thematic analysis* (inspired by Mason 2002 and Mayring 2002) that in turn leads to the production of a range of different, research-question-aligned *codes.* Participant observations (as part of go-alongs, joint forest management activities etc.) and qualitative interviews are analyzed similarly. So, starting from field notes and interview transcripts, what I first do is a close reading of those texts (Emerson *et al.* 1995). This is followed by an open qualitative thematic analysis, in turn comprised of different analytical steps. Usually, I start with a round of open coding in which it is all about identifying interesting, evocative and/or research-question-related text sections and assign these sections with first codes, or indexing categories (Mason 2002, 149pp.). Next, I complement this by switching to a more specific, a more theory-led form of coding in which I code on basis of categories that have proven useful in the open coding phase or that directly come from my theoretical framework (e.g., to scan the transcripts for passages that directly hint at (or explain) Multi-Species conflicts, Multi-Species relations, assemblages, world-making practices etc.). Whereas the two mentioned coding steps are sufficient for processing my field notes, interviews additionally undergo a "structuring" content analysis (adapted from Mayring 2002) in which so-called "anchoring examples" are defined for those statements that illustrate certain roles and practices within Multi-Species conflicts, that hint to a specific forest management paradigm – in other words, examples that help me answer my research questions. While the CDA translates into a thematic analysis of the discursive negotiation of concepts like bark beetle outbreak, climate-fit forestry, sustainable forest management, “bread tree species” etc. (here using analytical tools like indexicality, claim, assumptions, intertextuality), the answers to the open questions in the survey are treated and analyzed like the interviews, namely through a combination of an open, thematic and theoretical coding (Emerson *et al.* 1995, 142pp.). The quantitative elements of the survey are collected/processed in Excel and subjected to a simple descriptive analysis, with the goal to calculate some basic distributions, point to interesting approval ratings and produce meaningful charts and cross tables. Not interested in establishing correlations and regression indices, the descriptive analysis is simply dedicated to exploring whether there are tendencies in people’s perceptions of forests, forestry and bark beetle outbreaks among the 82 respondents, and whether these tendencies are also reflected in the public discourse as well as in my interviews and participant observations. As my survey is not representative of all (bark-beetle-affected) Upper Austrian forest owners/managers due to the size and properties of my sample (here: an overrepresentation of male respondents, academics and large forest owners, lack of statistically-representative geographical and age-class-related distribution of respondents etc.), my goal with the survey is to illustrate the complexity of people’s sense-making practices regarding forests, forestry and bark beetle outbreaks. Since the interviews and the survey allowed me to reach more than a hundred different people with a connection to forests and forestry, my results are, if not statistically representative, still meaningful, they are certainly suitable for drawing some cautious conclusions with regards to a larger context.

In a second step, the *codes* from the interviews/participant observations/CDA and the relevant information heuristically derived from the secondary data are refined and condensed into first statements, interview summaries, code tables and ethnographic vignettes. Together with theoretical considerations and contextual information, these first analytical “interstage products” (in the form of loose textual pieces) become what I term “preliminary findings”. It is these findings that are then in the second phase of the analysis examined for *complementarity*, *convergence*, and *divergence*. Put differently: The preliminary results from the different methods are compared under the continuous influence of theoretical concepts and in accordance with my research questions. Now, as I expect that results from (epistemologically) different methods are going to *diverge*, I specifically focus on the gaps and tensions between the analyzed results.

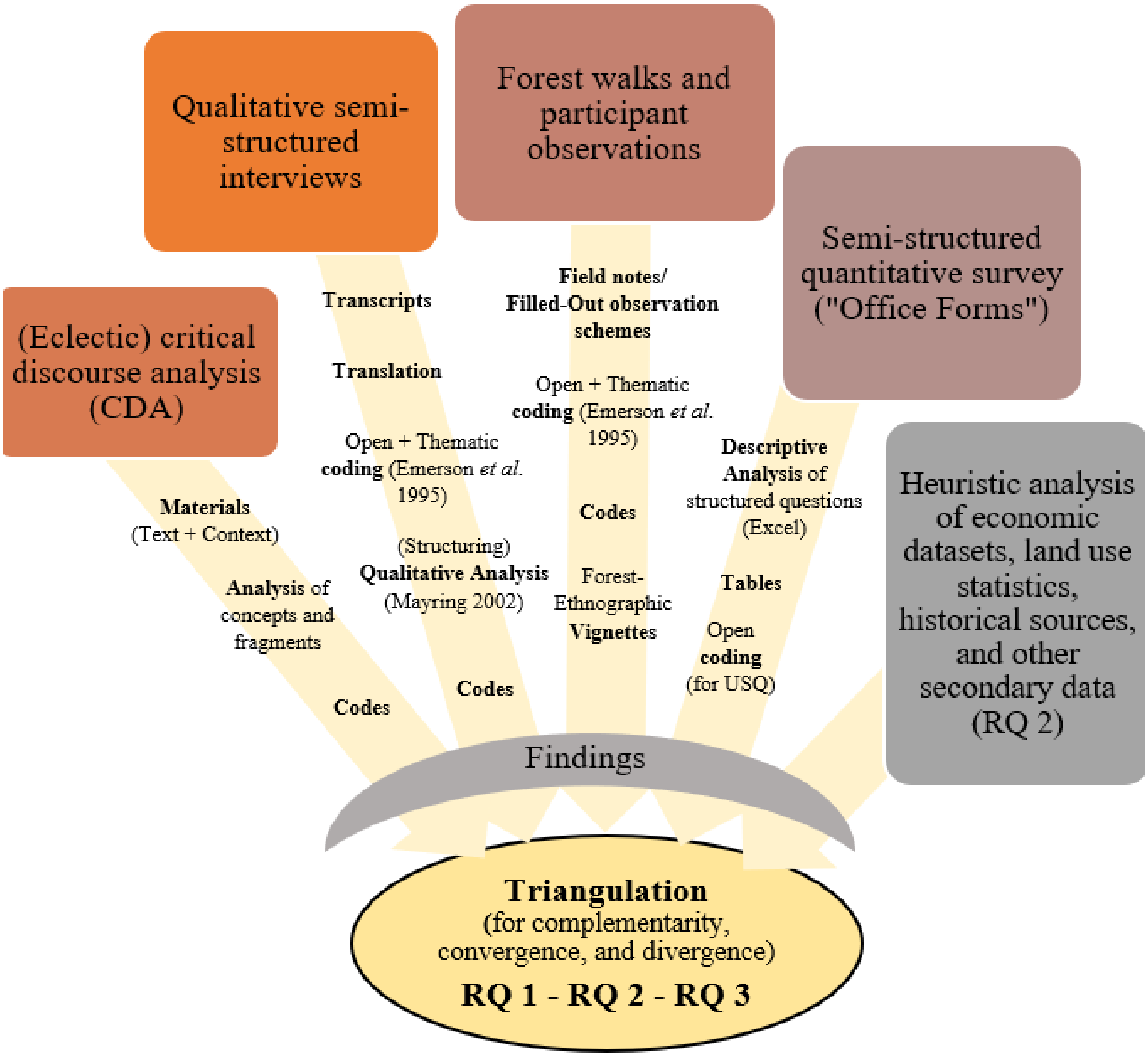


Fig. 12: Data Analysis, Intermediate Steps and Triangulation. © Author, 2024.

3.2.5 Research Design: Sampling, Sites, and Levels of Inquiry

Assuming that my methodological approach is neither suitable nor meant to study an entire federal province, my Multi-Species forest ethnography focuses on three research sites, that is on three Upper Austrian forest areas that I use as extended cases (Burawoy 1998) for exploring manifestations of bark-beetle-related Multi-Species conflicts. As we will see, the three sites exhibit notable differences, particularly in terms of ownership and management structure, and it is not mere coincidence that my selection includes 1) a patchy forest area with privately-owned *secondary* spruce forests (mostly managed by part- or full-time farmers), 2) a publicly-owned (non-managed) national park with *secondary and natural* spruce forests (and a contested bark beetle management in its boundary zones), and 3) a large church-owned forest area with *natural* spruce forests right at a state border (and adjacent to a foreign national park). In exactly this order, my research sites are

1) the (Central and Eastern part of the) *Sauwald* in the *Innviertel*
2) the (boundary zones of the) *Kalkalpen National Park* in the *Traunviertel*, and
3) the Northwestern Austrian part of the *Böhmerwald/Bohemian Forest* in the *Mühlviertel* (adjacent to the Czech national park Šumava; see figure 13[xxi]).

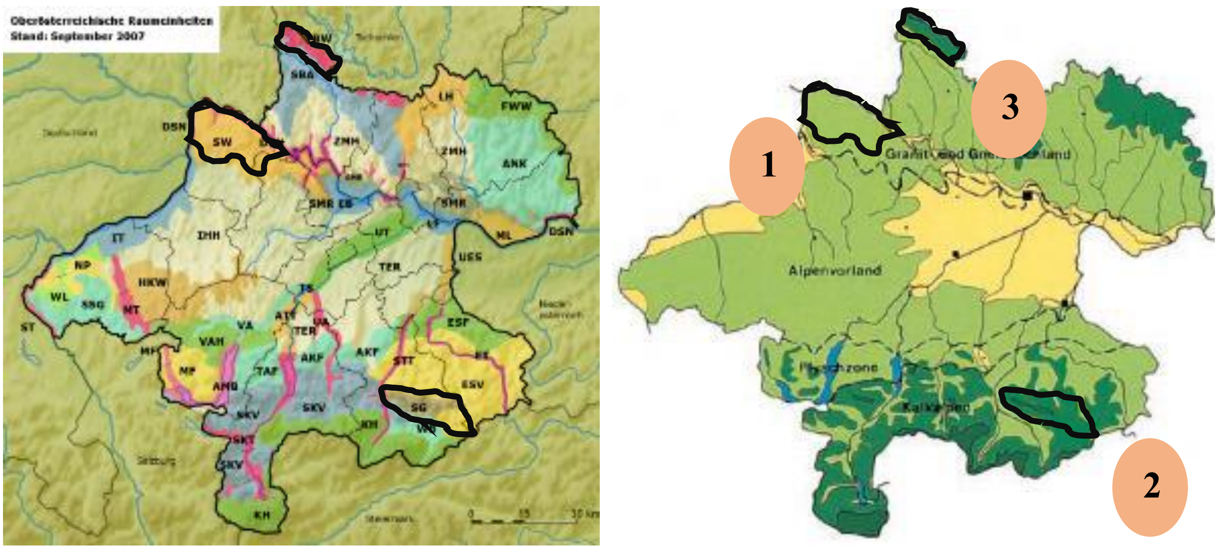


Fig. 13: My three research sites (black forms) as mentioned in the text – here against the background of Upper Austria's bio-geographical spatial units (left; Source: NaLa OÖ n.d.) and in light of the (potential) natural forest vegetation in Upper Austria. (Source: LFW/LFD OÖ 2017, 17; adapted by author).

As we will see in the case study chapters (chapter 8–10), all three sites have their particularities, they point to different, but complementary dimensions of the contestedness of bark-beetle-related Multi-Species gatherings, and it is characteristic for the relationality and multi-sitedness of my approach to not limit my analysis to the three sites, but to trace connections between them, to follow discourses, stories and creatures from one place to another (Desmond 2014). However, when I speak of conflict dimensions that the three sites exemplify, I like to emphasize that neither are the conflicts depicted in the three sites representative of conflicts over bark beetle outbreaks in the whole of Upper Austria, nor are the three forest areas representative of forests in the federal province. As with the selection of my research partners, the selection of my research sites is indebted to a sampling for diversity approach (Salzman 2010, 464). In other words, the three sites were selected because they are unique and interesting in their own respect, they are suitable for exploring particular conflicts over bark-beetle-affected forest landscapes – conflicts that, although they appear to be local, point to and are informed by national and international controversies about the societal role of forests. Next to the areas' similarities, namely, that all of them are shaped by Norway spruce, affected by bark beetle outbreaks and marked by conflicts related to the latter, another reason for focusing on such different sites comes from the assumption that different ways of making sense of and dealing with bark beetle outbreaks (in turn assumed as a byproduct of different ownership and management structures) tell us a lot about Multi-Species relations, that bark beetle outbreaks force humans to re-think what they want with and in the forest, and in doing so point to the ongoing debate between proponents of intensive forest management and forest protection. Precisely because the sites differ with regards to geology, elevation, natural vegetation, micro-climate and species composition as well as in historical, cultural, social and political terms, we can use those differences to shed light on how social, historical, political, and ecological trajectories shape the way in which conflicts over bark-beetle-affected forest landscapes unfold, on how relationships between bark beetles, humans, spruces and others play out differently depending on the respective context.

Precisely because context plays a role, because what happens in the three forest areas is not to be understood without a consideration of state institutions, supra-local policies, historical legacies, cultural particularities and the global forest economy, my research does not remain at the level of the three research sites, but attempts to navigate different scales of inquiry (see also chapter 2.3.1). This is reflected in the scope and alignment of my methodology, and most of the methods that I work with operate on or cover at least three predefined levels – I) a federal state perspective, II) a federal province focus, and III) a research-site-specific method application. This multi-scalar approach means that I lead interviews which relate to what happens in the whole of Austria, interviews which refer to the situation in the federal province, and interviews which describe realities in one specific research site. Figure 14 (next page) summarizes the multi-level character of my research project and shows how the different methods play together to get a comprehensive and holistic picture of (Upper) Austrian forests in times of bark beetle outbreaks.

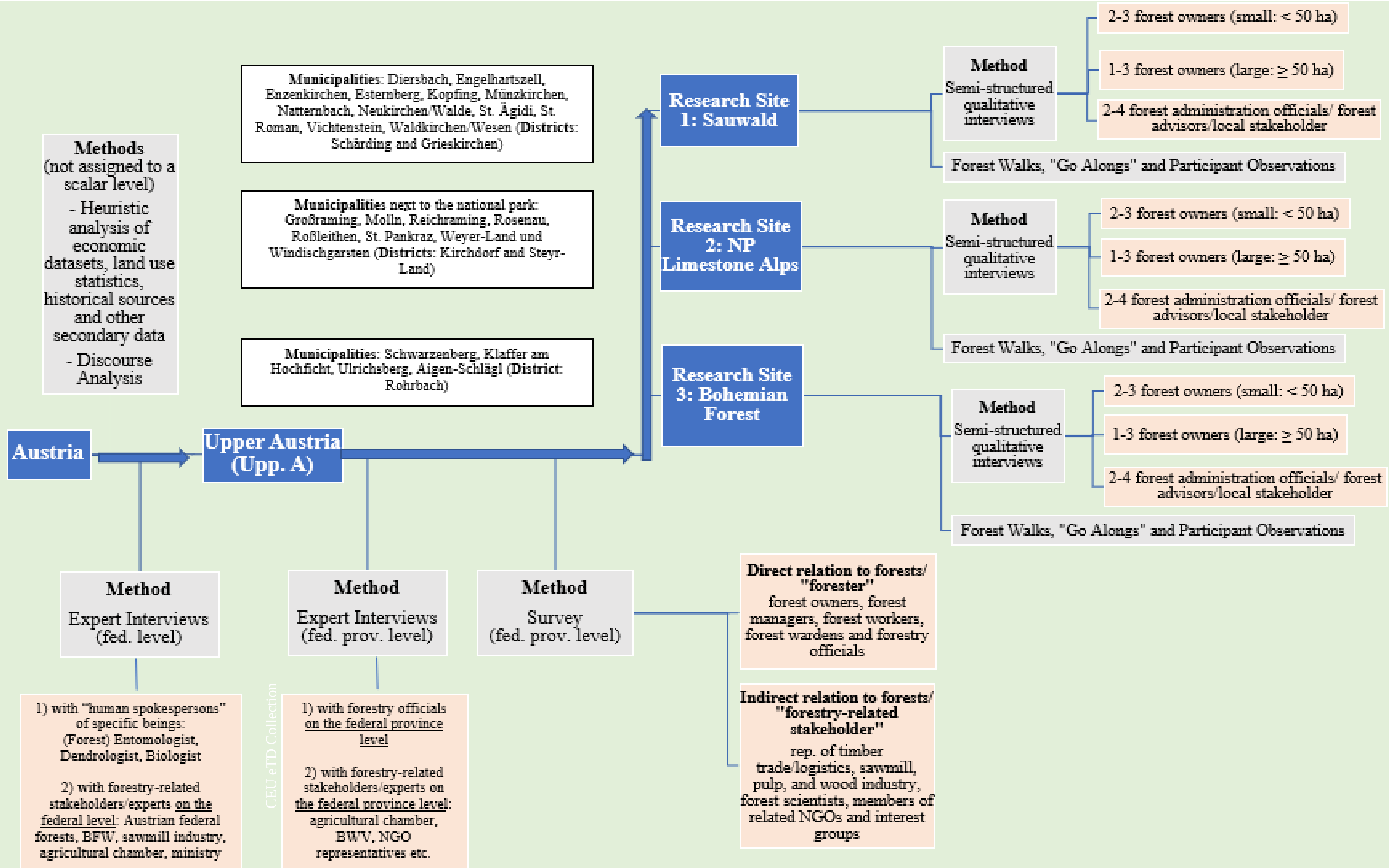


Fig. 14: Methods and Their Level of Inquiry. © Author, 2024

3.3 From Lay Forester to Fulltime Researcher: Some Thoughts on Positionality

When I think of forests, I have mixed feelings. On the one hand, as the nature enthusiast that I am, I love them for their liveliness, for how they embrace you with their all-encompassing green. Whenever I need to calm down, I envision a forest that smells of earth and tree resin, in which the crowns of gnarled trees sway gently in the wind – that helps to sooth myself. On the other hand, as the lay forester that I was, there was a time when forests had a different meaning, when our family-owned forest was not a place of rest, but of trouble and hard work – particularly so for my father. There was a time when going into the forest was accompanied by fear, doubts and heaviness; a time when we struggled with stopping the spread of proliferating bark beetles, or differently: when the Forest Act forced us to remove infested spruce trees. Trees which we did not love fervently, because we knew that there were other trees that would fit much better into our forest, that would have it easier in the face of climate change. Yet, this is not to say that we did not feel sorry for our vanishing spruces, after all, they were trees that we planted, trees that we knew; trees that we valued. What foresters and farmers around me always emphasized (and what I usually found pathetic), namely to claim that there would be a difference between those who admire a landscape as bystanders, and those who *dwell* in a landscape, who are active in shaping the landscape (Okely 2001), only really became clear to me during this time: For some forests are beautiful (and bark beetles are fascinating), for others forests mean hard work (and bark beetles intensify that hard work). Because of my past, I am torn between these positions – my background as a son of a forest owner, as someone who has worked in the forest, has a significant impact on my positionality, my way of thinking and ultimately on my research approach (Reed-Danahay 1997). The positive side of my position is that, maybe a bit more than others, I take forest owners' concerns seriously; maybe a bit better than others, I can understand what it means (and how it must feel) for forest owners to lose control of their forest in the course of a few hot summer weeks. I have been there. The personal ties to forests and forestry help; they allow me to understand statements that others would find problematic, incomprehensible or simply wrong; they provide me with a certain credibility and standing among forestry stakeholders, they allow me to establish relationships with people who would otherwise only see me as an overprivileged academic city dweller. Even if I do not consider it a good thing, my position as a white and dialect-speaking male Upper Austrian with (practical) ties to forestry has facilitated my access to the field; in the context of locally prevailing normativities, there is hardly a more “accepted” position for a researcher from a private English-speaking Viennese university. That said, my personal involvement with the topic also presented me with challenges, my biographical proximity to forestry translated into biases, prejudices and certain beliefs. Beliefs I did not even know I had, that I only became aware of when my research forced me to think of more fundamental questions – of whether forests should be used by humans at all, of who gives humans the right to plant trees, only to kill them later. I realized that my own past, the matter-of-factness with which I cut down trees, with which I understood forests as something usable, shaped my assumptions of what forests are (and who they are made for), it made me naturalize and sympathize with foresters, *when I also knew* that a Multi-species perspective would mean criticizing the hubris of forestry, and leaving more ecological space to more-than-human beings. Maybe because I am convinced that we should strive for co-habitation, an acknowledgement of interdependence and a “more mindful silviculture” (Simard 2013), and not for an end of silviculture, I am less convinced than others that the solution for a just coexistence of living beings lies in keeping people away from forests, in separating people and forests through protected areas. Conversely, I also do not believe that the exploitation of forests can continue as it has for the past centuries, that something needs to change. It is this neither-nor position that usually helped me to take a "neutral" or “balanced” position in the conversations with my research partners, but from time to time also got me into trouble when I was asked to take a more explicit stand. My proximity to and in some cases personal acquaintance with my research partners did not make it easier, and more than once people tried to use me to obtain information about others. In line with that, I was repeatedly asked by my interviewees who else I would have spoken to, and what this or that person thought about him/her, or about a specific interview question[39]. This is not surprising considering that “the ethnographer generates strategic knowledge, one that incorporates multiple points of view. In some cases, the ethnographer possesses information that no other social actor has access to, which endows her with a specific quota of power within the conflict’s political arena” (Little 2007, n.p.). As much as I adhered to my research ethics which forbade me to give away information about others, it was demanding to navigate the whispers, interferences and the constant gossiping. What was also unpleasant was that I felt personally attacked on multiple occasions when interviewees complained about the incompetence of non-local, non-farmer, non-professional foresters (like I once was), when interviewees boldly asserted that it would be easy to manage a forest and to control a bark beetle outbreak. There are many reasons why I wrote this dissertation, one of which is certainly a biographically-inspired “coming-to-terms” with the loss of our forest. As Goldschmidt once put it, “all ethnography is self-ethnography“ (Goldschmidt 1977, 294), and I agree that there is a lot of truth in the statement that we engage with the world in order to come to terms with ourselves. In what follows, I will deal with actors, dynamics and developments that I associate with what overwhelmed us as foresters, actors that I believe to be central for understanding bark beetle outbreaks and bark-beetle-related Multi-Species conflicts in Upper Austria.

[39] That I was asked who I had spoken to is no coincidence in a climate characterized by conflict, mutual accusations and distrust. Beyond that, a noticeable distrust (towards me as a social scientist) and – as much as I have tried to allay this concern through information, transparency and anonymity – a certain fear of negative consequences from participating in the research may have also contributed to the skepticism I have often encountered.

III. *WHEN SPECIES ASSEMBLE*: BARK BEETLE OUTBREAKS AND THE ENTANGLEMENT OF SPRUCE, HUMAN AND BARK BEETLE FOREST-MAKING

If you talk to foresters, if you follow discourses on forestry, if you visit forests in certain regions and at certain times of the year, you are likely to encounter three particular actors, or at least their signs: Slender spruces growing in dense stands, humans wandering through those stands, anxiously looking at crowns and trunks, and in those trunks, bark beetles digging tunnels and feeding on the tree's tasty phloem. A not unusual meeting of three creatures that have been interacting as long as we can think of forestry. A few weeks later, we enter the same forest. The slender spruce trees are cut into logs and piled up in heaps, humans are still wandering around anxiously, now with a chainsaw and a spray can in hand, and bark beetles have produced thousands of offspring that have spread all over the area. An ordinary meeting has become something else – an outbreak, as the second of the three actors would call it.

After we have familiarized ourselves with what we need theoretically and methodologically to embark on our journey into the forest, we turn to the question of *what happens when species such as spruces, humans and bark beetles assemble*, to the exploration of what happens and had to happen so that we can, firstly, speak of bark beetle outbreaks as Multi-Species gatherings, and, secondly, understand why these happenings produce and come with conflicts. As we will see, outbreaks are complicated, and above all they are preconditional. For them to happen, to have an effect like described, many things must play together. Certain actors must be present, must be able (and willing) to do certain things, certain relationships must be expressed in certain ways, certain constellations of assembled actors and practices must form, world-making projects must be *entangled*[40]. Understanding bark beetle outbreaks as a social and political

[40] Outbreaks only happen/gain significance when world-making overlaps, when world-making is entangled (through happening at the same place and at the same point in time, through affecting and co-constituting one another etc.), and if only one of the involved world-makers is absent (i.e., disentangled from the world-making of others), an outbreak might not happen or might not be noticed – there is no bark beetle outbreak without bark beetles, no outbreak without spruce, no (observable) outbreaks without humans noticing.

problem requires to consider at least three actors (when in fact so many more need to be involved for bark beetles to become able to infest spruce trees): Actors that as entry points structure my thinking about why outbreaks happen and why they matter; actors that help me to tell the story of bark beetle outbreaks from more than one perspective; actors that serve as focal points for getting a hold of certain assemblages; actors like Norway spruce, Human and the European spruce bark beetle.

Tailored to these three actors and their function as reference points for certain (entry point) Multi-Species assemblages, we will look at what happens when species assemble, and describe that through three similarly set-up chapters (4-6) – each of them telling a slightly different, but complementary story, each of them using a specific approach (natural history – historical political economy – political entomology) and a specific timescape (*Plantationocene* – *Capitalocene* – *Proliferationocene*) to understand why and how each of the three (assembled) actors is involved in and contributing to bark beetle outbreaks (figure 15).

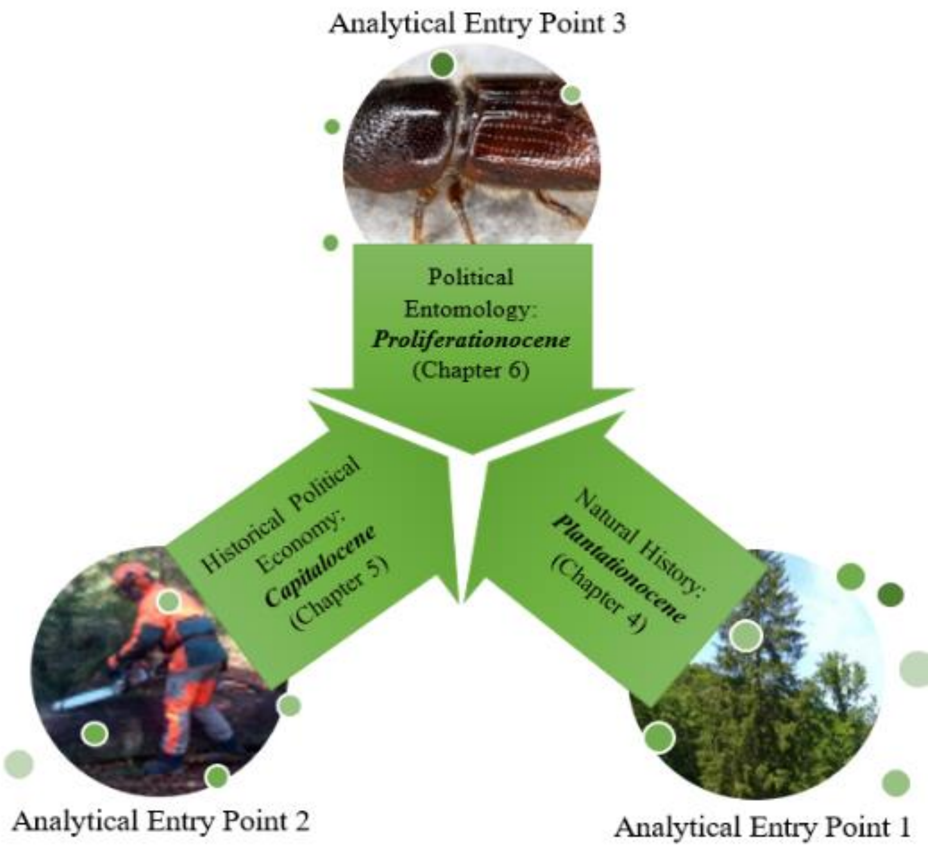


Fig. 15: The Three Entry Point Perspectives and their Different Lenses. © Author,

4. “When The Word for Forest Becomes Spruce[41]”: On the Natural History of Spruce Forest-Making through the Lens of the *Plantationocene*

When I arrived at our forest, I was shocked. Spruce trees deprived of their needles, their foliage fiery red, trunks covered in currents of tree resin. When I was stepping closer, I shivered. Big heaps of brown bore dust next to the foot of the trunk. Signs of the enemy, I thought bitterly. An enemy ever present, to my eye invisible, sucking up tree saps, eating away what I deemed family property. The air shimmered in the heat of that hot and dry summer day. The floor almost bare, dry needles crackling underneath my feet. Spruce as far as the eye can see, standing packed, not able to reach out, doomed to grow ever-higher, to compete with their siblings for sunlight, to fall victim to one of our chainsaws. We have turned the forest into a plantation, it came to me. A plantation falling apart, slipping through our very fingers…

(Vignette by author, based on observation in the former family forest in 2018, Upper Austria)

Fig. 16: Infested Spruce Trees in the Bohemian Forest. © Author, 2022.

To experience a forest die, to see hectares fading away before one’s eyes is a tragedy, for foresters as much as for forest lovers. If we look at what has recently happened in Upper Austrian forests dominated by Norway spruce, if we look at the current frequency and severity of epidemic outbreaks of spruce’s most feared antagonist, the European spruce bark beetle, the tragedy seems to have become normality (Sommerfeld *et al.* 2021). That said, there are tragedies that are self-inflicted. For years, forest scientists have pointed out how the interplay of climate change, intensive forest management and specific forms of silviculture has increased spruce’s susceptibility to disturbances such as bark beetle outbreaks (Pasztor *et al.* 2014; Seidl *et al.* 2016; Marini *et al.* 2017; Biedermann *et al.* 2019; Hlásny *et al.* 2021). If spruce were an economically insignificant tree species, only a few people would be concerned about that susceptibility, about spruce’s current ordeal – presumably this dissertation would not be written either. Yet, spruce is the very opposite of insignificant. Accounting for the lion’s share of harvested wood in Austria, spruce is the ”bread tree” (BFW

[41] Indebted to the title of Ursula K. Le Guin’s (1972) novel „The word for world is forest“.

2013) of Austrian forestry, the backbone of the Austrian wood industry, and in the case of outbreaks of the ESBB, the most immediate victim.

In making sense of spruce's predicament, forestry-critical actors remarked that spruce should have never been planted in monocultures outside of its *natural* range, that the collapse of these "unnatural" forests was only a matter of time. In analytical terms, more frequent and severe disturbances would be a repercussion of the *Plantationocene*, an unintended consequence of transforming "forests into extractive and enclosed plantations" (Haraway 2015, fn. 5, 162). Following that, bark beetle outbreaks would be an *only natural* reaction to the simplification and domination of forest landscapes, they would be nature's "revenge", as Friedrich Engels (1986, 180) once put it. As apt as these accounts are to making sense of why spruce plantations fall apart, they do not tell us much about the contingent and complicated relationships between spruce, humans and other beings, about why the human-spruce relationship was a "success story" (Jandl 2020) for the longest time. While for conservationists and forestry-critics the fate of spruce is exemplary for everything that is wrong and reprehensible about forestry, forest owners and forestry representatives are confronted with a monster that they themselves have created – an economy dependent on one single tree lifeway, an economy that makes them hold on to spruce. I argue that from their biased positions both groups are unable to see the historical, cultural, political and socio-metabolic developments that have contributed to the current abundance *and* vulnerability of spruce. In addition, both tend to ignore spruce's active role in the story, its "ability to make worlds" (Tsing 2013, 31) and create *spruce-places*, its powerful "plantiness" (Fleming 2017; Lawrence 2022), that is its ability to *persist* despite being exploited by humans, pressured by a heating climate and infested by bark beetles – an ability that, as we will see in later chapters, plays out quite differently depending on where spruce lives and with whom it assembles.

The following chapter is dedicated to the attempt of approaching bark beetle outbreaks from the vantage point of Norway spruce, from a "plant point of view" (Chamovitz 2012). In doing so, the chapter sets the stage for understanding the role of spruce world- and forest-making in the context of outbreaks; through a *vegetal political ecology* lens (Fleming 2017), it deals with the ecological, historical and political dimensions of spruce's relationships with humans, bark beetles and others. Situated at three levels of inquiry (from the *spruce tree* over the *spruce assemblage* to the spruce-dominated forest as an *assemblage of assemblages*), the first part of the chapter draws on forest botany and forest ecology to describe spruce's physiological and biological particularities (4.1) as well as spruce's relationships with beings with which it *usually* gathers, with which it forms the spruce-centered assemblage (4.2). This is followed by an exploration of the assemblage's forest-making in the light of the *Plantationocene*, i.e., on spruce's practices of perpetuating (humanly-initiated) spruce plantations, of *making tree-places* livable for their offspring and assemblage partners, of making tree-places *spruce-places* (4.3). Given that spruce was not always in power, I will adopt an environmental-historical and arbori-cultural perspective to explore how spruce managed to exploit the help of humans to dominate forests all over Upper Austria, to become economically needed and socially appreciated, but as part of its success also *susceptible* to disturbances.

4.1 Becoming a Spruce: Physiology, Biology and Agency of Norway Spruce


Fig. 17: A Spruce Tree Seen from the Ground. © Author, 2022.

Standing beneath a mature spruce tree is a humbling experience. One might recall the millions of years of evolutionary history[xxii] that made this tree possible. One might step closer to observe the texture of the bark. One might catch a glimpse of the crown reaching skyward, one might dig to find fungal hyphae wrapped around spruce's root tips. One might also consider a textbook to get a sense of what it could mean to make worlds like Norway spruce. From a botanical-taxonomic perspective, *Picea abies* is an up to 35 meters high and in rare cases up to 600 years old coniferous tree of the Picea *genus*, the Pinaceae *family* and the Pinales *order*, or much more basically: a perennial vascular plant (Nultsch 1996, 204pp.; Schütt *et al.* 2013, 62). That a tree like spruce is *perennial* and *persisting* for many years *on what appears to be the same spot* is not trivial, especially when considering the site-boundedness, temporality and efficacy of a tree's world-making. "Appears to be" insofar as

> "it is evident that the fixedness of plants is an impressionistic mistake, given their lateral and vertical extensions both above and below ground level. Although they appear to be anchored in a place, plants incessantly explore their environments, maximizing their exposure to sunlight, avoiding or growing toward the roots of their neighbors and monitoring and responding to changing environmental conditions" (Marder 2012, 1367).

In outliving humans by far, trees have much more time to change themselves and the world around them (Macnaghten and Urry 1998, 142pp.); through their size, form and materiality (Boyer 1994), through their everyday bodily performances of living, growing, respiring, reproducing they *make places*, both materially and in symbolic terms (Rival 1998; Jones and Cloke 2002; 2008; Jones 2011; Weisser 2015). Yet, having that much time in combination with being unable to move physically (at least not in terms of immediate locomotion in the strict sense) makes trees dependent on favorable site conditions and partnerships with other beings

(Pollan 2002), as well as more lastingly exposed to pollution, environmental changes, human interventions and potential enemies (Lanner 2002). As Trewavas (2009, 607) argues, it may be for the very fact that “plants are sessile organisms, [that] they may perceive more environmental signals and with greater sensitivity and discrimination than the roaming animal”. The perennialism of a tree is also not trivial as a temperate forest tree’s metabolism and physiology is designed for going with the seasons, for growing “upward and outward through primary and secondary growth processes”[xxiii] (Grebner *et al.* 2022, 240).

Turning to the question of what makes spruce special, let us focus on what spruce does (together with others) throughout its life cycle. Imagine how everything starts with sexual reproduction. Spruce is a monoecious gymnosperm, a “naked-seed”-bearing plant with female cones and male flowers on the same individual (Grebner *et al.* 2022, 242-243). What happens during pollination is that the male pollen grain is carried with the wind to a female cone. Once the grain finds itself attached to a cone scale, it produces sperm cells that move through the pollen tube towards the ovule with the female megagametophyte and the egg cell. After sperm and egg cell have merged, the zygote transforms into an embryo. It is this embryo that together with the coat and the seed wing, as well as with the remains of the gametophyte forms a fertilized seed (Küster 2022, 129). On a suitable substrate, the spruce seed germinates, enlarging cells, using the stored energy reserves, developing a root system and a *hypocotyl* with embryonic leaves (Grebner *et al.* 2022, 244). Now strikes the hour of the root, and, depending on soil conditions and physical obstacles, the root makes its way through the soil[xxiv]. Generally, spruce has a shallow *lateral* root system with a main root horizon in a depth of 20 to 60 cm (Gulder 2017). “Generally” insofar as depending on soil type and water accessibility, this depth may vary, and under ideal conditions (on deep, sandy and fresh soils) spruce can develop sinker roots reaching to a depth of over one meter. Conversely, this means that under less ideal conditions, i.e., on shallow, compacted and water-logged soils, and due to specific planting practices, spruce develops a *plate root system* (figure 18) through which it is particularly susceptible to windthrow (Leitgeb *et al.* 2013, 8p.; Hanewinkel *et al.* 2011). In addition to spruce's generally low "drought tolerance"[42] – as an *isohydric* boreal tree, spruce is adapted to cold winters and dependent on precipitation-rich summers – the shallow root system exacerbates spruce's susceptibility to drought stress as in prolonged dry periods the short vertical roots do not allow to access low groundwater (Klápště *et al.* 2020). In turn, these two particularities of Norway spruce (its high susceptibility to windthrow and its high drought sensitivity) are considered central predisposition factors for epidemic bark beetle infestations (Netherer *et al.* 2015; Netherer *et al.* 2019; Hlásny *et al.* 2021). In the case of drought stress, this is because "the decline of photosynthetic activity due to [the drought-induced] closure of stomata results in reduced availability of carbon for primary and secondary metabolism", thus impairing tree health and tree defense, making weakened spruce trees easy targets[43] for forest pests such as bark beetles (Netherer *et al.* 2021, 592).

Fig. 18: (above) The Author in front of a storm-uprooted spruce with a root plate in the Bohemian Forest. (below) Exposed spruce stand on a crest, with an unfavorable forest edge and a problematic height-to-diameter ratio. © Author, 2022.

Ten years have passed since the germination, and the seedling which we have chosen for our story has against all odds survived and has become a sapling, a young tree, around two meters in height. Against all odds insofar as the survival of our seedling was dependent on a

[42] Moran and colleagues (2017, 1035) define a tree's "drought tolerance" as "the ability to survive, and sometimes grow, during periods of water shortage. Survival and growth are often correlated, with trees exhibiting a history of below average growth or abrupt decreases in growth having higher mortality."
[43] Like any other tree, Norway spruce has several defense mechanisms against biotic invaders, "including physical, histological, and biochemical components" (Raffa *et al.* 2015, 6) such as resin flow, autonecrotic reactions or toxic substances (f. ex. terpenes).

next to infinite number of factors (Oliver and Larson 1996), ranging from a topo-climatically adequate growing site over the availability of (enough) light, a good position under the canopy including the "just right" inter- and intraspecific competition (Zavala *et al.* 2007), to favorable soil conditions including nutrient and water availability (Grebner *et al.* 2022, 246pp.). Beyond that, our seedling successfully responded to frosts[xxv] and droughts, enjoyed enough annual precipitation (ideally more than 800 mm), managed its water and resource balance, was not eaten up or (critically) browsed, was neither exposed to windthrow and (extreme) snow pressure, nor severely set back by pathogens, antagonists and pests (Hoch 2013; Leitgeb *et al.* 2013; Triebenbacher *et al.* 2017). As one can see from this enumeration, a lot had to (not) happen in order for our young spruce to prevail, a whole set of Multi-Species assemblages had to play out in a way for our young spruce tree to survive and to thrive. World-Making, in the sense of Making-it-in-the-World, is a risky and open-ended undertaking. Yet, more than just being lucky, more than simply being acted upon, our tree actively changed the physical character of the inhabited place to its advantage, it adapted and responded to its surroundings (Hall 2011; Head *et al.* 2015; Lawrence 2022), and (through being assembled with others) modified environments to survive and suit its needs. In doing so, it displayed a specific "force-fullness" (Shaw and Meehan 2013) driven by what Trewavas (2009) calls "plant intelligence", by a "non-conscious intentionality […] expressed in modular growth and phenotypic plasticity" (Marder 2012, 3) allowing our spruce to grow with directedness, react to changes in the environment and gain a specific "picture" of the world around it through exploring resource gradients and assessing dangers (cf. Hoffmeyer 2008).

After years gone by, our seedling has not only changed in size, shape and form, but moved in the taxonomy from an herbaceous to a woody plant by developing a lignified stem with a red-brown cork tissue that make people call our spruce "red fir"[xxvi] or in Latin "Picea abies" – the spruce that looks like fir (in Latin: *Abies*) (Häne 2017; figure 19). What was once a centimeter-large seedling is now a meter-high plant with lateral branches and leaves, in our case four-angled needles sitting on woody pegs all around the twig (see figure 20).

Fig. 19: Red-Brown Spruce Bark. © Author, 2022.

Fig. 20: Spruce Needles and Woody Needle Pegs. Source: Wikimedia Commons, 2023. https://en.wikipedia.org/wiki/Spruce#/media/File:Picea_abies_Nadelkissen.jpg © Eugster, 2012.

Given that the first ten years of our spruce were a time of vulnerability and slow growth, being a sapling high enough not to be browsed and to surmount the (competing) understory vegetation comes with faster growth, in good years and on good soils up to one meter in height. At least now, a race to the top begins, and as our sapling is in the so-called "thickening phase" pressed by same-age and towered by older trees, the order of the day is to grow, reproduce, extend the foliage, secure resources, recover from attacks, damages and stress situations (Lanner 2002). We are now at the heart of spruce world-making, of what it could *mean* to be a tree, of "treeness" as Perlman (1994, 41) puts is, that is

1) to make places *spruce-places*, that is to make places *livable* for itself, its offspring and assemblage partners (Jones and Cloke 2002, 74; see chapter 4.3.1),
2) to *make sense* of its surroundings, i.e., to discern, interpret and respond to environmental signs (Hoffmeyer 2008, 184), and
3) to live in accordance with its world-making *rhythms* and *temporalities* (Bastian and Hawitt 2023).

The latter point also means to "grow *large enough* and live *long enough* to produce viable seed that perpetuates its species" (Grebner *et al.* 2022, 231; italics by author), to become so old as to become a "mother tree" that helps its offspring to make the common (family) surroundings ever more spruce-friendly (Simard 2021). Among other things, spruce's world-making and its shared history with others is visible in the *bodily form* of every individual tree (Mathews 2018), as well as imprinted into the inhabited landscape. With regards to tree form, Ingold (1993, 167-

168) reminds us that “in its present form the tree embodies the entire history of its development from the moment it first took root”. Contrary to most humans having a more-or-less determinate body form, trees “keep growing and changing throughout their lives. […] Their form shows their biography; it is a history of social relations through which they have been shaped“ (Tsing 2013, 32). As we will see in later chapters, it is this history of relationships with human and more-than human actors, a history of being planted, harmed, pressured and supported by others, that shapes how a spruce tree makes and can make worlds (Grange 1997; Jones and Cloke 2002). In other words, spruce *never acts alone* as an independent organism. In life and death, in growth and decay, being spruce means *becoming with* others.

4.2 Becoming Assembled: More-Than-Human Constituents of the Spruce Assemblage

Fig. 21: Own Depiction of the Spruce-Centered Assemblage with Important Constituents. Inspired by Hoch 2013. Source: All pictures except of ant beetle, ESBB and human taken from Wikimedia Commons under C.C. license. Drawing of Spruce, and other pictures by author, 2024.

For grasping Norway spruce as a Multi-Species assemblage that lives and dies because of others, we may quickly reconsider the *ecological niche*[xxvii] of spruce, that is how *spruce lives* given its potential distribution, soil demands, range of (climatic) tolerance, and biological needs (Townsend *et al.* 2014, 127). In the previous chapter, we have learnt that spruce grows well on deep, well-watered soils, is an intermediate shade tolerant and shallow-rooting tree species, and undemanding with regards to nutrients (Jandl 2020). While it needs much light and has a rather slow growth in its youth, spruce is fast-growing, competitive and a long-lived member of a "climax forest community" in later life stages (to the delight of foresters) (Schütt *et al.* 2013). If we remain at the scale of one "single" spruce at first, we see that the *realized* niche of spruce is different from its *functional* niche, from the living conditions in the absence of other beings. In other words, spruce's *realizable* world-making is shaped, limited and enabled by its interactions with other beings (see figure 21), its susceptibility to bark beetle infestations depends on its relationships with others. In line with that, accounting for interactions with more-than-human antagonists[xxviii] and symbionts is a first step to understand who *usually* gathers with and because of spruce, *who* is *how* a part of the assemblage and what role this plays for spruce forest-making.

4.2.1 Living at the Expense of Spruce: Antagonists and Pests from Root to Tip

One of the relationships through which different beings gather around and become assembled through spruce is one in which spruce is eaten, colonized, infested and/or inhabited, here by forest-protection-relevant *antagonists* and *decomposers* – some of them known as “forest pests” (Bernier and Smith 2015) or “disturbance agents” (Morris *et al.* 2018). Many of these interactions take place right under our feet. In spruce’s rooting zone and on the forest floor, dead and living spruce parts are *constantly* nibbled upon, metabolized and ingested by ground and soil organisms such as fungi, worms, isopods, nematodes and microbes (such as bacteria). All these lifeways fulfill important functions (they break up dead matter, accelerate succession processes, contribute to nutrient cycling etc.), and fall prey to beings on “higher” trophic levels. While some, such as isopods and millipeds, feed upon and shred litter, others such as earthworms convert the shredded particles into humus[xxix] and contribute to the mineralization, fertilization and ventilation of the soil – something that trees greatly appreciate, and there are studies that show that trees grow much better (and are healthier) on soils that are well ventilated and fertilized by worms, ants and others (Blouin *et al.* 2013). That said, there are also beings in the rooting zone of spruce that have the potential to damage (and in some cases kill) spruce. Feared by foresters are not only the root-eating larvae of the forest maybug (*Melolontha hippocastan*), but also the large pine weevil (*Hylobius abietis*) with its trunk-like head extension. While the larvae of the large pine weevil develop in tree stumps and feed on root tissue, adult beetles consume the bark of young saplings, making them a particular threat to post-clearcut regeneration sites (Dillon *et al.* 2008). One important fungal pathogen that can make life difficult for spruce is *Sirococcus conigenus*, a fungus that proliferates in the case of magnesium deficiencies of the host plant and induces the outbreak of the sirococcus blight disease, in the course of which the youngest (annual) spruce sprouts curl and lose their needles (Triebenbacher *et al.* 2017). Even more unpleasant than needle blight diseases, are fungi parasites of the *Armillaria* genus – “white rot”-causing fungi that spread from tree to tree by black rhizomorphs, infest roots and root collars, and induce tree-rotting (Nierhaus-Wunderwald *et al.* 2012). It is the ability to spread fast and over large areas that makes *Armillaria* fungi a forestry challenge – even more so given the fungus’ ability to reappear time and again on once infested areas. *Armillaria* infestations also point to problematic planting practices and an unsuitable tree species selection (Cech 2018). It is not surprising that the occurrence of *Armillaria* is common in those areas where deciduous forests have been transformed into pure spruce stands[xxx].

Not every being living off spruce has hyphae and a mycelium. When considering that from ten animals on this planet seven are insects, we may only speculate about the diversity of insects that gather within, around and because of spruce (Wermelinger 2022)[xxxi]. We have already encountered the forest maybug and the large pine weevil, and we will speak more specifically about bark beetles in the next chapter. One being that is feared as a distinguished connoisseur of buds and needles is the larva of the nun moth (*Lymantria monacha).* A dark-brown larva that after it has hatched can eat several thousand spruce needles in the course of its two-month development, and – when part of a mass occurrence – can defoliate, and eventually kill entire trees[44]. Very often and in line with the co-constitutive character of interactions among assemblage members, a nun moth larvae outbreak paves the way for other biotic disturbances[xxxii], and it is not uncommon that a devoured spruce is subsequently infested by bark beetles (Hoch 2013).

We come to the mammal members of our spruce assemblage, beings that challenge[xxxiii] spruce through browsing, gnawing and/or bark-stripping. Next to mice species such as the wood mouse (*Apodemus sylvaticus*) or the bank vole (*Clethrionomys glareolus*), beings that

[44] Provided moderate population densities and a sufficient tree health, most of the mentioned insect larvae outbreaks are not deadly for spruce. Yet they are straining, and particularly dangerous for the plant when they happen over a number of subsequent years and fall together with diseases, drought stress and nutrient deficiencies.

occasionally gnaw and browse on young spruce trees to bolster their food supply (Odermatt 2011), the most significant mammal browsers in (lowland) spruce forests are hoofed game, in Upper Austria especially roe deer (*Capreolus capreolus*) and red deer (*Cervus elaphus*). Mostly browsing in the wintertime and often selectively on deciduous trees and more tasty conifers such as Silver fir (*Abies alba*) (Bernard *et al.* 2017), hoofed game can cause significant damage to forest regeneration and tree growth. Less a problem for sparsely-browsed spruce, but for foresters who rely on the natural regeneration of other-than-spruce tree species, game are impactful forest-makers, capable of shaping stand structure and tree species composition (Partl *et al.* 2002; Ammer *et al.* 2010; Putman *et al.* 2011). We will see later how hoofed game participate in and are drawn into Multi-Species conflicts (see chapter 8 and 9).

4.2.2 Partnerships with Spruce: Symbionts and Companions from Root to Tip

As we may know, a tree is nothing without its fungal partners. The same holds true for Norway spruce, and when digging into the ground, we can discern how spruce roots are enveloped in the hyphae of ectomycorrhizal fungi[45]. These hyphae not only facilitate and enhance the uptake of water and nutrients (for instance by increasing the surface area of the roots, or by dissolving mineral nutrients via digestive acids), but also produce and release substances that protect the tree from heavy metals, harmful chemicals, pathogens, and above-mentioned herbivores (Tedersoo 2015, 309p.). Moreover, the "mycorrhizal mycelium linking the roots of at least two plants" (Simard *et al.* 2012, 39), multiplying in the form of a *mycorrhizal network*, or "wood wide web" as forest ecologist Suzanne Simard calls it, allows trees to communicate with one another through chemical signals and to nurture surrounding plants with nutrients and water (ibid.). In that sense, fungi are not only beneficial for trees in terms of nutrition and health, but in fact offer trees through their mycelium and its "constellation

[45] *Mycorrhiza* describes the "symbiotic interaction between plant roots and fungal mycelium in which the tissues of both partners are specifically differentiated for improved exchange of nutrients" (Tedersoo 2015, 309).

of tree hubs and fungal links" (Simard 2021, 5) a subsurface communication and nutrient exchange infrastructure (Courty *et al.* 2010). Conversely, trees supply the heterotroph fungi with products from photosynthesis, i.e., with sugar, and offer them shady and moist habitats. Given all the advantages and benefits for spruce being associated with fungi, it is not surprising that spruce trees that are incompletely/poorly associated with mycorrhizal fungi tend to be less healthy, less resilient and have a lower growth rate than the ones associated with fungi, and are thus attached to the "wood wide web" (Anthony *et al.* 2022)[xxxiv]. In the case of Norway spruce, important ectomycorrhizal fungi partner with characteristic fruiting bodies are the False Saffron Milkcap (*Lactarius deterrimus*) and the edible Penny Bun (*Boletus edulis*). Next to those, spruce is also in a symbiosis with nitrogen-fixing *Actinomycetales* bacteria. As we will see, a forest is so much more than a bunch of trees, and the spruce assemblage is not restricted to spruce being the only entangled plant holobiont. Not by accident, forest ecologists pursue plant sociology, they name *forest plant communities* after the most abundant tree species (or tree communities) and the dominant understory grasses, herbs and mosses. Irrespective of the huge variety of forest plant communities in Upper Austria with significant spruce shares, what I most often encountered on my forest walks was the assembling of Norway spruce, European blueberry (*Vaccinium myrtillus*), lingonberry (*Vaccinium vitis-idaea)*, wavy hair-grass (*Deschampsia flexuosa)* and *Hylocomium* as well as *Hypnum* mosses – a constellation of beings quite typical for secondary spruce forests on acid, compacted and nutrient-poor soils. Depending on water availability, soil conditions as well as (past) silvicultural practices, the understory plant species composition varies, in the Upper Austrian context often also including *Luzula* and *Juncus* species, quaking sedge (*Carex brizoides*) or Eagle fern (*Pteridium aquilinum*). All of these plant species are indicators and companions of specific beings and their world-making projects. Similar to how a spruce's bodily form tells us about its biography, who gathers with whom tells us a lot about Multi-Species histories in the making.[xxxv]

With regards to spruce's animal partners, perspective is everything. As an example, spruce maintains complex relationships with seed-eaters, i.e., with high-climbing mammals and *granivorous* birds such as the Common crossbill (*Loxia curvirostra*), the Spotted Nutcracker (*Nucifraga caryocatactes*) or the Eurasian Squirrel *(Sciurus vulgaris)*. Complex insofar as these beings can be considered spruce antagonists – diminishing spruce's potential descendants, thus exerting a selective pressure on spruce (Steele and Yi 2020) – as much as they are partners in helping spruce to disperse seeds, to expand the family over long distances (Küster 2013, 51). Others become spruce partners because they are *antagonists of antagonists*. From clerid and ground beetles feeding on spruce pests to mites, spiders, nematodes and microorganisms that prey on beings potentially harmful to spruce. Naturally, this group also includes insect-eating birds such as woodpeckers or the wood nuthatch (*Sitta europaea*) as well as larger carnivores that manage to regulate the population of the browsing megafauna – in the Upper Austrian context martens, foxes, lynxes and birds of prey. As interesting and ecologically needed wolf and brown bear would be from a wildlife ecology perspective, particularly with regards to their effects on browsing cervids (Kupferschmid and Bollmann 2016), as antagonized is their presence in Upper Austria. As we will see, who is allowed to assemble in and through forests, is always contested.

4.3 Becoming a Spruce Forest: On Spruce Forest-Making, the Making of *Spruce-Places* and the Role of the Plantationocene

Fig. 22: "Ugly Stand" or "Productive Plot"? A “Spruce-Place” in Our Former Forest in the Sauwald. © Author 2019.

I remember that a neighboring forest owner once complimented us on our spruce forest while my father and I were working in what we considered to be the “ugliest” part of our entire plot, a dense and dark stand of pure spruce. Leaning out of his jeep, he congratulated us: How dense the stand was, how vigorously growing and beautifully straight the trunks of our spruce trees were. He was serious. I had never seen the stand like that before. To me it was ugly, monotonous, dark, lacking in biodiversity. I secretly cursed my ancestors for planting the forest like this. But the way our forest looked today was not only because of that past planting. Spruce seemed to spread by itself, taking over our property, shaping the forest according to its particular needs...

(Vignette by author, based on observation in the former family forest in 2019, Upper Austria)

As the proverb says, it is all too easy to *not see the forest for the trees*, even more so when the forest is a dense spruce forest, only consisting of one single tree species. But what do we mean when we speak of a “forest”, and what is it that makes even a monotonous spruce forest an organic whole with emergent properties, with “wisdom and intelligence” (Simard 2021)? From a Multi-Species perspective, many conceptualizations of forests are not very helpful. For instance, the FAO defines a forest quite technically as a “land with tree crown cover […] of more than 10 percent and an area of more than 0.5 hectares […][xxxvi]” (FAO 1998, w.p.). Other authors such as Grebner and colleagues (2022, 3) grasp forests “as a living community of trees […] within which plants and animal reside, reproduce and forage […]”. For our purposes, this definition is, although not perfect, better suited as it stresses that forests are more than just a quantity of trees, they are living *communities*, they are inhabited by human and more-than-human beings. Beyond, forests are “complex adaptive systems”, and the agents within those systems are not just individuals, but “meta-networks of fungi, fauna and flora” (Simard *et al.*

2013, 133). If we replace the term *network* with *assemblage*, i.e., address forests as "meta-assemblages of fungi, fauna and flora", as an *assemblage of assemblages*, we have a first entry point to what a forest could be, particularly with regards to the question of how forests are connected to other ecosystems, and where forests in fact *begin* and *end*.[xxxvii]

Forests are also Multi-Species *landscapes*. This is the case regardless of whether we are talking about a spruce plantation or a mixed forest. Even in the case of the former, where we encounter only one tree species and might be inclined to speak of a "Single-Species landscape", the co-constitutive relationships between spruce, fungi, birds, and so forth demonstrate that (despite all the talk of the *plantation*) even a pure spruce stand is a Multi-Species landscape: "Landscapes are not backdrops for historical action: they are themselves active. Watching landscapes in formation shows humans joining other living beings in shaping worlds" (Tsing 2015, 152). In this sense, spruce *makes* forests as much as it gathers in them. If a landscape is a "taskscape made visible" (Ingold 2000, 204), then spruce-dominated landscapes are a product of spruce's world-making, including the multiple ways in which spruce trees *make place(s)*, and conversely "how place(s) are makers" of spruce (Jones and Cloke 2002, 73). Albeit it is obviously true that spruce was (and is) supported by humans in its world-making ranges, possibilities and practices, spruce has existed much longer than (and not only for) human purposes. Given that I approach spruce as a powerful actor and not just as a passive plaything, I will briefly talk about the history of spruce's expansion in Central Europe – an expansion happening before, because and sometimes despite human interventions.

4.3.1. One Tree among Others: Spruce from the last Ice Age to the 18th Century

It is most meaningful to begin an environmental history of the rise of spruce at the end of the last ice age, i.e., with the return of spruce from its glacial refugium in southeastern Europe (Küster 2013, 30–33), which in turn was made possible by rapid warming, the retreat of ice sheets, and the formation of soils after the end of the *Late Glacial*, about 10,000 years ago. It is believed that spruce became the dominant tree species in the Austrian Alps only during the *boreal* period, between 8,000 and 6,000 years ago, with high area shares of oak, ash, and hazel in the northeast, east and southeast (Kral 1994, 24p.). At the same time, trees such as fir and beech began to spread, replacing or complementing spruce, and forming a well-assembled forest community, namely mixed mountain forests consisting of spruce, silver fir (*Abies alba*) and European beech (*Fagus sylvatica L.*) – until today the supposed "natural" forest community[46] of most (Upper) Austrian forest areas between 600 and 1400 m above sea level (Bebi *et al.* 2001; Pretzsch *et al.* 2010; Hilmers *et al.* 2019; see figure 23). Although it is well documented that ever since the Neolithic revolution humans have been more actively and extensively intervening in forest communities (Küster 2013; Kirby and Watkins 2015), the human influence on forests in the area of present-day Upper Austria was relatively small for the longest time. This means that until the early Middle Ages the tree species composition in Upper Austria largely resembled what Kral (1994, 31) frames as a "natural tree species composition". The latter can

Fig. 23: Structure-Rich, Uneven-Aged Mixed Forest Comprised of Beech, Spruce, Fir and Sycamore Maple close to the Austrian-Czech border in the Bohemian Forest (app. 1100 m a.s.l.). © Author 2022.

[46] Supposed insofar as recent research projects of categorizing suitable forest/tree communities (such as FORSITE, n.d.) start from the assumption that there is no such thing as a stable "natural" forest community, that forests are dynamic and complex adaptive systems (Oliver 2022).

also tell us something about the (supposedly) *natural* distribution of spruce, its (hypothetical) role in Upper Austrian forests in the relative absence of (intensive) human management, and thus about how spruce benefited from human forest interventions ever since (see appendices A11). If we look at the *natural* forest communities of Upper Austria, we see that most Upper Austrian forests below an altitude of 1000 m a.s.l. *would be* dominated by deciduous trees. While European beech, hornbeam (*Carpinus betulus*) and members of the Quercus (oak) genera would account for the highest (lowland) area shares, complemented by other deciduous trees, conifers such as larch, pine, fir, and spruce would be found at higher elevations, in specific ecotones or as mixed species (Ellenberg *et al.* 2010; see figure 24; LFW/LFD OÖ 2017, 17). In the context of Norway spruce and its *natural* occurrence "from Siberia to Fennoscandia through the Baltic countries all the way to the mountain ranges of Central Europe" (Honkaniemi *et al.* 2020, 591p.), spruce in Upper Austria is usually accompanied by silver fir and beech (Leuschner and Ellenberg 2017). At higher elevations, mainly above 1200 m, spruce either forms pure stands, or occurs together with European larch (*Larix decidua*) or Swiss pine (*Pinus cembra*) (Leitgeb *et al.* 2013). In other words, if we want to find allegedly *natural* pure spruce forests in Upper Austria, we have to go to the mountainous south of the province (e.g., to the Kalkalpen) or to one of my research sites around the Plöckenstein, the highest elevation of the Bohemian Forest. However, since this area has also come under pressure from storms and droughts, we can see that in times of climate change, the

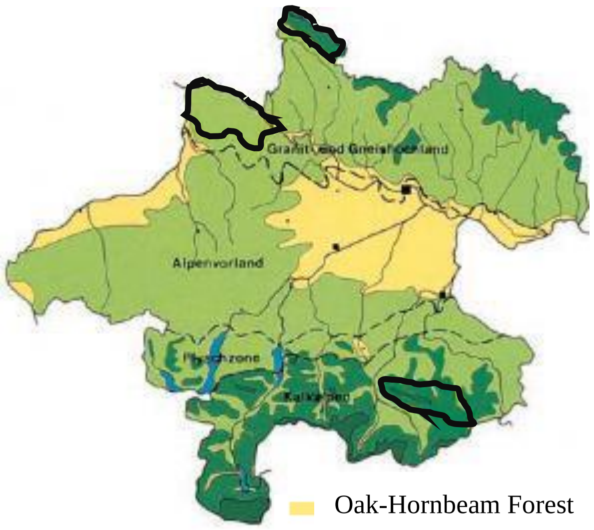


Fig. 24: Natural Forest Communities in Upper Austria. Source: LFW/LFD OÖ 2017, 17; adapted by author.

naturalness of a spruce forest is no longer a protection against bark beetle outbreaks (see Chapter 10).

Having equated the pre-Medieval with the *natural* forest communities, we can conclude that even in the vicinity of human settlements spruce was well until the Middle Ages *one tree species among others*, that deciduous trees such as oak or beech were much more needed and popular than spruce because of their importance for firewood, coal production and animal husbandry. As we will see, this changed all too quickly, and against the backdrop of a changing social metabolism, increasingly based on fossil fuels, and a forestry industry increasingly focused on timber production (Johann 2007), spruce experienced an unprecedented rise, an era of being planted and preferred over all other tree species – mainly because of being fast-growing/competitive, undemanding with regards to nutrients, and easy to drift through waterways (in contrast to fir or hardwood) (Interview X). As a result, silvicultural systems shifted to favor spruce over (coppice) hardwoods. This was the birth of the spruce plantation.

4.3.2. One Tree among Itself: On Spruce's *Plantationocenic* Dominance ever since the 19th Century

More than any other tree species in (Upper) Austria, the story of the rise of spruce is a story of the *Plantationocene*, of an epoch of humans transforming fields and forests "into extractive and enclosed plantations" (Haraway 2015, FN 5, 162), of humans attempting to make Multi-Species landscapes scalable[47], manageable and exploitable for fiscal/capitalist purposes (Scott 1998; Haraway 2015; Thomas 2019). As forestry's monocrop, spruce was crucial in the rationalization, scientification and modernization of the Habsburgian forest economy in the 19th century, it became the real-life equivalent of the standardized tree ("Normalbaum") (Lowood

[47] "As projects of scale and desire, plantations are rooted in the logic of mastery, discipline, and control over environments deemed useful only insofar as they serve particular humans' ends. In plantation regimes, the fates of uprooted and transplanted humans and plants become strangely intertwined. Simultaneously positioned as objects and subjects of extractive labor, their bodies and vitalities are put to work under the dictates of capitalist production and its limitless, linear, and singular arrow of time-as-progress" (Chao 2022a, 362).

1990), the epitome of the "modern" productive tree species (Ritter von Guttenberg 1899). A portrayal of spruce that illustrates how the tree was hailed in the 19th century is found in the work of forest chronicler Joseph Wessely (1853, 271; translated by author). For him spruce in the Alps is not only "*the* timber species of all timber species", forming in certain regions alone "what people call forest", but also "what the simple farmer is in the state: the unadorned, but indispensable 'common man' that […] constitutes the foundation of society". That the indispensable common man could ever let you down was unimaginable at the time; and despite the fact that spruce's disturbance-susceptibility was already known in the 19th century (Wessely 1861; Schwappach 1886; Gayer 1886), the *Plantationocene* cultivated the belief in an ever-continuing availability and profitability of spruce plantations. I have mentioned that humans *attempt* to make forests scalable, manageable and exploitable, and I stress attempting here because humans' control over forests is never absolute, because monoculture pests and "feral proliferations" (Tsing *et al.* 2019) like bark beetles challenge and antagonize human simplifications. They show us that after a short period of (incomplete) dominance and economic gains (such as in 19th and 20th century), after a period of making pure spruce or spruce-dominated stands an omnipresent feature of Upper Austrian forest landscapes, the simplification of forests (Scott 1998) brings about unforeseen and undesired consequences. Put differently, planting and treating trees as if they were crops, ripping apart Multi-Species communities, and degrading and compacting forest soils has its price, it reduces the diversity in niches and species, and makes it easy for diseases and spruce antagonists to pursue their world-making (Liu *et al.* 2018). Given that plantations "are embedded within, and generated by, specific temporal, spatial, multispecies and material contexts" (Chao 2022b, 168), the beings drawn into and put to work in plantations act back, through their world-making practices and intra-/inter-actions with one another they produce their own (re-wilded) versions of that initial plantation – often to the displeasure of the plantation manager (Tomich 2011).

As great as this *recent* displeasure might be, we should not forget that (specific) human actors have for the longest time benefited and continue to benefit from spruce plantations. In this sense, "being alongside" (Latimer 2013) spruce has shaped the (self-)image and wellbeing of the modern Upper Austrian forester. With people "as much bound up in the life of the tree as is the tree in the lives of the people" (Ingold 1993, 168), spruce has more than any other tree species shaped the way foresters have practiced and thought about forestry. In line with that, spruce plantations became the blueprint for how a forest should look like, for a forest that is profitable, cheap to "create", easy to manage (compared to an uneven-aged mixed forest; Interview III, V, XIV), and simple to harvest (Büchsenmeister 2013). Differently put, the physiology, biology and ecology of spruce with its fast growth, its competitiveness, its straight (and relatively branchless) trunk, its little proneness to browsing, its low nutrient demands, and its regeneration fitness made (and makes) spruce an ideal, because *scalable* plantation tree. Furthermore, spruce is considered "uncomplicated to handle in dense stands and in its youth" (Interview XV), and is portrayed as cost-efficient when it comes to re- and afforestation:

> "One just needs to see that spruce is in this sense the cheapest plant, in its youth it is very profitable, late frost is not really an issue, browsing is not an issue, it can deal well with weeds, I must say, if I do not have to do so much maintenance [and weeding], then I have already saved a lot of money. That is the economic side of it, when I do a reforestation" (Interview VII, L. 619pp.)

Next to that, spruce's wood properties (here: the combination of high durability, low weight and good workability) make it suitable for many different purposes (Interview VIII; Honkaniemi *et al.* 2020). Several interview partners highlighted that (the availability of) spruce was a precondition for the Austrian reconstruction after the two world wars, and betting on spruce became part of the post-world-war narrative of recovery, prosperity and continuing progress (Weigl 2002; Interview X, XV; see chapter 5.1.2), driving the establishment of spruce forests on sites where spruce would not occur *naturally* (see figure 25, next page), where spruce would not be the only/dominant tree species. In the (humanly-enforced) absence of other beings, spruce was able to act at its own discretion, to become a most powerful maker of "tree-" and *spruce-places* (Jones and Cloke 2002, 11; cf. Rival 1998).

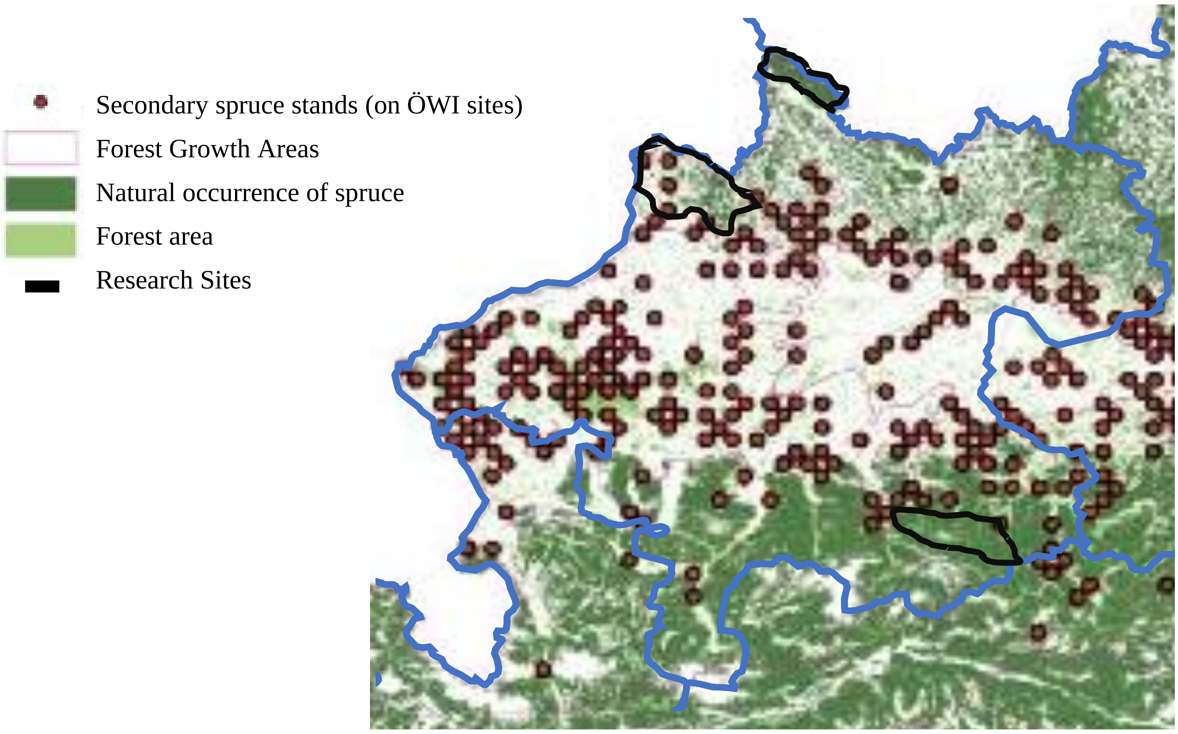


Fig. 25: Secondary Spruce Stands in Upper Austria. The figure shows that particularly in the West (Hausruck and Kobernaußer Wald), Northwest (Sauwald) and in the central area ("Zentralraum") anthropogenic spruce stands are a dominant landscape feature. Source: Leitgeb *et al.* 2013, adapted by author.

4.3.3. One Tree in Its Place: On Spruce-Places and Spruce Place-Making

> "A tree stands in its own place […] Not only is a tree in its place; it actively contributes to its place, filling it up with its own organic substance. It knows no menacing void. […] A plant, having no place to go, is never lost" (Casey 1993, xi–xii).

Approaching forests as "tree-places", and spruce forests as "spruce-places", helps to see how trees as "'players of place' par excellence" (Jones and Cloke 2002, 73) make worlds livable through place-making. If there is one being that does not make room easily, that has a century-long presence and imprint on its surroundings, then it is a tree. A being that is capable of enduring, but also of rearranging the prevalent site conditions, that needs to work with and changes what is there, and – at least in its lifetime – does not have much scope for relocation. Precisely because trees are "more bound" to their inhabited places than other beings, they need to control and modify those places, they need to make sure that their descendants will be able to live in a similarly comforting environment hundreds of years from now (Casey 1993; Perlman 1994). In other words, when the opportunity arises, trees *appropriate* places, and, as we have seen, the *Plantationocene* has above all others presented spruce with that opportunity. However, as the reputation of spruce plantations has faltered in the face of the current crisis, spruce's once-welcomed and- supported appropriation of tree-places is beginning to be viewed differently. In line with that, there is increasing talk of spruce growing where it would not "belong" (Jones 2011), of limits to the appropriation of forest by spruce (and their human allies) (Von Teuffel *et al.* 2004). Although "belonging" (in the sense of surviving under certain conditions) may itself change in the face of climate change and proliferating bark beetles, the framing of plants as "(not) belonging" is from a vegetal political ecology perspective (Fleming 2017) less a question of biological possibility, but "a culturally variable practice that pays only partial attention to the exuberance of planty life" (Head *et al.* 2014, 863). Differently put, the fact that spruce could have sprouted and grown to maturity in most parts of where it was planted in Upper Austria, i.e., that spruce managed to become that abundant despite competition, antagonists and often non-ideal growth conditions, relativizes the increasing, politically-motivated portrayal of spruce as "out of place" and "unadapted" (see chapter 7). A portrayal that owes its emergence to the century-old, but only recently more considered realization that even-aged pure spruce stands are more than other stand forms affected by and susceptible to high temperatures, precipitation deficits, storm events and forest insect disturbances (Pretzsch *et al.* 2010; Leitgeb *et al.* 2013; Neuner *et al.* 2015; Netherer *et al.* 2019). In times of high precipitation, mild temperatures, and little ecological concern for the impacts of forest management on biodiversity, the *plantationocenic* spread of spruce was not a cause for concern. However, as soon as the climate changed, it became clear that monospecific spruce stands are susceptible to disturbances, that spruce growing among itself, in densely packed stands, and on shallow and heavy soils with a (sharp) forest edge have dramatic consequences for tree health and the stability of the entire stand. (Netherer and Nopp-Mayr 2005; Hanewinkel *et al.* 2011; Grodzki *et al.* 2014; Bartsch and Röhrig 2016; Kamińska *et al.* 2020).

What forest ecologists call plant sociology, i.e., the specific form and structure of the mingling of different tree lifeways, is far from trivial. This is because world-making is an emergent property of the gathering of different beings, meaning that spruce trees that live together with beech and fir have other world-making needs and options than spruce in monospecific stands. To illustrate this point, recent studies have shown that in a mixed forest setting spruce benefits from "having the right neighbors" (Grossiord 2019), for instance in the form of better growth (and higher yields), better health and an increased resilience to disturbances and climate-change-related stresses (Bauhus *et al.* 2017; Honkaniemi *et al.* 2020). In other words, it matters greatly which tree lifeways assemble, and by that how trees are distributed *horizontally* (via plant cohorts, given specific patches etc.), and how tree communities are structured *vertically* (on basis of age, height, domination-subordination relationships etc.) (Pretzsch 2019), particularly in the context of resilience to climate change, resistance to droughts and susceptibility to disturbances. Yet as we have seen, plant distributions are neither just "out there" nor strictly determined by the respective site conditions, they "are governed by tolerances, competition, disturbance and people" (Head *et al.* 2014, 862). Whether spruce has (with human help) managed to replace beech, fir and oak in the (low) Sauwald and benefits from not being browsed by roe deer (chapter 8), or whether spruce has been drawn into the biopolitical question of which tree lifeway is deemed natural and is *thus* allowed to live in the Kalkalpen National Park (chapter 9) – plant distributions, i.e., the ways in which trees are assembled with one another and with others are an expression of the history and politics of Multi-Species relations. *Who assembles with whom in which way (for whose benefits and at whose expense)* is even more important when we return to approaching a spruce forest as an "assemblage of assemblages" and assume with Manuel DeLanda (2016, 21) that every assemblage "acts as a source of limitations and opportunities for its components". In line with that and based on Jane Bennett's "*agency* of assemblages" (2010, 34; italics in the original), it makes sense to speak of the *agency* of a forest, here the forest's "agentic capacity" owed "to the vitality of the materialities [and actors] that constitute it"[48]. To strain Kohn's (2013) figure of "thinking forests", we could say that spruce trees *represent* and respectively *make* the world around them differently when they are planted in dense stands, on soils to which they are not well-adapted, in areas where they do not get the precipitation and climatic conditions they need, where they are pressured by Armillaria fungi, nun moths and bark beetles. As an example, one only needs to look at the influence of spruce world-making on a place's "forest micro-climate" (Augusto *et al.* 2002). Compared to beech-dominated forests, spruce-dominated or pure spruce forests have (under warm conditions) a higher transpiration and interception rate, meaning that inside a (dense) spruce stand less precipitation reaches the ground, and the seepage of water into deeper soil layers, is respectively lower – as the root penetration in "spruce forest soils" is superficial, and soils are often badly aerated and compacted (Bartsch and Röhrig 2016, 228 and 233pp.). One can imagine that in time periods and/or on sites with little precipitation (or little/non-accessible groundwater reservoirs), non-site-adapted spruce stands with their inability to hold and access water are particularly affected by precipitation deficits (Honkaniemi *et al.* 2020). Beyond that, spruce assemblages impact "the chemical, physical and biological characteristics of soil" (Augusto *et al.* 2002, 233) including soil fertility and nutrient budget. More concretely and depending on climate, forest management and parent rock, Norway spruce has adverse effects on the calcium and magnesium budget, contributes to soil acidification and a decrease in the pH value (Ayres *et al.* 2009; Cools *et al.* 2014; Cremer and Prietzel 2017). Also, dense spruce forests dramatically change the on-the-

[48] To be more specific, I assume that the *agentic capacities* of a pure spruce forest are different from the capacities of a beech-fir-spruce forest, and that spruce world making plays out differently when spruce is only among its own kind, or more accurate: is *forced* to be among its own kind.

ground light conditions, they do not leave much light for understory plants, (young) competitor trees and conspecific successors[49] (figure 26). Additionally, spruce needles decompose badly, and by that intensify the build-up of acid raw-humus layers, especially on granite and gneiss parent rocks such as in the Sauwald or Bohemian Forest (Cremer and Prietzel 2017). Given that spruce has low nutrient demands and can deal with acid soils better than other tree species (Leitgeb *et al.* 2013, 7-8), one central aspect of the competitiveness of spruce world-making is the circumstance that spruce changes the soil properties to an extent that makes it difficult for other tree species and/or understory plants to succeed (Augusto *et al.* 2002). In this sense, spruce's place-making, its attempt to make tree-places spruce-places alters not only the forest-ecological starting positions for "other" Multi-Species assemblages, but also the availability and cycling of water and nutrients, and by that the entire character of a forest ecosystem[xxxviii]. Spruce forests, to put it more bluntly, re-make the world according to their needs and preferences, and in doing so shape and limit the world-making possibilities of others.

Fig. 26: Two younger (20-30 years) spruce stands in the Sauwald on granite and gneiss, 600 m a.s.l. Notice the thick needle layer, almost no understory vegetation and the specific within-stand light conditions. © Author, 2022.

[49] As two interview partners, both operating managers of forest enterprises, know from their own experience, a (bark-beetle- or drought-induced) loss of an entire age group in an even-aged high stand ("Hochwald" system) in the absence of (successful) natural rejuvenation bears considerable economic risks as in the worst case a lot of time, money and energy needs to be invested in planting when there could be a "more continuous" natural forest regeneration such as in a "permanent forest" (Interview V, XII, XVIII).

4.3.4. One Tree and Its Demise: On the Limits and Possibilities of Spruce's (Future) Forest-Making

As much as spruce has been able to extend its world-making spaces and opportunities through its (unequal) partnership with humans – a partnership in which expansion at the population level was paid for by the death of individuals through logging –, as much are these opportunities threatened by climate change (Honkaniemi *et al.* 2020) and its consequences in the form of proliferating bark beetles, extreme weather events, and longer periods of drought, having already translated into a "doubling of the proportion of [spruce] forests affected by tree mortality since 1984" (Korolyova *et al.* 2022, 1). Spruce has fallen into a serious crisis, and with it the spruce-dominated forestry. From record spruce harvesting to a loss of spruce forest stocks (Hlásny *et al.* 2021), the concerns about (the future of) spruce have reached an entirely new level (see chapter 7). In some regions of Upper Austria, spruce mortality has been so high that some are asking how long spruce will survive in these areas. With that in mind, roaming through Upper Austrian (lowland) spruce forests these days is quite depressing, it is roaming through "blasted landscapes", as Kirksey *et al.* (2014) would put it. The suffering of spruce is all too visible, be it when encountering clearcuts replacing former spruce forests (figure 27), or when recognizing signs of impaired tree health and grave physiological stress – signs that foresters use to assess the tree's disturbance susceptibility including its risk to bark beetle infestation and premature death (Hlásny *et al.* 2021; see figure 28, next page). What appears to be undesired, an anomaly, a tragedy, namely tree mortality, is a re-assembling and re-positioning of Multi-Species communities (Van

Fig. 27: (above) Clearcut within a spruce forest in the Sauwald (below) Clearcut of a spruce forest at the edge of the Kalkalpen National Park © Author, 2021.

Dooren 2011; Rose and Dooren 2011); tree mortality is "natural and unavoidable, […] a key ecosystem process in forests" (Searle *et al.* 2022, n.p.). In other words, death in forests is an important precondition and driver for the complexity, diversity and continuity of life. As Eben Kirksey (2021, 81) puts it, "ecological communities – associations of predators and prey, omnivorous scavengers, parasites and hosts – depend on ongoing intergenerational cycles of life and death". In this sense, without death there would be no forest succession, forest regeneration and a change in forest structure and species composition. Put differently, "living futures are always 'indebted' to the dead that surround them" (Kohn 2013, 24). Whether initiated by felling, natural death or disturbances, clearcuts and glades are important habitats, they are sites of (*unintended*) change, both for human and more-than-human actors. As much as they may seem like ugly cracks in the landscape to recreationists, as much as they may be perceived by forest owners as unproductive and labor-intensive areas, and as an obstacle to the forest's protective function, clearcuts and glades are places for the gathering of those beings that would not occur in dense closed forests, they are hotspots for biodiversity (Davis *et al.* 2020; Gandhi *et al.* 2022). To return to how I have started this chapter, sites of spruce death, clearcuts and glades are shattering, but they are also "possibilities for transformative encounter" (Tsing 2015, 152), they are places of surprise and resistance. Resistance insofar as spruce actively inhabits and shapes the landscape. Spruce is not a passive "victim" doomed to go extinct or be replaced, but has a say in how future forests will look like; through its exceptional adaptational capacities (Klápště *et al.* 2020), it has its own way of persisting despite being declared unadapted or presumed dead all too often (figure

Fig. 28: Stressed-looking, non-vital (and assumedly bark-beetle-susceptible) spruce trees at the edge of a clearcut in the Sauwald. At closer look one can see that several trees have already lost their treetops, have a sparsely-needled and already discolored crown. © Author, 2022.

29). Spruce has been here for quite some time, and the millions of years of co-evolution with biotic disturbance agents and of intergenerational recoveries from abiotic disturbances have prepared the tree for certain setbacks (Schurman *et al.* 2018). That said, the setbacks that spruce faces today are insofar special as they are largely caused by humans, as they occur with an immense speed and intensity. Following that, it is humans who are responsible for spruce dying by the thousands, for having forced the tree to live in areas where it is (now) too hot, too dry, or where pests have an easy time proliferating. Because of their fetish for an easily-plantable and fast-growing, i.e., for a scalable tree, humans have given spruce an undue support and in doing so have not only spread spruce over large parts of Europe, but have also put spruce (and those who are dependent on it) in a position of great agony.

Fig. 29: “There is life in the old spruce yet”. Spruce survivor in the midst of a storm and bark beetle calamity area close to Plöckenstein, Bohemian Forest. © Author, 2022.

In what reminds me of Goethe’s sorcerer’s apprentice, of a “wannabe master” who believed he could summon the spirits of spruce at will, it feels like we have reached a point, where cutting down dying trees, like chopping up broomsticks in Goethe's poem, only creates ever new problems. Problems of *blasted landscapes* in which humans are haunted by dying trees and expanding clearcuts, by the ghosts of torn-apart Multi-Species communities (Tsing *et al.* 2017; Blazan 2021). In what follows, we will turn to these “wannabe masters”, to both spruce’s greatest ally and its greatest misfortune, to an actor with whom spruce shares a particularly complex history.

5. “Wannabe Master[50]”: On the Historical Political Economy of Human Forest-Making through the Lens of the *Capitalocene*


Fig. 30: Human forester in the Sauwald. © Author, 2020.

> “But when they came here there had been nothing. Trees. A dark huddle and jumble and tangle of trees, endless, meaningless. […]. Roots, boles, branches, twigs, leaves, leaves overhead and underfoot and in your face and in your eyes, endless leaves and endless trees […]. But men were here now to end the darkness, and turn the tree-jumble into clean sawn pans, more prized on Earth than gold”
>
> (*The Word for World is Forest* – Le Guin 1972, 16)

We have reached a point where the statement that a bunch of great apes have messed up terribly does not require an elaborate explanation. By altering living conditions on a planetary scale, by ripping apart Multi-Species communities, by overstretching the web of life, *certain* (esp. *white*, *Euro-American*, and *wealthy*) representatives of *Anthropos* have drastically limited the possibilities for a *good life for all* (Malm and Hornborg 2014; Tsing 2015; Steffen *et al.* 2015; Brand *et al.* 2021). Forests have not been spared in this regard, and under the pretext of “sustainable forestry” the *capitalocenic* destruction, degradation and fragmentation of forests continues (UNEP and FAO 2020; Vian *et al.* 2023). Even in Central Europe, where the (partial and selective) increase in total forest area in the last decades is often celebrated as a great success of “sustainable forestry”, forests are not doing well in many places, forests are still being lost at a rapid pace, despite or maybe precisely because of those who call themselves *foresters*.

In its two most common meanings, the *Oxford English Dictionary* (OED n.d.) defines a *forester* either as a beast “inhabiting a forest” or “a person that is in charge of [managing]

[50] Following Val Plumwood (1993) and her brilliant analysis of the "mastery of nature", the behavior of many foresters in the face of bark beetles reminds me of the desperate attempt to cling to Plumwood’s “master model” – a model based on the instrumentalization of *nature* and the denial of one's own dependence on the latter; a model which is "blind to the intricate pattern and workings of nature, seeing only a *disorderly other* in need of the imposition of rational order via development. The mechanistic world-view means that the master rationality is unable to see in biospheric nature another center of striving and needs for earth resources, or to see that these needs must limit and bound its own demands".

forests". What started in terms of humans' historical role in/for Upper Austrian forests as the former – as "human beasts" inhabiting and subsisting from forests –, has with the emergence of *rational capitalist* forestry, forest science and the nation state turned into the latter, into human individuals getting trained for *managing* forests *for specific economic purposes,* based on the generalization of the "master model" (Plumwood 1993) and an "ecological dominance" narrative placing humans above all other forest-makers (Lowood 1990; Vitousek *et al.* 1997; Nocentini *et al.* 2021). This is not to say that human actors did not "manage" forests in the millennia before (Kirby and Watkins 2015). What became novel was that management's subsumption under *modern* (colonial) state administrations (Peluso 1992; Scott 1998; Rajan 2006) and its institutionalization as a *science* in the service of a specific mode of production, a specific "way of organizing nature" (Moore 2016, 2): Capitalism[xxxix]. Following Moore in understanding capitalism not as a counterpart to *nature*, but "as a multispecies, situated, capitalist world-ecology" (ibid., 6) and seeing how this world-ecology is based on the exploitation of "Cheap Nature" – an uncapitalized nature not re-producible by capitalists –, capitalist forest-making is all about using *cheap forest nature*, about creating exchange values from putting the "web of life" to work (Bear *et al.* 2015), about expanding and reworking the "forest frontier" (2003). Albeit forestry in Upper Austria is these days for the most part not the one-size-fits-all plantation forestry (of the 19th and 20th century), I will show that even in times of an allegedly "more sustainable" and "close-to-nature" forest management, human forest-making continues to take place in the *Capitalocene,* under the premises of capitalism as "a system of power, profit and re/production in the web of life" (Moore 2017, 594).

The following chapter is dedicated to a historical political economy perspective on the historicity and power-ladenness of precapitalist and capitalist human forest-making in Upper Austria and beyond. In the first part, this translates into looking at the historical processes of humans becoming (spruce) foresters in and beyond Upper Austria, of humans turning from use-value-oriented forest users into exchange-value-focused timber producers (5.1.1-5.1.2). This is followed by an exploration of what makes people own, manage and maintain a (spruce) forest *today*, of the different ways in and through which human-forest making takes place in Upper Austria and how this plays out differently depending on context and on one's emotional, economic and ideological positioning vis-à-vis forests and forestry (5.2). As I have shown at the example of the spruce assemblage, foresters neither act alone nor in a political, social and economic vacuum, they act because of and from within an assemblage of practices, infrastructures, technologies, customs and institutions (Murray Li 2007). What humans (are able to and want to) do in and around forests is thus shaped by their position in "webs of relation" (Rocheleau 2008), and it is above all the international (wood) *market* (as an *assemblage of assemblages*) that shapes how these webs are structured, how humans go about forest-making, how humans are affected by bark beetles and the downfall of spruce. In line with that, the last part of the chapter will focus on *the market* as a forest-maker and on how humans, practices and institutions are shaped and re-assembled through the market's *capitalocenic* forest-making (5.3).

5.1 Becoming a (Spruce) Forester: On the Past and Present of Human Forest-Making in and beyond Upper Austria

5.1.1 Using Forests: On Mixed Forests and Multifunctional Landscapes

Humans have lived off, used, altered, and eventually overused[xl] forests as long as they exist (Westoby 1989). While it is believed that human's direct influence on forests and tree species composition was rather small in hunter-gatherer times, the neolithic transition to an agrarian metabolic regime led to a stronger integration of forests into the social metabolism (Sieferle *et al.* 2006). That said, what many see today as the main function of forests, namely the provision of timber, was "secondary" back then, and well until the Middle Ages, (fire) clearing (for creating cropland, meadows and settlements), firewood collection, forest pasture and litter raking were the more common interventions into Central European forests (Küster 2013, 68pp.). In today's (Upper) Austria this was no different, and until the enforcement of "scientific forestry" in the 18th and 19th century, forests were considered multifunctional landscapes, used for multiple purposes – be it for energy provision (charcoal, fuelwood), for the provision of non-timber-forest products/materials (potash, sap, resin[51], berries, plants, mushrooms etc.), or for fodder production/supplementation (through litter raking, lopping, shredding etc.) (Weigl 2002, 597p.; Pichler *et al.* 2022). Since forest use was based on livelihood needs (Johann 2007, 56), and since most forests in Austria were managed as commons with local rights of use until the Habsburg Forest Act of 1852, it is contested to what extent smallholders (as those dependent on forest resources) "overused" their forests, and whether they were responsible for the deforestation and forest degradation in the early modern period, as it is often portrayed (for different perspectives on that see Radkau 2000; Kaplan *et al.* 2009; Jandl 2020).[xli]

While deforestation processes in the Mediterranean peaked in the millennia before and after Christ (Kirby and Watkins 2015), the large deforestation waves in (Upper) Austria

[51] Not by accident, the botanical name of spruce, "Picea", is derived from one of those uses, namely the harvesting of tree resin for herbal medicine – in Latin, resin is called "pix" or "picis".

occurred between the early Middle Ages[xlii] and the late 18th/early 19th century (Sandgruber 2009), with an estimated decrease in forest cover in Central Europe from over 90% in prehistoric times to a minimum of 20-25% in the late 18th century (Firbas 1949; Kral 1988; 1994; Kaplan *et al.* 2009; for slightly different numbers see Winiwarter and Bork 2014). One central element in German-Austrian forests throughout the Middle Ages were imperial forest preserves, so-called "banished forests" ("Bannwald"), in which all forms of use were strictly forbidden and only the king (or later: the landlord) was allowed to go hunting (Johann 1994c). From the 11th and 12th century onwards, this institution was enhanced with royal prerogatives ("Forstregale") given out to landlords who in the form of "forest reserves" ("Waldreferat" or "Waldwidmungen") exerted pressure on local forest users, specifically in the context of safeguarding the continuous timber supply for their mines, saltworks, smelting industries and construction purposes (Johann 1994b). From the 14th to 16th century, this culminated in a situation in which many Austrian landlords had the right to extract as much timber as needed for their businesses, or at least were entitled to a considerable share of every harvest made by local forest users ("Stockzins"). This claim was accompanied by the establishment of forest wardens responsible for patrolling forests and protecting the landlord's interests, while peasant forest users still had the right to remove timber bound to a forest (=*Einforstungsrecht*) or at least the (servitude) right to use forests in specific ways, for instance as a pasture (=*Servitutsrecht*). As Johann (1994b, 57) argues, what was once a relatively free access to forests, became concentrated in the hands of a few who in turn justified the restrictions by arguing that forests would be overused by local peasants and that the continuous supply in timber would be an irrevocable priority.[xliii] As one can imagine, conflicts of interest between forest users, forest authorities and landlords were on the rise (Johann 1994b, 76). One actor that particularly benefited from the increasing appropriation (and beginning privatization) of forests in the 17th and 18th century, was Norway spruce, and with the increasing use of forests as a source of timber, a time began in which spruce was preferred over other tree species, in which (coppice) deciduous forests had to make way for conifer plantations. Given that landlords and their executives increasingly had the upper hand in struggles over the control of forests, entire silvicultural systems changed according to their needs (Weigl 2002, 703). More than just promoting spruce through using it as the preferred afforestation plant, many foresters were even instructed to push back beech or fir at that time (Johann 1994b, 166pp. and 180) and were supported by high game stocks that selectively browsed on deciduous tree species. Other authors explain the increase in spruce differently, arguing that spruce simply had competitive advantages on acidified and nutrient-depleted soils, a result of mediaeval forest degradation related to forest pastures, fuelwood collection, litter raking, as well as to the planting of "soil exhausters" like pine and spruce (Jandl 2020; Oberklammer and Gratzer 2022). The reasoning here is that "excessive forest biomass harvesting" in the wake of the industrialization and driven by population growth (Glatzel 1991; Kilian 1998) had severe effects on forest ecosystems, and peasant forest users would be the ones to be held responsible for deforestation, degradation of forest soils and the respective changes in tree species composition (cf. Ebermayer 1876). As convincing as these explanations appear from a forest-ecological and forest-chemical perspective (Glatzel 1991; cf. Thom *et al.* 2018), one should be aware that explaining spruce's "rise to power" as a consequence of forest degradation caused by "irrational" smallholders follows the same argumentation with which 19th century forest politicians justified "scientific" forestry, and the respective exclusion of peasant forest users. If political ecology has shown us one thing, then that authorities blaming locals for the (alleged) degradation and mismanagement of local resources tells us more about power relations than about actual environmental change (Peluso 1992; Fairhead and Leach 2003; Robbins 2012).

5.1.2 Producing Timber: On Single-Species Stands and Rational Forestry

Although forests had already been subject to various forms of legal and political institutionalization even before the 19th century, the rate of conversion of mixed forests into pure spruce stands and the exclusion of peasant forest *users* (in favor of private forest *ownership*) took on a whole new dimension with the emergence of "scientific forestry" – in Habsburg Austria mainly in the 19th century (Johann 2007, 60; for the similar case of Germany see Scott 1998, 13pp.; Küster 2013, 185pp.). Even before that, first public forestry schools had begun to train forest wardens and forest officers, driven by the cameralist conviction that forest management should be in the hands of the professional "calculating forester", a civil servant of the state (Lowood 1990, 320pp.), and not in the hands of an uneducated peasant[52]. Ultimately, the claim of the Habsburgian state (shared by large private forest owners) to drive peasants and stallholders out of the forest and to impose the "right" kind of forestry – a kind of forestry based on the clear-cutting of even-aged pure stands – culminated and expressed itself in the Forest Act of 1852[xliv]. Stipulating at the very beginning of the legal document that "no woodland may be taken away from timber production or used for other purposes without permit" (§ 2), the Forest Act "codified mechanisms that increasingly excluded peasants and their practices of multifunctional forest use from these forests" (Pichler *et al.* 2022, 853). In this sense, "the guiding thought of the act was the liberation of forests from burdens harmful to the public and the conversion of forests into stands that do not adversely affect the public good" (Hafner 1979, 100; translated by author). Given that "harmful to the public" meant harmful to the continued supply of timber for the state and large forest enterprises, historian Joachim Radkau (2000, 253;

[52] Given that "around the middle of the 19th century forests were mainly in the hands of farmers (46%), rural and urban communities (26%), […] and large and small private estates (12%)" (Johann 2007, 57), with only 16% belonging to the monarchy, the claim for state control over forests is interesting in several regards. *First*, as these numbers illustrate, the claim did not reflect the actual ownership situation, *second*, it entailed ignoring or devaluing the forest-ecological successes of traditional forest-farm management (Wessely 1867; Johann 2007), and *third*, the claim for a change in ownership was justified by the assertion that the future of forests was threatened above all by peasant "Waldmißhandlungen" (=forest maltreatments), and not by the large-scale extraction of timber by states, cities, heavy industries, and mines (Wessely 1873; Ritter von Guttenberg 1899).

translated by author) demonstrates how "the rise of the ecological forest protection agenda was mainly due to strategic-tactical considerations of state forest administrations, and served as a stopgap measure when the timber shortage alarm was no longer useful". In keeping with the liberal thrust of the Forest Act, one of its first demands was the establishment of private property rights in forests and the abolition of the institution of forest servitudes (Mally 1854) – two projects that were only partially successful, as most forests remained in the hands of peasants, and it took decades to remove non-owner forest users from the forest (Weigl 2002).

In retrospect, the act represented a paradigm shift in the perception of the societal functions of forests. Accordingly, forests were no longer seen as multifunctional landscapes, used as a "commons" for multiple purposes by multiple stakeholders – for what forest scientists came to call "side uses" from there on ("Nebennutzungen"). Instead, the Forest Act stipulated that forests had to be managed for the production of timber, for maximizing yields based on standardized and scalable stands (Johann 2007; Pichler *et al.* 2022). In doing so, the Forest Act not only enshrined forestry's role in the late-emerging Austro-Hungarian capitalism, it also reflected the state's "supreme self-confidence about continued linear progress, the development of scientific and technical knowledge[53], […] and, not least, an increased control over nature" (Scott 1998, 89p.).What was for the longest time perceived as a forest ("Wald"), became now compartmentalized into homogenous management units, into so-called *stands* – to use German terms, the "Wald" became a "Forst" (Bartsch and Röhrig 2016, 5). As James Scott (1998, 13) puts it, "the state's narrow frame of reference", the "fiscal forestry" lens expressed in the Forest Act entailed excluding all those beings that were economically irrelevant – with its *tunnel vision* "the utilitarian state could not see the real, existing forest for the (commercial) trees" (ibid.). What happened in the decades after the Forest Act was that – through the subjugation of forestry

[53] In the case of forestry, as Max Weber (1922b, n.p.) once put it, the confidence "that one can, in principle, master all things by calculation" found its practical expression in the emergence of forestry geometry and economics, with its measuring techniques, yield tables and accounting schemes (Lowood 1990; Scott 1998, 14p.).

matters to state authorities, the stricter enforcement of forest laws, and the production of scientific expertise on the "right" kind of forestry informed by the theory of net soil yield ("Bodenreinertragslehre"; Pressler 2019 [1858]) – "side" or "secondary uses" such as forest pasture and firewood collection actually declined, while conifer monocultures increased (Hasel and Schwartz 2002; Johann 2007; Schmidt 2017).

In addition to the rationalization of forestry, the second half of the 19th century saw a remarkable increase in forest area and forest biomass density in Austria, inspiring social ecologists to speak of the Austrian "forest transition", of a "long-term national shift from deforestation to reforestation […] characterized by forest area expansion and/or vegetation thickening" (S. Gingrich *et al.* 2021). Ironically, the reduction of socio-ecological pressure on forests in that time was not a direct/intended result of the Forest Act, in the sense that "sustainability" would have been achieved as servitude holders and peasant foresters had been driven off the land once and for all. In fact, the introduction of fossil fuels, above all of coal, fundamentally changed the energy and livestock system, making possible what proponents of the Forest Act had always hoped for, namely that forests could be used for timber production, and not for fuelwood and pasture (ibid.). As Pichler and colleagues (2022, 854) argue, the "substitution of fuelwood by fossil fuels contributed to simplify the multifunctionality of forests", namely insofar as industries, cities and later on peasants themselves were no longer (to such an extent) dependent on fuelwood (Johann 1994a, 91), and forest enterprises could from then on fully concentrate on timber production (Küster 2023, 194p.). At the same time, forests were relieved from pressures like litter raking, forest pasturing or chopping as the industrialization of agriculture – contributing to major changes in manure and livestock management (availability of nitrogen fertilizer, different fodder etc.) – translated into land-sparing effects, meaning that forests were no longer needed for agricultural purposes[xlv] (Gingrich *et al.* 2021). The single-species single-use forestry was further strengthened by the expansion of the Austrian-Hungarian railway network (Weigl 2002) and encouraged by a growing sawmill industry that relied on the continuous supply of timber, above all of spruce (Johann 2007, 58p.; cf. Wessely 1853; 1867). The joint rise of spruce and the Austrian sawmill industry – in 2023, the 7th largest exporter of industrial sawn wood in monetary terms world-wide (Workman n.d.) – had great consequences for the political economy along the wood value chain. Whereas the relationship between timber producers and timber processors/buyers like sawmills had taken place on a relatively equal footing in the centuries before, meaning that foresters had a direct relationship with sawyers operating in the vicinity of the "forest frontier" (Hyde 2012, 274), the 19th century industrialization and capitalization of the forest sector made sawmills gain enormous market power[54]. While from the first years of the 20th century until the end of second world war Austria's total forest area and the area share of spruce remained relatively constant, a drastic increase in both followed from 1945, marking the beginning of the high phase of spruce's popularity up until the 1970s (Küster 2013, 221pp.). As timber was needed for paying post-war reparations and funding reconstruction efforts, and given that industrial agriculture turned out to be ever more productive, many marginal-yield sites were given up and afforested with spruce in the 1950s and 60s, particularly in the *Sauwald*, *Mühl-* and *Waldviertel* (cf. Weigl 2002, 648pp. and 724pp.; Johann 2007, 59). As a forest ecologist and a forest manager from the Sauwald told me, these (meadow) afforestations were often carried out with seed material from Russia, with "Russenfichte" (Interview XII, L. 795), i.e., with provenances that given the plant's genetical alignment with colder/precipitation-richer climates made spruce particularly susceptible to droughts and disturbances (Interview XV).

[54] Enabled by innovations in saw technology (steam-powered sawmills, later electric band saws) and transport infrastructure (particularly trucks in the 20th century) as well as driven by the capitalist growth and competition several sawmill family businesses became large industrial compounds with a huge timber demand, a respectively increased supply radius and a powerful negotiation position vis-à-vis forest smallholders (Teischinger 1994, 370pp.). As we will see later, it is these big sawmill and wood-processing moguls who, through their influence on the market, have a major impact on forests and forestry.

Another milestone for understanding the historicity of human forest-making was the passing of the Forest Act of 1975, replacing the Forest Act of 1852 and marking a "new", but in fact rediscovered understanding of forests as providers of *multiple* ecosystem services, not only of timber (Weigl 2002; cf. Interview IX). Even if this novel understanding was seldomly reflected in practice – meaning that despite all the talk of the forest's multiple *ecosystem services,* timber provision remained the single most important forest function –, the 1970s and 80s were characterized by a growing public interest in forests and forestry, and especially the "Waldsterben" debate in German-speaking countries sensitized people to matters of forest health and biodiversity. As exaggerated the "Waldsterben" debate might appear in retrospect (Henning 2020), there were practical reasons to be concerned about the health of forests, and under the imprint of environmental pollution and large disturbance events, spruce-obsessed plantation forestry began to be increasingly questioned. As Edwards and colleagues (2022) put it, growing environmental movements and efforts (both within and outside forestry) helped to replace, or better complement, forestry's *modernity* paradigm with an agenda of *ecological modernization* and *sustainable development.* I say "complement" because the talk of sustainability should not hide the fact that forestry in Upper Austria (as elsewhere) is still a capitalist endeavor, that most forest owners own and manage forests because they can make money from it. That said, making money from forests used to be easier, and in the light of climate change, increasing disturbance events, and general economic instabilities, many foresters are convinced that forest-making is not what it was thirty years ago, that the demands on forestry and forest-making are much higher today than they used to be. As an interviewed forest manager looks puts it: "The forest managers of tomorrow must be able to do more than produce wood" (Interview X, L. 322pp.). But what about the forest managers of today, why are they (still) foresters, and how do they act in and through forests?

5.1.3 Managing Ecosystems: Human Forest-Making between Joy and Despair

> "I just find it extremely fascinating, watching the trees grow […] And it is always enlightening and also surprising when […] you look back and see the stands that you established yourself or that you cared for, what kind of forests they are now. It has a lot to do with a generational contract, because we basically reap what our grandfathers left us with, and I find this to be very honorable and joyful […]" (Interview III, L. 34–47).

It is striking that despite the many challenges that Upper Austrian foresters face today, their personal and professional connection to forests is (still) predominantly positive. More than that, many find human forest-making to be exciting, joyful and fulfilling. For a start, this is remarkable insofar as even those who as full-time foresters make a living from forests, and are exposed to the profit imperative of capitalist forestry, do not complain about what workers in other economic fields experience as *alienation*. On the contrary, forest owners/managers across the board feel connected to their forest, they praise them as "one of the most beautiful workplaces" (R. 31), forest work as "a beautiful and joyful task" (R. 7, 40), as a "recreation" (R. 6, 8, 45; Interview XVII) from everyday life, as something that connects them to previous and future generations (R. 9, 12, 19, 23, 26, 38, 43). Asked after the motives why they own and/or manage a forest, survey respondents indicated that besides economic and vocational reasons (chosen by 63%), "interest in ecological matters" (47%), "commitment to family members and/or heritage" (74%), "self-sufficiency with wood" (42%) and "hobby" (33%) are what motivates people to (continue to) manage forests. This is followed by a smaller number of respondents pointing to the role of "care for the cultural landscape" and "preservation of local traditions", stressing the importance of forest-making as embedded in a "moral economy"[55] (see appendices A12). As we see, there are different motives to become and remain a forester (Terrasson 1998; Feliciano *et al.* 2017; Matilainen *et al.* 2019).

[55] Acknowledging that the concept of "moral economy" is in Thompson's (1971) original use a historical concept in that it describes a specific countermovement to "rational political economy" in the 18th century, I use "moral economy" in reference to James Scott (1976) and Karl Polanyi (2021), describing a (*domestic* or only partially market-based) mode of production that is embedded in (reciprocal) social and moral obligations, that is not committed to maximizing profits but to guaranteeing the well-being of its producers (Edelman 2005).

One important aspect of why private individuals come to own and/or manage forests in the first place is related to ownership structure and here to the (Upper) Austrian particularity that the lion's share of the 42,000 forest owners in Upper Austria are (ever since the dissolution of serfdom and manorial rule) "small" (< 200 ha) and "micro" (< 10 ha) private forest owners, many of them farmers having inherited the plot and managing farm and forest as a (complementary) part-time-business (Hogl *et al.* 2005; Mostegl *et al.* 2019). To be more specific, around 50% of Upper Austrian forests (most of them with a size of less than 5 ha) are privately owned – mostly by farmers, representing so-called "farm forestry enterprises"[56] (Toscani *et al.* 2021)[xlvi] – , followed by 28% in the hand of the public Austrian federal forests (ÖBf) and around 20% owned by large private forest enterprises, many of them related to aristocratic landowners (with forest properties > 200 ha) (LFW OÖ 2023)[xlvii].

Coming back to the relationship between people and forest, I hypothesize that it is the part-time character of (farm-based smallholder) forestry, of using forests as a "reserve" (Interview XIII, L. 242), as an additional income and as "symbolic capital" (Niskanen *et al.* 2007) that plays a role in forest owners' attitudes towards forests and forest management. Conversely, those forest owners that are financially dependent on a forest-related income do not paint such a rosy picture of forestry (Rametsteiner *et al.* 2005). It thus makes a difference whether one is not or only to a small extent dependent on income from the forest, or whether (already small) losses in that income present one with financial challenges[57] (Mostegl *et al.* 2019). Ultimately, this brings us to the question of *why* foresters have and/or manage a forest, to the *goals* they pursue with forest management, and by that to which forest ecosystem services they prioritize

[56] "[Farm forestry enterprises] represent entities, where individuals, families or corporations are engaged in agriculture as well as in forestry […]. The combination of agriculture and forestry within an institutional unit (the farm) is especially typical for the alpine region and is vital for the provision of various ecosystem services, the safeguarding of diversified cultural landscapes as well as for the rural economy" (Toscani *et al.* 2021, 298).

[57] This is also reflected in the survey: 35 out of 60 people state that they are not or only to a small extent dependent on income from the forest, with 10 respondents saying that major losses would present them with considerable financial challenges, and only 7 persons – mainly representatives of large forest enterprises – hold that even smaller losses in the income from the forest pose already great financial challenges for them (see appendices A13).

over others (Ziegenspeck *et al.* 2004; Rametsteiner *et al.* 2005). Interestingly, and contrary to what one would expect given the continued emphasis on timber production and economic viability, survey respondents ranked the protective and regulative functions of forests higher than “classic” provisioning functions like “timber production” or “source of income and jobs”, with “water protection, water filter and regulation of water cycle” chosen as the most important forest function (for a full ranking see appendices A14). In addition to the restriction that the ranking in the survey referred to forest ecosystems in Upper Austria and *not* to one’s own forest, the latter reinforces the impression that the primacy of timber production is increasingly questioned in favor of a “more holistic ecosystem management” (Interview X, L. 230), also centered around the often-mentioned concept of *Payment for Ecosystem Services* (PES), that is compensating forest owners for maintaining specific forest functions such as forests as carbon sinks (Interview V, VIII). At the same time, a greater focus on non-economic goals does not mean that management would lose its significance. Rather, many forest owners that I have spoken with argue that an economically viable and at least *close-to-nature* (“naturnahe”) forest management fulfills most other forest functions. This view is indebted to the still-alive “wake theory” (German: “Kielwassertheorie”), a forest management theory that proclaims that “in the wake” of profitable timber production other forest ecosystem services would be *equally* and *automatically* fulfilled. Differently put, a profitable and well-managed forest would be high in biodiversity, a good water storer, a functioning carbon sink etc. (Interview IV, L. 190pp.) – whether this is true or not is subject to debate, and critics of business-as-usual-forestry doubt that intensive management is the key to diverse and ecologically intact forests (see chapter 7).

If we talk about human forest-making, there is no getting around taking a quick look at some (general) forest-making modalities/practices in Upper Austria. For a start, we can say that forest-making in the sense of *managing forest assemblages* requires experience and knowledge, particularly with regards to the interpretation of the local site (conditions) and the question of what trees can grow well together on which soil, in which kinds of stands, with which light demands and under which climatic conditions (Englisch 2009). In other words, forest managers need to have a *representation* of the (possible and future) world-making of forest beings. For say a spruce to grow fast, foresters need to understand *how spruce likes to make worlds* (cf. Kohn 2013, 87pp.). Two of the recurring questions that human forest-makers are confronted with relate to tree species selection and the choice of *silvicultural system*, i.e., to determining what trees one wants to have, promote and harvest for what reason in which way, and at which point of time[58] (Hyde 2012, 9pp.). Once one has decided on what tree lifeways to focus on, a next step is to determine whether one wants to (and can) work with tree species that are already there, i.e., with *natural regeneration*, or whether one uses *artificial regeneration* such as planting, or a combination of both (Grebner *et al.* 2022, 268). Right after a tree has been planted or "appears" as a seedling from natural regeneration, many foresters invest a lot of time and money in "early tending" such as weeding or mowing of the understory (ibid., 273p.). On a go-along with a forester in the Western Sauwald (figure 31), I was able to experience (through terribly scratched legs) that – with enough light – natural regeneration and "early" forest succession express themselves in a thick layer of flourishing green. Considering that grasses, ferns, blackberry, and economically insignificant pioneer trees like birch or willow are predominant in this phase, many foresters find it necessary to counter that, to clear the understory vegetation and get to marketable "climax"/late successional tree species more quickly (Interview XVIII, 29:40). As


Fig. 31: Natural regeneration and early forest succession at its best. Dense understory layer on a forest edge in the Sauwald. © Author, 2022.

[58] As a forestry advisor explains, tree species selection and opting for specific silvicultural treatments is in turn "dependent on the respective goal of the re- or afforestation. […] Should the economic side be the priority or does the owner just want it to become a forest again, a forest that is beautiful, that is the fundamental question" (Interview VII, L. 597pp.). Depending on the answer given to that question and depending on a forest owner's skills, resources and commitment, there are different options that a forest owner has in a particular region and on a particular site (Interview VIII; see chapter 7.2).

we will see later, this is one of many instances where the temporality of natural forest succession does not match with the temporal expectations of human management. As we have mentioned earlier when talking about browsing, tending often entails the mounting of game fences and the application of bite protection devices. Next to tending, and depending on the silvicultural system, *precommercial* and *commercial thinning*[59] (figure 32) is carried out with the increasing age of the stand (Kellomäki 2024).

Fig. 32: Precommercial and commercial thinning in a spruce stand in the Sauwald. © Author, 2022.

As one of the last steps in the sequence of silvicultural treatments, human forest-making in a managed forest comes in the form of harvesting, i.e., of cutting down trees. Which and how many trees are harvested when and in which part of the stand depends on silvicultural strategies, rotation length, economic considerations, ecological concerns and practical reasons. The globally still dominant, albeit in Austria declining mode of harvesting in even-aged forests is the "clearcut method", also called "area-wide felling" or "complete cutting" (ibid., 278p.). As these terms indicate, clearcutting means the harvesting of all trees in a defined area in the course of one continuous operation, leading to large gaps in the forest canopy or to a complete destocking of a forested area (Mason 2004). Since it would be too-labor-intensive and cost-ineffective to accomplish the complete cutting of an entire stand *motor-manually*, that is with individuals operating chainsaws, clear-cutting is mostly carried out with wood harvesters, whilst cable winches, tractors with grapple skidders, forwarders or different types of cable cranes (on steep slopes) are used for the removal of the logged timber (figure 33; next page). In

[59] Whereas precommercial thinning describes the cutting-down of not-yet-marketable young trees, commercial thinning relates to the removal of older, nearly mature and sellable trees (Grebner *et al.* 2022, 276). The guiding idea behind both is to reduce the stand density, improve the growth of remaining trees, and filter out deformed, sub-canopy or diseased trees.

order for these harvesting and transport machines to reach the respective operation area, a more or less dense network of forest roads and “skid lanes” is required. That too is human forest-making, with all the destruction that arises when machines weighing tons roll across an easily-compactable forest floor (figure 34), or when these machines injure spruce trees during harvest so that these trees become susceptible to disease and bark beetle infestation at a later point. From an economic perspective, clear-cutting is cost-effective and easy to implement; from an ecological persepctive, it destroys habitats, compacts the soil, changes micro-climates, and increases the risk of erosion[xlviii]. Acknowledging these ecological costs and following the (recent) advises of forest authorities and scientists against clear-cutting, more forest owners opt for different silvicultural systems and less-destructive harvesting and regeneration strategies (for overviews of non-clearcut-based silvicultural systems see Adams *et al.* 1994; Mason 2004 and Stovall 2024).

Fig. 33: Various Harvesting Techniques and Machineries, Sauwald and KA NP. All © Author 2020-2022.

Fig. 34: Deep Tracks and soil compaction caused by a heavy wood harvester. © Author, 2023.

However humans plan to make forests, implementing those plans is something else, and, as I have experienced myself, there is a huge difference between vision and reality, between what was intended and what is feasible when conditions change. That plans – especially in the case of forests, which, unlike Petri dishes, can never be so simplified as to exclude all kinds of “disruptive” other beings – cannot be implemented has a lot to do with the fact that humans are not alone in the forest, that their forest-making is both enabled and limited by the world-making practices of other beings (Ingold 2000, 69). This is especially true in the face of bark beetles, and on my forest walks and in my interviews, I could often see and hear foresters complaining that what started out as an attempt to manage a forest in one way ended up being something else in the face of proliferating bark beetles and collapsing spruce forests (see chapter 7). Knowing this, it makes all the more sense to approach human forest-making by beginning ”with arrangements humans set into motion, but then trust guides such as form and assemblage to tell us about social relations in which we are only indirect participants” (Tsing 2013, 34). Taking seriously that bark beetles, fungi, hoofed deer, and others mess with human management plans, making humans harvest trees that were not supposed to be harvested, many foresters increasingly experience themselves in a new und unfamiliar role, namely as an “indirect participant”. Most of them are not happy to be confronted with what should be self-evident, namely that, as Tsing (2016, 14) writes, "man does not fully rule, [that] no ‘one’ covers the planet". This is an insight that takes time to digest when one has grown up in the Western "master model" of dealing with forests, used to believing that one is always in control of forests. Losing this (sense of) control means not only losing trees and suffering economic damage; losing control means losing one's self-image as the most dominant forest-maker (see chapter 7.1). It is not surprising, then, that the same foresters who reflect on the beauty of their forest condemn it in the face of disturbance, speaking of a “fear of going out into the woods and finding beetle nests” (R. 36), of forest work as stressful, of forestry as an economic zero-sum game, and of a great personal burden – a burden that can only be borne because of “one’s great love for the forest” (Interview XVII). As we see, one’s affection for the forest is not unconditional; in forests managed for economic purposes, it also depends on the political economy, on whether the market as an assemblage of people, practices, and institutions makes one’s forest appear valuable – an assemblage to which we will turn in the next part.

5.2 Becoming Assembled: On the Political Economy of the Upper Austrian Forest Sector

Fig. 35: Own depiction of the human-centered assemblage. Source: All figures except of spruce, harvester, timber freighter taken from Wikimedia Commons. Drawing of human, and mentioned pictures by author, 2024.

Forest-making does not happen in an economic, political, social and historical vacuum. More than simply planting and harvesting trees, forest-making is embedded in and driven by a historically-grown, uneven political economy of forest use and forest resource management (Peluso 1992; Schwarzbauer *et al.* 2013; Vandergeest and Peluso 2015; Brockhaus *et al.* 2021; Thomas and Hubo 2024). In that sense, forest-making does not unfold in "politically innocent" *local forests*, and for humans to be able to practice forestry, to *benefit* from *making forests usable,* multi-scalar assemblages of actors, practices, institutions, markets, technologies, terms of trade, accumulation cycles and capital fractions must be put to work (Murray Li 2007; Peluso and Vandergeest 2020; Devine and Baca 2020; figure 35). So to better understand how such assemblages are involved in creating power disparities through/along the entire globalized wood commodity chain (Tsing 2009), we must consider what happens and who benefits when trees are harvested, brought out of the forest, onto the market and into international trade (Neumann 2005, 6). This is important not because "politics and *the* economy" has an impact on "*the* environment", as Jason Moore (2016, 2pp.) puts it, criticizing the assumption of such independent essential collectives, but because international timber markets, sawmill companies, human foresters, chainsaws, spruce trees and bark beetles form an organic whole (Rocheleau 2008), and without considering the political economy of that whole there is no way of knowing *who benefits at whose expense* from forest-making (cf. Bernstein 2010). What is for spruce the agentic (spruce) forest and for bark beetles the epidemic outbreak, is for humans of the *Capitalocene* the (timber) market – a powerful assemblage, an emergent forceful entity that, albeit it is constituted of humans and everything they do, develops a certain independence from its components, that once "in place […] starts acting as a source of limitations and opportunities for its components" (DeLanda 2016, 21). In what follows, I will look at human forest-making in the light of the wood value chain (5.2.1), and then discuss how forest-making is shaped and carried out by what people mystify as "the market" (5.2.2).

5.2.1 Becoming a Sector: Actors, Institutions and Inequalities along the (Upper Austrian) Wood Value Chain

That specific human actor groups in Upper Austria benefit from putting forest assemblages to work is evident in the fact that forestry, esp. the growing and harvesting of wood *for material and energetic use,* is a central pillar of the (Upper) Austrian economy (BFW 2023)[60]. What usually happens after a tree is harvested can be divided into two major pathways extending through and beyond the Austrian wood value chain, in the course of that transforming tree parts into specific commodities (FAO 2022). Whereas the first relates to wood being cut into *roundwood* and sold either to sawmills (as *sawlogs*) or the paper/pulp/panel industry (as *industrial roundwood*), the second pathway is using roundwood (here: firewood) and/or logging residues (such as wood chips) for energetic purposes (as *wood fuel*). In 2021, of the 21.5 million cubic meters of domestic logging almost half of it went into the sawmill industry as sawlogs (additionally importing 8 million cubic meters, mainly from the Czech Republic and Germany), the rest went either as industrial roundwood into the paper, pulp and panel industry or was

[60] According to the *Austrian Forest Report 2023*, "the production value of the entire wood value chain amounts to around 12 billion euros, with an average export surplus of 4 billion euros" (BFW 2023, 41), making wood – right after tourism – "the second most important good in the foreign trade balance" (Hafner *et al.* 2021, 15). That not enough, the entire Austrian forest sector including the downstream woodworking industry (sawmill, paper, pulp, panel and furniture industry) has around 300,000 employees (in Upper Austria: 70.000), meaning that around 10% of the working population "earn their income completely or partially from wood" (ibid.).

thermally used for energy provision (see figure 36, next page). From the 20 million cubic meters of sawlogs processed by the domestic sawmill industry in 2021, 8 million cubic meters ended up as sawmill by-product (saw dust etc.) used by the paper, pulp and panel industry, around 5 million c.m. got on the domestic market as sawnwood, and 6 million c.m. were exported mostly to Italy and Germany, but also to Eastern Asia and North America – making Austria the seventh largest exporter of sawn softwood (here: HS code 4407) worldwide.

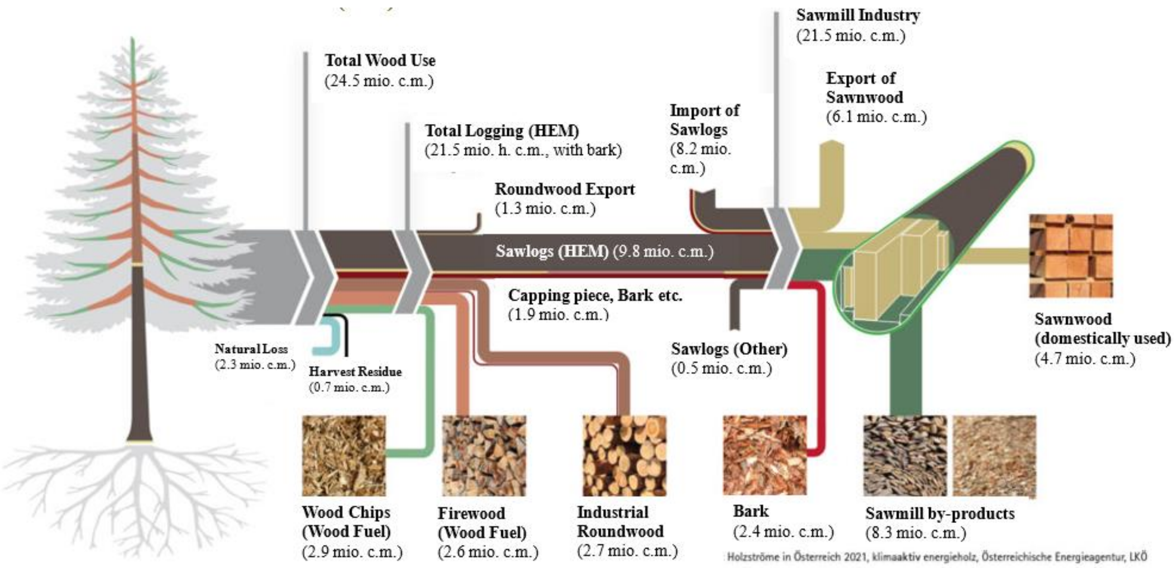


Fig. 36: Wood Value Chain in Austria (2021). Source: https://www.biomasseverband.at/bedeutung-der-bioenergie-2-2/. Translated and adapted by author.

In terms of actors and institutions, what we see along the wood value chain is first of all forest owners, forest managers and employees of forest service companies (i.e., forest workers), in short, the ones that are "producing" roundwood and carry out forest management, guided by forest-making narratives, policies and traditions as well as by institutions like the federal Forest Act. As I have stressed above and will discuss below in greater detail, in terms of vested interests, bargaining power, capital, political representation and resiliency/vulnerability to disturbances, forest owners are not a homogenous group, and there are significant, often politically instrumentalized differences between public and private, individual and corporate, small and large, farmer and non-farmer, "traditional/established" and "new" forest owners

(Hogl *et al.* 2005)[61]. Between wood suppliers and wood buyers/processors, there are a number of intermediate actors such as timber traders and timber freighters/transport companies, actors that in times of epidemic bark beetle outbreaks hold a powerful "bottleneck" position as everyone needs them to get the infested wood out of the forest and via trucks/trains into the downstream woodworking industry. The same holds true for sawmill companies. It is not by chance that if one asks forest owners/managers who they think has benefited the most from recent bark beetle outbreaks, the answer is almost (instantly) "sawmill industry" or "sawmill companies" (appendices A16). That the sawmill industry is both a bone of contention and an important partner for Austrian forest owners has a number of historical, political and economic reasons, revolving around the powerful position the sawmill industry has managed to occupy in the (globalized) wood value chain as well as its influence on tree species selection (indirectly forcing forest owners to work with spruce), pricing, assortment and forest policies (Hyde 2012). Particularly, the uneven distribution of costs and benefits of bark beetle outbreaks as experienced by forest owners is associated with power disparities in the negotiation of prices and delivery quantities between *thousands* of forest owners/enterprises and a *handful* of large, internationally operating sawmill players[62], in turn dominating the timber market and the price-building process (Interview III, XII; cf. Interview IX). That sawmills are (regarded to be) beneficiaries of forest disturbances is related to the particularity that such disturbances usually lead to an oversupply of wood and a subsequent price drop. It is this price drop that disproportionately benefits the sawmill industry because it allows sawyers to buy cheap, but quality-wise still usable roundwood, sell it as sawnwood with a high added value and thus make

[61] This is also reflected in how these groups are represented by interest groups such as the Chamber for Agriculture or the voluntary Forest Association ("Waldverband") with its local "forest helpers" (for a depiction of selected forestry-related stakeholders see appendices A15).

[62] Albeit there are Austria-wide around 1.000 sawmill companies with 6.000 employees, only ten companies (f. ex. Maresch, Stora Enso, Binderholz, Mayr-Melnhof Holz etc.) account together for a cut of around 8.4 million cubic meters of conifer wood. That is almost 60% of the total cut in Austria in 2023 (Holzkurier 2023). In fact, when speaking of sawmill companies, these companies are better described as industrial groups, usually owning a number of branches, factories and subsidiaries throughout Europe, making four Austrian sawmill groups to be found among the 20 biggest sawmill groups in the world (Holzkurier and Jauk 2021).

profits out of forest owners'/enterprises' predicament. This is aggravated as in times of a bark-beetle-induced oversupply of cheap timber existing contracts between forest enterprises and sawmills are often terminated or the agreed-upon prices are lowered (to current prices), making forest owners question the invoked *partnership* between them and the woodworking industry:

> "It is a brutal game. It is all about supply and demand. So I personally believe […] when it gets tough, there are only a few sawmills who really stand by the supplier in bark beetle times. It is all about the money […], but it is communicated completely differently, it is communicated like a partnership, like we all have to stick together [interviewee laughs] […] Yes, it is a game […], and in the end, I would say, the sawyer always sits on the longer branch" (Interview I, L. 743pp.)

Others, even those who are very careful about criticizing the sawmill industry, note that despite the legitimacy of price fluctuations on "free markets", one cannot deny that the sawmill industry took advantage of the bark beetle situation (Interview III, VII, VIII, XIV). Related to that, the head of the forestry department at the Chamber of Agriculture emphasizes that "it was strategically unwise of the sawmill industry to let it come to a situation in which politicians needed […] to suggest measures […] But there is a *gold rush atmosphere* and then this is what happens" (Interview VIII, L. 377pp.). The reference to a gold rush situation refers here to a phase in the years of 2018, 19 and 20 in which – despite Austrian forest owners already impatient for someone to pick up/purchase their damaged timber – the sawmill and wood processing industry continued to import cheap bark-beetle-damaged timber from the Czech Republic. In 2019, that import amounted to over 3.6 million cubic meters[63] (over 50% of that amount bark-beetle-related; Banschitz and Timber Online 2020), according to one interview partner from the Bohemian Forest particularly associated "with the Czech state forestry administration [in Telč], a business with 15.000 hectares that, within two years had 1.5 million cubic meters of bark beetle-damaged wood" (Interview IX, 527pp.). Needless to say, remaining

[63] In 2020 and 21, only 51% of the roundwood use by the Austrian sawmill industry came from domestic wood, the rest was imported, mainly from Germany and the Czech Republic (Association of the Austrian Wood Industries 2021).

stuck with one's harvested wood whilst hearing from Czech wood trucks crossing the border hourly enraged many Austrian forest owners and forest enterprises. At the top of the excitement, forest owners even tried to block the Austrian-Czech border crossing at Wullowitz (Hirsch 2019), blaming the Czech republic for the low prices they achieved (chapter 10). Respectively, calls for a ban on imports or at least an obligation for the wood industry to purchase domestic wood were issued, and under then minister Köstinger a discussion unfolded on how to protect the Upper Austrian forest economy from being "flooded" with cheap damaged wood from abroad (Ebner 2020). Not surprisingly, strong resistance against such a purchase obligation came from the sawmill industry and the Austrian Chamber of Commerce, categorically rejecting any intervention into *the market*, pointing out that the export-oriented woodworking industry would lose its competitiveness and would be forced to migrate abroad[64]. In the words of a sawmill industry representative, a purchase obligation is

> "completely absurd. It is like saying we have swine fever, now you have to purchase the pigs, so absurd, how do I end up having to buy poor quality, that is the first thing, the second, who tells me where I have to shop in Europe [...], if you think it further, *we are somewhere in North Korea*, […] and the third thing would be that […] it violates *every law in the world* to have such an obligation" (Interview IX, L. 287pp.; italics by author)

According to this representative, the situation would present itself to be totally different from what he considers to be the "one-sided" storytelling by "jealous" foresters (ibid.). First, imports from the Czech Republic did not particularly increase in that time, but continued on basis of long-term contracts that in non-calamity years allowed the sawmill industry to "remain alive" when there was too little domestic timber on the market – besides, the imports would come from Bavaria and Southern Czechia making it a *local* supply source for North Austrian sawmills (cf. Interview XIV). Second, in an atmosphere of tightening competition it would be "only logical" to buy same-quality wood from abroad for a lower price, even more so as "Austria has

[64] "It is easy, ultimately the economy always reacts to such absurdities [here: market interventions]. The sawmills will close in Austria, they go where the raw material is, and that is in Ukraine, Russia or *elsewhere in the jungle*, where nothing matters. Yes, but then it is also over with any ethical values and standards" (Interview IX, L. 583pp.; italics by author).

traditionally the highest roundwood prices in the world" (Interview IX, L. 355pp.). A sawmill operator in the Bohemian Forest takes a similar stance, stressing that the entire debate about a purchase obligation of domestic damaged wood is in his view "not well thought out, *running counter to any free market economy*" (Interview XXI, 00:27:13–20). As we will see, it is this "free market economy" that – according to several interviewees – appears as quasi unassailable, that, as a powerful actor, shapes who benefits and suffers from outbreaks.

5.2.2 Becoming a Market: On the Fetishization and Agency of Free Timber Markets

It is hardly surprising that the proposed, but due to resistance never implemented measure to oblige wood buyers to buy domestic damaged wood has not been well received by sawmill operators and timber industrialists. What is surprising is that the purchase obligation is not (unanimously) approved by foresters who suffer from the import-related oversupply of wood and the respective (price) pressure due to imports of damaged wood[65]. In fact, a closer look reveals a diversity of stances on the measure, and especially between forest smallholders and large forest companies there is a difference in terms of one's agreement to an increased regulation (and protection) of the Austrian timber market. While smallholders (and some isolated forest managers) "have found the suggestion exciting because the Czechs completely swamped us with wood and the sawyers really took us for fools" (Interview XII, L. 322p.), most (academically trained) forest enterprise managers (with their long-term contracts with the sawmill industry) hold the position that market interventions are better to be avoided (Gill 1995), that one would "not want to support this development [of resorting to market interventions]" (Interview X, L. 1019p.). Instead, these actors speak of how trusting and beneficial the (long-term) relationship was between forest company, sawmills and the downstream wood industry[xlix], that "the market" would qua the play of supply and demand (how

[65] In the survey, there was a 71% approval rate for the introduction of a purchase obligation of domestic wood. This is a high value, but by no means a universal approval.

often I have heard this formulation) lead to “fair prices” (Interview IX, L. 907) for everyone, that (going with) the market would be the key to prosperity. Statements like this are proof for people’s trust in (free) capitalist markets, a trust that seems relatively unshaken despite the market’s responsibility in creating an economic situation characterized by “price and supply instability” (Interview VIII), a “challenging cost-revenue situation” (XIV), a looming “labor shortage” (Interview I, XII), and a “narrowing of the assortment” to (conifer) industrial wood (Interview XII). The latter point particularly shows the becoming-with of spruce forests and the (European) timber market, and, as economistic as it may seem, we can use Alf Hornborg’s analogy (2009, 241) to conclude that what keeps spruce forests growing and sawmills running are not preferences of individuals, but global terms of trade; what makes spruce (appear as) irreplaceable is less people’s emotional attachment (to the tree) than the tree’s role for the (Austrian) timber economy (Interview XII).

I have emphasized the peculiarity that although many (at times!) complain about the efficiency of the market, only few dare to question it as a whole. Only in times of crisis do the voices of those who admit that the market does not work the way it should seem to grow. As an example, the mentioned interviewee from the Chamber of Agriculture, despite all his other defense of the “free market”, holds that

> "the bark beetle year of 2019 has shown us that reason is not a category of the market, [in such situations] it is only about money, […] and this is of course problematic, *not in terms of the market*, but in terms of the further development of a bark beetle calamity […]. You can only get a calamity under control if the market functions to an extent that the infested wood that is processed is also transported out of the forest, and if that is no longer the case because the wood is two euros cheaper in the Czech Republic, Germany or anywhere else in the world [...], then for me limits have been reached where *only then* I say that it is justified, in order to protect the forest, that the state intervenes" (Interview VIII, 377pp.; italics by author)

If we follow this statement, we could say that for the (otherwise unquestionable) market to be questioned an economic catastrophe must first befall (Upper) Austria's forest owner. In times of stability, this criticism fades, and the trust in the efficiency and righteousness of the market is quickly re-established, and with it the market's *fetishization,* that is its rendering as natural, given, self-regulating and detached from society (McCarthy and Prudham 2004; Prudham 2012; Mathew 2023). On the one hand, it is this *fetish*[66] (of the free market as something neutral, as something that magically works beyond being tied to social relations (cf. Marx 2009, 85pp.), that gives us the impression that the market is all-knowing and all-powerful (cf. Polanyi 2021; Hornborg 2001), that the market "decides" efficiently in being guided "as if by an invisible hand" (to refer to misquoted Adam Smith at this point). On the other hand, it is not necessarily fetishization to assert that the market, as an emergent *assemblage of assemblages*, develops a certain agency, a certain dynamic of its own (Callon 1998), that it eludes the influence of individual people, that "in a capitalist economy the market exerts power over consumers, producers, and middlemen. It enriches and bankrupts, expands and contracts—the market actually acts. Or does it?" (Mathew 2023, 1650p.). As we know, this "dynamic of its own" has great consequences, particularly so in the case of attempts to subject all spheres of life to the market, of attempts to exploit, govern and protect nature by turning it into a commodity (Harvey 2005). As Diana Liverman (2004, 734) puts it, the capitalist market brings about "a massive transformation of the human–environment landscape". In line with people's commitment to and their trust in a free timber market, the conviction that "the state" (as an alleged counterpart to the market, but in fact producing and safeguarding a "free market"; Wacquant 2012) should not intervene in the market (via laws, price caps etc.) is respectively pronounced[67]. This is often accompanied (or justified) by a skepticism or distrust towards the state as a forest owner/manager (f.ex. expressing itself in reservations about the forestry approach of the

[66] Mommersteeg (1990, 64) defines a fetish as "a man-made object that is considered to contain certain magical powers and as such is supposed to protect its owner or render him successful in his pursuits. The crucial aspect, however, is that it is a human fabrication".
[67] In the survey, 58% of the respondents (strongly or rather) disagree with the proposed policy measure of a public regulation of timber prices (appendices A30). Or in the words of an interview partner, himself the head of the forestry division at the Chamber of Agriculture: "Fundamentally, it would be good and smart if the state or politicians – I here do not only include the state, but also the European Commission and the European policies on forests – would not interfere into the market. We have developments at the EU level that are very worrying, […] and the Austrian state should not interfere in the timber market either, in principle" (Interview VIII, 368pp.).

Austrian federal forests), a distrust that is reinforced by the prevailing public perception that (Upper) Austrian forests should be in the hands of private smallholders rather than state-owned companies (cf. Mostegl 2019).

To understand the market's role in the face of bark beetle outbreaks and collapsing spruce forests, we need to understand that whenever people speak of economic losses and property value reductions due to bark beetles, those losses have less to do with the physical impairment of the wood than with the market, its political economy and its dominant actors (Abbott *et al.* 2009; Petersen and Stuart 2014; Grégoire *et al.* 2015). In other words, it is the market, or better a heterogenous network of (influential) actors, institutions, customs and policies that structures a political economy in a way for bark beetles to become a financial burden (while lucrative for others), for spruce trees to be codified as indispensable and for international trade and competition to be stylized as necessity. When we speak of economic losses for forest owners (as a result of the market's way of reacting to bark beetle outbreaks) several dynamics must play together. Provided that certain climatic conditions or extreme weather events (storms, drought phases etc.) coincide with a large number of infestation-susceptible spruce trees, there is quite a chance of bark beetle outbreaks becoming epidemic (see next chapter). When epidemic outbreaks happen in many regions simultaneously, large quantities of damaged timber push onto the market all at the same time (Hlásny *et al.* 2019), undermining one of the central premises/axioms of capitalist markets: scarcity. As forest owners are obliged to remove (freshly-)infested timber and very few have the possibility to store infested wood, the order of the day is to get the timber out of the forest, making owners prone to sell to whomever and at whatever price they can get. This in turn creates a vicious cycle of dropping prices fueled by an oversupply of roundwood, overstocked storages and overwhelmed timber freighters (Interview VIII). From the perspective of economic losers of bark beetle outbreaks it appears as if the market fails in guaranteeing them the prices they need for competing with others, from the perspective of economic winners of bark beetle outbreaks (such as sawmill operators) the market works just fine, it lowers the costs of a resource needed for production, and in doing so increases one's competitiveness. What we will do below, namely focusing on winners and losers of bark beetle outbreaks helps us to see that the market creates novel and reproduces old inequalities, as capitalism's main allocation device it is the political economy of the timber market that produces and distributes *vulnerability* to bark beetle outbreaks (see chapter 7).

As we have seen in the last two chapters, both human forestry and Norway spruce have experienced a common boom in recent centuries. Admittedly, the partnership with humans has not always been pleasant for spruce; being planted in dense stands and on sites where it is hot and dry, being killed and cut up by a chainsaw before reaching old age may not seem like much of a success for the individual tree. Nevertheless, with regards to abundance and world-making reach, spruce has (on a population level) benefited from being demanded by foresters and the fetishized "free market", from the historical process of humans transforming multifunctional mixed forests into single-purpose forest stands. Spruce and human, plantation tree and plantation owner – as many hoped, a never-ending story of progress, were it not for a six-legged spoilsport, an actor with the potential to mess with the foundations of *plantationo-* and *captialocenic* forestry, a being that more than others threatens the human-spruce complex.

6. “*Ferally* Hungry”: On the Political Entomology of Bark Beetle Outbreaks through the Lens of the *Proliferationocene*

Don‘t belittle me, says beetle, the little
I have come to your rescue, I urge you, don‘t fight,
Don‘t belittle me, says beetle, the little
For your forests meant darkness, I will give them now light.

Don‘t you harm me, beetle, says human, the harmer,
It is me who have planted these forests just right,
Don‘t you harm me, beetle, says human, the harmer,
Trees are made for my longing, why cause me that plight

(Poem by author, first part)

Fig. 37: A European Spruce Bark Beetle on the Author’s Palm. © Author, 2022.

Imagine a being only four millimeters large, dark-brown in color, cylindrical in shape. Imagine a being boring through thickest tree bark, flying several kilometers and bringing down a mature tree. Imagine a being making humans despair, trees die, and landscapes change. Imagine a bark beetle.

No matter how often I encountered the European spruce bark beetle during my time as a forester and researcher, I was always impressed. As a forester, I was impressed because I could not believe how a being so small and fragile can cause so much trouble among a species that claims to be in control of forests. As a researcher interested in power, I was impressed because bark beetles made me realize that power is not an exclusively human domain, but unfolds through “relational, performative moments” (Ahlborg and Nightingale 2018, 387), involving more-than-human beings and running through the entire web of life. Who else but the bark beetle could have taught me that, who else than a creature I sensed to be powerful from the first moment it crawled across my palm? Powerful here not in the sense of an intentional use of resources to enforce one's will against that of others, but power as the relationally-grounded ability to affect the world-making of others including the structural settings in which that world-making plays out (see chapter 2). By breeding in, feeding on and killing Norway spruce by the thousands, by re-making forest landscapes and the living arrangements of forest inhabitants, there is no denying that bark beetles are powerful, particularly when considering how bark beetles mess with the world-making projects of humans and spruces (Raffa *et al.* 2015), how their world-making is entangled with the world-making of humans (through being dependent on the same tree species), and of spruce.

While it is obvious that bark beetles are a matter of public concern due to their impacts on forest management, forest landscapes and forest economies, that bark beetles are politically deployed and instrumentalized by human groups in various ways and for different purposes (see chapter 7), I argue that more than just "beings of contention", more than beings that are *good to do politics with*, bark beetles have a political life in and through themselves. Their performances of making environments livable, their world-making practices make them "political actors" (Hobson 2007). For making sense of the *disruptive* and for this reason *political* agency of bark beetles (Swyngedouw 2014), I will draw on approaches from the novel field of "political entomology" (Beisel *et al.* 2013), looking at the "entomo-politics […] of the ubiquitous encounters between insects and political power" (Deb Roy 2020).

Complementing the first entry point chapter on the forest-making capacities of Norway spruce under the premises of the *Plantationocene* and the second on (historical) human forest-making before and in the *Capitalocene*, the chapter at hand deals with the *proliferationocenic ferality* of the ESBB. While ferality (from the Latin *ferus*, meaning "wild") has a specific meaning in ecology, describing free-ranging creatures that either escaped captivity or have been (unintendedly) released into the wild (and allegedly threaten "native life forms" there; Helmreich 2005; Trigger 2008), anthropologists have recently extended "the feral to include 'counter-intentional forms' of nature that proliferate in spite of anthropogenic design" (Barua 2022, 898). Following Tsing (2016, 14), it is these "feral biologies", or "feral ecologies" as Barua (2022) puts it, that *erupt* as unintended consequences of, and if we will as "counter movements" to humanly-initiated "'machines' 'of replication' – those simplified ecologies, such as plantations, in which life worlds are remade as future assets" (Tsing 2016, 2). To *erupt* is a suitable formulation in that respect as it is precisely the mode through which bark beetles emerge from and through plantations, through which they proliferate in the ruins of simplified forests.

In tracing bark beetles' *proliferationocenic* ferality, the following chapter aims at a better understanding of the "nonhuman charisma" (Lorimer 2007) of the ESBB, its world-making specificities, and also addresses the silvicultural and forest-ecological conditions for ferally *epidemic* bark beetle outbreaks to happen. Re-emphasizing that no species acts alone and working on different scales of inquiry, the first part of this chapter takes us on a journey into the life worlds of bark beetles: After a description of the life cycle of *Ips typographus* (chapter 6.1) and its entanglement with symbiotic partners and antagonists (6.2), I will look at what makes the gathering of bark beetles and others an "epidemic outbreak" (6.3). In the last part of this chapter (6.4), I will approach bark beetles as *feral cosmopolitical* actors that are powerful in and through themselves, as actors exemplary of what I term – in reference to Tsing's and colleagues' *feral proliferations* (2019) – the *Proliferationocene*, a timescape in which the human simplification of life and landscapes paves the way for the rise of insect pests, fungal pathogens and epidemic viruses.

6.1 Becoming a Bark Beetle: Biology and Life Cycle of the European Spruce Bark Beetle (ESBB)

Insects have been populating the earth long before us, and it is likely that they will be around when humans are long gone. Insects are also the most speciose and abundant group of animals[68], and from ten animals on this planet seven are insects (MacNeal 2020, 10). Insects are in the majority, not only are they ever present, they are indispensable in the web of life. For humans they are both vital and troubling; they create, pollinate, decompose, host microorganisms, intoxicate, damage, vector diseases and as bark beetles compete over *shared* resources and ecosystems.[1] It may be for these latter reasons that most insects do not have a particularly good standing among humans, they are all too often considered dangerous, disgusting or undesirable, an *unloved other* as Rose and Dooren (2011) would put it. In Hugh Raffles' enumeration of common insect reservations "insects are without number and without end", and with that comes "the nightmare of uncontrolled bodies and the nightmare of inside our bodies and all over our bodies, […] the nightmare of swarming and the nightmare of crawling, […] the nightmare of knowing and the nightmare of nonrecognition" (Raffles 2010, 201p.). It may be for the very fact that insects are omnipresent, that they can appear everywhere, often in a far-too intimate way [xiii] in/on one's food, body, clothes, bed or on "one's tree", that human-insect encounters are characterized by such an ambiguity of awe and disgust, of fascination and rejection. Part of the peculiarity of human-insect relationships might also lie in the quiddity of insects, in their "insectness" (Beisel *et al.* 2013, 3), be it their six-leggedness, tininess, daunting appearance in magnification or their population-wise often "outbreak-like" and unforeseeable occurrence. This insectness and its practical expression in how insects make worlds has a considerable potential to unsettle "being human", dealing with insects provokes to reflect about the human

[68] Taxonomically, the class of *Insecta* (or *Hexapoda*) is the largest class of the *Arthropoda* phylum, and biologically it includes beings that characteristically have "segmented bodies, [six, hence *Hexapoda*] jointed legs, and external skeletons" (Wigglesworth 2024, n.p.). Regardless of these common features, the diversity in shape and appearance of insects is stupendous.

hubris, about a two-legged mammal thinking that every other being has to dance to its tune, yet freaking out when confronted with a thumbnail-sized bug. Albeit as lab animals[li] in sealed-off boxes insects may be *good to think with*, insects can be *good to live with* as well (Gandy 2019) – even if many people see that differently. Also, I argue that insects display a certain "nonhuman charisma" (Lorimer 2007), they are – if not beloved *companion species* such as cats or dogs (Haraway 2003) – at least "asymmetrical companions" admired for the very reason that they appear to be so strange and different (Ogden *et al.* 2013, 3; cf. Latimer and López Gómez 2019). Humans and insects are unavoidably also companion because they share common worlds, they pursue entangled, overlapping and sometimes competing world-making projects, they are dependent on and exposed to one another in multiple ways (Raffles 2010; Clark 2011; Gandy 2019). Exposed to as in the case of a human forester claiming a specific tree to be a harvestable property just to find out that the tree has been already "claimed" – in our case claimed by the European spruce bark beetle, a most fascinating and successful forest-maker.

No one knows that better than interview partner and forest entomologist Martin Schebeck. When he speaks about them, his eyes light up with excitement. Asked how he would describe the ESBB if I had never heard of it, he starts like this:

> "So the *Buchdrucker* [= German term for the ESBB], is a widespread insect in Europe and Eurasia that is ecologically very successful and important on its host tree spruce, and has a great ecological and also economic importance, and in this respect is in quite a field of tension between different actors [...]" (Interview XIX, 12:50-13:20; italics by author).

Contrary to the commonplace simplification of speaking of "the bark beetle", but meaning the ESBB, *Ips typographus* is in fact only one of around 300 native bark beetle species in Europe. Taxonomically, the ESBB is a member of the *Scolytinae* subfamily, in turn part of the *Curculionidae* family and the *Coleoptera* (=beetles) order. Generally, bark beetles are not limited to spruce, meaning that almost every tree species has *its* distinct bark beetles. It is more than likely that if spruce was not the most common and economically most important tree species in Central Europe, hardly anyone apart from our interviewed forest entomologist would be very concerned about the ESBB. But this way *Ips typographus* becomes the bogey-beetle, in human categories the economically most destructive forest insect and the developmentally most "aggressive"[69] bark beetle species in Austria and Central Europe (Hlásny *et al.* 2019; Hoch *et al.* 2019). At first glance, ESBBs are very much like other bark beetles[70] and as a defining feature "they spend most of their life histories within plants" (Raffa *et al.* 2015, 1), breeding in and feeding on the inner bark, i.e., on the sugary phloem of their host tree(s) – trees that need to be weakened by a preceding disturbance event to be colonized by ESBBs beetles as typical *secondary pests* (Wermelinger *et al.* 2007; Interview XIX). If we get the chance to look at one of these little creatures through a microscope, we can see that in adaptation to life in narrow tunnels and galleries, bark beetles have developed a distinct anatomy. They have strong boring mandibles, short snouts, legs and scent-sensitive antennae, as well as a number of morphological adaptations for removing bore dust from galleries and blocking conspecifics or enemies from gallery entrances (Raffa *et al.* 2015; Schopf *et al.* 2019, 9p.). What looks from above like a big head, is in fact not the head but the prothorax with the pronotum ("collar shield") that covers the much smaller, downwards pointing "head" with its compound eyes, elbowed antennae and mandibles (Hulcr *et al.* 2015, 60-61; see figure 38, next page). Next to the prothorax, the greater visible part of the bark beetle is comprised of its dark, shiny and at the margins curved elytra[lii] (=hardened forewings). Once these protective wings are opened and the hindwings are extended, bark beetles can fly from several hundred meters to few kilometers, in very rare cases, when supported by the wind or by the terrain a dispersal flight can be up to 20 kilometers long (Baier 2019). The question of how far bark beetles can fly is not only

[69] "Aggressive" refers to the bark beetle's capability to infest healthy trees qua mass propagations, to evolve from a *secondary* into *a* quasi-primary *pest*, into a "facultative tree-killer" (Fettig *et al.* 2007; Schebeck *et al.* 2023).
[70] The term "bark beetle" points to an ecological *and* taxonomic designation – taxonomic in the sense of encompassing all species of the *Scolytinae* family, ecological as bark beetles are strictly those Scolytinae members "whose larvae and adults live in and consume phloem of trees and other woody plants" (Hulcr *et al.* 2015, 42).

important for bark beetles themselves, but it is also crucial for human bark beetle management and the effectiveness of countermeasures, particularly in the context of the “right” size and place of bark beetle management zones in the “outskirts” of national parks (see chapter 7 and 8). Even though forest science can say with some certainty that “the majority of new infestations occur within a radius of 100–500 m from [previously] attacked trees” (Netherer *et al.* 2019, 2), and forest owners are pinning their hopes on these numbers when they decide where they want to look for and fight bark beetles, bark beetles often have the element of surprise on their side. More than one perplexed forest owner stood before me, telling me that "out of nowhere, in the middle of the forest, where there was previously no beetle, there are suddenly thirty trees that the beetle has infested, and you [ask yourself] where did it come from?" (Interview XIII, L. 450pp.).

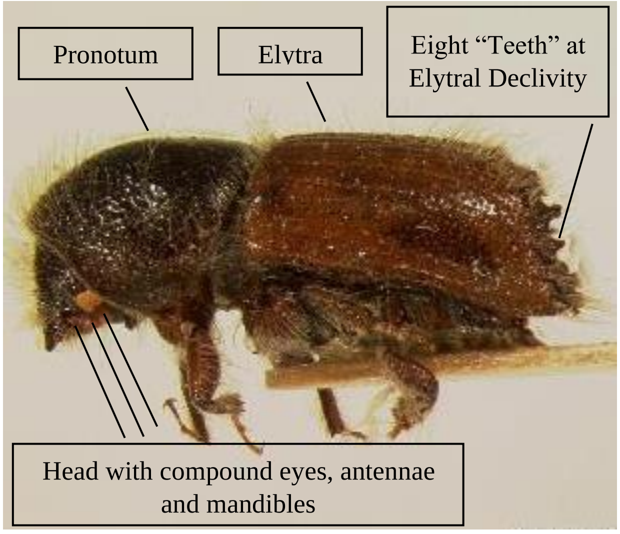


Fig. 38: Lateral view of the ESBB. Picture by Jim Stimmel, Pennsylvania Department of Agriculture, Bugwood.org. Source: www.forestryimages.org, adapted by author.

For depicting *Ips typographus'* short, but eventful life cycle, we might start with envisioning the dispersal flight of “generation zero” and the subsequent host tree location, selection, acceptance and colonization. For an adult bark beetle to end its diapause, to leave its hibernation spot in tree trunk or litter, and to swarm, certain conditions regarding temperature, photoperiod and day length must be met (Schebeck *et al.* 2017). Provided that (the success and speed of) brood development of bark beetles, like that of any other insect, is temperature-dependent, bark beetles usually start swarming at above 16,5 °C *and* not before a daylight length of around 14 hours (Schopf *et al.* 2019, 15pp.; Wermelinger and Seifert 1998). At low altitudes in Upper Austria, this point is usually reached in April, whereas in mountainous areas it can take until

June or even July for pioneer bark beetles to go on their dispersal flight. In the case of *Ips typographus* being a polygamous species with one male mating with several females, it is also male beetles that initiate the attack and select the host tree (Raffa *et al.* 2015, 2). As we will see, this process is a risky undertaking and given that the "identification of scattered, adequate hosts is challenging for a small insect" (Netherer *et al.* 2021, 601), the mortality in this early dispersal phase is respectively high (Raffa *et al.* 2008). With regards to the different stages from heading out and settling in, from flight to tissue acceptance, Netherer and colleagues (ibid.) distinguish between "dispersal through the landscape, ending in directed search of host trees in suitable habitats, and final acceptance of host tissues" (see figure 39).

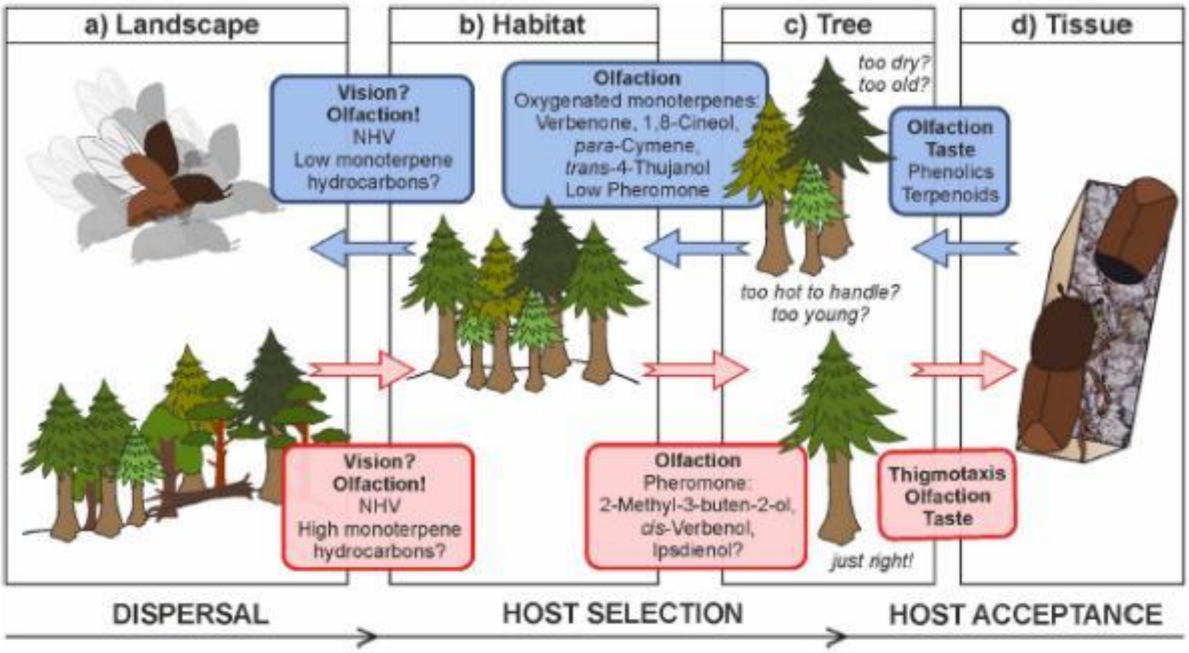


Fig. 39: ESBB's Behavioral Sequence from Dispersal to Host Acceptance. Source: Netherer *et al.* 2021, 602.

Whereas visual and (positive and negative) olfactory cues (in the form of pheromones, hydrocarbons and microbial volatiles) are believed to direct beetles on the landscape and habitat level (Schebeck *et al.* 2023), making them avoid non-host trees (Lindgren and Raffa 2013) and making them sense potential host trees – spruce, in rare cases pine or Douglas fir –, the host selection is related to the circumstance that pioneer beetles seem to recognize whether a tree is

1) ”severely/chronically stressed/already dying” and by that not attractive, because “too dry” and “too old”,
2) “too young” and/or “too hot to handle” (meaning that a tree is healthy, non-stressed and its defense mechanisms are simply too strong), or
3) “just right”, meaning that a tree is at an advanced age, moderately and *acutely* stressed, and thus with a high probability colonizable (Netherer *et al.* 2021, 602; cf. Netherer *et al.* 2015, 2019).

Approached differently, and this brings us to Eduardo Kohn’s “ecology of selves”, to an understanding of “life as constitutively semiotic” (Kohn 2013, 9), bark beetles just like anteaters or jaguars do *representational work*, they signify, they have “points of views”, representations of the world around them that help them *interpret* and follow visual and olfactory cues. In other words, if a bark beetle did not have *a representation* for how an infestable tree looks like, smells like, tastes like, it would get lost on its first dispersal flight. Once a pioneering male beetle has arrived at a “just right” (as “just right” represented!) host tree, the actual attack begins, and with it the risk of not surviving it. Not surviving insofar as trees have a number of defense mechanisms to respond to the attack. As mentioned above, these mechanisms include the “formation of traumatic resin ducts and accumulation of [toxic] terpenes in affected tissues”, with the aim of reducing “the number of *I. typographus* attacks, parental tunnel lengths and numbers of deposited eggs” (Netherer *et al.* 2021, 603). It is due to the tree’s tough defenses that bark beetles have teamed up with ophiostomatoid fungi, reliable partners that “detoxify defence compounds and help them to colonise even healthy trees” (ibid.). So taking seriously that no species acts alone, there is actually no such thing as an *individual* bark beetle *attacking* an *individual* spruce tree. Rather, we should speak of one temporarily-convening Multi-Species assemblage (of bark beetles, fungi and others) interacting qua world-making with a variety of other assemblages (of spruce, antagonistic fungi, viruses, ant beetles etc.). Back to our attacking beetle. Assuming the tree’s defense mechanisms are impeded due to a tree experiencing acute drought stress or being injured, thus smelling tasty for bark beetles (see appendices A17), and assuming that our beetle is not alone, but joined by hundreds and thousands of conspecifics, the odds are not bad for our pioneer beetle to survive the attack and get into the tree. What happens next, is that the male beetle bores through the outer bark and once within the inner bark excavates the so-called *nuptial chamber* (Raffa *et al.* 2015, 2). Attracted by aggregational pheromones emitted from the male's brown bore dust (figure 40), both ready-to-mate females and males land on the tree. It is precisely this aggregational effect of pheromones that I used to pose as a (male) bark beetle. As one can see in the picture (figure 41), even in a forest that appeared to be barely infested in late August, it took no more than an hour for bark beetles to "hear my call" (or differently: to smell the devices with which I intended to reach out to them), and to appear right next to the pheromone-filled vial that I held in hand or attached to a spruce tree.

Fig. 40: Male ESBB in a Heap of Ejected Bore Dust. © Author, 2022.

Fig. 41: Bark Beetle attracted by Pheromone-Filled Vial. © Author, 2024.

Whereas the arriving males lead further attacks, the females attempt to enter the nuptial chamber, at first prevented from doing so by the male who blocks the tunnel entrance with his elytral declivity. Only after the females have overcome the male's resistance, two to three of them mate with the male in the nuptial chamber (figure 42; Schopf *et al.* 2019, 10). Next, the female excavates an around 15 cm long maternal gallery along which 50-80 eggs that are placed into niches created on either side of the gallery (Raffa *et al.* 2015; figure 43, next page). After hatching, the white larvae go

Fig. 42: "In Flagrante": Surprising Two ESBBs in the Nuptial Chamber. Bohemian Forest. © Author, 2022.

through three instars, all the while feeding on the phloem tissue in an own gallery radiating away at a right angle from the maternal gallery and ending in a niche-like extension where the larvae pupate and become a bright callow beetle (figure 44, previous page). It is this process of hundreds and thousands of larvae, callow and adult beetles boring through and eating all over the phloem tissue that disrupts the flow of plant assimilates and ultimately also of water, causing the tree to die (Wermelinger *et al.* 2007; Hlásny *et al.* 2019, 9). But the tree does not vanquish without a last fight, and so it happens that with beetles feeding and inhabiting the tree, polyphenol-rich defense cells of the tree are activated, leading to a reduction in the nutrient content of the feeding substrate and to parental beetles leaving the tree in search for another tree to colonize and to create a so-called “second” or “sister brood” there (Schopf *et al.* 2019, 13). Back in the initial host tree, we are at the end of the brood development and once the callow beetle has finished its *maturation feeding,* it becomes the dark-brown beetle we already know (Raffa *et al.* 2015). With our sexually mature beetle leaving the tree for its own adventures, the cycle starts all over again. Given that it takes a sum of 557 diurnal (bark) degrees for an ESBB to develop from an egg into a beetle (Wermelinger and Seifer 1998), meaning that given typical temperatures/day lengths it takes between 6 and 8 weeks for the first generation to develop, a second and – at low altitudes – a third generation is possible. Once temperatures and day lengths have fallen below a certain

Fig. 43: Elongated Maternal Gallery with Short Larvae Galleries at an Early Stage of Infestation. © Author, 2022.

Fig. 44: Advanced Breeding System with Bright Callow Beetles and Larvae. © Author, 2022.

threshold – at low altitudes this is usually in October – no new generation is created. It is from this point in time that the beetle's diapause is induced, and hibernation[liii] begins accordingly.

As much as the journey through the bark beetle life cycle may have given us the impression that the individual beetle acts as if unchallenged in all of its life stages, many larvae, young, and adult beetles never reach the point of becoming "successful infesters", parents, or part of an epidemic outbreak. As we have seen with spruce, world-making as "making-it-in-the-world" is risky and uncertain, it is dependent on many things – from happening to live under the right topo-climatic conditions to surviving tree defenses and antagonists such as predators, humans and diseases (Biedermann *et al.* 2019). Put differently, the fundamental question of whether bark beetles succeed, or fail (in terms of forest-making) is, once again, the relationships they enter/form with other beings, it is how bark beetles assemble with/through others.

6.2 Becoming Assembled: More-than-Human Constituents of the Bark Beetle Assemblage

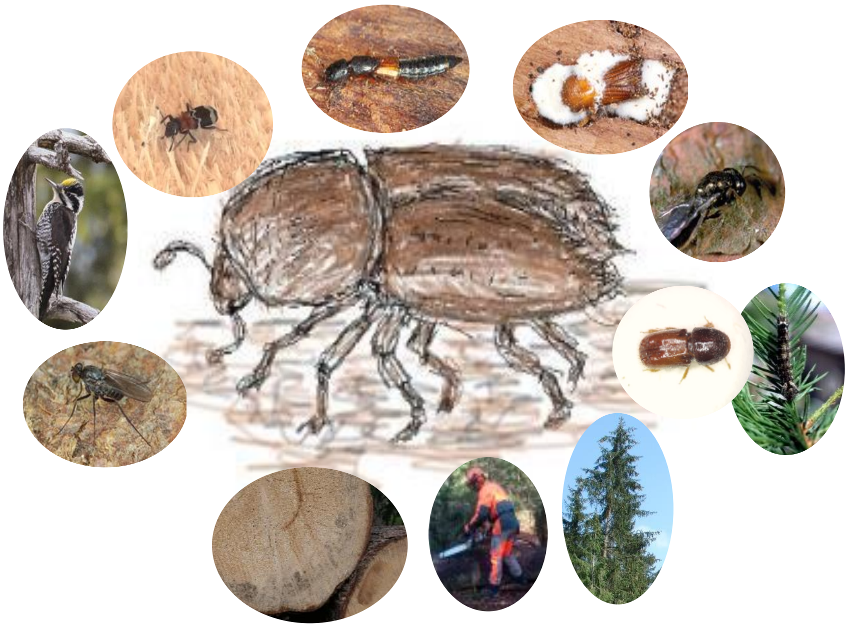


Fig. 45: Depiction of the Bark Beetle-Centered Multi-Species Assemblage with important antagonists, symbionts and other forest inhabitants. All figures except from drawing of ESBB, and pictures of human, ant beetle, spruce tree and blue-stained fungi (all of them from author), taken from Wikimedia Common (C.C. license) or from Wermelinger and Schneider Mathis 2021.

Bringing down a tree, let alone an entire forest is not something that an individual species can do and does on its own. In the case of the ESBB, we see that the beetle's infestation and reproduction success, and eventually the entire transition (or build-up) from an endemic to an epidemic population development (but also the collapse of epidemic outbreaks), depends on a number of other beings and their world-making practices (Biedermann *et al.* 2019; see figure 45). Following that, bark beetle outbreaks are *Multi-Species happenings* (see also chapter 5.2.3), with bark beetles, in the words of forest entomologist Netherer, living "in a complex, multitrophic environment. Their ability to survive depends on their senses, which mediate intra- and interspecific interactions with plants, animals, fungi and other microorganisms" (Netherer *et al.* 2021, 598). It is these interspecific interactions with beings that the ESBB *usually* depends on and gathers with, that I will focus on in the following part, albeit *for now* leaving out humans as sufferers, antagonists, promoters and admirers of bark beetles all at the same time.

6.2.1 Teaming up with Bark Beetles: Selected Symbionts and Companions

In order to understand the reproduction and colonization success of conifer bark beetles, symbiotic microorganisms such as fungi, bacteria and yeasts are one of the first that need to be considered, even more so as "bark beetles' habitat is a hot spot of microbial diversity" (Cheng *et al.* 2023, 2). Among these beings, it is fungal (mutualistic) symbionts and here particularly ophiostomatoid fungi that are particularly important to bark beetles (Six 2012; Biedermann *et al.* 2019; Netherer *et al.* 2021; Schebeck *et al.* 2023).

Fig. 46: Blue-Colored Sapwood due to Ophiostomatoid Fungi. © Author, 2022.

Generally, ophiostomatoid fungi are a diverse, tree-pathogenic group of exosymbiotic ascomycetes, also known as blue-stain fungi. "Blue stain" because once the fungi have used bark beetles to get into a tree, their hyphae turn the outer sapwood of the tree blue. Not affecting the durability or quality, but the visual appearance of the wood, blue-stain fungi reduce the value of the wood (cf. Chow and Obermajer 2007; figure 46), and sawmillers can tell a story about how difficult it is to sell blue-colored wood (Interview XXII). Although little is known about the evolutionary origin and the full breadth of the spectrum of interactions between fungi and bark beetles, it is evident that blue-stain fungi like *Endoconidiophora polonica*, *Grosmannia penicillata* and members of the *Ophiostoma* genus support bark beetles in multiple ways: "According to the 'classical paradigm', fungi are considered to support bark beetle attack by overcoming and exhausting the host tree defence system and aid beetles to promote tree death" (Netherer *et al.* 2021, 604). Given that fungi are unable to get through the thick tree bark on their own, it is bark beetles' job to carry them inside the tree, here: in the form of fungi spores sticking to the outside of the beetle or residing in the beetle's digestive tract (Schopf *et al.* 2019, 37-38). Once inside the phloem tissue, the fungi do a number of things. First, ophiostomatoid fungi "trigger extensive hypersensitive reactions around the infection site […], deplete and consume tree reserves" (Netherer *et al.* 2021, 604) as well as detoxify tree defence compounds such as terpenes and phenolics. Further, the fungi produce bark beetle semiochemicals that influence the behavior of other beetles (Zhao *et al.* 2015; Koski *et al.* 2024), meaning that the fungi are *able to speak the beetle's language*, to semiochemically "tell" other beetles when and where to attack and aggregate, likely for minimizing the intraspecific competition with other fungi coming in with additional beetles[liv]. Research also shows that bark beetles seem to be able to distinguish between different symbiotic ophiostomatoid fungi, that bark beetles seem to seek specific services from specific fungi partners (Kandasamy *et al.* 2023).[lv] Taking all this into account, we could easily say that when people think they are dealing with bark beetles, what they are really dealing with is the inextricably intertwined comradeship of fungi and beetles. To make things even more complicated, there is no way for us to know whether it is not actually the fungi, using bark beetles as vehicles for their world-making/evolutionary advancement, that compete with humans over trees and habitats (Sheldrake 2021).

Not counting as a partner in a strict sense, but at least as a crucial companion, other bark beetle species can benefit from and positively influence the world-making possibilities of *I. typographus*. On my forest walks, I have often encountered the ESBB sharing a tree with the "second most destructive" spruce bark beetle in Upper Austria, the copper engraver (*Pityogenes chalcographus;* Steyrer *et al.* 2020; figure 47). While there may be displacement and competition effects between the two, the red-brown copper engraver with its smaller size of only 1.6–2.9 mm is specialized on

Fig. 47: Copper Engraver under the Microscope. © Author, 2021.

younger spruce trees with a smaller trunk diameter (Wermelinger 2007; see appendices A18). Colonizing thinner stem segments, treetops and branches, the copper engraver often precedes or appears together with its bigger sister, weakening a tree by colonizing it from top to bottom and making it even more susceptible to an infestation by the ESBB (Lobinger *et al.* 2020). Not limited to other bark beetle species, the ESBB generally benefits from other biotic disturbance agents and the damages they cause to tree defenses (Baier and Netherer 2019, 92). In line with that, it is not uncommon for the ESBB to occur in the wake of other forest insect pests, making nun moths, spruce web spinning sawflies and ESBBs "partners in crime", collaborating members of the bark beetle assemblage.

6.2.2 Antagonizing Bark Beetles: Adversaries from Large to Small

The world is a dangerous place, and, just like other insects, bark beetles fall victim to a number of *natural enemies* – from birds and predatory insects over parasitoid wasps and mites to pathogenic fungi, bacteria and viruses (Beat Wermelinger and Schneider Mathis 2021). Forest entomologist Wegensteiner (2019) estimates that for every ESBB there are up to 60 *natural* enemy species, and although this has not yet been sufficiently studied, it is likely that natural enemies not only regulate bark beetle population sizes, but are able to prevent future or stop ongoing outbreaks (Biedermann *et al.* 2019). Following Wegensteiner (2019), it is for our purposes most meaningful to group such adversaries into three different categories: 1) predators, 2) parasitoids and 3) pathogens.

With regards to the first, the largest predators of bark beetles like *I. typographus* are birds, and here woodpecker species such as the Three-Toed Woodpecker (*Picoides tridactylus*; figure 48) – an inhabitant of old montane and subalpine forests with high deadwood shares (Wermelinger and Schneider Mathis 2021). Particularly in wintertime, the woodpecker relies on feeding on the ESBB, consuming several thousand beetle larvae per day (Wimmer and Zahner 2010), or an incredible 670,000 beetles/larvae per year, as Bütler and Wermelinger (2014) estimate. Given the significant antagonistic effect of these woodpeckers, it is likely that in those forests where – due to uniformity, human interventions, and low levels of deadwood – such woodpecker species are absent it takes longer for epidemic outbreaks to collapse.

Fig. 48: Three-Toed Woodpeckers. Source: Wermelinger and Schneider Mathis 2021, 9.

Among predatory insects and more specifically among predatory beetles, the most iconic bark beetle antagonist is the (spotted) ant beetle (*Thanasimus formicarius*) – a specially-colored and ant-shape-like insect (figure 49) that is so indicative of the presence of bark beetles that I encountered it not just once before detecting the actual ESBB (Kenis *et al.* 2004). Specialized not only on the ESBB, but on a number of different bark beetle species in all of their life stages, ant beetles are masters in scenting bark beetles via kairomones. Whereas adult ant beetles hunt bark beetles right on the tree trunk, its larvae invade the tunnels and feed there on bark beetle larvae (Wegensteiner 2019, 96-97). With regards to the regulatory effects of ant beetles on bark beetle populations, ant beetles are not to be underestimated. Given that an adult specimen can eat up to three bark beetles per day and an ant beetle larva kills up to 60 bark beetle larvae

Fig. 49: Spotted Ant Beetle. © Author, 2022.

during its development, ant beetles are powerful antagonists, in some cases increasing bark beetle mortality by up to 80% (Wermelinger and Schneider Mathis 2021, 2)[lvi].

If considering selected symbionts and antagonists of the ESBB has shown us one thing, then that the decisive unit of world-making is the Multi-Species assemblage, and not an individual species. In this sense, bark beetle outbreaks are more than one lifeway's population suddenly increasing, but a result of the gathering, displacement and absence of different beings that are entangled with one another through synchronized world-making projects with particular rhythms, together forming what Tsing called "polyphonic landscapes" (Tsing 2015, 23). Parasitic, antagonistic, commensalist, symbiotic and many other relationships – relationships for which we might not even have names yet as they extend our narrow anthropocentric gaze – are all about timing, about being in the right (or wrong) place at the right (or wrong) time, about coming together, both by purpose and by chance. In that sense, world-making comes with a pace, a rhythm (of patterned and recurring practices), a certain temporality such as when predator populations like ant beetles rise in temporal accordance with increasing bark beetle populations (Wegensteiner et al 2015; Wermelinger 2022). Messing with that temporality, and with the order of the appearance of world-maker has its consequences (Wolfe and Whiteman 2016). I have experienced more than once that the removal of trees weeks after bark beetles have left them results in the removal not of the bark beetles, but of the latter's antagonists, a serious interference with the assemblages and relationships on site (Schroeder 1999). It is this interference, this ripping-apart of assemblages based on ill-timed logging and a false understanding of cleanliness in the forest, but also more generally the simplification of forest landscapes (and thus the destruction of niches where antagonists could thrive), that contributes to the absence of certain natural enemies, and indirectly to longer and more intensive *epidemic* outbreak phases (Biedermann *et al.* 2019).

6.3 Becoming an Outbreak: On the Drivers, Phases and Management Implications of Eruptive Mass Propagations

Neither a handful nor several hundred bark beetles are powerful enough for killing spruce trees by the hectare, for changing the face of forest landscapes – for that it needs what forest ecologists term an *eruptive bark beetle mass propagation* or an *epidemic bark beetle outbreak* (Raffa *et al.* 2008; Hlásny *et al.* 2021), or differently a "Multi Species happening" (Tsing 2015, 27), i.e., a gathering of lifeways with a quality "greater than the sum of its parts". Bark beetle outbreaks are exactly that, they are not singular ahistoric and context-less events that can be explained as a mere result of *too many* bark beetles in a defined area. Instead, I consider bark beetle outbreaks to be gatherings, and eventually *happenings*, because only through interaction, through the coming together of multiple histories, through the co-constitution of world-making projects, bark beetle outbreaks acquire an *emergent quality*, a kind of power that cannot be traced back to individual beetles (Tsing 2015; DeLanda 2016).

That said, we have to start somewhere to understand how such happenings come about, and for doing so we might first consider what forest ecology can tell us about bark beetle outbreaks. As troublesome and negatively connotated *outbreaks* usually are for humans, for bark beetles themselves outbreaks are an important part of their sociality, an important means for making words livable, for satisfying their comparatively high demands on feeding/breeding substrate quality. In other words, for a bark beetle to overcome a tree's defense mechanisms, to become a landscape engineer, to advance from a secondary to a "quasi-primary" pest, an outbreak is the "method" of choice. Given that a pioneer decomposer like the ESBB has relatively high demands on food and logistics, thus preferring still-living over already-dead trees (Hoch and Schopf 2019, 4), for getting into these still-living trees, the ESBB relies on a reproductive strategy that is based on *exhausting* and *not avoiding* tree defenses. Differently: A strategy that relies on "mass attacks coordinated by powerful chemical signals" and is enabled by high population densities (Hlásny *et al.* 2021, 140). That means that when we talk about the "aggressiveness" of *Ips typographus*, what we mean is the lifeway's ability to mass-attack and "to kill healthy trees [as well as] to sustain outbreaks in relatively healthy stands even after the inciting stress is relaxed" (Hlásny *et al.* 2021, 140).

When forest ecologists speak of *outbreaks* (or of population eruptions), they commonly define those as *intermittent events* that mark a completed transition from an "endemic" to an "epidemic (population) phase" – a transition dependent on a number of factors, encompassing several thresholds, and in fact only happening among "less than 1% of bark beetle species" (Raffa *et al.* 2008, 503), with *Ips typographus* being one of them. Stressing the intermittent character of such eruptions, epidemic outbreaks are by no means the norm, and it is much more common that populations of eruptive species like the ESBB "remain in an endemic state for long periods" (ibid.). Here, "endemic state" points to a *dynamic* balance between few attackable (and widely distributed) trees and a sparsely-dense bark beetle population (Hoch and Schopf 2019, 4-5). Put differently, in a non-outbreak situation "beetle populations are constrained by tree resistance, certain forest structural features […], weather, competitors, and natural enemies, and the beetles breed only in sparsely distributed dead or severely weakened trees" (Hlásny *et al.* 2021, 140).

For a bark beetle population to erupt, several things must happen. In most cases, bark beetle outbreaks require and/or follow an abiotic disturbance event like a storm (causing windthrow), drought or heatwave (Hoch and Schopf 2019). It is such an event that – together with favorable climatic conditions and in stands with a "high share of Norway spruce, increased stand age, and stand density" (Netherer *et al.* 2019, 1) – turns hundreds and thousands of healthy trees into weakened ones, i.e., into (potential) brooding material, causing the beetle's reproduction rate to explode, and an epidemic population development to follow[71]. With the beetle population

[71] In Upper Austria and particularly in all of my three research sites, many of the large-scale bark beetle population eruptions have been initialized by storms or snow-break – from the storms Kyrill and Emma-Paula in 2008 paving the way for the big bark beetle calamities in the Bohemian Forest and the Kalkalpen National Park in the years of 2009 and 2010 to the snow-break and subsequent heatwaves in parts of the Sauwald in 2018 and 19.

surpassing a critical threshold, "[…] beetles no longer focus solely on weakened trees", but "become capable of overcoming healthy, well-defended trees via their aggregation mechanism" (Hlásny *et al.* 2021, 140; figure 50).

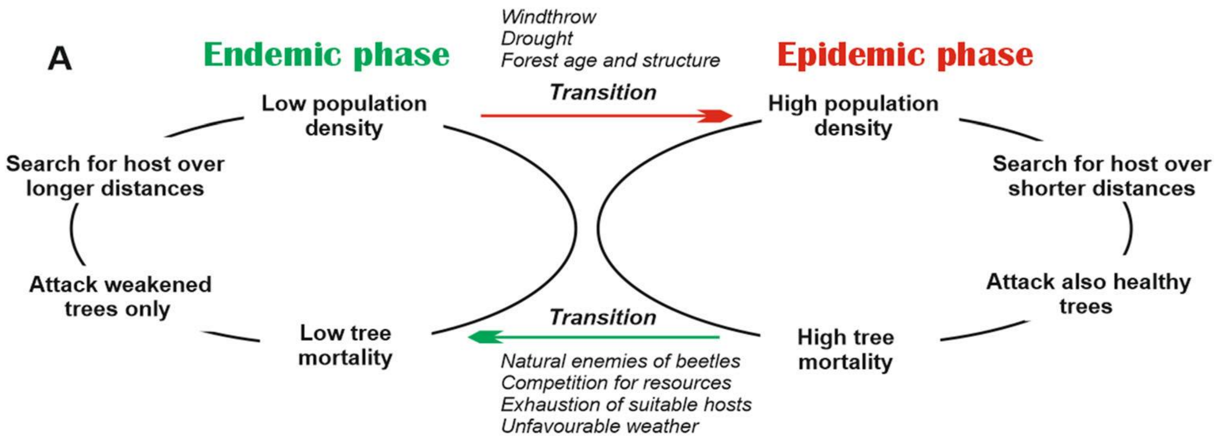


Fig. 50: Scheme of Bark Beetle Population Dynamics. Source: Hlásny *et al.* 2019, 10.

Recapitulating that at low altitudes and under favorable climatic conditions bark beetles can produce up to three filial generations per year and by that increase their population by a factor of 10 to the power of 4 (Hoch and Schopf 2019, 6), enormous population densities are possible in a very short time. It is these densities and their expression in form of mass attacks that lead to a situation in which healthy trees are infested, making bark beetles colonize almost every single spruce tree within a radius of several hundred meters. Yet whoever observes bark beetle outbreaks in the field also knows that albeit population densities might be at a peak, humans have limited capacities to discern the progress of infestation, to know that an epidemic outbreak is already ongoing. Neither have humans the eyesight to spot a millimeter-large bark beetle landing on a tree at a height of ten meters, nor can humans, like trained dogs, sniff out bark beetle aggregation pheromones.

Therefore, infestations at standing trees and at an early stage are particularly difficult to detect for humans, and in the so-called "green attack" stage (at a time when bark beetles have just started to attack and infest a tree) the infestation is only visible through small drilling holes and the typically red-brown bore dust at the tree cortex or the base of the trunk (Hlásny *et al.*

2019; figure 51). Additionally, resin flow around drilling holes, the presence of typical antagonists, the falling-off of green needles or a thinned-crown can be further signs of an infestation (Steyrer *et al.* 2020). In practice, this means that once the weather conditions allow bark beetles to swarm foresters are advised to carry out regular inspection walks and to check trees for infestation symptoms, particularly so in susceptible or previously bark-beetle-affected stands (Hlásny *et al.* 2019). Next to personal knowledge and diligent weather observation, determining the right timing for these walks can be supported by tools like the phenology model PHENIPS or the recent bark beetle dashboard (Hallas *et al.* 2024)[lvii]. In addition to that, pheromone-baited traps[lviii] (figure 52) and trap trees – when set up properly, monitored and removed at the right time – help to get a picture of population densities and swarming peaks[lix]. Once one has realized that a tree has been infested recently, forestry officials recommend carrying out *salvage logging, i.e.*, the removal of the infested tree, as soon as possible (Stadelmann *et al.* 2013; Leverkus *et al.* 2021), in any case before the new beetle generation emerges (Steyrer *et al.* 2020). This is where the law comes into play, and here specifically paragraph 44 and 45 of the Forest Act, prescribing that forest owners are *obliged* to prevent and fight (the propagation of) forest pests (RIS n.d.). That includes making sure that an infestation does not spread to a third party, translating into the obligation to timely remove infested trees from the forest or to treat the logs chemically or mechanically (f.ex. debark or spray them) and to store them (far away from the forest) to prevent beetles from breeding and/or dispersing (to other trees). In other words, forest owners have no

Fig. 51: Red-Brown Bore Dust at the Base of a Tree Trunk – an Early Infestation Sign. © Author, 2022.

Fig. 52: Author checking a pheromone-baited trap in the Kalkalpen National Park. ©Author, 2022.

other choice than to deal with bark beetle outbreaks, to limit the world-making possibilities of bark beetles, and it is forest authorities' job to execute that[lx].

In case the infested tree has neither been removed nor chemically/mechanically treated, what follows is the "red attack stage". As the name says it all, this stage comes with the discoloration and loss of needles, including the peeling-off of large bark parts (Hlásny *et al.* 2019). Well visible from afar, and interpreted by locals as a proof that the responsible forest owner has missed out or neglected taking timely measures, the red stage occurs (long) after the tree has been initially infested (figure 53). At this point, trees are almost or already dead (making the tree uninteresting for further infestation by conspecifics). Salvage felling that has not been carried out so far has little effect now, it might even be counterproductive given that the bark beetle brood has left the tree, but not so the slightly-delayed developing antagonists (Wermelinger and Schneider Mathis 2021, 10p.).

Fig. 53: Infested Red Spruce Tree Crowns in the Sauwald. © Author, 2022.

With bark beetles long gone and other xylobiontic organisms entering and decomposing the dead tree, we finally speak of the "gray stage", and what remains here is a gray tree skeleton without bark and needles (figure 54) – as we will see later, these gray tree stumps are a highly contested, instrumentalized and grieved-for feature of bark-beetle-affected forest landscapes (see chapter 7-8).

Fig. 54: Gray Tree Stumps on a Windthrow and Bark Beetle Calamity Area in the Bohemian Forest. © Author, 2022.

With regards to the duration and intensity of an epidemic population development, we can say that with favorable climatic and feeding conditions (particularly in homogenous, dense and connected stands with a large amount of feeding substrate), and with beetles benefitting from good hibernation conditions, outbreaks can extend over several years. What is in any case remarkable in Upper Austria, Austria and Central Europe, and this brings us to the question of why recent outbreaks are unprecedented in their extent, frequency and severity, is the specific combination of high temperatures, precipitation deficits and abiotic disturbances (Temperli *et al.* 2015; Marini *et al.* 2017). It is this combination, well visible in the explosion of bark beetle damages since 2015 in Upper Austria, that has enabled large-scale bark beetle outbreaks, and increasingly *without being induced or triggered by* preceding abiotic disturbances (Pasztor *et al.* 2014; Hoch and Schopf 2019; Hoch and Steyrer 2020). When looking at historical outbreaks in Austria we see that although extreme weather events have also happened in the 1960s, 70s and 90s, they did not translate into comparably severe bark beetle calamities. Only with the climate-change-related interplay of these events with high temperatures, precipitation deficits and drought stress impacting (age- and stand-wise) susceptible trees, the amount of damaged timber due to bark beetle outbreaks could reach those unprecedented levels[lxi] (Morris *et al.* 2018, S35; see appendices A21).

To sum up, for a bark beetle population to erupt, to become an *outbreak*, to become a *Multi-Species happening*, a multitude of entities, factors and processes must play together on different levels, and even then, there is a great amount of uncertainty whether an eruptive population dynamic also translates into an area-wide, multi-year dieback of spruce trees. Understanding epidemic bark beetle outbreaks as Multi-Species happenings with emergent qualities that come from the interactions between the assembled beings, and looking at driving forces of the extent and severity of such happenings through the lens of more-than-human agencies, we could argue that greenhouse gases (fueling climate change[lxii]), heavy storms (contributing to uprooted/damaged spruce trees) and other extreme weather events (contributing to say drought stress for spruce) are themselves actors or actants (Latour 2005) that make worlds. As Wolfe and Whiteman (2016) put it at the example of the mountain pine beetle in Colorado, bark beetles and climate change are allies. Given that so many things must happen in past and present for a number of beetles *becoming an outbreak*, it is not particularly surprising that our knowledge of bark beetle outbreaks is incomplete, that, as Biedermann and colleagues (2019, 914; appendices A2) note, “the drivers of population eruptions and crashes are still not fully understood”. Bark beetle outbreaks not only remind us of how little humans are aware of processes that are taking place right before their eyes, but also that what people do has unintended consequences – consequences such as making bark beetles powerful, such as creating conditions under which bark beetles thrive, under which bark beetles can become “feral”.

6.4 Becoming Feral: On the Cosmopolitics of Bark Beetle's *Disruptive* Forest-Making in and beyond Upper Austria

…don't fear me human, says beetle, the fearless,
You will lose anyway, just give up this fight,
Don't fear me human, says beetle, the fearless,
You don't have to hold to these forests so tight.

Embrace me human, says beetle, the savior,
We have so much in common, why pretend you don't see
Embrace me human, says beetle, the savior,
Don't be so frantic, I will help set you free.

(Poem by author, second part)

Fig. 55: A fictional interview with a bark beetle representative. Source: Johnstone 2011. © Ceska pozice.

Ever since Kafka turned Gregor Samsa into a giant bug, I have been fascinated by the thought that this could happen to me as well, that one morning I would awake as a human-bark beetle-hybrid, or at least see the world through "bug eyes" as Hugh Raffles (2010, 345) puts it when talking about Japanese insect lovers taking a "*mushi*", i.e., an "insect's point of view". Instead of guessing around, I would finally understand *what it is like to be* a bark beetle, as philosopher Thomas Nagel (1974) once famously asked at the example of a bat. One day, I stumbled upon an article in the Czech newspaper *Lidovky*, a fictional interview with "Gregr Kafr […], head of the Czech and Moravian Bark Beetle Association" on matters of logging in the NP Šumava and how bark beetles would be excluded "from the current debate over the national park's future" (Johnstone 2011, n.p.; figure 55). I was immediately intrigued. That is the kind of anthropomorphism I like, an anthropomorphism that could help to detect, as Bennett (2010, ix) puts it, "a fuller range of the nonhuman powers circulating around […] human bodies", that eventually makes us less "conceptually as well as physically violent" (Raffles 2010, 345) in only seeing the category "bark beetles", the abstraction of a biological species, but never the being itself. So if it helps acknowledging the political agency, "the semiotic powers" of bark beetles (Kohn 2013), why not let them wear suits, why not put them in front of microphones?

Easier said than done, as we can see when looking at the issue that the chapter so far has not contributed to a portrayal of bark beetles as political actors in and through themselves. It is high time to show that more than beings that are *good to do politics with* (see chapter 7–10), bark beetles have a political life in and through themselves, their world-making practices, their semiotic capacities make them “political actors”. That does not mean that humans do not play a role in this. In fact, a significant part of the scope and effectiveness of bark beetle world-making comes from (unintended) human world-making, with bark beetles as “feral proliferations” (Tsing *et al.* 2019) thriving because of spruce plantations, because of “modular simplifications” of formerly (more) heterogeneous forest landscapes. Respectively, it is the *Proliferationocene* and its *feral ecologies*, whereby human world-making has gotten out of control, where feral proliferations and (collapsing) simplifications advance as the dominant landscape forms, that open up chances for other-than-humans to come to the forefront, f.ex. for bark beetles to replace humans as most impactful forest-makers. This in turn demonstrates that the allegedly “great age of humans”, the *Anthropocene*, has always (also) been a *More-than-Human Anthropocene,* a *Proliferationocene* – a timescape in which anthropos' *will to power* has unintentionally brought other actors into play. I argue that the *ferality* of bark beetles is a central moment in their political power. It is their ability to proliferate (unlike many other typical forest dwellers!) in spruce plantations, in “landscapes […] dominated by industrial forms” (ibid.), to endure and resist the repression it experiences from the forest sector “with its traps, its pesticides, its arborists, its public-education programs” (Raffles 2010, 330) that makes bark beetles recalcitrant *political subjects* (Hobson 2007). Subjects that force themselves into the political fray, in Rancière’s words, that *disrupt* the existing order, and in doing so make themselves “political”, that is “counted, named and recognized” (Swyngedouw 2014, 8). Understanding political agency as coming from world-making not only redistributes “politicalness”, but it also makes us re-think what we mean by “politics” (Corbey and Lanjouw

2013). One way of "opening modern politics to the possibility of divergence among collectives composed of humans *and* nonhumans" (Blaser and De La Cadena 2018, 12; italics by author) is to approach the gathering of humans and more-than-humans through the lens of *cosmopolitics*, a concept related to the work of philosopher Isabelle Stengers (2005, 2010). In contrast to "cosmopolitanism", Stengers' merger of *cosmos* and *politics* embraces "the unknown constituted by the [. . .] multiple, divergent worlds and the articulations of which they could eventually be capable" (Stengers 2005a, 995; cf. Latour 2004b), similarly to what Escobar (2020) calls "pluriversal politics". In doing so, Stengers argues for a *flat ontology*, for an egalitarian "ecology of practices" (Stengers 2005b), thought further: for a "new constitutional space wherein both humans and nonhumans gather in a political assembly" (Biemann and Tavares 2018 quoted after Sheikh 2019, 130). To gather in, to *be allowed* into the assembly is hence not a question of representation, of having the right "human spokespersons", as Latour (2004a) suggested in his idea of a "parliament of things", but simply a matter of *making oneself considered* through collaborations with others. Bark beetles do not pursue world-making goals only for themselves, they make worlds (more) livable for themselves *and* their partners such as fungi and bacteria. Similar to being a member of a political party with shared beliefs, goals and strategies, bark beetles are through their shared/entangled world-making projects members of certain political alliances, of what I have introduced as Multi-Species interest coalitions (cf. Bennett 2010, 22; see chapter 8–10). Undoubtedly, one aspect of bark beetles' efficacy lies in their capacity to set other lifeways into motion. In terms of *Actor-Network Theory*, bark beetles are good at *enrolling* other beings such as fungi, smaller bark beetles etc. into such interest coalitions (cf. Latour 2005; Staddon 2009). From an ecological perspective, for instance, bark beetles *mobilize* other beings as by killing and opening up trees they make it possible for other decomposers and detritivores like woodlice, longhorn beetles and fungi to make worlds in and through spruce (Beudert *et al.* 2015; Davis *et al.* 2020). Conversely, by changing living communities from the micro-habitat to the landscape level (see appendices A22), they make it difficult for others (to continue) to make worlds, and in doing so have a great impact on the cosmopolitical balance of power in the forest.

That bark beetles are feral proliferations in “anthropogenically simplified” landscapes is easily visible throughout Upper Austria. We only need to consider how forest landscapes – be they dominated by secondary spruce stands or by climatically-distressed *natural* spruce forests – have changed under the influence of (wind and) bark beetles to get a sense of bark beetles’ forest- and *place-making* capacities (figure 56). Given that forests are as *places* more than material arrangements, but “politicized, culturally relative, historically specific, local and multiple constructions” (Rodman 2003, 205), bark beetles also change the sociocultural meanings of (affected) forests[72]. On the forest stand level, bark beetle-induced changes go from a different tree species abundance and selection over revisited (human) harvesting and cutting strategies to a change in silviculture and rotation length (such as cutting trees already after 60, instead of 80 years). On a landscape level, and this is directly visible in the figure above, bark beetles lead or contribute to reconfigurations of the form, structure and connectivity of landscapes – well in line with a *Patchy Anthropocene*, they make forest landscapes *patchier*, that is more fractured and more heterogeneous (Raffa *et al.* 2008; Biedermann *et al.* 2019). Last but not least, happening on what Morris *et al.* (2018, S40) define as the scale of the “social-ecological system”, (epidemic) bark beetle outbreaks have a strong

Fig. 56: Where beetles feasted”. Bark-beetle-induced clearcut close to Haugstein, Sauwald. © Author, 2022.

[72] In the survey, this is reflected in 53 of 60 respondents (of the longer survey) agreeing that bark beetle outbreaks have changed the face of surrounding forest landscapes, and in 55 respondents answering that bark beetle outbreaks have led to changes in forest management and silviculture, not to speak of the emotional, social and cultural impacts that bark beetle outbreaks have when it comes to the ways in which radically altered forest landscapes are perceived, used and negotiated by human stakeholders (see chapter 7).

impact on what forests can provide for human (and more-than-human) societies, they influence the aesthetics and recreational value of forests (Arnberger *et al.* 2018; M. Müller and Imhof 2019), the availability and quality of natural resources, the air quality, water and nutrient cycle as well as the protective function of forests (Mikkelson *et al.* 2013; Maguire *et al.* 2015; Stritih *et al.* 2024). Moreover, qua tree mortality, increased harvesting, degradation of forest soils, forest cover losses and reduced forest stocks (Dye *et al.* 2024), bark beetles are driving actors of what Dunn and Crutchfield (2009) call "entomogenic climate change". This means that bark beetles fuel climate change and with it the very conditions that make them proliferate (Bentz and Jönssen 2015), they negatively "impact the forest carbon budget, and are suggested to contribute to the recently observed carbon sink saturation in Europe's forests[73]" (Seidl *et al.* 2014, 806). If we did not know better, we might say that bark beetles are doing everything they can to ensure that climate change continues at full speed, and it is the negative feedback loops of forest loss, reduced carbon sink potential, increased emissions from clearcuts, glades and bare soils, and warmer temperatures that make bark beetles ever more *feral*.

To sum up, bark beetles are political actors in and through themselves, their political agency expresses itself in their *disruption* of Multi-Species communities, a disruption made possible by bark beetles *becoming* epidemic outbreaks, by Multi-Species gatherings turning into impactful *Multi-Species happenings*. Differently, bark beetles' political power comes from making themselves considered, from playing a decisive role in the political ecology of forests landscapes.

[73] Given that governments all around the world count on forests as carbon sinks, these latest developments are an additional cause for concern – a concern that is reflected in contradictory solutions/approaches with regards to the question of how to make (future) forests sequester as much CO2 as possible: by increasing forest stocks and the age of stands (Kirchmeir *et al.* 2020) or by shortening rotation lengths, increasing harvests and intensifying the wood-based bioeconomy (Jandl *et al.* 2019).

IV. WHO BENEFITS *WHEN SPECIES ASSEMBLE*: FROM CONTESTED FORESTS TO BARK-BEETLE-RELATED MULTI-SPECIES CONFLICTS

Ever since Johann Friedrich Gmelin has described as one of the first forest scientists the devastating effects of a multi-year bark beetle outbreak in the Upper Harz in late 18th century Germany in his *Treatise on Worm Dryness* (1787), generations of foresters have racked their brains about how to prevent, explain, make sense of and deal with bark beetle outbreaks. Even though outbreaks have in material terms usually affected those most directly who made a living from forests, bark beetle outbreaks have always concerned non-forestry-related groups as well – they have a significant potential for "social unrests and political instability" (Hlásny *et al.* 2021, 144; see esp. Müller and Imhof 2019). Not only has this to do with the fact that bark beetle outbreaks happen in "political forests", in socially-constructed landscapes, in inhabited *places* (affecting local economies, scenery, recreational value, identity, land use narratives etc.; Müller 2011; Flint *et al.* 2012; Sacher *et al.* 2017; Arnberger *et al.* 2018), but also with the assertion that bark beetles serve as providers of "imaginaries of the social" just like other insect *pests*, as "illuminating exemplars of political order[74]" (Beisel *et al.* 2013, 3). In addition, bark beetle outbreaks have the potential to "expose vulnerabilities and challenge relationships, trust, and confidence" (Flint *et al.* 2009, 1174) between and among forest communities. When forest owners tell me that they despised their neighbors because of their neglect of bark beetle countermeasures, that they no longer felt attached to a landscape that has changed because of bark beetles (Interview XI, XIII, XVI, XXIII), then bark beetles definitely have an impact on the social fabric, on people's identity (e.g., Stallhofer 2000). Based on that, bark beetles and bark beetle outbreaks feed into a "politics of belonging" (Trudeau 2006), they reinforce social divisions and strengthen as well as undo political alliances among humans, such as forest

[74] This becomes apparent when the German imperial chief forester Eichhoff writes in 1875, in a time of political controversy, of the ESBB as an "infamous social democrat" who "once here, once there, thrives in a communist way at the expense of our forests and foresters (Eichhoff 1875, 501p.; translated by author).

smallholders uniting against the sawmill industry that would take advantage of bark beetle outbreaks, or private forest owners rallying against an adjacent national park that does not do enough to combat bark beetles (chapter 8–10). In this sense, bark beetle outbreaks are as much an ecological as a sociopolitical "disturbance". Through being interspersed with allegations and accusations of who is responsible for or benefits from outbreaks for what reasons, they are not only *good to think* or *good to (not) live with*, but also *good to do* and *understand politics with.* As forest politics has an inherent biopolitical dimension – involving decisions like who gets to live and who gets to die (Foucault 2003, 241) – knowing, managing and governing bark beetles in specific ways, and increasingly as matters of "biosecurity", "identity" and "economic wellbeing", tells us a lot about power relations within and beyond the forest-political domain, for example about "whose security", "whose identity" and "whose wellbeing" counts in the face of bark beetle outbreaks (Biermann 2016; Marzano *et al.* 2017; see chapter 9–10). Beyond, bark beetles are politically deployed in the sense of being instrumentalized for (more-than-forest-)political matters, with bark beetle outbreaks functioning as proxies for negotiating landscapes and competing environmental narratives (Prentice *et al.* 2018). As we will see, these competing narratives unfold along the more general tension between those who want to *protect* forest landscapes for ecological reasons, and those who want to *use* forest landscapes for economic purposes such as timber provision. In other words, bark beetles are deployed to argue for and to warrant certain "truths" (of why bark beetles proliferate and what this tells us about forestry in times of great uncertainties); they are brought into play to pursue particular forestry- or conservation-related goals (Flint *et al.* 2009; Prentice *et al.* 2018). Serving as the ideal beings of contention, bark beetles act as crystallization points for contrasting approaches to forests and forestry; as bone of contentions, bark beetles have a significant potential to escalate latent conflicts. That they do so, that they bring about situations in which actors "perceive their goals, interests, beliefs, or actions as incompatible with each other" (Froese and Schilling 2019, 25) is not just an assumption, but easily supported with findings from the survey and the interviews. In the former, 61 out of 82 people held that bark beetle outbreaks would lead to tensions or conflicts, to “beetle fights”/”Käferkämpfe” as Müller and Imhof (2019) call them. From the 61 respondents, 98% specified that conflicts took place “between forest neighbors (between those who react to an infestation in a timely manner and those who do not)” (see chapter 8), followed by conflicts “between forest owners and forest authorities” (chosen by 59%; see chapter 8) and conflicts “between forest owners, timber freighters and sawmill companies” (chosen by 43%). In addition, there are a number of other, either place-specific conflicts between national park administrations and property neighbors (23%; see chapter 9 and 10), or more-than-human conflicts between bark beetles, spruce trees and humans (15%; appendices A23).

One general tension that cuts across the mentioned fault lines in the struggles over bark-beetle-affected forests, that plays a role in all of my three research sites (albeit to varying degrees), is that of the tension between *forest use* and *forest protection*, between those in favor of the ecological, and those in favor of the economic function of forests (Nousiainen and Mola-Yudego 2022; Eckerberg and Sandström 2013). In line with that, there are significant differences in how bark beetle outbreaks are perceived and responded to, in how bark beetles are discursively negotiated, policy-wise institutionalized and practically acted-upon – from *natural disturbance agent* and uncontested *ecological partner* by those who want to change business-as-usual forestry to detested *pest* and *economic threat* by those who pursue and want to uphold that business-as-usual forestry (see next chapter).

In what follows, we will look at how bark beetle outbreaks act as triggers, proxies and drivers for conflicts over the form and function of forest landscapes, and how these conflicts play out differently from forest area to forest area. In other words, we will turn from the question of *how species* such as spruce trees, humans and bark beetles *assemble* in chapter 4-6 to the political-ecological question of *who benefits when species assemble*, thus looking at the social processes, Multi-Species relationships and historical legacies that produce winners and losers of bark beetle outbreaks. In doing so, the four following chapters progress from a general overview of how bark beetle outbreaks politicize forests and forestry (chapter 7) to a site-specific perspective on different (and differently-scaled) conflicts around and due to bark beetle outbreaks (figure 57) – from *local* neighborhood conflicts in the Sauwald over *regional* Multi-Species conservation conflicts in the Kalkalpen National Park to *interstate* conflicts over the border-related bark beetle management in the Czech national park Šumava.

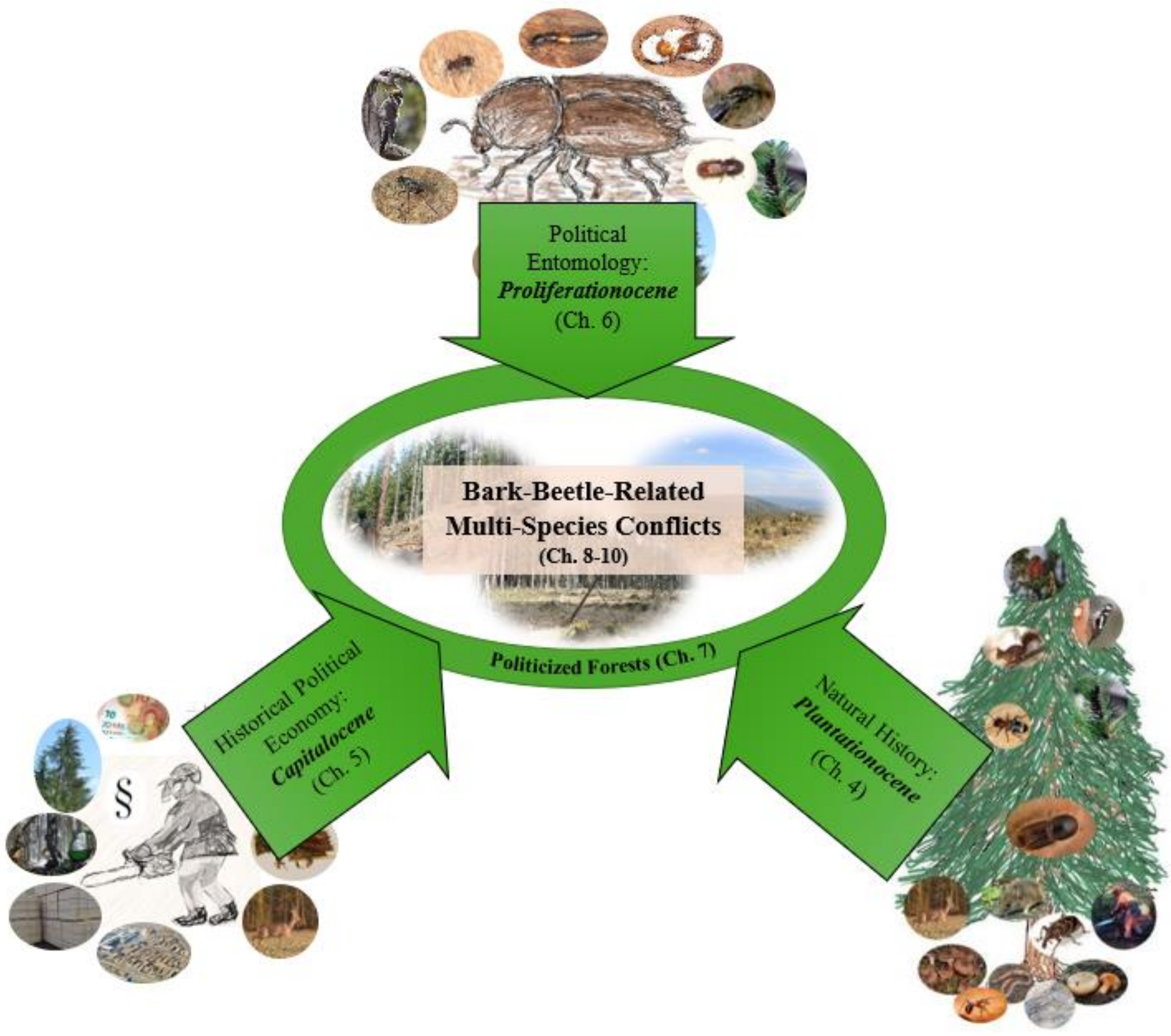


Fig. 57: From the Entry Point to the Conflict-Analytical Chapters. © Author, 2024.

7. Contested Outbreaks, Contested Forestry: Bark Beetle Outbreaks and the *Politicization* of Forests

Most in the forest sector would deny that forest-making in Upper Austria looks and works the way it did thirty or forty years ago. Too much has changed, and under the imprint of the climate[lxiii] and the "bark beetle-spruce crisis[lxiv]", the uncertainties, demands and contestations around the future of spruce-dominated and bark-beetle-hit forestry have reached a whole new level (Honkaniemi *et al.* 2020; Hlásny *et al.* 2021). That said, crises always provide a momentum for rethinking what is important, for (re-)politicizing the question of what society wants from forests (and who actually benefits from that). Although from a political-ecological perspective forests are necessarily "political forests" in that they act as arenas and proxies for conflicting social interests, in that they "are congealed and convergent in material, ideological, discursive and institutional relations as well as claims by states or other governing bodies" (Vandergeest and Peluso 2015, 162), struggles over form and function of forest landscapes have gained a particular momentum in recent years (Nousiainen and Mola-Yudego 2022). Above all, the polarizing *EU Forest Strategy*[75] (EU Commission 2021), the EU deforestation regulation (EU Commission 2023), and the *EU nature restoration law* (EU Commission 2024) have contributed to forests being brought (back) into discussions of (sustainable) land use, into the focus of discussions around the form and dominance of certain societal nature relations. Bark beetle outbreaks play a role in that increased politicization, and as I will show the "bark beetle-spruce crisis" functions "as a site for the emergence and deployment of various environmental narratives" (Prentice *et al.* 2018, 83). Assuming that environmental narratives "are nested

[75] Causing an outcry among countries like Austria or Finland, countries with a strong forest and woodworking sector, the *New EU Forest Strategy* (EU commission 2021, 11) can be understood as an attempt to remove forests from the influence of intensive forestry, it entails the target to "protect at least 30% of the EU land area under effective management regime, out of which 10% of the EU land should be put under strict legal protection". Particularly opposed by private forest owners and private forest companies fearing for usage restrictions and a loss of (international) competitiveness, the EU forest strategy polarizes. While some consider it an important step towards trans-European conservation, most forestry stakeholders that I met in my research complain about the strategy, saying that the strategy would represent the interests of "elitist" conservationists, but not theirs.

within broader institutional and power arrangements” (ibid.) and that they provide answers to the question of how forest landscapes and forest management should (not) look like (Fairhead and Leach 2003; Eckerberg and Sandström 2013), I will discuss how different (human) forestry stakeholders negotiate bark beetle outbreaks (7.1) and the precarious condition of spruce (7.2), and how this negotiation is shaped by the overarching tension between forest *use* and forest *protection*, between *right* and *wrong silviculture* (Jandl *et al.* 2019; Hagge *et al.* 2019; Kortmann *et al.* 2021; Creutzburg and Lieberherr 2021).

In the first part (7.1), I will focus on human perspectives on bark beetles and bark beetle outbreaks along a discursive spectrum reaching from "bark beetles as an economic threat" to "bark beetles as ecological partners" and intersect this spectrum with the semantic matrix of "using vs. protecting forests”. As I will argue, this is insightful as there is a strong overlap between those who think that forests need to be (intensively) managed *and* bark beetles need to be controlled, and those who want to protect forests *and* consider bark beetles as ecological partners that can do as they please (Kortmann *et al.* 2021). In the second part (7.2), I will sketch out the field of tension between “status quo” and a “climate-fit” future forestry through an examination of diverging (silvicultural) stances on (the future of) spruce and spruce-dominated forestry – stances that reach from stressing spruce’s role as a “bread tree species” to emphasizing spruce’s reputation as the “evil twin” of rational forestry, as a disturbance-susceptible plantation tree.

7.1 From Economic Threat to Ecological Partnership: Bark Beetles and Bark Beetle Outbreaks in the Field of Tension between Forest Use and Forest Protection

When bark beetles proliferate in the form of a mass propagation, people with a connection to forests are concerned for a variety of reasons. Some are concerned because bark beetle outbreaks have economic consequences, they happen in managed forests, on one's property and to somebody's financial detriment. Others are concerned that bark beetle outbreaks impair the protective function of forests, that *patchier* forests threaten the groundwater and micro-climate. Then there are those who are concerned about the ways in which forest landscapes change under the impact of bark beetle outbreaks, be it in terms of biodiversity or simply with regards to how forests look like as identity markers, tourist destinations and inhabited landscapes[76] (Flint 2006; Flint *et al.* 2009; Müller 2011; Arnberger *et al.* 2018). In short, there are a number of different, often conflicting conceptions of why bark beetle outbreaks happen, who is responsible for them and what to do about them (Flint *et al.* 2009; Qin and Flint 2010; Kortmann *et al.* 2021), and it matters greatly whether one perceives and responds to bark beetles as "major sources of economic loss, integral agents of ecosystem function, challenges to natural resource policy, or environmental threats arising from anthropogenic change" (Raffa *et al.* 2008, 502). It is these different perspectives in "the social construction of forest insect disturbances" that tell us a lot about the environmental narratives against which these perspectives are formed, what Prentice *et al.* (2018, 78) call "ecological imaginaries", that is "competing conceptions of nature" based on "the various environmental identities of actor groups that emerge in relation to prevailing institutional power structures and to a constructed environmental problem".

[76] In short, epidemic bark beetle outbreaks are perceived as a challenge for forest ecosystems and forest management systems in Upper Austria, and this applies to almost everyone who has a direct relationship to forestry either through forest ownership or a forestry-related profession. In the survey, biotic disturbances like bark beetle outbreaks were the second most frequently chosen challenge (77%, appendices A24). Survey participants were also asked to also rate the severity of the bark beetle situation in Upper Austria on a scale from 1 to 10, ranging from the bark beetle is neither a topic nor a challenge (1) to the bark beetle is *the* central topic and a very big challenge (10). Here, an average value of 7.61 shows that even among those respondents who are not directly affected by bark beetle outbreaks, the severity of the situation is assessed as high (appendices A25).

In what follows, I will discuss the differences in how bark beetle outbreaks are constructed, made sense of and dealt with in Upper Austria along an idealized spectrum[77], reaching from negatively connotated perspectives on bark beetle outbreaks as an "economic threat" (chapter 7.1.1) to conservationist framings of bark beetles as "ecological partners" (chapter 7.1.2.; see figure 58). As I will show, these perspectives are dependent on varying degrees of affectedness, they are enacted differently by different actor groups, and above all fall together with different stances on forest management and silviculture, with different takes on what functions forests have to fulfill – from timber provision for human needs to the conservation of biodiversity for more-than-human needs (Hlásny *et al.* 2021, 138).

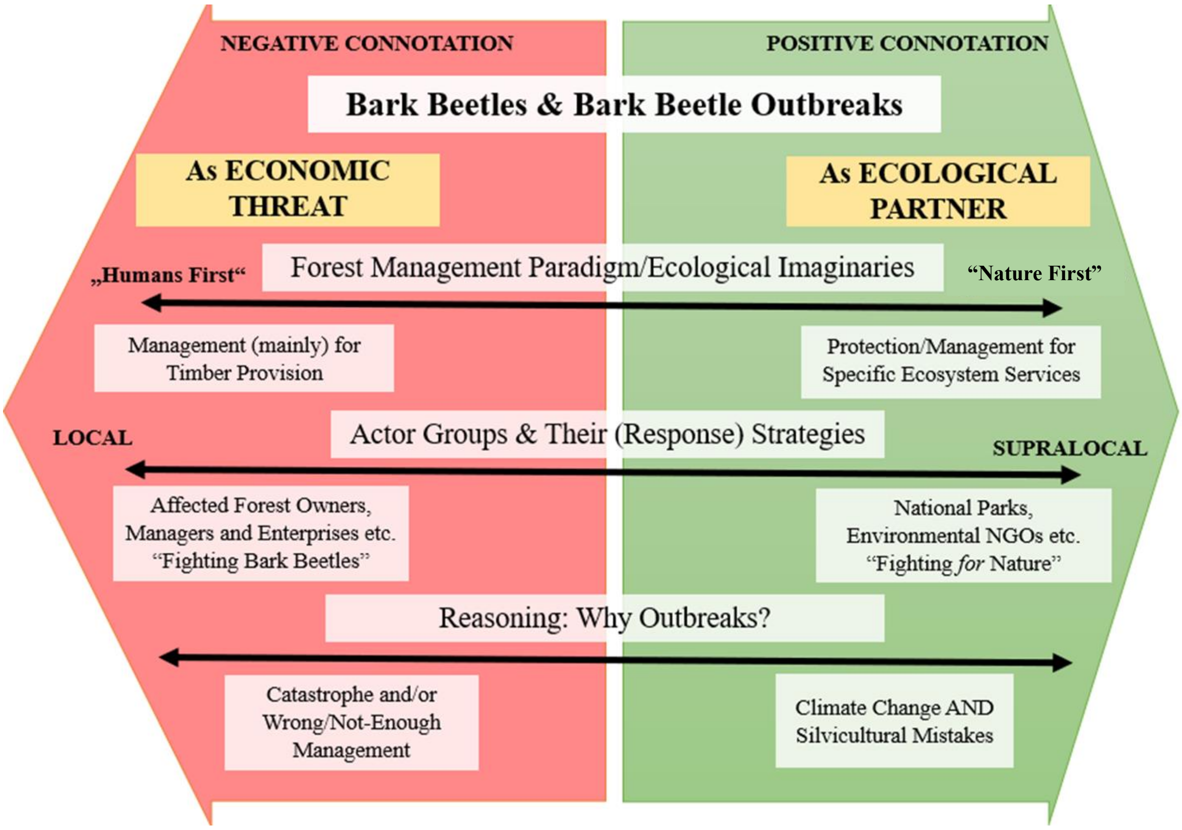


Fig. 58: Analytical Continuum of Simplified Human Perspectives on Bark Beetle Outbreaks. © Author, 2024.

[77] Aware of the danger that the two poles of the spectrum may appear arbitrary, not doing justice to the diversity of lived experiences with bark beetles, I stress that the scheme is meant to structure, not depict reality.

7.1.1 Economic Threat to *Used* Forests: On the (Non-)Manageability and Political Economy of Bark Beetle Outbreaks

> *"*So when the bark beetle calamities came about, it was apocalyptic. My largest coherent damaged forest area was eight-hectares-large, an area that was completely eaten up by the beetle in only one week [!]. This was apocalyptic. *I couldn't find a tree to hang myself from*. If you would enter the forest and say, I'll look for a healthy, non-infested tree and I'll hang myself on it, you would not have found one*."*
> (Interview XII, L. 425pp.; italics by author)

When interview partners told me that being hit by a bark beetle outbreak is traumatic and stressful, it did not come as a surprise. From our former family forest, I knew that trying to stop an ongoing bark beetle outbreak is a Sisyphean task: Remove a couple of infested trees, just to return a week later to find a dozen more infested, followed by a dozen more in the week to come and so forth. And all of that happening to trees one did not want to harvest, at a time of the year when one did not want to work in the forest, in an economic situation in which prices have gone down, forcing one to sell at a spot price or leave the wood to rot in the forest. In short, many affected forest owners experience bark beetle outbreaks as a *threat* to *managed*, to *cared-for* forests and they suffer from outbreak consequences in the form of economic losses, property devaluation, entrepreneurial uncertainties, reduced manageability, increased workload and emotional distress (Flint 2006; McFarlane *et al.* 2012; Grégoire *et al.* 2015; Hlásny *et al.* 2019). From this point of view, bark beetles are first and foremost negotiated as a *pest*, bark beetle outbreaks are assigned the category of a *catastrophe*, referred to as "disasters" and "calamities", challenging human claims over forest landscapes and running counter to a "humans first forestry approach" centered around the primacy of timber production (cf. Johann 2007). An approach based on the conviction that for achieving what is most important, that is meeting human needs through generating (ever higher) yields, forests need to be (intensively) managed (Duncker *et al.* 2012; cf. Bell *et al.* 2006). In this context, the above-mentioned *wake theory* is taken to an extreme, making proponents of intensive management stipulate that *only managed [!]* forests would be able to provide multiple forest ecosystem services, even more:

that the moment management is abandoned, the survival of the forest would be in danger[78] (Interview IX, XIII, XXIII).

What makes bark beetle outbreaks special (and a nightmare for proponents of intensive forest management) is that in a blink of an eye they radically change the scope for human forest-making, they disrupt and turn forest management on its head. As a visibly shaken operative manager of a large Upper Austrian forest enterprise recalls, bark beetle outbreaks deprive foresters of what they think they would (and needed to) have when managing forests: Control.

> "Already five or seven years ago, I have said to my colleagues: I finally want to have a year again where I decide how to use the forest. And that does not exist anymore, *we lost control 15 years ago*, so that is when it all started" (Interview XII, L. 677pp.; italics by author)

"To lose or have lost control" is a constitutive part of *why* forest owners and managers feel threatened by bark beetle outbreaks. This is because "losing control" not only points to one's inability to prevent outbreaks from happening and causing damage, but also comes in the form of being unable to manage one's forest according to one's plans and needs, of becoming forced to adapt one's form, time horizon and extent of management interventions to (the demands and world-making practices of) a more-than-human actor. In this sense, "losing control" is undesired and unsettling, to be losing control is an affront to the (humanist) *human hubris*, it stands in sharp contrast to a "command-and-control [forestry] approach" (M. Cox 2016), to the "high modernist" promises of "the development of scientific and technical knowledge, the expansion of production, […], and an *increasing control over nature* (including human nature)" (Scott 1998, 91; italics by author). It is this very experience of "losing/not having control", of becoming externally determined, of feeling helpless, of not recognizing one's former forest anymore (cf. Milton 2002), that most forest owners/managers perceive as stressful, and less the economic losses and the increased workload as such. In line with that, the table in the

[78] Not a forest owner himself, the introduced sawmill representative is convinced that "the forest will die if it is not managed, and you can ask that more renowned experts. An unmanaged forest dies […]. You might be able to play the forest ranger for a little while […], but at some point, the forest will die if it is not managed, or falls victim to a storm or to bark beetles" (Interview IX, L. 599pp.).

appendices (A27) shows a number of answers respondents gave to the question of how they feel when they think about bark beetles – reaching from “powerlessness” and “helplessness” over “anger” and “fear” to “stress”, “tiredness” and “increased work burden”). Taking seriously that forest owners have the impression of losing control, of feeling powerless, this means that there must be the assumption that something like control existed *in the first place* – an assumption held despite many interviewees also acknowledging that “there are many things that one cannot influence, that nature does a lot on its own, that one needs to accept that things can run in all kinds of different directions” (Interview VI, L. 853pp.). Given this ambiguity of (human) control and the “control of nature”, I find it remarkable that (“human first”) *rational forestry* with its idea of making forest ecosystems manageable, scalable and profitable (Chao 2022a), could gain such a foothold, that for several decades it appeared as if forest ecosystems would be easy to handle. This may have to do with the circumstance that throughout the second half of the 20th century forestry has been rarely confronted with comparatively severe economic backlashes, multi-year disturbance events and “feral proliferations” like bark beetles (Tsing *et al.* 2019). This phase of temporary stability and continued growth (of forest area and the forestry-related GDP) may have led to the impression that forestry would be a sure-fire success, with spruce as forestry’s “magic bullet” guaranteeing for high yields without requiring much intervention (Johann 2007; Interview X, XV). In line with that, I argue that bark beetle outbreaks are experienced as a threat because they endanger this *easiness*, they force forest owners to invest more energy, knowledge and money into forests than usual, they mess with the plannability of forest management interventions. In the words of the operative manager of the forest enterprise in the Kalkalpen National Park, “you cannot plan anything with the bark beetle. You cannot plan the harvest quantities, you cannot plan what you are doing with it, [and – relating to the temporality of world-making –] you are always lagging behind […]” (Interview I, L. 676pp.).

Closely tied to the (non-)plannability and (non-)manageability coming with bark beetle outbreaks is the question of outbreaks' *predictability*, here: in terms of the nightmare of never knowing *when* infestations will happen, *to what extent* and *in which part* of the forest. Although research regarding the drivers and conditions for bark beetle outbreaks has come a long way and there are many hints indicative of a pending population eruption, there is no such thing as knowing for sure *when exactly* outbreaks will happen. This has to do with a number of factors, some of them related to the world-making of bark beetles, some of them to the (seasonally-changing) predisposition of spruce stands, others, as we have learned, concern unpredictable processes like macro-climate and weather conditions in particular times of the year. Bark beetle *outbreaks*, and here the name says it all, happen fast and "out of nowhere":

> "You have to experience that for yourself, that was two years ago, my neighbors just had bark beetles, they cut down four hectares […]. You get to the border [of the forest property] […], and you think, thank God, I am still all right, I am spared. The neighbor cuts down green trees, he will catch all the beetles and stops the [outbreak] dynamic. How lucky have I been. A week later, I entered the same forest and I thought to myself: That cannot be! On eight hectares, every single tree has been infested, you could write your name under every tree with your finger, so much bore dust there was" (Interview XII, L. 952pp.)

Next to the anger, frustration and shock of being hit repeatedly and unexpectedly (making statements in the survey such as "please not again" (R. 22) or "fear of going out into the woods and finding beetle nests" (R. 36) relatable), the economic losses that come with infestations contribute to the image of bark beetle outbreaks as a threat (Hlásny *et al.* 2021, 143p.). Less a consequence of bad wood quality, economic losses happen because of the market, because of human behavior in the face of the sudden oversupply of spruce wood (see chapter 5.3). In other words, it is the market as a structured and aggregated form of human forest- and world-making that – during the heyday of bark beetle outbreaks in the years of 2017 to 2020 – made the average price for the "spruce/fir B 2b leading assortment" go down to less than 70 € per cubic meter – with further 30–40 € deductions for bark beetle damaged timber, i.e., the lowest timber price since 1996 (appendices A26). At the bottom of this development, forest owners received less than 30 € per cubic meter spruce roundwood (Ebner and Holzkurier n.d.; Holzkurier 2020). Considering that many of the more affected forest owners or the ones not equipped to deal with bark beetle damages had to hire external forestry workers and harvester companies, revenues moved towards zero. As a consequence of the fall in prices and the related panic to find (reliable) buyers (and freighters), foresters find themselves in a precarious position:

> "Bark beetle outbreaks frighten people who do business. Because the first thing that happens in a bark beetle year, is that the sawmill industry goes down with the price, and when they go down with the price, the next thing is that everything that looks a bit like bark beetle wood, gets downclassed, so not only the price itself, but also the quality class classification is set down, which means you have a lower income at once" (Interview I, L. 668pp.).

As we will discuss below, it is this inequality with regards to the production and distribution of *vulnerability*, the contested question of who actually suffers and benefits from bark beetle outbreaks (Parkins and MacKendrick 2007; Holmes *et al.* 2008; Abbott *et al.* 2009) that contributes to "blame games" in which responsibilities are (re-)distributed, vulnerabilities are negotiated, and multiple accusations are made – a blame game that not only hints to power relations, but also shakes the social fabric in affected regions (e.g., see chapter 8–10).

I have mentioned that the perception of bark beetle outbreaks depends on ecological imaginaries and one's forest management goals, in turn shaped by one's position within local communities and fields of power (Flint *et al.* 2009). Looking at how a specific "conception of *nature"* (Prentice *et al.* 2018, 78), a certain forest management paradigm and a particular reasoning regarding the drivers of bark beetle outbreaks play together, we see that particularly among those forestry stakeholders that are convinced that forests are meant to be (intensively) managed for economic purposes bark beetle outbreaks are regarded as *catastrophic events*. Respectively, bark beetles are framed as the *enemy*, as a being that – according to survey respondents – is "an unnecessary insect only causing damage" (R. 19), "a dangerous pest to be exterminated" (R. 40) and (in a highly anthropocentric way) "an animal that really no one needs" (R. 49). The assessment of bark beetles as unnecessary goes as far as to make some forest owners question that bark beetle outbreaks would be *natural* disturbance events at all[79]. Others, undoubtedly the majority, admit that albeit “bark beetles are a natural factor” (R. 38) and “belong to nature” (R. 43), their naturalness does not make them appreciated and/or welcomed. In this sense, proponents of (intensive) forest management are quite selective in what “part” or “kind of nature” they want to have *when* and *where* in *their* forest, and what “parts” they can do without. Bark beetles might be *natural*, they might be ecologically important, but insofar as they jeopardize (specific forms of) human forest-making, they must be fought[80], and that using all means possible[lxv], translating into “top-down approaches that strive to exert control over the disturbance and post-disturbance vegetation development” (Hlásny *et al.* 2021, 144; cf. Vanická *et al.* 2020). That management is stylized not only as the right way to respond to, but also as an explanation for outbreaks, becomes clear when looking at the sense-making processes regarding the drivers of recent bark beetle outbreaks. Albeit acknowledging that adverse climatic conditions, preceding abiotic disturbances and susceptible stands play a role in the rise of bark beetles, a common position among proponents of the ”humans-first forestry approach” is that bark beetle outbreaks would be an outcome of missing “forest hygiene” and a lack of care by forest owners[81]. In other words, it is the *lack of right management*, and *not* – as environmentalists would argue – the *too-much of wrong silviculture* that lets bark beetles proliferate (for the sense-making of proponents of intensive management see also appendices 29). However, the fact that bark beetles thrive is by no means a problem for everyone.

[79] This is visible in the survey in which 43% of respondents rather or strongly disagree with the statement that “bark beetle outbreaks are natural disturbance events and important for the dynamic in the forest” (see appendices A28). Whether this disagreement comes from the cognitive tension of acknowledging that something so stressful and threatening can be *natural* and *important* or whether this disagreement is an expression of being convinced that bark beetles are really something *not natural*, is difficult to say.
[80] In the survey, there was a high agreement regarding the statement that bark beetles should be fought using all means possible, while the statement "bark beetle outbreaks should not be fought at all, because nature regulates itself" was met with strong rejection (see appendices A28).
[81] In the survey, 67% of respondents agreed to the statement that “many bark beetle outbreaks could have been prevented if forest owners would manage their forests in a better way” (appendices A28).

7.1.2 Ecological Partner in and for *Protected* Forests: Bark Beetles through the Lens of Conservation Ideology

Fig. 59: Cartoon drawn by former head of the environmental NGO “Naturschutzbund OÖ”. Source: Gamerith 2011, 10. © Limberger.

“And they call us pests? At least we leave the trees standing!” – what forest owners might find cynical in the adjacent cartoon (see figure 59) drawn by the former head of the Upper Austrian *Nature Protection Association* (“Naturschutzbund”) is a position that is more widespread than one might think. A position, here: the other end of the spectrum on how bark beetles are made sense of, in which the latter are framed not as threat or “villains” (Wohlleben 2023a) but as *partners* in forest conversion, as – in the words of an icon of the German forest protection movement, the forest ranger Peter Wohlleben – “ambassadors for a return to natural forests” (Wohlleben, n.d.; translated by author). Proponents of that imaginary stress that “bark beetles play key roles in the structure of natural plant communities and large-scale biomes” (Raffa *et al.* 2015, 1), that by redeeming *dying* trees bark beetles would “restore an out-of-balance ecological *equilibrium*” (Interview XXV, 00:15:45-47; italics by author).

As we have seen, bark beetles are more than other forest inhabitants crystallization points for negotiating what is “natural” and what is to be concluded from that (with regards to the management or protection of forests). Whereas proponents of (intensive) forest management have their own ideas of what is *natural* (and desirable) in a forest managed for economic purposes, with the tendency to relegate unwanted beings to areas where they do not interfere with human management – such as national parks (cf. Hagge *et al.* 2019) –, proponents of *natural* succession (and “rewilding”) via bark beetles tend to grant the latter a universal “right to exist” (Müller and Job 2009). It is interesting to note that the role that bark beetles play *in* and *for* national parks is something that has repeatedly come up during my research (e.g., Sacher *et al.* 2017; Riedl *et al.* 2018). Looking at how bark beetle outbreaks are associated with (happening in or because of) protected areas is insightful as that semantic connection reinforces the discursive dividing line between those who oppose and those who "embrace" bark beetles, between those who use and those who protect forests, and related to that "between national park supporters and opponents" (Flint *et al.* 2009, 1181; cf. Lindenmayer 2017; Blicharska and Smithers 2018; Kortmann *et al.* 2021). Whereas for a number of forestry stakeholders national parks are a deterrent, a "worst case" example of what happens when you let nature be nature and bark beetles be bark beetles (Interview XIV, XVI, XXIII), national park administrations, environmental NGOs and conservationists stress that it is necessary to "have national parks where we have process protection and can observe what happens on a larger area" (Interview III, L. 264pp.; Interview XXVII). Given that the latter perspective remains primarily within a (normative) Cartesian dualism of "nature" and "culture", with "nature" read as "good" and "balanced", and "culture" qua human forest management as "unnatural" and "destructive" (Morton 2007), bark beetle outbreaks are stylized as welcomed *natural* events (Wohlleben 2015). One can imagine that portraying bark beetles as positive has a particular impact on those who consider the latter to be a pest and a threat. Related to an introductory film shown in the early 2000s at the visitor center of the Bavarian Forest National Park, a forest manager describes how bark beetles were portrayed in that film:

> "There was a short movie where forest management in historical times was shown in black and white images and with very dark music, and then it suddenly switched to color images and a friendly music, then there was the main character, the bark beetle, that now takes on the blessed task of erasing the sins of the past. And now that the ignorant man, who is unconnected with his environment, has finally disappeared from the forest, the beetle is beginning to produce the ideal world again […] We were a group of foresters and we found this to be nothing less than brainwashing" (Interview X, L. 761pp.).

It is this depiction of bark beetles as "saviors" and humans as "destroyers"[82] (or as a *pest* in the cartoon above) that arises from and reproduces a specific ecological imaginary based on the notion that a self-regulating *nature* must be protected from humans, that "the order of nature has been violated by society's utilization of nature" (Linnér 2023, 112). Insofar as bark beetles are believed to change forest ecosystems in a way that is compatible with the ideas of conservationists and environmental NGOs, protecting *nature* – or better: protecting a *certain, as-right-imagined kind of forest nature* from human access (Küster 2013, 225pp.) – is equated with supporting bark beetles. During a stakeholder meeting, a nature conservationist whispers in my ear that with regards to a forest conversion (towards mixed forests) bark beetles "would have achieved what foresters have not been able to do for 30 years" (pers. communication, M.D., 31.05.23). Similar views such as associating bark beetles with the emergence of "very exciting new forest compositions with a high biodiversity" (Interview XXVII, 00:20:53–58) by an employee of the nature conservation department of the federal province reinforce the impression that bark beetles are believed to re-establish "better" forests, that is forests with higher ecological value (Lehnert *et al.* 2013). Even if ecological studies support the idea that habitat heterogeneity and biodiversity increases after bark beetle infestations (e.g., Janík and Romportl 2018; Davis *et al.* 2020; Kortmann *et al.* 2018), there are site-/context-specific differences in how certain species respond to bark-beetle-induced forest changes and it is not a certainty that bark beetles always lead to the desired tree communities, i.e., to the disappearance of spruce:

> "And yes, you have to be very careful if bark beetles lead to a forest conversion, especially with the automatisms. Because when you look at the Bavarian Forest National Park, one might have thought that mixed forest would appear in the upper elevations, but that does not happen, only spruce comes back. And the green alder and the buckthorn, which were there at the beginning, and the birch, they disappear again, so spruce comes in again […]. So one should stick to the scientific truth and not introduce one's own *ideologically colored* wishes, that is often a big problem" (Interview XIV, 466p.; italics by author).

[82] The starting point for conservationists and more-ecologically-motivated stakeholders is often the assertion that intensive management that has led to the impoverishment, degradation and disturbance susceptibility of forest ecosystems in the first place.

Apart from the quote expressing the devaluation of conservation imaginaries (and subsequent environmental policies) by framing them as "ideologically colored" (and one's own positions as rational and true, i.e., as non-ideological)[lxvi], it is in any case remarkable *with which emphasis* conservation-adverse forestry stakeholders point to the "ideological character" (Interview VIII, L. 237) of nature conservation. Defining ideology here as a politically-potent "set of ideas" (Linnér 2023, 94) and following Terry Eagleton (1991, 202) as referring "to the processes whereby interests of a certain kind become masked, rationalized, naturalized, universalized, legitimated in the name of certain forms of political power", it is indeed a "conservation ideology"[83] that informs the way that certain stakeholders think about and act upon forests[lxvii]. Regardless of the heterogeneity of strategies and goals of advocates of such a conservation ideology, a shared assumption of conservationist "bark beetle proponents" is that something like an ecologically ideal *state of nature* exists that can (and should) be restored by putting forests out of use and letting bark beetles have their way. This stance of imagining bark beetles as needed forest converters and conventionally-managed forests as unsustainable is not an isolated view of some (in the words of foresters) "conservation fundamentalists" (Interview VI, L. 676) or "conservation scatterbrains[lxviii]" (Interview XIII, L. 586), but is also (indirectly) expressed in the mentioned *EU Forest Strategy* and particularly pronounced in the public discourse on the crisis of forests (Henning 2020). Conversely, this might explain, why a significant number of survey respondents find the media reporting and public discussion on bark beetles to be "not fact-based enough" or "*ideologically* charged"[lxix]. As we see, making sense of and dealing with bark beetles (and bark beetle outbreaks) is not only an economic and ecological question, but also a matter of ideology, particularly in the field of tension between forest use and forest protection. Insofar as ideology is enabled, tied to and brought about by

[83] For Linnér (2023, 112) the post-war „conservation ideology" rests upon and reproduces a certain story: „In short: scientific evidence shows that humanity itself is endangered, since the order of nature has been violated by society's utilization of nature. Thus, a political change toward an ecological society was needed to avoid catastrophe, where the common resources of the world household were to be planned in international cooperation".

political power, ideologizing bark beetle outbreaks, that is warranting and pushing through certain ideas of bark beetles and their role in/for *nature* as the truth, is an exemplary power move in struggles over the “right” kind of forest management. In this sense, what seems to be all about bark beetles and their impact on forestry, becomes a question of identity and power upon closer examination. The same holds true for spruce, and there is a significant amount of contestation around the question of who is responsible for the rise and fall of spruce.

7.2 From "Bread Tree" to "Problem Child": Spruce in the Field of Tension between "Wrong" (Past) and "Right" (Future) Silviculture

> "We are atoning for the *mistakes of our predecessors* who did not want to do forest management in a way that was close to nature, but wanted to have an economically lucrative forest" (R. 41).

> "One only needs to look at the Bavarian forest, at the Bohemian Forest, […], what has been happening there, namely bark beetle calamities in natural spruce forests that have been put under protection for the very reason that they are natural. They have been eaten up by the bark beetle, […], everywhere in these untouched areas bark beetle outbreaks happen, […], so it is *completely absurd to speak about mistakes in the past in forest management"* (Interview VIII, L. 200pp.; italics by author).

With spruce increasingly ailing, going through an episode of impaired health, increased disturbance susceptibility, decreasing abundance and unprecedented mortality, forest owners are concerned, to say the least. There are plenty of reasons for that, be it record-breaking harvest quantities, forest (canopy) cover losses, devaluation of forest properties, a saturation of carbon sinks or collapsing timber prices. In particular regions of Upper Austria, f.ex. in the Eferding basin or in parts of the Danube valley, spruce has basically disappeared from the scene altogether (Interview X, XII). With spruce's area shares decreasing[84], so is its reputation, and only few believe that the tree will have an easy future. On the contrary, climate change qua prolonged drought periods, temperature increases, and more severe disturbances will likely make it more difficult for spruce (Schüler *et al.* 2013; Dyderski *et al.* 2018; Sommerfeld *et al.* 2021; Chakraborty *et al.* 2021).[lxx]

Against the background of both the current situation and the grim outlook, spruce-dominated forestry is (in many areas) at a crossroads. Whereas it is largely uncontested that in light of climate change sticking with spruce is not a feasible option, the "elephant in the room" is the fact that the Austrian forest sector and woodworking industry is geared towards that one tree species: Spruce accounts for almost 80% of total harvested timber in 2023 (appendices A1)

[84] Decreasing does not mean that spruce is at risk of becoming extinct in the federal province in the near future. So even if spruce area shares in Austria have declined from 70% in the 1992-96 forest inventory (Schieler and Schadauer 2011) to around 50% today (BFW 2024), that share is still high – and in any case too high to speak of spruce slipping into insignificance (Büchsenmeister 2013).

and for 85% of the produced sawn wood, (still) enabling the international competitiveness of the export-oriented Austrian sawmill industry. It is one thing to say that spruce is unadapted and outdated, but a different one to bear the (economic) consequences of pushing this tree species out of forests overnight. In "arbori-cultural" terms (Jones and Cloke 2002), there is no other tree that has determined Austrian foresters' destinies as much as spruce.

Precisely because of that, there is a great interest in (the future of) spruce, and like bark beetles spruce has advanced into a crystallization point for conflicts over the "right" and "wrong" way of dealing with forest ecosystems (Winkel *et al.* 2011; Karopka 2017). Discursively, the great interest in spruce is reflected in an increased thematization and problematization of spruce, both in forestry and in the general public (Zobl 2018; Bettel 2024; Isopp 2020). What one notices when dealing with the discursive frames through which spruce is negotiated is that those are divided on the question whether spruce has the capacity to adapt to changes and remain the "bread tree" species, or whether spruce is a "problem child[85]" (BFW 2013) and better to be replaced with other, more "climate-fit" tree species (Schüler *et al.* 2023). Whereas it is above all forest owners, managers and authorities that adhere to the "bread tree" narrative and stress spruce's economic and cultural importance (Büchsenmeister 2013), conservationists and NGOs frame spruce as a "problem child" and spruce forests as aesthetically unappealing[86] – often "from the distance" and without a consideration of stand structure and local site particularities[87] (Henning 2020)[lxxi]. This latter position is also most

[85] Albeit the discourse on spruce *having* or *being* a problem mainly dates back to the 1980s and 90s, the equation of spruce with threateningly dark and dense plantations is much older, and often grounded in war ideologies, cultural programs and historical events: In the context of the Napoleonic wars, romanticist painter Caspar David Friedrich depicts in his painting "Der Chasseur im Walde" (1814) a hostile French soldier surrounded and threatened by an impenetrably-dense German spruce forest. In the context of the Nazi propaganda movie "Der ewige Wald" ("The Eternal Forest"), a dense spruce forest is equated with lining-up German soldiers (Schmidt 2017; Küster 2013, 215pp.).

[86] While most people that I have met would agree that dense spruce forests are not necessarily the epitome of beauty, there are also those for whom the definition of a beautiful, that is a *productive* and *tidy* forest is exactly that: an easily-accessible, dense stand of even-aged spruce trees – a forest without much structure, without much light for the ground vegetation, without much work besides planting and harvesting.

[87] I can still remember an excursion organized by the Upper Austrian Nature Conservation Association to a forest (also owned by the association) during which the excursion leader explained that the first thing they had done in the forest was to cut down all those "non-belonging" spruce trees, regardless of their health and fitness.

dominant in public reporting, and, coupled with a pinch of catastrophism, headlines of newspaper articles state that spruce is right “before the burnout” (WienerZeitung 2019), “spruce will disappear” (ORF.at 2019) and “tips over in rows” (KURIER 2020). In short, the claim is that spruce is at the brink of collapse, and as the epitome of extractive plantation forestry that would not be a bad thing.

Countering this narrative (of equating spruce with all that is problematic), specific actors have come to the defense of their “bread tree” or at least relativize what they see as a black-and-white portrayal of *spruce as bad* and *deciduous trees as good*: Whereas the (former) director of the Kalkalpen National Park, not the classical apologist of forestry, insists that “spruce or a spruce monoculture on a Northern slope, […] at 1200 m a.s.l, has its justification and is not inherently bad” (Interview II, L.), the head of the forestry department at the Chamber of Agriculture emphasizes that

> “the activities that have produced spruce-rich forests date back decades, and that no one mentions that the forests [that have been lost recently] are primarily forests that have been planted on agricultural marginal yield sites after the war, when […] timber was needed, and people have afforested with spruce because of that” (Interview VIII, L. 222pp.).

In the context of justifying what forest authorities from previous generations have done and propagated, the question of whether one can (and should) address today’s spruce-related problems (and the bark-beetle-spruce crisis) as rooted in “silvicultural mistakes of the past”[88] was particularly contested in the interviews (and especially among forest authorities). Aware that agreeing to the existence of silvicultural mistakes like the plantation of spruce in even-aged pure stands[lxxii] might translate into blaming oneself, previous generations and former colleagues (as well as the forest science of that time), prompted an interview partner, a forest authority working in the provincial forest administration, to the following statement:

[88] Looking at the survey, and here specifically at the question of which actor groups agree with the diagnosis of past silvicultural mistakes and which do not, I have found that while in the survey 42 out of 60 respondents (70%) consider “silvicultural mistakes of the past” to be one of the (repercussing) central challenges (rank 4 of 16; see appendices A24) for today’s forest ecosystems in Upper Austria those who abstain from acknowledging such mistakes are often those who have benefited or continue to benefit from spruce being planted all over the place.

> “Oh well, silvicultural mistakes, *I do not want to say it like that*, I believe it is known that the rotation period for spruce is between 80 and 100 years, and what has been planted 40 to 50 years ago, this is what has been recommended back then. *So to be fair*, one needs to say that pure spruce stands have been recommended, and you cannot remove a middle-aged spruce stand only because it is *no longer site-adapted*, or because there is simply *another* situation *now with climate change*” (Interview VI, L.; italics by author).[89]

Differently put, denying (the existence of) or downplaying silvicultural mistakes has a lot to do with wanting “to be fair” towards (former) forestry colleagues and forestry institutions (producing a specific kind of knowledge now turning out to be problematic), but is also used to obscure, dismiss or externalize one’s responsibility for today’s problems. It is this very rejection of the diagnosis of silvicultural mistakes that makes forestry officials and forest scientists stress the unprecedentedness and unforeseeability of recent disturbances. We just need to take a closer look at the last interview quote. Here, two interesting allegations can be found, namely that for spruce “there is simply *another* situation *now with climate change*” and that spruce stands would “be *no longer* site-adapted”. More than a matter of choice of words, these two ways of framing current problems of spruce, namely as unprecedented or “new” problems happening due to *changes in the last years*, and not as problems long-known and inherent to spruce-dominated forestry, point to a strategy that I have often encountered. In a nutshell, this strategy is centered around “overemphasizing” the role of current changes to omit that (until recently) forest authorities and forest experts have acted against better knowledge, adhered to vulnerable silvicultural systems, as well as ignored (or devalued) “non-hegemonic” forest-ecological insights and practices. For instance, historical accounts (f.ex. Schwappach 1886) as well as recent studies on long-lasting impacts of natural disturbances on forest landscapes show that already in the 19th and early 20th century natural *and* planted spruce forests were periodically

[89] Whereas I agree that it does not change the current situation to just ask what went wrong, and that it is neither feasible nor desirable to remove healthy spruce trees only because they have been planted in the “wrong” form and in the “wrong” places, I find it interesting that a number of influential actors within the forest sector are not (yet) willing to admit that things could have been done differently.

affected by large-scale disturbance events, and spruce was known to be vulnerable to heavy storms[lxxiii], drought and forest insect pests (Brůna *et al.* 2013; Čada *et al.* 2016;).

With regards to the question of whether recent happenings in Upper Austrian spruce forests came as a surprise, studies demonstrate that the current degree of spruce mortality and the recent severity of bark beetle outbreaks may indeed be unprecedented (Hlásny *et al.* 2021), and mainly driven by temperature increases and precipitation deficits and not so much (as in the past) by abiotic disturbances such as storms and snow pressure (Hoch and Schopf 2019, 3p.). Still, this does not mean that only because the extent is unprecedented and the drivers are different, today's problems are novel and unforeseeable. In this sense, claiming that spruce was *back then* adapted, and that the situation *now* is completely different from what one could have anticipated, might be a strategy to defend "business-as-usual" forestry and to perpetuate its economic reliance on secondary spruce stands. This is done by highlighting that

> "one *should not forget* that spruce is the bread tree species in the entire federal province, and will continue to function there very well despite climate change, so where it [= spruce] is *really* adapted to the site, I say in mountainous areas, above 600, 700 or 800 meters, spruce will play a massive role in the future. We will not have a lack of spruce timber in the next 50 years despite of climate change, I am sure about that" (Interview VI, 581pp.).

Apart from finding the statement that one can *be sure* about anything in the face of climate change suspicious, recent developments such as the situation in Eastern Tyrol and Carinthia in 2022 and 2023 show that large-scale bark beetle outbreaks increasingly happen where people do not expect them, that is in mountainous areas, in areas where spruce occurs in its *natural* range. Yet, as *natural* ranges are shifting in the age of climate change (Albrich *et al.* 2020), the fact that bark beetle eruptions occur at (ever) higher altitudes makes the claim that "above 600, 700 or 800 meters, [spruce] will play a massive role in the future" questionable. It is not just that spruce is increasingly under pressure in the mountains, but the crisis of and with spruce is all the more serious as

> "we [=foresters] still do not manage to create alternatives to spruce, to the use of spruce, there are a lot of small individual projects going on, but the way forestry once used to be is

> gone, a way where every tree had its basic use, now everything is aimed at spruce […] You can hardly sell birch anymore, ash, beech, there is not enough innovation for me in the sector (Interview XII, L. 737pp.)

Related to the question of what to do about that overdependence on (an ailing) spruce, several strategies are up for discussion. The first is to find ways to "save" spruce as the economic "bread tree", that is to work under headers like "assisted migration" with better-to-drought-adapted[lxxiv], or even drought-resistant spruce provenances (Schüler *et al.* 2013; Fichte Plus n.d.; Trujillo-Moya *et al.* 2018; Johannes Wessely *et al.* 2024). This includes managing spruce forests in a way that minimizes their disturbance susceptibility and/or reduces the spruce share in particular regions, and that in line with expert-issued "species distribution recommendation tables" ("Baumartenampel") showing the ideal tree species distribution for what is framed as "climate-fit forests" and a "climate-smart forestry"[90] (Klimafitter Wald n.d.; Bowditch *et al.* 2020).

As perceived throughout my research, the majority of forest owners *present themselves* (!) to be sensitized to the fact that in the face of prolonged droughts and increasing disturbances "off-site spruce monocultures" are at particular risk, and establishing more of those is better to be avoided. In line with that, forest authorities, forest wardens and forestry advisors are called upon to advise against planting spruce in pure stands, particularly on sites where spruce had previous problems (with bark beetles, drought stress etc.) (Interview III, IV, VII etc.). According to interviewed forest authorities and forestry advisors these recommendations are at least partially followed as there are "not so many anymore that only plant spruce" (Interview V, L. 206pp.; Interview IV, VII). *Partially* insofar as there are still many who stick with spruce. Frustrated by forest owners not following his advice, a forest authority recalls:

> "What I see again and again when I am out in the forest, and it is easily visible that this person has a big bark beetle area, getting bigger and bigger, already affecting the neighbor. And then I look at what he has just planted, and I see he has planted a 100% spruce, then

[90] That forestry today is not yet regarded as "climate-fit" is confirmed when looking at the survey. In the latter, participants were asked to rate the climate-change adaptedness of forestry in Upper Austria on a scale from 1 to 10, ranging from forestry is not at all adapted to climate change (1) to forestry is perfectly adapted to climate change (10). With not one person assigning 9 or 10 and an average value of 4.68, we can say that with regards to "climate fitness" forestry in Upper Austria has still a long way to go (appendices A33).

this is frustrating, because I think, when do they ever learn from *mistakes* that they have now made several times" (Interview IV, Z. 583pp.)

It is one thing to accuse forest owners of being ignorant, of not learning from (past) mistakes, when there are in fact a number of economic, political and psychological reasons for forest owners to not follow those (and other) recommendation(s) and re-plant spruce. The most obvious reason is that spruce is still the "bread tree" in terms of being the tree species that is easiest to grow and easiest to make money with. So as much as there may be a need for forest conversion and a change in the practiced silvicultural systems, there is a difference between what is theoretically possible and (ecologically) desirable and what is economically feasible and practically implementable, particularly for small, part-time forest owners (without a professional forestry background/education)[lxxv]. One other reason for sticking with spruce is related to the (psychological) mechanism that disturbance-affected forest owners and enterprises tend to forget or repress what they experienced in times of "catastrophe":

> "So if there are two good years again, then the former affectedness will be repressed. They are aware of climate change, but they say they want to try it [=planting spruce] again. Of course, if there is another year of drought, nobody will plant spruce in autumn, because then it is fresh in people's minds, […] but if two or three years go by, then it is forgotten. You only have to look at the storm events, what was reforested after the big storms [in 2007 and 2008], for the first two years no spruce at all, it was demonized, people said it cannot withstand the storms, but with not even 5 years moving into the country, people reforested again with spruce" (Interview VII, L. 462pp.).

Fig. 60: Douglas fir seedling in the Sauwald. © Author, 2022

One increasingly prevalent strategy is to replace spruce with other tree species (and other silvicultural approaches). When it comes to the former, I would say that there are three different versions of that strategy that overlap in practice, namely 1) to replace spruce with non-native tree species better adapted to a hotter climate, and 2) to replace spruce with economically-profitable native conifer tree species like fir, larch and pine and 3) to replace spruce with (a mix of) native deciduous and conifer tree species (for ecological purposes) (Interview XVI, XVII).

A hotly debated example for the first approach is placing one's hopes on trees like the North American Douglas Fir (*Pseudotsuga menziesii;* figure 60, previous page), often without changing the underlying management logic and the silvicultural system. Whereas Douglas fir is praised by some as the "new spruce" due to its fast growth and good wood properties (Interview VIII) – after spruce (15%), fir (15%) and larch (12%) accounting for 8% of reforested trees in Upper Austria in 2021 (WV OÖ 2021) –, it is rejected by others as ecologically "out of place" and as similarly damage- and pest-susceptible as spruce (Interview XII). Generally, forest authorities, forest scientists and forestry advisors are divided on the question of how to replace spruce. Whereas there are those taking the ecological side, arguing for the importance of high shares of deciduous trees in the lowlands, the narrative that one should not give up conifers all too easily (and be cautious about the "hype" around deciduous forests) is at least as pronounced, especially among those who stress the economic and protective function of forests (Interview IV, VIII)[91].

With the Upper Austrian forest sector shaken by bark beetle outbreaks, and that to an extent unparalleled in recent decades, forest management and silviculture have been subjected to a heated debate. It is not exaggerated to say that in many places humans have at times lost control of what is happening in the forest. Yet the reactions to this loss of control could not be more different, and there is everything from managing forests even more intensively, continuing to rely on spruce and nipping bark beetle world-making in the bud to putting forests out of use, promoting other-than-spruce tree species and allowing bark beetles and others to exercise their world-making powers. As we have seen, experiences with, explanations for and responses to bark beetle outbreaks vary considerably, telling us more about power relations, social conflicts,

[91] Accordingly, the head of the forestry department at the Chamber of Agriculture is convinced that for fulfilling such functions "we will need a certain share of conifers, only with deciduous trees this will not work. […] Also, the protective function of forests is important, and the big question will be how long this will be possible with spruce at lower altitudes on the valley floors […] Maybe we already need to admix other conifer tree species, and I think that the Douglas fir will also need to play a role, […] So when spruce begins to fail, and this will be the case at some point, then we will need other conifer species as an alternative" (Interview VIII, L. 125pp.)

ideological differences and the ascription of responsibilities than about the actual disturbance events and their drivers. This is because diverging human perspectives on the bark-beetle-spruce crisis are linked to and rooted in diverging environmental narratives, in diverging conceptions about the “right” kind of “forest nature”, and accordingly about the “right” kind of human forest-making, including the question of how human forest-making will (need to) look like in the future. While some say that foresters need to be *not only* wood producers, but above all holistically-thinking “ecosystem managers” (Interview X), others, such as the prominent German forest ranger Peter Wohlleben, demand that foresters (“Forstwirte”) should become climate stewards (“Klimawirte”) responsible for ensuring that forests are preserved as biodiversity-rich carbon sinks (Wohlleben 2023b). Whatever the answer, we can be sure that human forest-making in the face of bark beetle outbreaks will remain contested, and, as we will see in the next chapters, these contestations go well beyond human groups.

8. Inside the "Bark Beetle Blame Game": On the *Political Ecology of Responsibility*[92] in the *Sauwald*

Fig. 61: (Bark-beetle related) tree skeletons in the Sauwald. © Author, 2022.

When I was a child, I remember that I was once present at a forest border dispute between my grandfather and one of our property neighbors, in my view a bad-tempered and terribly choleric person. The event had a huge impact on me; I remember how terrifying I found it at the time to witness two grown men insulting each other right in front of me, and all of that because of an allegedly moved border stone. After that incidence, the relationship with the neighbor only deteriorated: Our game fences were driven over, trees were cut down on our side of the property. Not surprisingly, when the large bark beetle calamities in the Sauwald came about in 2018 and 2019, the publicly much-invoked neighborhood help was nothing that we could count on. On the contrary. Instead of informing us, the neighbor called the authorities and the forest warden whenever he spotted an infested tree on our property, earning us two written warnings – an enormous burden for my rule-following father. Back then I was upset, with a bit of distance I see the neighbor's behavior a bit differently. I know now that similar conflicts happened in the entire Sauwald, that there are socioeconomic and sociopolitical drivers for why bark beetle outbreaks have such an impact on the social fabric, that outbreaks tear at the structures of trust, cooperation and responsibility in the regional forestry network.

(Vignette by author, based on memories and observations in the Sauwald, Upper Austria)

[92] A concept that I borrowed from political ecologists Sanna Komi and Anja Nygren (2023).

The forest idyll in the Sauwald, a forested region in western Upper Austria, is deceptive. There is unrest, not only under the canopy, but also in taverns, municipal offices, and forest administrations. An unrest that is related to the effects of proliferating bark beetles on the region's social fabric, an unrest expressing itself in what I will analyze as the "bark beetle blame game", revolving around the question of who is to be held *responsible* for the recent extent and course of bark beetle outbreaks in the Sauwald for what reasons, and who is particularly at risk and/or affected by the latter (Flint *et al.* 2009; McFarlane *et al.* 2012). As we know from the literature and from the last chapter, bark beetle outbreaks are not only used to negotiate and consolidate contrasting imaginaries of "proper" forest management (Flint *et al.* 2012; Prentice *et al.* 2018), but – depending on what scholars grasp as the "community context" (Qin and Flint 2010; Qin *et al.* 2024) – they are also deployed to strengthen group boundaries and stir up sentiment against specific actor groups (Buijs and Lawrence 2013). This is done through a complex "politics of belonging" (Trudeau 2006) in which those who think about and/or respond to bark beetles *differently* are framed as non-belonging or even as dangerous (Müller 2011; Prentice *et al.* 2018, 97), as actors who cannot be trusted, who are considered unsuitable of owning/managing forests. Related to these questions, the chapter at hand looks at the negotiation, (discursive) production and ascription of *responsibility* for the recent extent and spread of bark beetle outbreaks in the Sauwald, and by that at the "political ecology of responsibility", specified by Komi and Nygren (2023, 1239p.) as including "an examination of responsibility that extends to other-than-humans, but also acknowledges the unequal opportunities to shape the world and make decisions that affect both human and nonhuman others". Following that, manufacturing and negotiating responsibility is not an exclusively human affair, but matters of responsibility are particularly then raised when there is *Multi-Species trouble*, when Multi-Species relationships turn out to be challenging, whenever different lifeways come together under unequal conditions and with the result of unequallydistributed risks and damages (Ginn *et al.* 2014; Haraway 2016; Harris *et al.* 2023). In this sense, the "bark beetle blame game" is not simply an intra-human "discourse struggle" or a "discursive conflict" where different ways of meaning- and reality-making come together (Jørgensen and Phillips 2002), but bark beetles, spruce trees and others are themselves a lively part of the blame game in that they are the ones that raise and/or make the question of responsibility relevant, in that they require a "response-ability" (Haraway 2016) on the part of involved beings. Understanding "response-ability" as the ability to become affected by others, as the ability to respond to more-than-human beings and their world-making projects, we will see that responses (as well as the abilities to respond) to outbreaks differ, and that these different responses have the potential to divide affected communities. In line with that, the following chapter will look at what bark beetle outbreaks do to the social fabric of Multi-Species communities in the Sauwald. To get a sense of the human social fabric, I will first deal with the (peasant-like[93]) "moral economy" (Scott 1976) and the "community structure" (Qin and Flint 2017) of the Sauwald (8.1.1), only to then engage with the more-than-human social fabric, with the more-than-human sociality of forests in the Sauwald (8.1.2). This is followed by an analysis of the "bark beetle blame game" (BBBG) and its unfolding through and along four selected (non-exhaustive) fault lines (8.2.1–8.2.4), in turn involving a number of actor groups and their differences in terms of forest (property) size, forest management objectives, ecological imaginaries, identity narratives, and social capital.

[93] Following Eric Wolf's (1966, 2) classic distinction of *peasant*s running a "household" and *farmers* running a "business concern", I admit that it is bold to describe Upper Austria's "Bauern" as peasants, given how integrated they are into capitalist markets, how profit- and price-oriented their agricultural decisions and management approaches are. Yet, there are significant "moral peasantry dimensions" in how the smallholder farmers in the Sauwald manage their forests (i.e., for normative reasons and/or subsistence purposes such as the provision of construction material etc.; Interview XXI, XXVII etc.) – dimensions that (at least with regards to forests) justify speaking both of "peasant forest owners" and "farm forestry enterprises" (cf. Toscani *et al.* 2021).

8.1 Bark Beetle Outbreaks and the Social Fabric of the Sauwald

8.1.1 Under People: On the Moral Economy of Forestry in the Sauwald

To get a sense of the Sauwald and its inhabitants, the so-called "Waldner" or "Wallner" (a common regional surname), history is helpful. It starts with the name of the region. Popularly associated with roaming wild boars ("Sau" as the German term for a female pig), it is more likely that the term Sauwald goes back to a shortened form of "Passauer Wald" (= Passauer forest), indicating the region's centuries-long affiliation with the diocese Passau and its subjection to Bavarian duchies until the Treaty of Teschen in 1779 (Keller and Keller n.d.). Claimed by different empires before, during and after the Napoleonic Wars, the "Innviertel" and its northernmost region, the Sauwald, only became a permanent part of the Austrian Empire in 1816, since then representing the last of Upper Austria's four quarters. Even though *Wald* (forest), as the name suggests, is a defining landscape element of the region[94], the Sauwald is by no means completely forested, but comes in the form of a structure-rich, agriculturally-shaped landscape with fields, meadows, (commercial) forests, hamlets and villages (NaLa OÖ SW 2007, 14). The importance of agriculture and forestry is evident in 1,100 agricultural and forestry-related enterprises in the 14 studied municipalities of the Sauwald, with around 40% of these enterprises managed full-time, with an average size of 25 ha – numbers that show that the region is characterized by a high number of (small-scale) full-time farmers. It is this significance of the agricultural community[95] that makes it necessary to deal with the social

[94] Particularly in the central Hochsauwald with its conifer forests and a forest cover of over 60% in the municipalities of Vichtenstein and Engelhartszell; see green dashed circle in figure 62 (next page). In geomorphological terms, the Sauwald counts as a low mountain range (with the Haugstein as its highest elevation, 895 m a.s.l.) that is part of the Bohemian Massif here extending south across the Danube (NaLa OÖ SW 2007).

[95] Qin and Flint (2017, 6) define a community as consisting "of three elements: (1) a shared territory in which people meet their daily needs ('locality'); (2) a comprehensive system of institutions and associations among local people ('local society'); and (3) a dynamic process of locally oriented collective actions ('community field')".

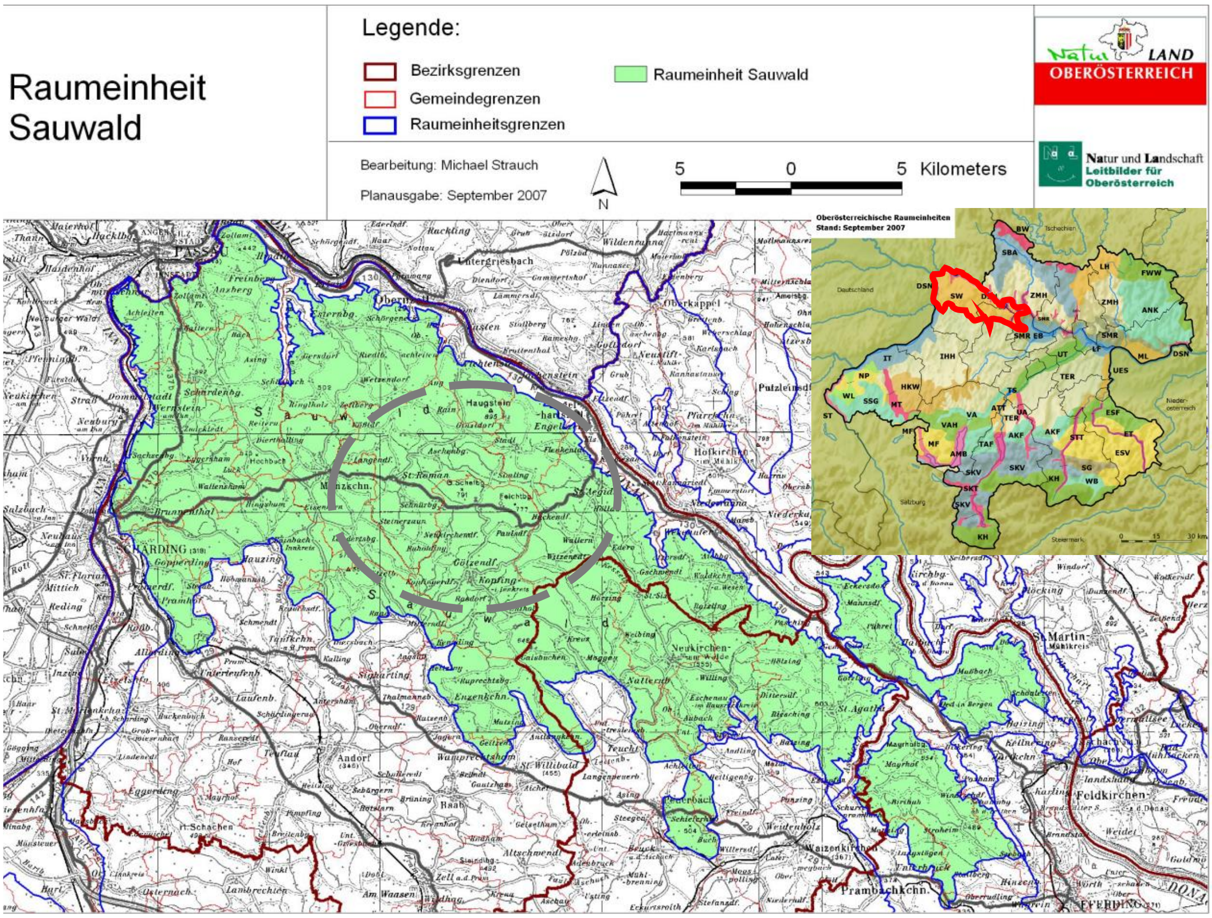


Fig. 62: Biogeographical Unit "Sauwald" (green area) and the area of the "Hochsauwald" (grey circle), together with a map of all 41 units in Upper Austria. Source (left and right): NaLa OÖ SW 2007, both adapted by author. Source: https://www.land-oberoesterreich.gv.at/Mediendateien/Formulare/Dokumente%20LWLD%20Abt_N/Sauwald.pdf.

structure and the "moral economy" (Scott 1976) of the Sauwald, eventually also because its inhabitants with their Bavarian-tinged dialect and their peculiar traditions are often read as "different" in the rest of Upper Austria, as the epitome of rural country life, as remnants of an anachronistic *peasantry* (Kearney 1996). In line with that, Sauwald inhabitants are negotiated as stubborn, change-averse, narrow-minded, nationalistic and (politically) conservative (with high approval rates for center-right and particularly for right-wing parties such as the FPÖ; for a discussion of the region as the hotbed of Austrian neo-Nazism see f.ex. Volkmer 2003), which – in the context of forestry – earns them the accusation of practicing an outdated form of forest management, of being unwilling of making silvicultural changes, of being opponents/skeptics of (allegedly conservationist) EU regulations/laws such as the Forest Strategy, the Restoration Law or the Green Deal (Pachner 2024; Bauernbund 2021).

One aspect of why the Innviertel and here the Sauwald might be considered different from the rest of Upper Austria can be related to the region's special historical path, to the fact that in terms of cultural identity, language and customs the region was for the longest time closer to Bavaria than to (today's) Upper Austria. In addition, the region and its inhabitants were repeatedly confronted with warfare and economic hardship, and in the face of such difficulties developed both a certain resilience and a drive for political autonomy. As an example, Sauwald inhabitants were prominently involved in the peasant-led Bavarian national uprising in the early 18th century and the subsequent formation of the "Braunau parliament" (in fact one of the first Central European democratic revolutions), consolidated the (protestant) peasant class in its opposition to the catholic Habsburgian aristocracy in cities like Linz or Vienna (Probst 1978). If one considers how local farmer groups in the Sauwald until today position themselves vis-á-vis so-called "urban elites" (particularly vis-á-vis "Brussels", cf. Seiser 2006) there is a certain continuity of the rural periphery's resistance against their economic and political centers (Field and Burch 1988; Seiser 2006; Edelman 2024). Again caught between the fronts in the Bavarian Wars of Succession, the Innviertel defended its reputation as a peasant stronghold, despite the fact that the Sauwald's harsh climate, unfavorable soil conditions and a dissected terrain with streams and ravines made/make agriculture challenging (NaLa OÖ SW 2007, 22) – as a matter of fact, the Sauwald is considered an agriculturally disadvantaged area with compensation subsidies to this day (LFW OÖ 2023). In addition, the region's location in the hinterland of Inn and Danube (far away from cities and major transport routes) and its only partial integration into supra-local markets reinforced the importance of self-sufficiency and "village-based networks of solidarity and mutual support" (Edelman 2005, 334), in turn making "subsistence security" one of the central objectives of peasant livelihoods in the region (cf. Scott 1976). Even though in recent decades structural changes have reduced the great number of (subsistence-oriented) *peasants* to a small number of (full-time) capitalist *farmers* producing for international markets (cf. Wolf 1966), the Sauwald remains a rural, sparsely-populated, settlement-wise fragmented and infrastructurally poorly-developed area – an area that with the exception of the forested Hochsauwald is almost exclusively used as arable land or permanent grassland (NaLa OÖ SW 2007). In the absence of cities, (larger) industries and a tertiary sector the region is confronted with out-migration and a high share of commuters. One staple food that has become important for the region ever since its introduction in the late 18th century is the potato, and the production of Sauwald potatoes is one of the most important pillars of regional agriculture along with crops like wheat, rye or corn (Bruckmüller *et al.* 2002, 212pp.). Next to and in complementation of agriculture, forestry plays a big role in the region, here predominantly in the form of private (multi-generational) "farm forestry enterprises" (Toscani *et al.* 2021) that manage "small" forest plots in the single- or lower two-digit hectare range, mostly in the vicinity of farms, with spruce as the dominant tree species, in turn cultivated in a high forest system with even-aged stands (NaLa OÖ SW 2007). Given that there are considerable differences between the forest-making practices of private smallholder foresters and wage-paying forest enterprises (see chapter 8.2.2), one thing that most of the former have in common is their agricultural background and an understanding of the forest as a "reserve", as something that supplements the agricultural income, that is usually only used when there are disturbances, when one is in financial trouble, when roundwood prices are particularly high, or when one needs wood for domestic purposes such as building a new stable [lxxvi] (see chapter 6).

We can say that forestry and its concerns shape the social, political and economic life in the Sauwald on several levels. One aspect of that relates to the particularity that – as it is the case in many Austrian rural communities – big forest owners (who are often also big farmers) are much respected and politically influential in their communities (often serving as mayors or municipal councils; cf. Hanisch 2002), thus being in a powerful position to establish their forestry imaginaries as the ”normal” and “right” way of doing things (Stott and Sullivan 2000; Bixler 2013; Prentice *et al.* 2018). One other central institution in shaping how forestry works and ought to work (thus producing specific forestry/environmental narratives and a conformity to comply with those) is the rural forest association (“bäuerlicher Waldverband”) and its “executive” representatives, the so-called forest workers (“Waldhelfer”, literally “forest helper”, every community has one or two). In their role as forestry advisors and timber sales consultants, the latter have a big influence on forestry-related economic, ecological and silvicultural decisions, they advise forest owners regarding questions like when to cut trees, at what price to sell, and also to whom. In addition, it happens that *Waldhelfer* also have their own forestry service company, a lucrative affair when considering that their dual function as a publicly-known contact person regarding forestry matters (with respective connections to authorities and sawmillers) and a forestry service provider makes it easy for them to get and retain customers. Coming back to the power of these Waldhelfer and the rural forest association, the former district chairman of the association and himself a forest worker for 27 years recalls that it was only thanks to the district association and to one of its founders, (deceased) Felix Pentz – a prominent figure in regional forest circles and, as my interviewee puts it, the mentor of first generation “Waldhelfer” in the Sauwald – that forestry in the Sauwald would be where it is today. That “as early as in the 1980s foresters would have already looked for alternatives to spruce”, knowing through the warnings of “Dr. Pentz that just relying on spruce will not work” (Interview XVII, 00:03:08–23). It is this Dr. Pentz, around whom there are numerous stories, rumors and anecdotes, who was definitely not liked by everyone, who is until today criticized for advising local forest owners to replace spruce and fir with non-native tree species like giant fir and red oak (Interview XVI).

One other aspect of why life in the Sauwald is so inextricably linked to forestry has to do with the fact that many people in the region's villages and dispersed hamlets live from and in (the vicinity of) the forest, making them the ones to be (most directly) affected by forest disturbances, be that economically[96], aesthetically/visually or in their social relationships with others. In terms of bark beetle outbreaks affecting the visual qualities of a landscape, it is understandable that, especially in those (few) regions of the Sauwald where tourism plays an economic role, the local population has its problems with red-colored forest slopes and huge clear-cuts, not to mention locals' own (aesthetic) disapproval of such landscape changes (cf. Müller 2011). In social terms, relationships between residents change under the imprint of tensions due to bark beetle outbreaks (Qin and Flint 2017, Prentice *et al.* 2018; Holmes and Koch 2019; Hlásny *et al.* 2021). The literature-wise widely-used term "community responses to outbreaks" must not obscure that "the community" does not exist as a homogenous entity that reacts uniformly to bark beetle outbreaks, but that community responses are "structured by local economies and the priorities of community members with access to local decision-making power […]" (Prentice *et al.* 2018, 78). In line with that, the question of how to deal with bark beetle outbreaks reveals different attitudes towards forestry and whom to (not) trust when it comes to it (McFarlane *et al.* 2012). As we will see, what happens in the forest does not stay in the forest.

[96] Despite the fact that the amount of damaged wood has fallen from several tens of thousands in 2018 and 2019 to around 6.500 cubic meters in 2022 (4.000 in smallholder forests, 2.500 in forests of large companies; pers. communication, H.P., 14.11.22) and to 5.000 cubic meters in 2023 (0,32 m³/ha; IFFF/BOKU and BFW, n.d.), local foresters still complain about economic losses and economic uncertainties due to bark beetle outbreaks.

8.1.2 Under Trees: On the More-Than-Human Sociality of Forests in the Sauwald

Fig. 63: Clearcut and Glade as seen from the Goderer Kogel close to the Haugstein, Sauwald. © Author, 2022.

I follow the operative manager of the forest company as he ascends the hilly Goderer Kogel, covered in beech, fir and spruce trees. Large, mossy granite boulders rise between the trees, a reminder that – although we are south of the Danube – we are geologically still on the Bohemian massif. That has implications, says the manager. Because the ground here is rocky and shallow, rainwater seeps away quickly, and when there is little rainfall like in recent years, spruce suffers, spruce becomes an easy target for the European spruce bark beetle. Once on the top of the hill, I see what he means. Below me, a former spruce forest, now a large clearcut, windthrow- and bark beetle-induced, several hectares in size, torn-up forest edges, spruces with poor color and withered branches. Natural regeneration is on its way, says the manager, close by they have also planted larch and Douglas fir – oak, on the other hand, had not worked, he had tried that. How is the natural regeneration going, I ask. In some parts better than in others, in some areas the browsing pressure would be too high; in others, fungal diseases mess with the young Douglas firs. What really worries him is the loss of certain age groups. Already today, there was a lack of the 40- to 50-year-old spruce trees. How long will it take for this gap to close? What to do in thirty years when the trees are ripe for felling? […] (Observation/Forest Walk, 19.04.2022).

Ever since this research has introduced us to the sociology of forest plants, we know that in many Austrian places spruces, beeches, and firs like to live together. This is no different in the higher-lying central Sauwald, and without human interventions the three lifeways would (albeit to different shares) also shape the submontane forests of the Hochsauwald, in an area that lies at an altitude between 700 and 900 meters above sea level, with an annual rainfall of up to 1200 mm in good years (figure 64). In theory insofar as the

Fig. 64: Mixed Beech-Spruce-Fir Forest on the Haugstein, Sauwald, app. 800 m a.s.l. © Author, 2022.

status quo in terms of tree composition is that many forests in the region are almost exclusively dominated by spruce[97]. As my grandparents recall at the case of their former forest in the region, the peak of re- and afforestation (here of unproductive agricultural areas) in the Sauwald was reached somewhere in the 1960s (cf. Weigl 2002), and according to their memories, they were explicitly instructed to plant spruce trees as densely as possible, to mow the regeneration plot regularly (or even cover the forest floor around the saplings with cardboards) and to remove any unwanted tree species (NaLa OÖ SW 2007, 24). Just like my grandparents, others implemented these instructions diligently and – against the background of economic considerations and a narrow understanding of forest hygiene – produced spruce monocultures, "tree pole fields" ("Stangenäcker"; figure 65), as an interviewed forest manager from the region likes to call them (Interview XII). In the Sauwald, and here especially in its lower-lying areas (in the East and West) close to settlements, this has led to the situation that today, as the head of the district forest authority emphasizes,

Fig. 65: 50-60 Years Old Spruce Stand (with Fir Regeneration) in the Hörzinger Wald, Sauwald, 580 m a.s.l. © Author 2022.

> "around 60%, maybe 70% of the trees in the region are spruce, and that albeit most locations in the district would not naturally have spruce trees. So, the natural forest community would contain spruce maybe on ten percent of the area. And the fact that it worked well with spruce, has contributed to spruce being [planted] again and again. Yet especially in the Sauwald, spruce will suffer more from the fact that the geological base is granite where drought is a bigger issue, so with spruce it will certainly be more difficult in the future" (Interview IV, L. 474pp.).

[97] The dominance of spruce trees has a long tradition in the region. As an example, the municipality of Vichtenstein (from the German "Fichte") owes its name to this tree species (NaLa OÖ SW 2007).

As much as this explains why bark beetles may have it easy in drought-susceptible (and overstocked) secondary spruce forests of the Sauwald, spruce is by no means the dominant tree species everywhere. Along the slopes towards the Danube, beech often dominates (so much so that some foresters already complain about a beech overhang; Interview XVIII), joined here by sycamore and the common ash. Given that ash is itself in decline due to an epidemically spreading, highly infectious fungal disease, things are in constant flux (Interview XII). When one tree leaves, others replace it, and with these others come other companions and by that other Multi-Species assemblages. This is no different in the Sauwald than in any other forest, and as Anna Tsing (2013, 38) reminds us "changes in the species mix have social consequences for both humans and non-humans". Although not exclusively and sometimes less than they like to think, humans play a central role in what tree communities look like, in how the social fabric of the forest unfolds. In the Sauwald with its small forest properties, the influence of individual foresters on how forests look is often so pronounced that, as experienced on my forest walks, two tree stands a stone’s throw away, only separated by a border (a line drawn on paper), look like entirely different kinds of forest, pointing to contrasting silvicultural choices, strategies and objectives – here for instance to the decision of one forest owner to bet on spruce while his neighbor bets on beech (figure 66). When different goals and management strategies coincide with different intensities of care, when forest owners suddenly stop their forest-making practices, particularly interesting *patches* of plant communities emerge (cf. Tsing *et al.* 2019). I have seen that on one of my forest walks through the Northeastern Sauwald, where in the midst of “typical” fir-spruce forests with

Fig. 66: A property line between two forest plots shows how the owner on the left bets on spruce, the other on beech. Sauwald, 550 m a.s.l. © Author, 2021.

interspersed beech or oak, I suddenly encountered a forest type that reminded me of Southern Sweden (figure 67). I can only speculate about the reasons for why the stand looks the way it does – f.ex. the combination of acidic soil, the (locally unusual) planting of pine and a low level of harvesting. What forests look like depends on many things, the way that more-than-human forest inhabitants become with one another involves geographic, topo-climatic and geological factors. Accordingly, abiotic disturbances like storms and other extreme weather events are important players in the health and form of plant communities, particularly so in the Sauwald – a region that is hit first (and often hardest) by storms from the main wind direction due to it being the highest elevation in the northwest of Upper Austria (Interview IV). That said, when it comes to the public negotiation of why calamities occur, abiotic disturbances and past silviculture are much less pronounced as explanations than attempts to allocate the responsibility for calamities to humans. With responsibility translating into acts of blaming others, the question of who has caused and who has suffered from bark beetle outbreaks shapes the local discourses on forestry and bark beetle outbreaks, with considerable implications for the cohesion of affected communities, be they human or more-than-human.

Fig. 67: (Scandinavian-looking) Spruce-Pine Forest in the Sauwald. © Author, 2022.

8.2 On the Negotiation of Responsibility, Vulnerability and Affectedness: Scapegoats and Central Fault Lines in the Bark Beetle Blame Game

"Es kann der Frömmste nicht in Frieden bleiben, wenn es dem bösen Nachbarn nicht gefällt"
("The most pious person cannot remain in peace if the evil neighbor does not like it";
Friedrich Schiller: Wilhem Tell, Fourth Act, Third Scene; translated by author)

Hardly any figure is as prominent in the discourse about tensions and conflicts related to bark beetle outbreaks as the *evil neighbor*, of a neighbor who – out of incompetence or malice – does nothing or not enough against bark beetles, who does not (properly) manage the forest. Whether in the survey or in the interviews, the neighborly relationship and its role in the context of (spreading) bark beetle outbreaks is almost always mentioned as one of the central and most pronounced fault lines tearing through the social fabric. There are several reasons for this, and in what follows we will look at some of them in greater detail. In general, as historians, sociologists and anthropologists of "rural settings" or conditions of "rurality" in (Upper) Austria have demonstrated, it applies that "rural settings" are in comparison to urban environments characterized by a higher degree of social cohesion *and* a higher pressure for social conformity (Schweitzer *et al.* 2010), by a higher degree of subjection of social behavior and/or social practices to conventions, rules and customary institutions (Bruckmüller 2002, 568pp.). Beneficial for the emergence of such a densely-knit web of social relations is a certain social proximity between the involved actors, and that in emotional as well as in physical terms (Ingold 1986) making *neighbors* (particularly in agricultural settings where people supposedly act and think in a more "place-based way") ideal subjects of a community based on mutual obligations (Salazar 1996). A community (*Gemeinschaft*), and not an anonymized and individualized society (*Gesellschaft*), – to use the old juxtaposition of (Tönnies 2024) – that holds together because every member has a place and function in the social structure, because there is an assemblage of conventions and mutual obligations that facilitates cooperation, produces trust and creates a certain sense of belonging (Garstenauer *et al.* 2010; Seiser 2012). Be it that one can expect that the property neighbor calls one as soon as possible when one has overlooked a bark beetle tree (and eventually even removes it for you instead), or that the neighbor who has just hired an expensive harvester company asks one whether one would like to share the costs knowing that one may also be in need of the company's services – forestry in the Sauwald including its economic dimension is – to use a term of economic historian Karl Polanyi (2021) – *embedded* in social relationships and should not, at least in the opinion of several interlocutors, be an exclusively price- and market-driven business. As we will see later, the embeddedness of forest-making in a moral economy expresses itself in regional sawmill enterprises purposefully paying higher prices than the common market rates, arguing that they could not justify purchasing wood so cheaply in times of need for (neighboring) forest owners, most of whom they know personally (Interview XVI, XXII). Precisely because forest owners, forest workers, sawmill owners and freighters know each other, have decades-long business relationships and operate within a morally-charged village structure (where everyone knows everyone, and one's reputation and trustworthiness has a direct influence on one's social capital), *reciprocity* in the sense of Sahlin's (1972) "generalized reciprocity" – creating a relationship between the one who gives and the one who feels compelled to give back – is a powerful mechanism of establishing mutual long-term obligations. The question now really is what happens when actors in these networks of obligations and conventions do not play along, when they do not return once-received favors, when they do not behave as others expect them. Precisely because bark beetle outbreaks (due to their potential for epidemic spread) usually never affect (or threaten) just one single forest owner, vulnerability to bark beetle outbreaks is a shared property, it concerns an entire group and its position in a political economy that has (structurally) produced that vulnerability in the first place (f.ex. to dropping prices due to the outbreak-related saturation of the timber market). Following Wisner and colleagues (2004, 11), vulnerability is thus defined as "the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard […]”. With vulnerability being a group matter and the misbehavior of one actor increasing the entire group’s vulnerability (or decreasing the latter’s resilience), the non-compliant actor not only becomes (stylized as) a threat to the group (and its shared world-making norms and projects), but (once outbreaks happen) is then also made responsible, i.e., blamed for them. Accompanied by the argumentation that because said actor has not followed rules and by that has proven not to care for the group and for what the group holds dear (thus forfeiting the right to be an acknowledged part of the group), the actor becomes a “scapegoat” to whom all blame concerning the time, extent and severity of bark beetle outbreaks can be attributed (Douglas 1995). It is these in- and out-group dynamics and the respective production and allocation of blame and responsibility that lie at the heart of what I will grasp and analyze in the following as the “bark beetle blame game” – a set of discursive practices, forms and structures that encompass powerful speech acts of pointing fingers, claiming affectedness, denying responsibilities, and producing scapegoats, with *scapegoating* describing the construction and reproduction of allegations through and “in which an out-group is unfairly blamed for having intentionally caused an in-group's misfortunes” (Glick 2005, 244). Who is part of the respective out-group (i.e., who feels the wrath of the blame game) depends not only on situation, perspective and context, but also on one’s social capital, on one’s power position in the game (and here in the extended forestry context). As a discursive field of conflict (with specific actors, interests, structural drivers and narratives; Dietz and Engels 2018), the BBBG produces specific fault lines, and it is these fault lines that I will analyze in what follows (for a summary see figure 68, next page). One first out-group in the Sauwald that is often blamed for (different kinds of) forestry-related misfortunes of the respective in-group (here: small-scale peasant forest owners, the majority group among foresters in the Sauwald, and also the group that dominates the local forestry discourse) refers to *non-local, non-peasant forest owners*, and it is through this first fault line that we dive right into the bark beetle blame game.

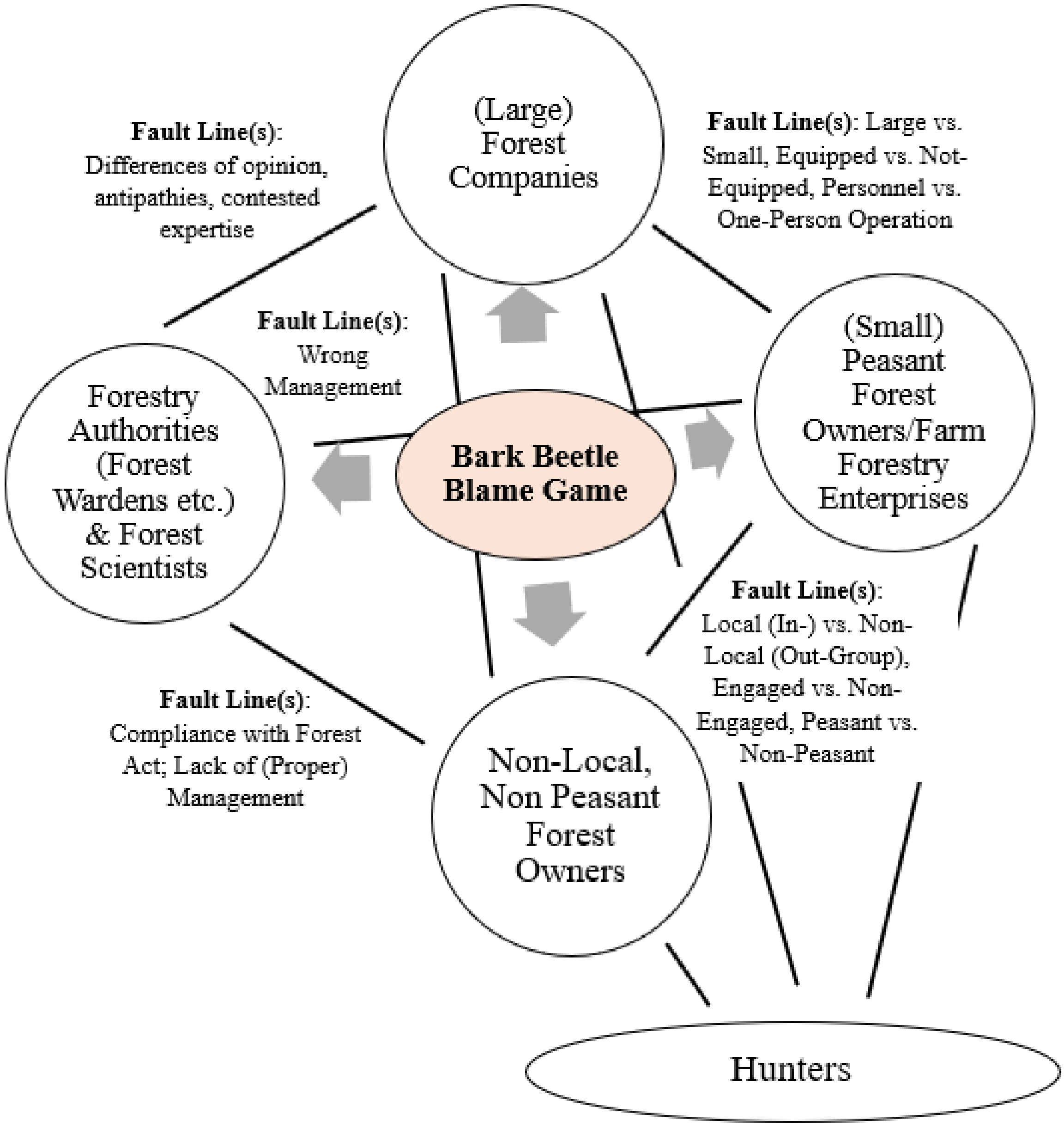


Fig. 68: The Bark Beetle Blame as a Field of Conflict. Depiction of Actors, Selected Fault Lines and Certain Narratives. © Author, 2024.

8.2.1. Local (Peasant) vs. Non-Local (Non-Peasant) Foresters: About Getting and Giving-Away Forests, or: About the Right of Owning a Forest

I have stressed that one aspect of neighborhood is proximity. Given that in the Sauwald (as much as in other regions of Upper Austria) forest plots often come in the form of fragmented, small and narrow forest strips, the forest property structure forces one to interact with the neighbor (cf. Matilainen *et al.* 2019). Practically, this can mean that if one wants to harvest a tree on a narrow forest parcel one may be obliged to ask for allowance to not risk unallowed trespassing on the neighbor's property (Interview VII). Being able to do so, requires knowing who owns/manages the forest plot in question and how to reach this person in the case of an emergency, say a spreading bark beetle infestation. Given that some forest owners do not want to talk to their neighbor (because they are already at odds over another issue; a recurring characteristic of peasant relations as Bruckmüller (2002) discusses it in his history of agricultural life in Austria) or simply do not know whom to contact – related to the fact that the forest belongs to a stranger not living close by – many forest owners do what they would never do in a reciprocally "functioning" forester community, i.e., they involve the forest authorities right away, and by that risk being publicly discredited as "snitches"[98]. They do that when the situation appears to be urgent, f.ex. when they see that the neighbor has infested trees, has not yet done anything against that and the risk is high for the infestation to spread. In addition to that, they are more likely to involve the authorities when they do not like the neighbor (and his way of doing forestry), for example when the neighbor falls under the category of the "sloppy" forest owner who has no relationship to the local (peasant) forestry culture, only acquired the forest for financial reasons or simply inherited it from (distant) relatives (Interview XI, XVI, XXII, XXIII) – in short, an outsider who does not go about things the way that they are

[98] Snitching, i.e., reporting a forest owner to the authorities, for instance the forest warden, (instead of addressing the person who is not directly) is – depending on who is reported by whom – either socially tolerated or rejected as socially destructive. As we can imagine, it most likely never improves an already tense neighborly relationship.

traditionally done. It is an aversion that is based both on stereotypes (of how "non-local" people assumedly act in comparison to *locals*) and on actual experiences (of having had trouble because of an absent neighbor *from elsewhere*), an aversion that is in any case grounded in constructing non-locally-based forest owners as "different", "uninvolved" and displaying a lack of forest care. As it turns out, this lack is taken so seriously that many forest owners actually assume that the lack of proper care by uninvolved forest owners is one of the main reasons for increasing bark beetle outbreaks in the region[99]. Accordingly, two forest owners from the Sauwald are convinced

> "that we could get the bark beetle situation *under control*, […] if everyone was more involved. But when the beetle always finds a spot where no management is being done, in a forest that the owner does not value, because the owner is from God-knows-where and never checks [what is happening in his forest], and does not even know where his forest is, then nothing changes" (Interview XI, L. 196pp.; italics by author).

What is served here is the enemy image of the *non-committed, non-locally-based, non-peasant forest owner* (in German referred to as "ortsfremde" and/or "hofferne Waldbesitzer*innen") that would neither be willing ("because they would not care" was here the most ticked answer in the survey) nor able to properly manage the forest (cf. Ziegenspeck *et al.* 2004; Hogl *et al.* 2005; Weiss *et al.* 2019). Operating with exclusion categories like local/non-local, established/outsider, new/long-term resident (Qin 2015; cf. Dixon and Durrheim 2000), the in turn *committed, locally-established peasant forest owner* who has cared for and lived off the forest for generations acts both as an identity marker (Müller 2011) and as a discursive antidote to those forest owners that would cause a lot of trouble – so much as to make the two forest owners suggest that such people should better give up their forest:

> "Yes, it is not right, they have to give up their forest plot straight away, so that would be the right thing. If the generation before had already thought ahead, but [now it is developing to] the negative, because now the farmers who are adjacent pay the price for

[99] "I cannot understand why some forest owners neglect forest care in such a way and not do remove the infested trees instantly! Back then, much more checking was done, and forests were thinned. In the past, there was also a profit from thinning, today there are only costs. Most forest owners are part-time foresters, and with no time and no profit, the interest in forest care is low" (R. 14, small forest owner).

> it, they clearly see, that the neighbor is not doing anything, and that is not right" (Interview XI, L. 211pp.).

Interestingly, and albeit a certain nativism undoubtedly plays a role in negotiating who belongs and who does not, being considered a *non-local* and/or *non-peasant* forest owner is not necessarily a geographical, biographical and/or profession-related issue (of having the "right" place of birth and residence, of coming from a local farmer family etc.), but may simply indicate that a forest owner deviates from local customs in forest-making. Following that, it may be enough for a forest owner to manage the forest differently (f.ex. to abstain from fighting bark beetles because of an ecological agenda) to become discredited as *non-local*, to be excluded from the existing networks of neighborship cooperation, to be stigmatized as sloppy, careless or even dangerous, as someone who – if we follow the conclusion of the two forest owners above – should not have any forest at all[100]. As much as such statements are also expressions of a certain (economic) envy, they are predicated upon the belief that forests should belong to local people (and not to the "rich entrepreneur from Linz", to "the prominent dentist from Salzburg", just to name a few of the common reservations; Interview XVI). Based on what I know from forest owners without local standing (Interview XXV), it appears to be the case that precisely those who grew up in the countryside, but then moved somewhere else (i.e., those who *left the community*, those who decided to live somewhere else differently), and still own a forest are the ones who most likely and intensively feel the wrath of long-term residents (Qin 2015).

[100] It is not only locally-based peasant forest owners that complain about allegedly absent forest owners. In line with that, the head of the forestry department at the Chamber of Agriculture (representing one of the forestry-wise most powerful interest groups in the entire country) joins the rant, stating that a big part of the "bark beetle problem" comes from "forest owners who barely know where their forest is, who can no longer do the forest work themselves and are not [aware] that they have to remove infested trees […]" (Interview VIII, L. 269pp.).

8.2.2. Small vs. Large Forest Owners: About Responsibility and Affectedness[101]

> "So the bigger the forest owners, the more they are blamed, for whatever reason, I do not really understand this logic, but it is often the case that the blame is placed on the big ones, saying that the big ones did nothing, […] they are easiest to pick as an enemy, because the large company is not next door, it is not the person who lives directly across the street, so that makes it a good enemy" (Interview VII, L. 846pp.)

Fig. 69: (above & below) Go-Along in the Hörzinger Wald. © Author, 2022.

In light rain, on a gray day in April, I accompany Hubert on one of his many patrols in the forest. You can tell that he does many just by the way in which he moves through the undergrowth, his two hunting dogs close by his side. Hubert and his family were born with forests, and as a forester in the fifth generation, he works as the operative manager of a large forest enterprise in the Sauwald. Even if the enterprise covers an area of many hundreds of hectares, Hubert speaks about those forests as if they were his vest pocket – that is how well he knows every corner, every old tree stand, every area recently damaged by storm or bark beetles. We stop at a clearcut. In front of us, tree stumps, the ground littered with blackberries and buckthorn. Hubert is frustrated, losing trees is painful. Where there is the clearcut today, there used to be an impressive stand of old spruce trees, some of them over 160 years old, much older than what most spruces are allowed to become in classic forestry. Hubert is interested in ecology, in the forest as an ecosystem, you can tell this from the appreciation with which he speaks of trees, beavers and other beings, and there is an anger in his voice when he refers to the forest industry – even if he himself is a part of it. It bothers him that forests are treated like plantations, that "if we are really honest, the forest is no longer a real ecosystem; of course, the forest has its biodiversity, but it is far away from being an actual ecosystem" (Interview

[101] Whenever I speak below of „small" and „large" forest owners, I differentiate between the two as follows: A forest (property/business) is small if it covers less than 200 hectares *and* is managed either by the forest owner or by (not-for-this-reason-employed) family members. A forest operation is considered large and a forest company in the true sense of the word if the forest area is over 200 hectares and the operation has one or more employees, i.e., there is a certain separation of ownership and management.

XII, L. 508pp.). Hubert says he is torn. From an ecological perspective, he does not have the slightest problem with bark beetles, but as the head of an enterprise, he has an economic responsibility, and the current economic situation is grim: Loss of age classes due to the beetle, high fixed costs, unstable prices. Hubert is concerned, not only because of bark beetles and the economic situation. Climate change, hunting issues, little innovation in the forest sector. We continue walking, rain drops form on my camera lens. The gray weather suits the topic.

(Vignette by author, based on go-along with Hubert in the Sauwald, Upper Austria)

If you ask forest owners in the Sauwald who would suffer the most from bark beetle outbreaks, the picture is clear: It is forest owners and forest enterprises that come to harm, with disagreements as to whether small-scale (peasant) forest owners are hit harder than larger (public or private) forest enterprises (see appendices A34). Far from reaching the dimensions of the blame game between sawmill industry and forest owners, the sense-making regarding who is worse off, and who is particularly exposed to the risk of outbreaks diverges considerably (Parkins and MacKendrick 2007; Flint and Luloff 2007; McFarlane *et al.* 2012). In line with that, the manager of a large private forest enterprise is convinced that albeit

> "everyone has been affected, the big advantage of the small peasant forest structures is that he can pay for himself, he creates his own work. Of course, if he has to log 100 or 200 cubic meters of damaged wood, it affects him a lot […], but he does not have to pay loans. We are the ones paying loans, […] I must pay the fixed costs. […] Of course, I also see that if one has only 20 hectares, and from that, five are eaten up by the beetle, that is a lot […]. So naturally it can be more existential for a small forest owner, because he can lose everything. Yet at least he can employ his own labor, and in that sense, it is easier for him" (Interview XII, L. 188pp.)

Conversely, small forest owners complain about not having the means (machinery/technical equipment, labor force etc.), knowledge, and (when they are also farmers) the time and capacities to deal with high quantities of damaged wood claiming that larger forest enterprises have long-term contracts with the sawmill industry guaranteeing them higher prices and a powerful negotiation position. The aspect of not finding the time or not having the (physical) capacities[102] to carry out bark beetle management is not to be underestimated, given that the prevention, control and management of bark beetle outbreaks usually comes with a time-intensive and heavy workload. This reaches from patrolling the forest for detecting bark beetle nests over cutting down infested trees to organizing the removal and sale of damaged wood. As if that was not enough, most of the bark beetle-related work takes place during summer, at a time when (small) peasant forest owners are busy with agricultural work and have little time for working in the forest. It is against this background that statements like "torment of the enormous summer forest work […]" (R. 9), "work that starts anew each and every year […]" (R. 23) and "hard work in the summertime at 30°C, and that for nothing" (R. 39) become understandable. Next to that, as compared to large enterprises small forest owners see themselves as disadvantaged in terms of not having the direct contact to freighters, authorities and sawmillers, of not having the personnel to get the infested wood out of the forest, with in the worst-case not getting anyone to pick up the wood timely.

That said, we need to keep in mind that for many, if not for most small peasant forest owners the forest serves mainly as a "saving bank" (Interview V, XII; cf. Weigl 2002), as an additional income to agriculture (when things are not going well). So albeit bark beetle outbreaks are economically painful (i.e., reducing the overall financial resilience of a farm), they are rarely existence-threatening (Toscani *et al.* 2021)[lxxvii]. Precisely because smaller forest can afford to do nothing, they are accused (by neighboring large forest companies) of not showing interest in a rapid response to bark beetle infestations, while it is in the economic interest of large forest owners or forest companies to limit the spread and impact of bark beetles as fast (and extensively) as possible. That said, it is remarkable that the stereotype that large forest owners

[102] Physical capacities relate here to the particularity that a large part of the work in small (family-owned) peasant forests is done by the older generation (more than half of European private forest owners are 60 years or older; Schmithüsen and Hirsch 2010), for which such an increased workload in times of outbreaks is a particular burden. I have repeatedly heard from older forest owners who decided to sell their forest due to bark beetle outbreaks, excessive work demands, and missing (or unwilling) successors (Interview VII).

and forest companies (as the economically most affected/pressured) are the ones that would not care enough about bark beetles, that they would be responsible for (the emergence and spread of) local outbreaks, is still so widespread. One of my interviewees, a *Waldhelfer* and small forest owner, has troubles calming down when telling me that the employees of a large neighboring forest company (owned by a wealthy family) take breaks all the time and do not do their work properly (Interview XVI). Next to that, there is rumor among my interlocutors that the (above mentioned) head of a large forest company and his employees *overlooked*[103] to take measures against infestations and that this was the main reason for why the damage had become so great around the Haugstein. Whether these rumors and allegations are true or not is not for me to decide, but it is definitely interesting that in a tightly woven social fabric like the Sauwald (in which cooperation, relationships of trust and a common way of doing forestry are held in high esteem), it does not take long to find culprits, and large forest companies are as impersonal legal entities “well suited as a scapegoat” (Interview V, L. 898pp.).

With the blame game going into different directions, the region's small (peasant) forest owners are also getting their share of criticism including the attribution of being responsible for (the extent of) recent outbreaks, and forest companies (through their operative managers) do not hesitate to blame the former for their inactivity, their conservatism and their lack of knowledge regarding forest management and forest ecology (Interview XII, XVIII). Given that managers of large forest companies are either academically educated or have a working knowledge of recent insights from forestry research, their criticism coincides with criticisms of scientists and government officials, namely that peasant forest owners tend to be “passive forest owners” (Weiss *et al.* 2019; Mostegl *et al.* 2019), only thinking about their forest when they need wood, money, or are coerced by the authorities to carry out forest protection measures (Interview XXI, XXII). Ironically, the stereotype that forest farmers only work in the forest

[103] In German, people say that someone “hat es übersehen” (literally: someone has overlooked to do something) – a frequently heard expression for describing that someone has not (properly and/or timely) reacted to outbreaks.

when they need money sometimes contributes to people not daring to do so because they do not want their neighbors to think they needed money. As absurd as this may sound (from the perspective of a “rational economist”), according to several interviewees, it is still the case that forest owners do not thin out a dense stand because "the neighbor might think that, if I cut out 200 cubic meters, this means that I struggle economically, and this is bad for the reputation” (Interview XVII, 24:11-24:21).[104]

In addition to the question of economic affectedness and (mutually attributed) responsibility for (the extent of recent) bark beetle outbreaks in the Sauwald, the question of whether there are major differences in terms of forest management between large forest companies and small-scale forest owners is interesting as well. Here, my thesis is that *acting ecologically* is largely linked to knowledge of ecological relationships, a knowledge that appears to be more pronounced among (specialized and academically educated) managers of forest companies than among small forest owners who, especially if they did not grow up with forestry and/or agriculture, may even have a hard time naming the tree species in their forest. As an example, this is reflected in the commitment to natural regeneration, and the particularity that the (talk of the) latter is (at least rhetorically) more pronounced among representatives of large forest companies than among (peasant) forest owners: In line with that, the two interviewed operative managers of large forest enterprises in the Sauwald emphasize that they have been “guided by natural regeneration” (Interview XVIII, 26:20) for years, that they “try to do everything with natural regeneration”, that they make sure that “every tree species that regenerates also […] gets its place” (Interview XII, 459pp.). In many cases, and this becomes apparent when interview statements (what people say they do) are contrasted with impressions from forest walks and site visits (with what people really do), large forest enterprises often fall short of their

[104] A similar assessment comes from a forestry advisor: “Neighborly issues and social pressure are also a thing, so for instance when the neighbor sees that I cut down trees, maybe he could think that I need the money etc. […] People come up with the most abstruse stories […] Nobody talks about this openly, […] but I think it plays a huge role, this kind of comparing oneself to the neighbors or with the social surroundings” (Interview VII, L. 101pp.).

expectations. One reason for that may be that such enterprises are subject to economic constraints much more than small forest owners in terms of tree species choice, management strategies and silvicultural systems. This explains why, at the end of the day, Hubert – as ecologically-moved and forestry-critical as he presents himself – still counts on spruce, still looks at sites from an economic potential perspective and still speaks the language of growth, yield and fixed costs.

8.2.3. Hunters vs. Foresters: About Controlling More-than-Human Beings and their World-Making

A particularly interesting line of conflict that runs through the bark beetle blame game is that between hunters and foresters/forest owners. It is interesting (as it is also paradoxical) because hunter and forester are in many cases one and the same person – "a theme of two souls in one breast", as one interviewee puts it (Interview X, L. 865). It is these two souls translating into two different, as I argue, not always compatible roles/functions in the forest that allow the forester/hunter in personal union to argue for contradictory things all at the same time, like on the one hand how important it is to feed the game through the winter (and well into spring), and on the other how important it is to shoot as many of them so to minimize the threat to the natural regeneration (Interview XIV, XVII). In the Sauwald as much as in other forest-rich regions of (Upper) Austria, hunting and forestry are two sides of the same coin, and these two sides exhibit a tense relationship (Wohlleben and Ibisch 2023, 322pp.). In the case of my research, many interview partners are either (practicing) hunters themselves, come from hunting or at least consider hunting to be an important form of forest-making, decisive for successful forestry. In the words of an operative manager of a large forest enterprise, he finds it telling that "if you as a forest company receive application letters from forestry students for an internship, then most of them are ready-made hunters with the vest and the hat, and in every CV, hunting is listed under personal interests" (Interview XXII, L. 868pp.). If we look at the history of forestry professions, this is not surprising, considering that the whole job profile of forester/forest warden developed from medieval gamekeeping (Küster 2013, 127pp.). That said, common roots do not mean common (current) goals, and in many instances hunter and forest owner want different things, depending on the type of forestry pursued, and whether we are dealing with private hunting grounds ("Eigenjagd", in forests larger than 115 ha where the owner is also the hunter) or cooperative hunting grounds ("Genossenschaftsjagd", where hunters hunt in other people's forests based on a lease system; Interview XIII). Whereas there is a tendency in private hunting contexts for higher kill rates and less feeding (given that hunting forest owners regulate the game population according to their needs and objectives), cooperative hunting grounds have a higher potential for conflict, especially when small forest owners are not satisfied with the way and extent of cooperative hunting, and, conversely, when hunters complain that forest owners set up game fences and make hunting more difficult. So while the hunter in a private hunting context wants as little game as possible (particularly around vulnerable regeneration sites), the interest of the leisure and trophy hunter in the cooperative model is more that of constantly having enough game in front of his gun. A forest owner and farmer puts it this way: "The usual hunter runs his hunt like I run my cowshed. He wants to have as much game as possible. If he can hardly see the game anymore, and there is nothing there to shoot, then it is no longer of interest to him" (Interview XIII, L. 341pp.). It should be said that not all hunting is the same and here too there are differences between what is popularly called "eco-hunting" (with higher kill quotas, in the Sauwald for example around Natternbach and St. Roman; Interview XVII) and conventional hunting (based on a trophy system and a fairly extensive,

Fig. 70: Questionable feeding practices in late April? Sauwald. © Author, 2022.

sometimes excessive feeding system; partly of maize and other non-species-appropriate fodder at times of the year when there should be no feeding; figure 70, previous page). Whatever hunting system we have before us, according to manager Hubert, hunting as it is currently practiced in (Upper) Austria would be highly problematic from a forestry perspective:

> "Hunting is an issue that I believe forestry has still approached in a completely wrong way. […] The whole trophy hunting of deer is a disaster, or of game in general. The hunting times need to be changed. We do not need to have such long shooting times if we give the game a rest, but then intervene properly during the hunt. I am talking about driven hunting or other forms, so the hunting method needs to be changed as well. […] And there should be a ban on feeding deer. That is one of the most stupid things you can do […] It is clear if we want to have a healthy forest, hunting is one of the most important tasks that we have to solve. […] Consider all the reforestation subsidies, they would not be necessary, if they would solve the hunting problem properly] […]. [and regarding values/priorities:] As long as the forester is praised more for shooting a big roebuck and a big stag than for a beautiful forest, nothing will change" (Interview XII, L. 118pp. and 660pp.).

As we have seen in chapter 4 and well in line with what has been highlighted by almost every single interlocutor throughout my research, hunting is a crucial factor in human forest-making because game populations (and their densities and distribution) have qua selective browsing, qua more-than-human world-making a massive influence on the tree species composition, i.e., deer, red deer and others (at high population densities) are able to determine which kind of forest will (re-)grow, which forest community, for example, can succeed an existing (say bark beetle infested) spruce monoculture (Partl *et al.* 2002). Precisely because young spruce trees are only little, but other tree lifeways severely browsed, there is the danger of a vicious cycle between spruce monocultures, browsing damages on other-than-spruce lifeways (f.ex. on Silver fir, figure 71, previous page), wrong game management and

Fig. 71: Visible difference in the impact of (roe deer) browsing on the growth of same-aged Silver fir in- and outside of a game fence in the Sauwald. © Author, 2022.

conservative hunters, making one of my interviewees – a forestry advisor and himself a hunter – stress how much hunting needs to change:

> Forestry has contributed to that problem [of massive browsing], I mean, when there is no logging and thinning in a dense spruce stand, and the floor lies bare, then the game has nothing to eat. […] So, instead of having spruce stands with no or little understory vegetation, but having a mixed forest with a lot of natural rejuvenation, then the game would have good retreating and grazing areas. Without doubt, forestry must do its homework, but I say, hunting must take the first step as the game stocks are too high, and there is an interplay between too few kills and too much feeding, and also massively feeding the wrong things […] But there is a huge resistance against changing that on the side of the hunters […] (Interview V, L. 284pp.).

It is not only hoofed game like roe deer, red deer or wild boar (or hares that particularly affect the natural regeneration of beech) that messes with human forest-making in the Sauwald; after its extinction in the 19th century and its recent return, the beaver is on the rise all over Upper Austria (Hölzler *et al.* 2019). Less a problem for (mature) conifers (for an exception see figure 72), which are rarely eaten/gnawed upon compared to the more tasty (soft) hardwoods like asp, willow or alder, the beaver is a powerful landscape engineer with a complex more-than-human sociality, as we have known in social anthropology ever since Morgan's *American Beavers and Their Works* (1868). A world-maker who is able to change the course of streams and rivers, flood entire landscapes and undermine dams, all of that to the (potential) displeasure of forest owners who moan the loss of trees, and prefer a dry and navigable to a swampy and hole-filled forest floor. It should be clear by now that when I say forest owners, I do not mean everyone. As I mentioned, there are very different ecological imaginaries regarding forest management and the question of whose needs the forest serve. Our forest manager Hubert, for example, would be willing "to put another 20 to 30 hectares under nature conservation, let beavers have it, cut down a few trees, revitalize a moor that is barely surviving", but only when this comes in the form of a coherent

Fig. 72: Beaver World-Making in the Sauwald. © Author, 2022.

ecological project (that he can plan with), and not of individual grants and (damage) compensations (Interview XII, L. 1044pp.). In saying so, Hubert points to the role of the authorities and the bureaucratic apparatus on the question of what kind of forest-making is permitted, desired and financially supported (via subsidies etc.) in the Sauwald and beyond. This brings us right to the next fault line.

8.2.4. Forest Authorities vs. Forest Owners: About Wrongly-Marked Trees, Personal Sensitivities and the Question of "Right" Forest Management

The following chapter will provide a more detailed examination of the role of bureaucracy in forestry and nature conservation, of the particularity that in an "era of total bureaucratization" as anthropologist David Graeber puts it in *The Utopia of Rules* (Graeber 2015), (environmental) bureaucrats and forestry officials have a significant influence on what happens in the forest and for Multi-Species communities. With the Forest Act rendering forest protection and epidemic bark beetle outbreaks a matter of public interest and security (Hinchliffe and Bingham 2008; Biermann 2016), outbreaks mean paperwork, especially when it comes to applying for compensation from the disaster/forest fund (Interview XXVIII)[105], or vice versa, when forest authorities monitor the (legality of) forest owner's dealings and issue written warnings demanding (and executing) the salvage logging of infested, but not yet removed trees. As one can imagine, receiving a written warning from the authorities is stressful for most forest owners, especially for those who consider it important to comply with rules (that they generally agree with). Others, however, are bothered by the warnings not because these would show that they have failed as (good, lawful) forest owners, but because they consider the warnings (or the underlying legal guidelines) as wrong, unjustified or unnecessary, because they have a bad

[105] An interview with a regional forest warden shows that even for those who are part of the bureaucratic apparatus paperwork is challenging, time-consuming and tiresome. Although he would not deny that the existing funding instruments are good and important, and he would try hard to help the forest owners through the often-complex application process, he also thinks it is a shame that as a forest warden he is so little "out there" in the forest, that the amount of office work in his job has increased so significantly (Interview XXVIII).

personal relationship or a different opinion than forest wardens and/or other authority representatives. Following that, it is not surprising that in conflicts around and due to bark beetle outbreaks in the Sauwald, the authorities and their representatives are repeatedly targeted. When asked about how he would deal with being criticized for exerting his administrative powers, and especially for relying on anonymous tips from neighbors to issue logging notices, the head of the district forest authority for Schärding and Ried (i.e., for a large part of the Sauwald) describes how he views neighbors reporting one another to the authorities:

> "I mean under normal neighborly conditions, I would see it like that, that you tell the neighbor, hey, you have a problem in the forest. If the neighborly relationship is not like that, then I do not have a problem, when the threatened neighbors go to the BH [=to the district authority], I do not see that as snitching, but I see it as protecting one's property because the bark beetle does not stop at the property border, […] I see the whole complaint as a support for the forest owner" (Interview IV, L. 748pp.).

Following this argument, the authorities would protect forests first and foremost in their function as someone's *property* (and not as Multi-Species communities), and thus fulfill the task that every state authority/administrative body has, namely the protection of the integrity of public, put particularly of private property. When it comes to this goal, the state, here through its federal province and district forest authorities, certainly has the means to coerce those who (threaten to) damage the property of others. Even if most people comply with the Forest Act and it usually only takes one written warning for forest owners to get going,

> "a very small percentage simply does not comply […] But the Forest Act allows us to force them – and that goes as far as auctioning off their big tractor, or whatever it is. This goes relatively far and we are very strict with it, of course some people cannot understand that […] Sometimes, the situation [of people not removing infested trees] is related to a stroke of fate, owners are too old and can no longer take care of it, […] or they are so stressed out in the summer time with all the agricultural work […], so there are understandable difficulties, but we cannot take that into account, because the bark beetle does not stop at one landowner, but also comes to the next, […] and only because the one *responsible* is not getting help, why should the neighbor end up having to sell his wood for half the money?" (Interview IV, L. 680pp.; italics by author).

In addition to a forest warden's official tasks of giving reforestation advice and of supervising the application process for forestry subsidies/funds, one central part of every forest warden's job is to monitor forest owners' compliance with the Forest Act, and, in doing so, to carry out inspection walks, including marking infested trees for removal. That said, the question of whether the right trees have been marked (i.e., those that need to be removed to stop the spread of bark beetle infestations) is one that leads to recurring tensions. In line with that, forest owners tell me that the forest warden marked trees that are not (visibly) infested or have long since stopped being inhabited by European spruce bark beetles. While this leads some to question the expertise of the forest warden (Interview XIV, XVI), others suspect unequal treatment behind the incomprehensible choice of trees (and the subsequent issuing of removal notices). One forest owner, for instance, accuses the head of the district forest authority of acting too emotionally, of "treating some well, and others not […], and that creates a lot of resentment among the population" (Interview XVII, 00:51:20–31). While the federal province forestry directorate with its seat in Linz is lauded as a good partner, criticism of local and regional forest authorities also comes from (employees of) large forest companies (Interview XII, XVIII), emphasizing that they have the impression that for some authority representatives "forestry is not the main focus, but rather personal sensitivities" (Interview XVIII, 00:58:23–30). An interesting allegation when considering what the head of the district forest authority said above, namely that personal feelings and individual fates would *not* be "taken into account", that everyone would receive the same treatment – the big promise of modern rational bureaucracy, as Max Weber (1922a, 162p.) once put it. A treatment, according to one of the criticized forest wardens, solely based on professional expertise (Interview XXVIII); or more exactly: based on a claimed entitlement to the "right" expertise (Pellizzoni 2011). Following that, forest authorities and official forestry experts are not only criticized, but also actively criticize, here particularly the management and response strategies of small (peasant) forest owners. Accordingly, representatives of the regional forest authorities and institutionalized forestry advisors remark that spruce stands would not be that susceptible in the Sauwald, and the situation not that severe, if forest owners managed their forests in line with scientific findings and professional recommendations (Interview IV, VII, XXVIII). Aside from (not) implementing and ignoring given recommendations, forestry advisors and forest wardens complain about the silvicultural conservativeness of small forest owners, about how "the traditional way of doing things" (Interview VII, L. 101p.) has significantly caused or contributed to current problems. This would give forest authorities the impression that some forest owners are unteachable: "[There are] today still reforestations only with spruce, they are thank God isolated things, but they particularly hurt" (Interview IV, L. 598pp.). As forestry advisors know all too well, it takes years and sometimes another generation for a forest owner (family) to change its management/silvicultural approach (Interview IV, V, VII). It is this slowness and resistance to change that has given peasant forest owners the reputation of being "stubborn" (R. 33), "ignorant" (R. 55), "too little involved" (R. 17) and "unknowledgeable" (R. 37) among forestry officials[lxxviii]. When accused like that, small peasant forest owners retort that they only did what they were advised to do (Interview XIII, XVI) and that what happened in recent years was/is a result of poor or incorrect (past) advice from the forest authorities.

As we have seen, the pendulum of the blame game can swing in all directions, with power relations, social capital and the respective moral economy of the Sauwald influencing whose version (of who is to be held responsible for the extent and course of bark beetle outbreaks) prevails. As I have shown, the Bark Beetle Blame Game in the Sauwald unfolds as a historically grown (discursive) field of conflict with certain logics, place-specific narratives, particular fault lines and vested actors. Historically grown and functioning according to certain logics insofar as the blame game revolves around the (perspective-dependent!) question of who threatens and who contributes to the region's wellbeing as a stylized region of small-scale forest owners, meaning that a large share of the reservations that characterize the BBBG are directed against those who do not comply with what is read as the "local" and "traditional" way of doing forestry, against those who are subsumed under the “enemy category” of the non-local, non-peasant and passive forest owner. Even though I did not explicitly address this in the survey or interviews, there is no doubt that “bigger politics” play a role in the renewed discursive emphasis on “us vs. them”, on categories such as “local” and “traditional”, on the supposed importance of “cultural conservatism”. Hence, in times of the rise of authoritarian populism, increasing political polarization, a strengthening neo-nationalism and a suspiciously nativist understanding of belonging and identity (Norris and Inglehart 2019), the rejection of everything that is considered “foreign”, “different” or “unknown” influences how (established) forest owners perceive "new forest owners" with different management goals and strategies, how foresters make sense of those actors that would prefer not to cut down trees at all (Weiss *et al.* 2019).

Even if the BBBG seems to be a (discursive) struggle among humans, and here between differently constructed in- and out-groups, I have elaborated on how more-than-human actors such as bark beetles, beavers or deer feed into and make the BBBG possible. In line with that, I have approached responsibility through a “political ecology of responsibility” lens, looking at the diverging ways in which human actors respond to and make sense of more-than-human beings and their world-making. Having elaborated on *world-making as sense-making,* and here as making sense of why bark beetles are able and allowed to do what they do, I have argued that responsibility is not only distributed along a number of fault lines (of small vs. large foresters, foresters vs. hunters etc.), but that responsibility “is diffused across a spectrum of human, nonhuman, and more-than-human elements” (Chua 2023, 26), pointing to the interplay of browsing deers, proliferating beetles, dying spruces, allegedly traditional management traditions, legal-administrative considerations, and interpersonal conflicts.

9. Between Wilderness and Bark Beetle Management: *Multi-Species Conservation Conflicts* in the *Kalkalpen National Park*

Fig. 73: Patches of Dead (Grey-Coloured) Spruce Trees due to Past Bark Beetle Infestations. Holzgraben, Kalkalpen National Park in October. © Author 2021.

Voices are getting louder at the evaluation meeting of the national park's bark beetle measures, the atmosphere is tense. On the one hand, national park representatives, local authorities and conservationists, on the other, forest property neighbors, heads of forest enterprises, one angrier than the other. Murmurs in the back row, some heads start to shake as the head of the ÖBf NP forest enterprise presents the numbers on last year's [here: 2021] *bark-beetle-damaged wood: 16,000 cubic meters. A first interjection from a neighbor, more shouted than spoken: "This only shows that you were asleep again! You gave the beetle 16,000 cubic meters to feast upon!" A representative from the forestry directorate grimaces, a nature conservation officer clears his throat. The presenter pauses briefly, then continues: The situation is under control, yes, the numbers are high, but in no way comparable to 2010 and 2011. Still enraged, the same participant, an opponent of the park as it turns out, bursts out: "You have bark beetles everywhere, why can't you do something about them, you have enough employees […] Just start searching for beetles and cut down trees! We have the damage, and you are paid for doing nothing!" Cautious agreement on one side of the room, people exhaling on the other. A second neighbor makes himself heard. He does not understand why one could afford to let wood rot in the forest. From a taxpayer's perspective, he continues, the national park is one big waste of money. Besides, he knows studies that show that biodiversity is highest in managed forests, that intensive management, and not protection, is the key to biodiverse forests. A fundamental* *debate is brewing. The* [former] *national park director feels compelled to speak. It is not about the quantity of species, he explains laboriously, but about the quality of habitats, and it is undisputed that the national park makes an important contribution here. A nature conservation officer jumps to his side, stressing that the national park is undoubtedly a model habitat for rare bird species. To the visible dismay of some, he then adds that the nature conservation department is very skeptical about approving any extension of the bark beetle management zone. The head of the federal forest protection department is getting involved, calling for calm in an admonishing tone: "I just want to remind all of you that we have a political commitment to the national park. We can't simply dissolve it. But of course the national park shouldn't pose any danger to its neighbors". Partial agreement, a local sitting right behind me whispers that he is not so sure whether this commitment still exists. If he had his way, this park would have ceased existing a long time ago. The discussion continues to gain momentum, the topic is now about the maximum quantities that can be harvested without breaking the law. The limit of the 3-year harvest threshold in the NP is almost reached and the operational manager wants to know from the authority representatives how to proceed in order to avoid reaching that threshold. All eyes wander to the authority representatives. They will need to have a look at it, they need to justify the extension of that threshold from a conservation perspective, the whole thing is not that simple. The head of an adjacent large forest enterprise speaks up, arguing that he cannot understand how one can be so inflexible in the face of disaster, that there is so much bureaucracy when rapid intervention is needed. My hand hurts from taking notes, my notebook filling up with claims, accusations, assertions. I am surprised. After all, the national park is more contested than I imagined…*

(Vignette by author, based on participation at a stakeholder meeting in the national park in 2022, Upper Austria)

While in the Sauwald bark beetles, humans and others are drawn into a complex blame game, into a "political ecology of responsibility", in and around Upper Austria's only IUCN category II national park, the Kalkalpen NP, bark beetles challenge relationships between, among and across Multi-Species assemblages, and here especially the relationship between national park inhabitants (and proponents) and (their) human neighbors (West and Brechin 1991). In line with that, a great deal of the region's recent forest- and forestry-related conflicts revolve around the "politics of conservation" (Saberwal and Rangarajan 2003), around the NP's conduct in the face of bark beetle outbreaks, around residents' accusations that, despite the introduction of a bark beetle management zone along the boundaries of the park, the park remains unable or unwilling to prevent bark beetle infestations from spreading to neighboring forest owners. While from the perspective of the national park administration and its approach aimed at preserving or recreating a "forest wilderness" bark beetles are not only allowed, but in fact welcomed to restructure the park's forests; local forest owners feel threatened by the park's sympathetic position towards a being that they deem an economic pest; they criticize the park's conservation agenda as an encroachment on their landscape, histories and identities. What at first glance appears to be the manifestations of typical "conservation conflicts", that is "situations that occur when two or more parties […] clash over conservation objectives and when one party is perceived to assert its interests at the expense of another" (Redpath *et al.* 2013, 100), is at closer look a much more complicated arrangement of differing human and more-than-human world-making interests, diverging land use claims, contrasting ecological imaginaries, conflictual "modes of conversation" (Lorimer 2015) and involved more-than-human actors. Acknowledging that the creation and management "of a protected area [like the KA NP] is as much a social process with political and economic consequences as it is an ecological project in which stakeholders' managerial, and consequently, cultural preferences and knowledge, play a fundamental role" (Vaccaro *et al.* 2013, 258), this chapter approaches conservation as a biopolitical set of practices (Lorimer 2015) – as a particular form of (modernist) world-making that by constructing, negotiating and controlling *nature* (Bromley 1991), *landscape*, and *place* in specific ways (Feld and Basso 1996) prioritizes certain beings and their world-making over others (Vaccaro and Beltran 2009). In line with that, conservation serves as site for "battles over nature" (Saberwal and Rangarajan 2003), conservation is not only tied to state-making and the governance and bureaucratization of (people's relations with) *nature* (Vandergeest and Peluso 1995; West 2006; Mathews 2011), but conservation also forms the subjects and their ways of thinking about/through the environment (Agrawal 2005).

The task of this chapter will be to unravel the complicated “conservation arrangement” in the face of bark beetles, i.e., to ask the question of who proposes/opposes, who benefits/suffers from the park’s bark beetle management, of *who counts* in the process of transforming a humanly-used forest landscape into an expert-managed protected area. I will show that *conservation conflicts* go beyond clashing human conservation and land use objectives, but need to be understood against the background of Multi-Species interest coalitions as it is the frictious entanglement of human and more-than-human world-making interests and practices that shapes and drives conflicts over the park's bark beetle management. Introducing the Kalkalpen national park area as a “landscape of (Multi-Species) conflict” (Adderley and Mills 2014), I will begin this chapter by focusing on the historical, political, social and ecological dimensions of transforming a humanly-used commercial forest into a national park (9.1.1), and on how public pressure forced the park to backtrack and establish a bark beetle management zone (9.1.2). This is followed by an analysis of selected conflict parties and their positioning vis-à-vis one another. As I will show, there is on the one hand a particular configuration of actors, world-making practices/interests and political strategies that I describe as the “conservationist status quo” (9.2.1), uniting those Multi-Species interest coalitions that benefit from the bureaucratized conservation apparatus and its manifestation in the form of the park’s current bark beetle management system. In opposition to this pro-conservationist coalition, there are those that long for or claim to benefit from a return to “traditional forestry” (as it was practiced before the establishment of the NP; 9.2.2); those that have a contrasting (world-making-related) position on how forests should look like and of how they should be *cared for* and *by/for whom.*

9.1. On Cutting Down Trees in a National Park: Historical, Ecological and Political Dimensions of the Park's Bark Beetle Management Zone

9.1.1 From Used Forests to Forest Wilderness: On the History, Ecology and Politics of the Kalkalpen National Park

Apart from tunnels carved through the stone, a gravel road and some overgrown tracks, there is little that reminds us of the forest railway ("Waldbahn") of the Reichraminger Hintergebirge, a train that until the 1970s chugged through what is today a UNESCO World Nature Heritage and one of the most beautiful parts of the Kalkalpen National Park (figure 74). The forest railway was built out of necessity and its construction was a consequence of the large storm of 1916 and the epidemic bark beetle outbreaks that followed. Outbreaks that happened during the First World War, in a time when lumberjacks had swapped their axes for rifles, drew ever larger circles, thus culminating into a total of one million cubic meters of damaged wood by the end of 1922 (Kammleitner and NP Kalkalpen 2020). Under suitable conditions and in the (un-/intended) absence of humans, bark beetles eat as they please; this was no different a hundred years ago than it is today.

Fig. 74: Walking on the former tracks of the Forest Railway in the Reichraminger Hintergebirge, KA NP. © Author, 2021.

As early as the 11th and 12th centuries, clearing monasteries such as Garsten had made first attempts to penetrate into the dense, at that point "pristine" forests between the rivers Enns and Steyr (Grau 1942). Providing the *Phyrn-Eisenwurzen* region with its name (Eisenwurzen literally meaning "the root of the iron", i.e., the origin of where iron comes from; Brunnthaler 2015), iron ore mining became important from this time onwards, first around the Styrian Erzberg, but in the 14th and 15th century also around Unterlaussa, Brunnbach and Weißenbach

(Weichenberger and NP Kalkalpen 1997). The production and processing of iron in turn not only required large amounts of wood and charcoal, but also led to a sophisticated system of wood transport via waterways including a dense network of wood rafting facilities: Wood that was cut in the mountain valleys was drifted through the Steyr or through the Reichramingbach and Enns to the city of Steyr, the seat of the local princedom dynasty Lamberg – a dynasty that with its regional hunting privilege and its good contacts to the imperial court oversaw the forests between Enns and Steyr for centuries (Heilingsetzer 2015). In addition to the iron industry along the Enns, the 16th and 17th century saw the foundation of the brass factory of Reichraming, while in Kleinreifling and Weyer hammer mills and scythe forges settled. Scythe forges were also important in the southwestern part of today's national park (f.ex. in Roßleithen) and in fact became the namesake for the entire local mountain range, the "Sengsengebirge" (from the German "Sense" for scythe; NaLa OÖ SG 2007). As we can imagine the wood consumption of these industries had a great impact on the forest communities of today's national park, and especially in times of the wood shortage in the 18th and early 19th century ever-greater forest areas (f.ex. the Jörglgraben or the Holzgraben) were clear-cut and reforested with spruce (Weichenberger 1994; 1995; Kammleitner and NP Kalkalpen 2020), changing the tree species composition from two thirds hardwood and one third softwood into two thirds softwood and one third hardwood (Flaschberger 2018). As everywhere else in the Habsburg Monarchy, industrialization processes in the second half of the 19th century brought additional changes to the Eisenwurzen region. While the availability of hard coal and lignite reduced the societal dependence on forests (as fuelwood providers), also pushing back wood transport via waterways in favor of an expanding railway network (the k.u.k-Rudolfsbahn was opened in 1870), another consequence of industrialization was that many family-run hammer mills had to close due to increased competition, higher cost pressure and the financial crisis of 1873. Only larger companies such as the "Josef-Werndl-weapons factory" in Steyr (later: Österreichische

Waffenfabriks-Gesellschaft and from 1926: Steyr-Werke) were able to survive during this time: When we think about trees ending up as rifles for the Austro-Hungarian army, we stumble upon the role of forestry in the political economy of warfare. After the end of the monarchy and in fact until today, the use of forests between Steyr and Enns has mainly been in the hands of the Austrian Federal Forests ("Österreichische Bundesforste/ÖBf"), with the latter founded in the 1920s managing the former Lamberg properties and the Habsburgian crown forests. After the construction and operation of the Reichraminger forest railway between the 1920s and 60s and its replacement by a dense forest road network in the 1970s, forestry reached another peak in the last decades of the century, only to be stopped in 1994 in the midst of the already advanced planning of today's NP (NP Kalkalpen 2018; Kammleitner and NP Kalkalpen 2020, 5). As a veteran of the local nature conservation movement recalls, the whole establishment of the national park was by no means the decision of some environmentally-moved politicians, but the result of year-long struggles by local resistance movements against two pumped storage power plant projects in Breitenau/Molln (1966-1976) and the Reichraminger Hintergebirge (1982-1984) as well as against a planned cannon firing range (1981-1982) in the same area:

> "In a way, the national park started with the resistance against the cannon firing range. It was planned that in the Reichraminger Hintergebirge […] large cannons were supposed to be fired and were indeed fired. So, that is how precarious the situation was, and fortunately a lot of people rebelled and not just locals, but well beyond that, and that was important. […] There were effective actions and occupations, leaflets […] and lectures. That was necessary because […] the population did not know the untouched character of the nature of this area […] Many people, even locals, could not believe that there were such beautiful places, that they were worth protecting […] And the moment when in all of that the term national park was uttered for the first time, that was almost utopian back then for me […], and that it happened in the end is like a wish come true (Interview XXX, 00:02:00–00:05:12).

Next to the establishment of the nature reserve Sengsengebirge in 1976 as a direct consequence of the successful struggle against the pumped storage power plant Breitenau, the protest actions around the cannon firing range paved the way for first national park plans, leading to the so-called "Mollner Declaration" and a statement of intention by the federal province government to initiate the planning of a national park (NP Kalkalpen 2018, 10). While celebrated by conservationists, supralocal politicians and tourism-savvy parts of the local population, the planning was also accompanied by resistance and conflict, and particularly the negotiations over land transfers, land rights and compensation payments proved to be both controversial and complicated. As the current head of the Austrian federal forest enterprise (ÖBf) in the NP remembers, it was not clear back then how the federal forests – at that time managing almost 90% of today's NP forest area – would be compensated for foregoing the economic use of the forest, how they would be integrated into the new NP construction:

> "It was not clear how the national park should be managed. So for us as the biggest owner, the federal forests, the question was: Should the entire area be transferred to the federal province, or should a foundation be formed? In the end, the politicians or the owner representatives said, no, the area stays with the Federal Forests, but the Federal Forests, because it is a company that has to be managed economically […], receive a financial compensation for the fact that they can no longer cut wood, that they are no longer allowed to lease out hunting or make a profit from agricultural leases and fishing. Well, the compensation was calculated, there was a report, and the owner representatives were satisfied with half of the value that came out of it. Now the national park company is practically paying the federal forests a compensation for use" (Interview I, L. 234pp.).

Given that nature conservation in Austria is legally the responsibility of the federal province and not the state (requiring the federal province to conclude a paragraph 15a agreement with the federal government to be able to pass a national park law and to establish a national park on what is state land; NPG 1996), a complicated and in fact costly NP management structure was created, comprising on the one hand of a *national park company* ("Nationalparkverwaltung", founded in 1997 by both the federal province and the state, responsible for the administration of the NP, led by a national park director and advised by a board of trustees) and on the other hand the above-mentioned *federal forestry enterprise* ("ÖBf-Nationalparkbetrieb", responsible for specific management tasks in the NP, especially regarding infrastructure, silviculture and phytosanitary measures). While (ideological) conflicts between the two bodies, i.e., between conservationists from the NP company and "old school foresters" from the ÖBf enterprise, were carried out more intensively and often publicly in the early phase of the park (Maier 2012; Wolf

2013; Madzar 2019), today they are said to be a thing of the past, and the cooperation is much better, as the (former) national park director and the operative manager of the ÖBf enterprise both emphasize (Interview I and II). While such internal conflicts are considered resolved, tensions between the NP management and local residents are not, and a first peak of these tensions was reached in the controversial founding phase of the park (Madzar 2019). Controversial insofar as local forest owners and other land users (regarding alpine pastures or other servitudes) either experienced the planning process as non-transparent or non-participatory, or suffered economic damage from (insufficient) compensations and land use changes (Cernea and Schmidt-Soltau 2006; Hammer 2007). With regards to participation, a local farmer and declared NP opponent recalls that – despite all the talk of "community conservation" (W. M. Adams and Hulme 2001) – an initially established citizens' forum was quickly "closed down after two to three years, [...] because it turned out that all the people from the communities were actually against the national park […], so suddenly participation was over" (Interview XXIIIb, 00:23:39–00:24:15). As we will see later, it is experiences like these that turn residents into NP opponents, into critics of converting a humanly-used landscape into a park for day tourists, as another interviewee puts it provocatively (Interview XXIIIa). And even a conservationist and admirer of the NP admits that "anniversary celebrations with the communities and the mayors" (Interview XXVII, 00:41:10–13) cannot disguise that locally the national park is still viewed with considerable skepticism and anger.

While initially established on an area of around 16,500 hectares in 1997, the NP amounts to 20,850 hectares today, with 25% of it declared as "preservation zone" with a continued human use of alpine pastures, huts and meadows and 75% "nature zone" in which nature "is left to its own devices" besides minor exceptional interventions (like bark beetle management;

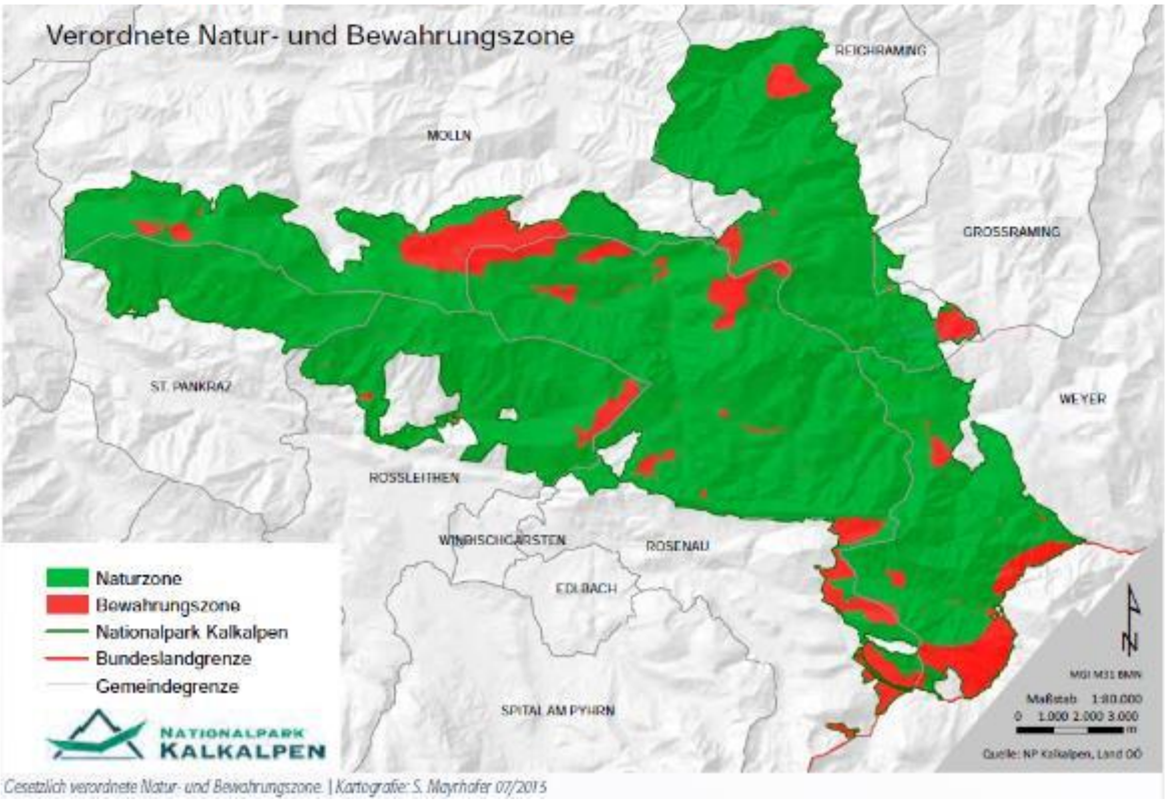


Fig. 75: Nature (green) and (Cultural) Preservation Zone (red) in the KA NP. Source: Mayrhofer 2016 in, https://www.zobodat.at/pdf/NP-Kalkalpen-Schriftenreihe_16_0001-0159.pdf

see figure 75). In addition to the recognition as a category II protected area by the IUCN in 1997 and to the designation as a Natura 2000 area and a Ramsar protected area in 2004, other important steps in the history of the NP were the integration of the local parishes into the Kalkalpen National Park Region in 2007 and 2011 and, most recently, the prestigious designation of the NP’s beech forests as a UNESCO World Nature Heritage Site in 2017. With regards to biogeographical and ecological characteristics, forests covers 81% of the NP (most of them at the montane level from 600–1,450 m a.s.l.), and that on and along the two mountain ridges Sengsengebirge and Reichraminger Hintergebirge, administratively part of the parishes Rosenau am Hengstpass, Reichraming, Weyer, Molln, Roßleithen, St. Pankraz, Großraming and Windischgarsten (belonging to the two districts Kirchdorf and Steyr-Land). With mountain tops reaching heights of almost 2,000 meters, trees are not dominant everywhere, and a considerable part of the NP is accounted for mountainous traipse areas (8%), alpine pastures/meadows (6%), and rock/rubble/barren land (5%) (NP Kalkalpen n.d.). With 81%

forests, the park represents the largest protected contiguous forest area in Austria, and it is this undisturbedness, intactness and diversity of deadwood- and structure-rich forest types (32 in number) that makes the NP so special. These types include endangered biotopes such as willow-floodplain-, spruce-fir-swamp or gray alder-swamp forests, not to speak of the over 5,000 hectares of old (and partially old-growth) beech forest communities. With the exception of some more low-lying forest areas in the proximity of forest roads and villages, most parts of the NP are difficult to access, and it is this remoteness that has prevented the disappearance of old-growth forest fragments in the past, allowing over 50% of the trees in the NP to be older than 160 years and single beech trees to reach ages of over 500 years (Kirchmeir and Jungmeier 2014; NP Kalkalpen 2016; Kammleitner and NP Kalkalpen 2020, 16). In addition to the distinct flora of the NP, the fauna speaks for the national park's significance as a refuge for endangered lifeways. Next to "typical" flagstone species such as the Eurasian lynx (*Lynx lynx*), Alpine longhorn beetle (*Rosalia alpina*), the white-backed woodpecker (*Dendrocopos leucotos*) or golden eagle (*Aquila chrysaetos)*, there are a number of endemic and old-growth forest relic insects that only occur in the Kalkalpen National Park (Eckelt and Kahlen 2012). As we will see later, it is these beings and their institutionalized conservation status (their status as a "Schutzgut") that in line with complex Multi-Species interest coalitions have a particular influence on where, how and to what extent bark beetle management is (allowed to be) carried out in the national park, and that not always to the understanding of forest neighbors.

The attentive reader might ask why there is any bark beetle management in the strictly-protected (i.e., intervention-free) nature zone of a NP at all. To understand how wilderness areas became management zones we need to keep in mind that before becoming protected most forests of today's NP had been used over centuries. As a result, humanly-established spruce

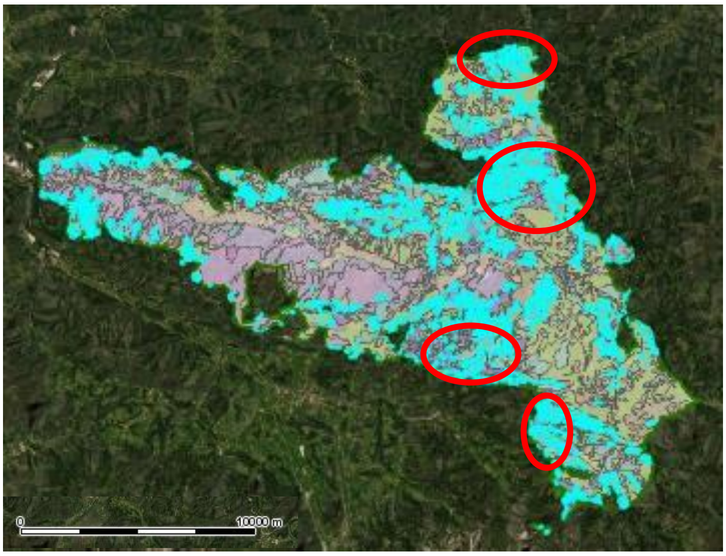


Fig. 76: Spruce Forests in the NPK (turquoise), red circles indicate areas with high shares of anthropogenic/secondary spruce stands. Maps created (filter: biotope: spruce forests) and taken from: https://gis.kalkalpen.at/NPK_WebGIS/synserver?project=WebGIS&client=coret, adapted by author.

forests ("Fichtenforste"; turquoise areas in figure 76) have become and still are a dominant feature of certain parts of the park (Kirchmeier and Jungmeier 2014; Flaschberger 2018), particularly so on sites and at altitudes (see red circles) where spruce would not be the *naturally* prevailing tree species or less prominent in the tree mix (with beech, fir and larch; see figure 77)[lxxix]. Even though spruce's area share has steadily declined since the foundation of the NP due to forest conversion measures (Kammleitner and NP Kalkalpen 2020, 5p.) and natural succession accelerated by disturbances, for NP employees that share is still (too) high:

> "We did a forest mapping from 2015 to 2018, and we compared the results with 1993. So what was right before the national park and what is the situation now. And before the national park we had 49% spruce, 31% beech, 15% larch. Then we had 2% pine, and overall we have 30 tree species, but they are all under or close to the one percent range. But the three main tree species were not spruce, fir and beech, but spruce, beech and larch. So, twenty years later […] there is quite a change. Spruce has decreased to 45%, beech has increased to 38% and larch has decreased to 11%. Well, that means that beech is at its optimum in the area, and what humans have taken away from beech, namely locations where beech used to be, where beech was felled and replaced with spruce, nature is now slowly getting that back, and it will take another 20 years that spruce will no longer be the main tree species, but beech" (Interview I, L. 548pp.).

As insinuated, one actor that has significantly accelerated the decline of spruce in the NP (and by that also the return of beech) is the European spruce bark beetle, a being that in the words of one former national park director (Interview II, L. 516pp.) is an "important part of the ecosystem", and not at all a "destroyer of nature" (Interview I, L. 664), as also the head of the ÖBf NP enterprise stresses. Precisely because bark beetles are considered beneficial for central objectives of the park (here: conversion to more mixed or deciduous forests, increasing the proportion of dead wood etc.), it becomes understandable why the NP does not condemn bark beetles, but even advertises with them, why they present bark beetles as restorers of *pristine nature* – as seen on one of my forest walks at the case of an NP information board describing the functions that bark beetles fulfill in/for a "forest wilderness" (figure 78). As problematic as the concept of "wilderness" may be in itself (Cronon 1996) and as needed as it may be to set up boards to inform unsettled visitors about why the national park does not fight bark beetles (Wolf 2013; Arnberger *et al.* 2018; Madzar 2019), such a storytelling (however cynical it may appear to the neighboring forest owner) disguises that bark beetles may also pose a problem. A problem that relates to the fact that – as much as bark beetles are partners in forest conversion and succession inside the NP – outside of it, they are considered a pest and an economic threat, and with that "threat" potentially spreading to the park's neighbors, the national park saw itself forced to come up with a solution.

Fig. 77: App. 60 year old, secondary spruce stand (interspersed with larch, recently infested by the ESBB) close to "Ebenforst" in the bark beetle management zone of the NPK (1000 m a.s.l.). © Author, 2022.

Fig. 78: Information board in the KA NP. © Author, 2022.

9.1.2 From Forest Wilderness to Bark Beetle Management: On Managing Bark Beetles in a National Park

When the two storms Kyrill and Emma-Paula swept across the country in 2007 and 2008, they left a trail of destruction in their wake. In the national park, hundreds of thousands of trees were knocked down, uprooted or injured, making them an easy target for the ESBB. As the number of bark beetles increased after the storms, so did the number of infested trees, and the years of 2009 to 2011 were characterized by a total of over 200,000 cubic meters of bark-beetle-related damaged wood in the NP, transforming big parts of it into a sea of tree skeletons (figure 79). Against the background of these drastic landscape changes, but above all because

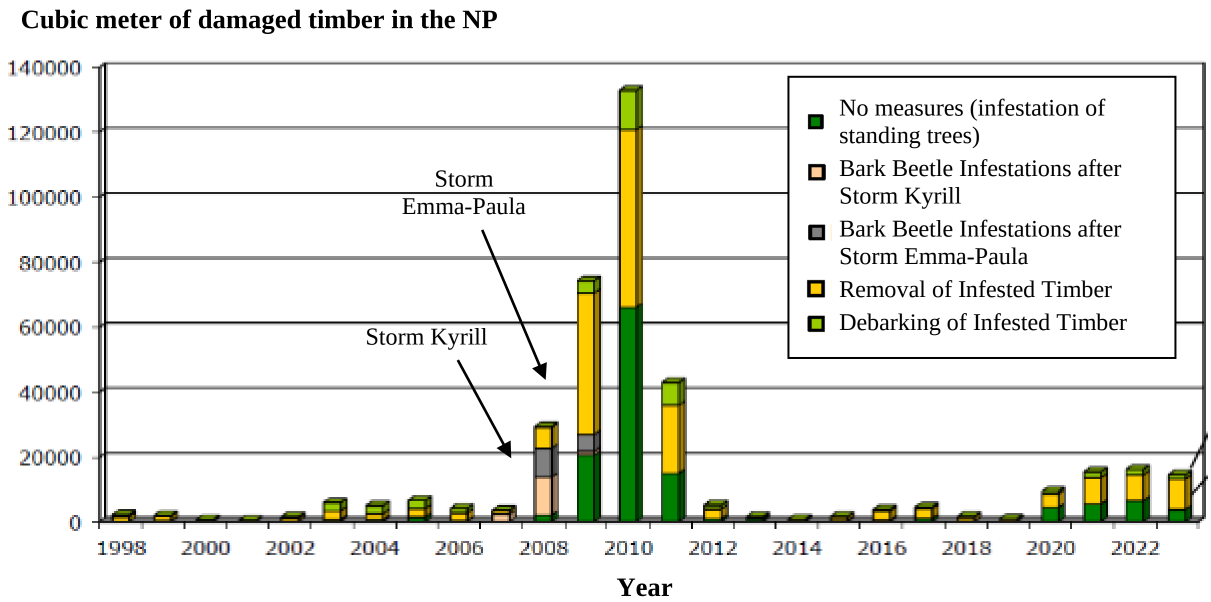


Fig. 79: Damaged Timber in the NP since 1998. Note the increase in the years after the large storms in 2007 and 2008, but also the increase in bark-beetle-related damages since 2020 without large preceding abiotic disturbance events. Source: Kammleitner 2021.

concerned neighbors and political decision-makers exerted massive pressure (Interview XXIV; e.g., Stögmüller 2009), a working group on the initiative of then federal governor Pühringer and under the leadership of the federal forestry directorate was founded in 2010 (preceded by a roundtable stakeholder meeting in 2009). The aim of the working group was to develop a bark beetle management system (NP Kalkalpen 2010) that would *both* protect the (property of) neighbors from the spread of bark beetles originating from within of the park *and* comply with nature conservation-related requirements in a way to ensure that such a management system would not impair protected species, FFH habitats and certain landscape elements (Kammleitner 2016; 2021; 2022; 2023; Kammleitner and NP Kalkalpen 2020). Fully approved by the authorities in 2013 and having undergone a number of amendments ever since (regarding zoning, modalities, legal requirements and exemptions from requirements), the current status of the bark beetle management system after the latest rezoning in 2020 can be summarized as follows: The national park, and here the ÖBf NP forest enterprise, oversees and carries out bark beetle management interventions on 21% (4.339 hectares; orange areas in figure 80) of its total area, with some minor exceptions mostly along its border and in the form of a "buffer strip" that varies in width depending on the forest community, beetle distribution estimates, the site-related predisposition to *Ips typographus*, and the proximity to "especially concerned" forest neighbors. Given that the NP (with its internal ÖBf enterprise) borders the "sister enterprise" ÖBf Steyrtal (with its practical territories Molln, Breitenau, Reichraming and Brunnbach) in

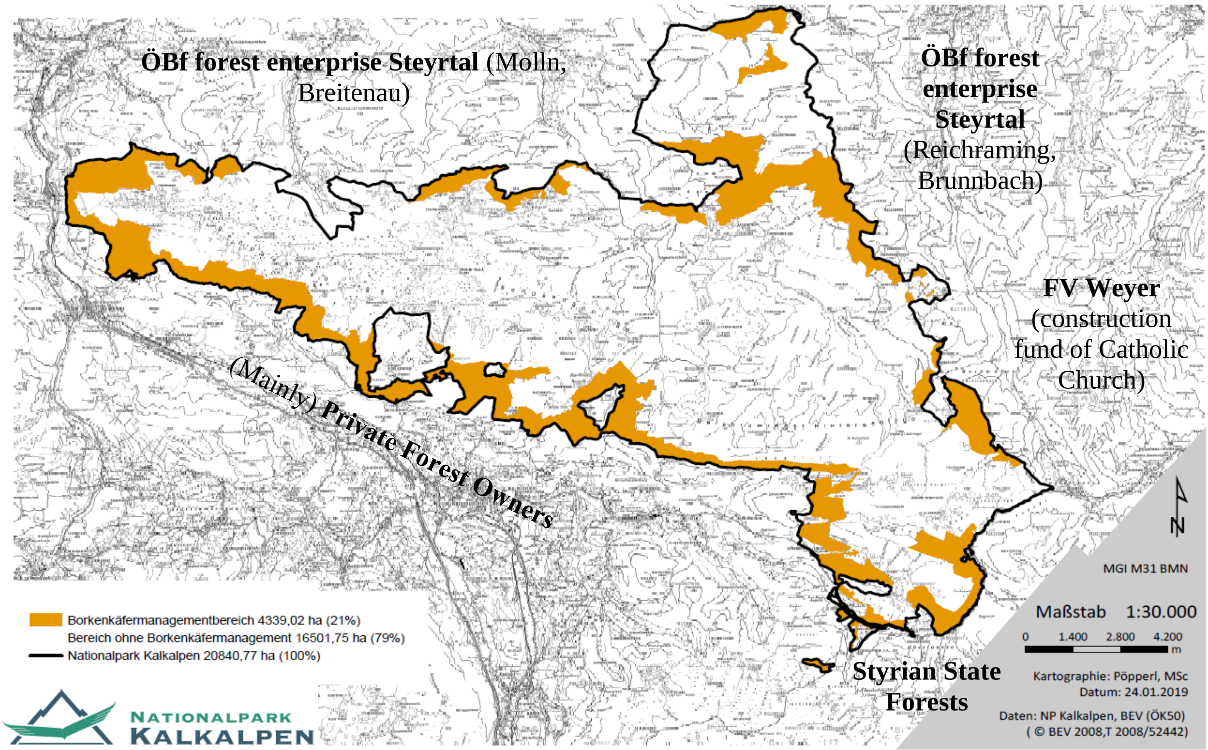


Fig. 80: Bark beetle management zone (orange) and central neighboring forest owners/companies. Source: Kammleitner 2021, adapted by author.

the north/northeast and that beech forest strips in parts of the northeast effectively prevent the beetle from spreading to neighbors (Interview I), the management zone is more pronounced (and the buffer strip respectively wider) in the west, south and southeast of the park, where there are both more spruces and (besides the Styrian State Forests and the Weyer Forestry Administration) a larger number of private forest owners. When talking of the bark beetle management zone, management means that freshly-infested trees are either removed, debarked or milled/carved in this zone (see figure 81), depending on practical considerations, location, proximity to beings/habitats with conservation status and the size of the infested area. In general, the process of removal and debarking is preceded/accompanied by a monitoring of population density and swarm flight, and the regular inspections of susceptible/formerly-affected forest areas for acute bark beetle infestations and wind throws (Interview I). When joining ÖBf employee Berhard Sulzbacher on one of those inspection walks through the impassable terrain of the "Langer Graben" on the south side of the Sengsengebirge, I was able to first- hand experience how arduous and tiring the search for bark beetles is,

Fig. 81: Bark Beetle Management and Control Measures in the KA NP. (top two pictures): Debarking and Carving of Infested Trees. (lower two pictures): Patrolling and Controlling of Pheromone-Baited Trap. All pictures © Author, 2022 & 2023.

how much effort[lxxx] and time the national park puts into its bark beetle management (figure 82, next page).

Fig. 82: Forest Patrolling in Rough Terrain. Go-Along in the KA NP.© Author, 2022.

Once an infested tree is detected in said management zone, its position and further treatment is documented on an infestation map, in turn transmitted to the authorities and the national park company. In general, it applies that – because cutting down trees in an NP is such a delicate matter – every aspect of the NP's bark beetle management is subject to expert reports and authorization from regional authorities (BH) and the Upper Austrian nature conservation authority (acting as a supervisory authority). Among other things, the management system has to undergo a triennial *nature impact assessment,* and apart from that must comply with conservation-related requirements safeguarding that the management has no negative impact on affected protected species, specific FFH habitats and sensitive landscape elements like springs, bogs and sinkholes[lxxxi]. In addition to these requirements, the NP commits to organizing recurring evaluation meetings and inspection walks with involved stakeholders in order to evaluate the success and to coordinate the form and extent of the future bark beetle management.

Even though the park's bark beetle management measures have demonstrably reduced the bark beetle damages of neighboring forest owners, have appeased many critics of the national park, and have so far not proven to endanger protected species/habitats (Kammleitner 2023; Interview XXVII), the controversy described at the beginning of this chapter reminds us of the still-latent conflicts around the NP. In what follows, we will dive now into the cosmopolitics of Multi-Species conservation conflicts, into the politics of forest-making in the Kalkalpen, into the processes of the NP-related formation of Multi-Species interest coalitions.

9.2 "Conservationist Status Quo or Traditional Forestry?" Multi-Species Conservation Conflicts around the Park's Bark Beetle Management

Given that the Kalkalpen NP is, on the one hand, largely owned by the Austrian Federal Forests (ÖBf), and, on the other hand, managed by the (publicly-owned) National Park Company, the NP is an interesting example of observing the state's "nature-making" (Whitehead *et al.* 2007), of analyzing how state bureaucrats speak the language of "rational" conservation to regulate and replace local jurisdictions and (unwanted) local land use practices (Adams 1997; Mathews 2011). Considered that "state-issued" conservation narratives (and the conservation-related sciences) are ultimately a product of how the modern state and its bureaucratic apparatus *knows* and *sees* (Nandy 1989; Scott 1998), tensions between local *land use* and state *conservation* narratives point to the question of whose narratives and claims prevail, of "who *knows*, with what authority, and with what moral, political, and environmental consequences" (Mathews 2011, 241; italics by author). Given that "state environmental knowledge, as promulgated by scientific planning authorities, has elided, shadowed, and crushed competing views of nature" (Robbins 2000, 126), it is not trivial with which intentions a landscape and its socionatural significance (to its residents and non-residents) is read, represented and acted upon by state institutions and actors like environmental bureaucrats (e.g., Fairhead and Leach 2003; Jenkins 2022).

Albeit the KA NP is not an exemplary case of "fortress conservation" (Brockington 2002) in the sense of representing a violent project based on dispossessions orchestrated by (post-colonial) elites, and enabled by a power disparity between "modern" state officials and "anti-modern" locals (cf. Duffy 2010), we will see that exclusionary policies, epistemically violent practices and a rigid environmental bureaucracy are constitutive elements of how the NP justifies and defends itself vis-à-vis critical residents – elements that are at the heart of what political ecologists have addressed as the "politics of knowing" (Robbins 2000). A politics of knowing that – because knowing is part and expression of world-making, and world-making is inherently a more-than-human endeavor – involves and affects humans as much as bark beetles, spruce trees, eagles and others, bringing into focus the *cosmopolitics of conservation* (Lorimer 2015), in our case with regards to the role of the NP's bark beetle management in the production and distribution of benefits and damages throughout Multi-Species communities. Coming back to the idea of more-than-human world-making interests and their pursuit qua interest coalitions, it is necessary to rethink the anthropocentric concept of "conservation conflicts". Albeit it is humans who discursively negotiate whether and why bark beetle management is "too much" or "too little", whether the NP should remain as it is or should be dismantled in favor of returning to "traditional forestry", more-than-human actors are through their entanglement with and reliance on humans suspended in the very same webs of significance (Tsing 2013). In our case, this means that albeit golden eagles may not be actively (or visibly) in favor of an intensification or reduction of bark beetle management measures in the park, their breeding requirements make them a beneficiary of no or little bark beetle management. In what follows, I will touch upon Multi-Species conservation conflicts related to the bark beetle management of the NP, starting with those groups that I deem beneficiaries and/or proponents of what I describe as the *conservationist status quo*, of a situation in which legal restrictions, ecological considerations and bureaucratic procedures require bark beetle management to be kept at a necessary minimum (9.2.1). As part of that, I will show that the conservationist status quo is characterized by a predominance of conservation scientists and environmental bureaucrats and their strategy of making bark beetle management dependent on expert reports, laws and official authorization. This is followed by a consideration of those actor groups for which the current bark beetle management regime is problematic because it supposedly violates their economic integrity and/or self-determination (9.2.2); actors that position themselves as opponents and/or as victims of the national park's bark beetle management (see figure 83, next page).

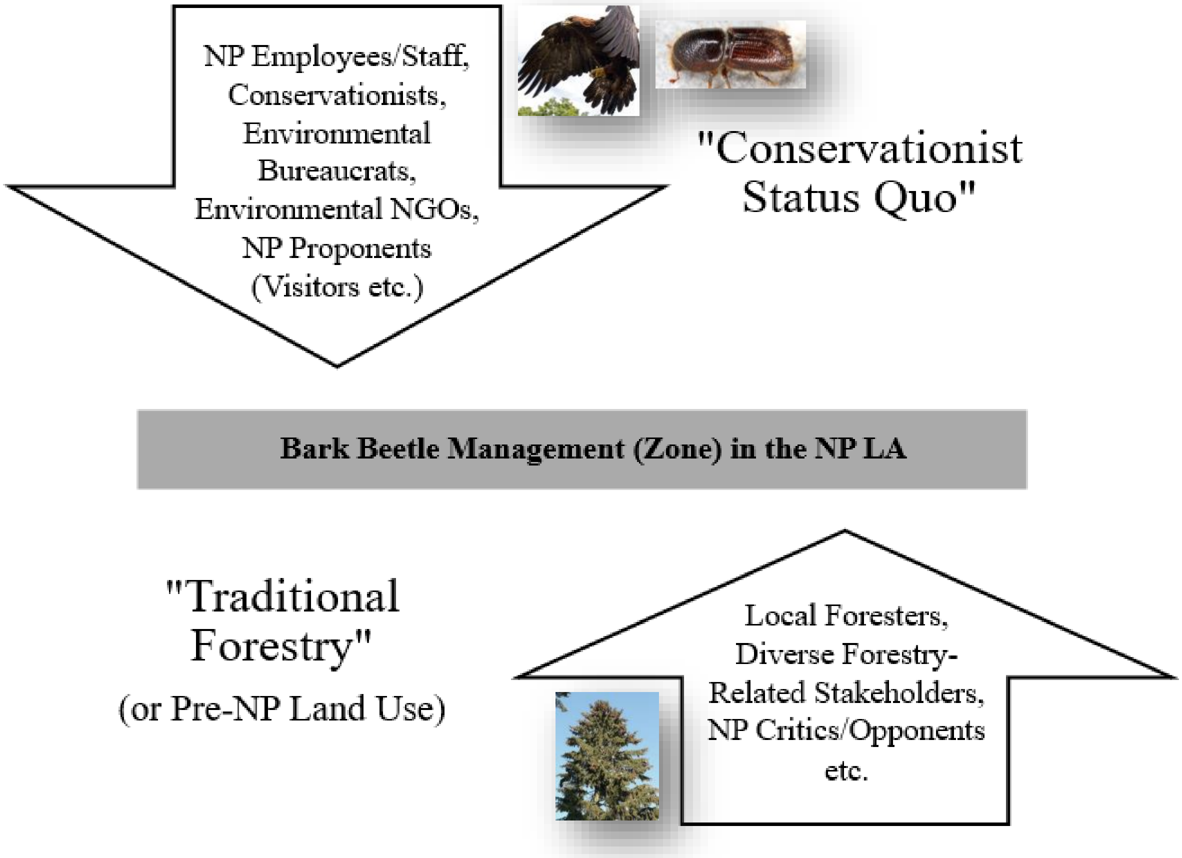


Fig. 83: Selected Proponents and Opponents of the NP's Bark Beetle Management Regime, Picture of golden eagle taken from Wikimedia Commons: Tony Hisgett from Birmingham, UK, CC BY 2.0 https://creativecommons.org/licenses/by/2.0 © Author, 2024.

9.2.1 "Conservationist Status Quo": Human and More-Than-Human Beneficiaries and Proponents of Minimizing the Park's Bark Beetle Management

> "So my nature conservation model in the forest is, and I am here influenced by the megafauna approach, [...] that we actually have a false image of the forest, to put it bluntly [...]. To be honest, I would prefer to fence off large forest areas as a nature conservation fantasy, and stock them with what we have available in terms of grazing animals, in order to *learn again* what we do manually on a small scale, namely clearing up forests [...], and that is also exciting when it comes to the national park, because I am more relaxed about tree cutting *when it happens according to rules* [...] And also the thing with bark beetles, they actually *play into our hands*, [...] because of them there are big gaps in the forest, where foresters often have no plan of what they want to do [...] and then, I have to say this, these very exciting new forest compositions *with a high biodiversity* appear at an impressive pace" (Interview XXVII, 00:15:22–00:21:20; italics by author).

What would be a both silvicultural and aesthetic no-go for most foresters is a desirable utopia for an expert from the Upper Austrian nature conservation agency, that is to fence off forests and transform them into pastures, to let them play into conservationists' hands. Albeit that same expert also stresses that every national park is only as good as its acceptance by the local population (and for that to happen a national park "has to communicate intensively, and give people the time to accept the park"[106]), and that it would be "only logical that different ways of thinking come together" between NP management and local foresters (Interview XXVII, 00:39:20–26), his conservation vision speaks a clear language: The language of striving for a *forest nature different from the picture of nature in forestry*, and that by separating *nature* and humans, by making biodiversity the ultimate reference point for how to value forests (Lorimer 2015). In doing so, said conservationist talks a specific "language of valuation" (Martínez-Alier 2002), he reproduces a discourse based on the invocation of "appropriate mechanisms for biodiversity management, including scientific research, in-situ and ex-situ conservation, national biodiversity planning, and the establishment of appropriate mechanisms for compensation and economic use of biodiversity resources […]" (Escobar 1998, 56p.). A discourse organized around technical terms and expert reports, that operates through the powerful language of laws, markets and conservation science (cf. Fletcher 2010), that is based on a notion of ecosystems as biodiversity assets and as "learning spaces", as my interview partner puts it. That *he learnt* a lot from watching the NP over the years, from looking at how species and habitats develop in the relative absence of human beings, is something that my interview partner recurringly emphasizes, particularly when it comes to bark beetles and their (epistemic) role for conservationists:

> "It is important to us that [with the NP] we *learn* what it means to put large areas completely out of use, also with regards to the bark beetle, how does this develop, will it be like what we *learned* from the Bavarian Forest […] At the beginning we had no idea what dimensions this would take […], because this has not happened before, because there has always been a latent control in managed forests, so what happens [in bark-beetle-affected forests] if you do not do anything at all, […] and something like that you can only do or *try out* in a large protected area, and that is the case in our national park" (ibid., 00:30:35–00:32:08).

[106] Related to that, the conservationist's main criticism of the NP is that the communication and coordination with the property neighbors "has not always been optimal, because it is not easy, also with regards to the bark beetle issue, you have to have a good understanding of what is really at stake" (Interview XXVII, 00:40:15–25).

Yet, given the (practical) effects of not counteracting bark beetle outbreaks, we can imagine that considering the NP as one big *learning space*[107] is not appreciated by everyone, particularly not by those who are (or claim to be) harmed by making the park an "epistemic project", a real-life laboratory for seeing "what happens if you do nothing at all". In line with what Escobar (1998) pointed out with the question of "Whose knowledge? Whose nature?", and what Mace (2014) specified as "Whose conservation?" we might as well ask who *pays the price* for conservationists using a landscape as a learning space, and *who benefits* from the knowledge derived from trying out what happens when bark beetles are allowed to spread. Despite the high costs at which it comes, that knowledge would *still* be insufficient, and my interlocutor criticizes that the NP has made very little effort to monitor the effects of bark beetle outbreaks on protected species and habitats. Asked why that is the case, the expert suspects that it could be that "the NP management may have the impression that the more they investigate, the more they are accountable to the supervisory authority […] Whereas I say that the more you investigate, the more exciting it becomes". Apart from the interviewee's personal curiosity, this statement is telling as it points to an *environmentality* that is particularly pronounced among conservationists and environmental bureaucrats (Agrawal 2005). An environmentality that is better described as a "green governmentality" (Rutherford 2007), or differently: as a *disciplinary environmentality*, i.e., a conduct of creating "environmental subjects through diffusion of ethical norms" and laws (Fletcher 2010, 177), a rationality of governing and protecting *nature* based on disciplining its users. An approach that stipulates to *first investigate and measure,* then to protect "a fixed Nature" (Lorimer 2015), with protection meaning to prescribe and (dis-)allow certain forms of world-making, i.e., to discipline and/or deter non-compliant world-makers (Cederlöf 2008). The more my interview partner spoke about commissioned studies, bird mapping, habitat monitoring and EU conservation frameworks, the

[107] Which it is intended to be, if we consider that IUCN category II national parks are required to fulfill an educational mandate and carry out their own research.

more that environmentality also expressed itself in what Turnhout and colleagues (2014) described as "measurementality", in the context of conservation referring to the conviction that only what is measurable can be protected, thus requiring biodiversity to be operationalizable and quantifiable, to be transferrable into lists and numbers of emblematic species and habitats (Jones *et al.* 2011). And that based on these lists, institutions and legal frameworks that would protect these species and habitats from pending human destruction are to be deployed. Frameworks that like the EU Habitats or Birds Directive reflect a "governance rescaling" (Swyngedouw 2000), a "politics of scale" in which actors like conservationists "attempt to shift the levels of study, assessment, deliberation and decision-making authority to the level and scale which most suits them, that is, where they can exercise power more effectively" (Lebel *et al.* 2008, 129). Related to the upscaling and enforcement of such a *disciplinary environmentality* is a particular trust in laws and legal frameworks, often to an extent that allows us to speak of a "fetishization of the law" (Taussig 1997), i.e., a rendering of laws and jural patterns as objective necessities, while disguising that laws are produced by specific groups (Biber 2012), and deployed "to maintain and restructure the economic, social and political relations of society" (Wolf 1972, 202). In line with that, it is far from surprising that when my interlocutor speaks about bark beetle management in the NP, he does so in terms of the latter's *legal* implications and consequences. Following that, the bark beetle issue is above all a *legal problem*, in the sense that – albeit the current intervention regime is (temporarily!) approved by the authorities – it is still carried out in what is legally the nature zone of the NP, thus conflicting with the national park law and providing potential *legal* grounds for NGOs to sue the national park and the federal province:

> "My impression is that we have an overlap of bark beetle management and the nature zone that does not fit, *namely in a legal sense* […]. We are here in an area of conflict [...] And you have to call it by its name, if we have a bark beetle management zone in the nature zone, you have to think about what that means, because in fact it is the case that we [the nature conservation agency] will not continue approving time and again that ever more wood is logged in a strictly protected nature zone [...], and also relatively far away from the

> property neighbors – where we already know, 30 years of putting mountain forests out of use, that has an effect we do not want to undo [by logging]. These are ecologically valuable areas, [and logging] there represents a contradiction, and *this has to be solved*" (Interview XXVII, 01:10:18–01:11:51).

Solving the bark beetle issue in the NP is thus not a matter of how to come to terms with concerned neighbors, of how to balance out interventions with the intactness of Multi-Species communities, but a legal and managerial task, making it appear as if developing and implementing the "right rules" would be the only way to deal with the tensions between nature conservation, bark beetle management and the claims of local residents. In the words of my interview partner, it is all about "finding the *right way of doing things*, and that *on basis of rules*, and I would say that with regards to the bark beetle issue we have not found this way yet" (Interview XXVII, 00:41:17–20). With all the emphasis on rules and laws, it is striking that at closer look there is no further deliberation on the legal, epistemological, axiological, and normative grounds against which those rules and laws are (to be) developed, thus sidelining questions like: "Who has what legal rights to speak for or against programs that enhance biodiversity? […], whose expertise and knowledge matters when scientists and non-scientists do not agree? […] are some values objectively better, and why? […], whose opinions about biodiversity *should* count?" (Takacs 2020, 43). Whether we listen to discussions at evaluation meetings or to the interviewed conservationist, the *disciplinary dispositive* of laws, reports and expert authorization defines the possibilities and "truths" of human world-making in (and around) the NP; it makes laws, and scientific studies appear as unquestionable grounds for deciding and assessing what to do about bark beetles. In other words: Rendering laws and reports unquestionable allows conservationists and NP employees to *depoliticize* the NP's bark beetle management, that is in line with Erik Swyngedouw (2009; 2011) to reduce bark beetle management to a technico-managerial problem. As I argue, what drives this depoliticization among other things is the alliance of environmental bureaucracy and conservation science (Mathews 2011), making bureaucrats and scientists the ones that produce and hold the "one true" knowledge on how conservation must look like (Biber 2012), that are authorized to carry out and assess the management of protected areas, that, "on behalf of the public institutions, generate knowledge and decide from the perspective of abstract managerial or political needs" (Vaccaro *et al.* 2013, 260). That said, it would be a gross distortion to claim that involved conservationists and NP employees would all be technocrats, totally uninterested in the wellbeing of residents. Both the former NP director and the interviewed conservationist emphasize the importance of protecting local people from negative effects of the NP[108], and also the head of the ÖBf NP enterprise is very concerned about the reputation of the park:

> "[In a bark beetle year], you have constant pressure from the neighbors, you have pressure from the authorities, […] you want to do it right, you do not want to harm anyone, […] also, *you do not want to have a bad reputation*. If you debark an infested tree and not remove it, […], you have the bad reputation. It is always a balancing act, what can I do with what level of care in the national park […] inside the national park, it is very important how to do things, to work carefully […] and the neighbors do not understand that. They do not understand why we debark trees and leave them to rot in the forest, for them it is a waste of money, and in turn it is not good for our reputation in the region. The further we get away from the national park, the better our approval rate is. If you ask someone from Linz or Vienna, is our national park great? 99 or 95% say yes. If you ask people in the region, you might get a 65% approval. I understand that. The population here has always lived from the forest. […] And if you tell them we leave trees to rot in the forest, you do not get very popular" (Interview I, L. 653pp.; italics by author).

Fig. 84: Excursion/Stakeholder Meeting with NP Neighbors. © Author, 2022.

As much as national park employees strive to maintain good relations with the park's neighbors, to inform and include them whenever possible (figure 84), one must not forget that due to their position as managers of a protected area, they are not employed to represent the interests of residents, but to act as "stewards" of plants and animals within

[108] Whereas the former NP director holds that they would be seriously "concerned with getting the bark beetle situation under control, and with protecting the neighbors" (Interview II, L. 566pp.), the conservationist also states that "there would be a clear political mandate to protect the neighbors from the spread of bark beetles [...]" (Interview XXVII, 00:42:04–12).

the park's boundaries (cf. Takacs 1996). In other words, they (are forced to) serve as spokespersons of *certain* more-than-human beings (Latour 2004b), they are biased participants of particular Multi-Species interest coalitions. And as such they are obliged to ensure that "the ecological state" of the park does not deteriorate which includes safeguarding the world-making interests of (certain) park inhabitants. So, when talking about the interests of national park employees in keeping the bark beetle management zone as unintensive and little as possible, we must do so against the background of their more-than-human interest coalitionaries as it is these beings that inform, guide, and justify how (conservationist) human world-making has to look like.

As we will see when talking about the cosmopolitical ties between Western capercaillies and Czech conservationists in the Šumava NP (next chapter), preserving the intactness of the habitat of certain beings prescribes and restricts certain kinds of human forest-making in the face of bark beetles. In the KA NP, this is no different, and here more-than-human actors play a role in when and what kind of bark beetle management is allowed as well. Just to give an example: With the golden eagle institutionalized as a protected species, logging and debarking of bark-beetle-infested trees in the immediate vicinity of a used eagle nest is strictly forbidden, and one employee of a neighboring forest company (who did not want to be recorded for this reason) complains about how his company must bear the damage for the NP not taking measures against bark beetles, *only* because of such an eagle nest (personal communication anonym., 14.06.). In my view, cases like this are interesting for a Multi-Species Political Ecology perspective because they point to untypical cross- and inter-species solidarities, they show that conservation produces constellations in which more-than-human beings and their world-making spaces become more important than the needs of humans, that conservation serves as a site for negotiating whose needs count in Multi-Species landscapes (Takacs 2020).

Difficult to spot in the dense greenery, three-toed and white-backed woodpeckers are other important, because strictly protected beings that play a role in how bark beetle management ought to be carried out, and whether that management is reconcilable with the birds' needs for *standing* dead wood. That means that even if one can avoid the removal of an entire infested tree as part of bark beetle management measures, it makes a huge difference to these woodpecker species whether a tree is cut down and debarked (i.e., left lying on the ground), or whether it is left to die and remains standing for another while. We can thus conclude that woodpeckers are beneficiaries of a reduced intensity of bark beetle management (i.e., of abstaining from removing entire logs) whilst they are also beneficiaries of bark beetle outbreaks in the sense of finding bark beetles as food. In addition to said woodpeckers, extremely rare beetle species such as the Hermit beetle (*Osmoderma eremita*[lxxxii]), the scarlet-red flat beetle (*Cucujus cinnaberinus)* or the power-post beetle (*Stephanopachys substriatus*) are dependent on standing dead wood as well, and are thus "interested" in either bark beetle outbreaks happening (providing them with living spaces) or at least in a type of bark beetle management that does not include (large-scale) tree removal. Only then are they winners of the conservationist status quo. Given that these three beetle lifeways are listed in the strictest protection category of the annex to the EU Habitats Directive they have a certain institutional standing, they *have to be cared for* from a conservationist perspective, they have pronounced world-making rights, and it is with and through these not particularly charismatic "biodiversity proxies" (Caro 2010) that conservationists argue for nature conservation in reports and at evaluation meetings.

Some might retort now that all of these beings' (world-making) rights would be a mere result of human sense-making, of *certain* humans declaring *certain* beings as worthy of protection (and having the power to institutionalize that worthiness qua a legal protection status). From that would follow that conservation conflicts are nothing more than human disagreements over what should be protected in which way, and what should not. Although this objection makes sense, and – to use this quote again – “conflicts regarding wild-life conservation have [indeed] more to do with prevalent legislation, institutional rules, power relations, political-economic conditions, and differences in values and priorities between different people” (Komi and Nygren 2023, 1242) than with the world-making of more-than-human beings per se, understanding conservation as a purely human endeavor reproduces an anthropocentric and asymmetrical way of approaching conservation as a special form of cohabitation. In line with that, I argue that more-than-human beings can be conservationist actors as well, namely in that they *make themselves and others protected* through their charismatic world-making (Lorimer 2007; 2015), through fulfilling important (practical and symbolic) positions and functions within Multi-Species communities (and thus also for human participants). Besides, we see in those cases where conservation does not work as intended that it is up to the protected beings themselves to (re-)appear, to play along with human conservation. In a way, it is them who enroll humans, who allow humans to identify and successfully protect them or not, who – as in the case of protected beings such as golden eagles, hermit beetles or white-backed woodpeckers – have the power to shape human forest-making (Roberge *et al.* 2008). As I will show in the next part, it is these world- and place-making restrictions specified and imposed by the alliance of eagles, beetles and conservationists that causes critics of the NP to long for good old forestry, for a time in which what mattered primarily was the fulfillment of human needs.

9.2.2 “Traditional Forestry and Other Anti-Conservationist Aspirations”: Human and More-Than-Human Opponents and Supposed Victims of the Park’s (Bark Beetle) Management

"We live from nature, in nature and with nature and that is why we do not destroy nature; only the national park destroys nature by not caring for the forest"
(Interview XXIIIa, 00:00:34–43)

The atmosphere is tense in the small farmhouse kitchen of my interview partner, a farmer and forest owner living on the southern slopes of the Sengsengebirge. After I had to reassure several times that I was not working for the national park, the rant begins, his eyes light up with anger: “It is truly a *crime* to have such a terribly sloppy neighbor” (Interview XXIIIa, 00:09:34–38), a neighbor who does not just cause harm, but “is then so provocative as to say that we [=residents] would need to prove that the beetle is not coming from our forests […], with the ex-NP director even saying that *he is happy that the beetle has come*, because there will be a forest conversion then” (ibid., 00:11.42–00:12:05; emphasis by author).

Years after the park has started to counteract the spread of bark beetles in its boundary zones a considerable number of neighboring forest owners (private smallholders and large forest companies) still experience the national park and its bark beetle (non-)management as a problem. At closer look, we may speak of critics in the form of two larger groups: There are those who specifically find the park's bark beetle management problematic (but generally accept or even appreciate the existence of the park), and there are those who I identify as categorical opponents of the park, i.e., people that ever since the 1990s oppose the idea and existence of a national park in their surroundings. Albeit outnumbered in comparison to the first group, some of these categorical opponents are relatively influential, and – as much as their criticisms are dismissed as “a matter of people’s character” by conservationists (Interview XXVII, 00:42:40–42), or trivialized by the former NP director qua the generalization that “it is in the *nature of things* that some people will always be against the park” (Interview II, L. 398pp.) – they are well-established in the region, have lived there for generations and have a close relationship and an identity-related attachment to the landscape (Altman and Low 1992). A relationship that because most of them are foresters and/or farmers is formed through their dwelling practices (Ingold 2000; Okely 2001), in our case of using forests for recreational and provisional purposes such as logging, hunting, hiking, collecting mushrooms etc. (Aschenbrand and Michler 2022). A relationship that, as some say, has changed ever since the founding of the national park, not only due to restrictions in the land use, but also due to changed visual qualities, the increase in tourism, and political tensions in the municipalities (Mölders and Hofmeister 2020). In addition to changes in the concrete use of specific places, we see that what Keith Basso described at the example of the Apache is also applicable to the Kalkalpen, namely that wisdom, history and knowledge *sits in places* (Basso 1996), that places make people what they are, with one interviewee remarking that "I have been in the forest for as long as I can remember" (Interview XXIV, 00:00:42–47). Given the social importance and cultural meaningfulness of these places, it is understandable that there is frustration when people feel to be detached from them through the exclusion implicit in the creation of an enclosed and protected *nature* termed national park (Kühne 2022). It is both this destruction of place and place-making, and the subsequent disillusionment of the *park residents* that Tim Ingold sums up like this:

> "Ultimately, the protection of nature and the protection of place are incompatible because the former entails enclosure, and enclosure destroys place. It does so for three reasons. First, it reduces the constituents of place to only that which can be 'parked' within a perimeter boundary. The result is a peculiarly landlocked view, as though everything of significance in the world we inhabit could be pinned down to the surface of the earth. But you cannot enclose the sky, or the birds that fly in it. You cannot enclose the clouds, the wind and the rain, or the water of flowing rivers, all of which are essential to life. You cannot enclose the sun or its light, or the moon, or the stars. Nature enclosed – the park – simply cannot be part of any world we experience" (Ingold 2005, 501pp.).

Thinking about the conversations with national park critics or categorical NP opponents, with those who complain about the park letting bark beetles spread to their managed forests (about "breeding bark beetles", as one central accusation goes; Interview I, L. 622p.), it seems to me that what bothers these critics is less the material consequences of *nature becoming enclosed* (and of bark beetles becoming released), of economically suffering from the neighborhood to the park[109], but rather (being exempt from) the design and interpretation of that landscape. Given that both of these things are now in the hands of supposed "strangers" (such as non-local scientists and environmental bureaucrats), former land users encounter an image of landscape in which they no longer play a role, in which they no longer "belong", in which the forester has been replaced by the national park ranger. An image in which mountain forests used for centuries are replaced by "wilderness areas", "refuges of biodiversity", if we think about the previous part of this chapter by "learning spaces" (for conservationists) – an image that (some) locals cannot and/or do not want to accept. It is these forced-upon (new) images and their practical implications for local people's world- and forest-making that many residents oppose, that make locals feel "put under a glass dome where we are no longer supposed to do anything, maybe not even drive a tractor anymore" (Interview XXIIIa, 00:28:48–55). The anger from what is experienced as paternalism is then directed against those who are believed to do the patronizing, against those who are associated with assigning *their* landscape a different meaning (Aschenbrand and Michler 2021), in short against "supersmart nature conservationists" (Interview XXIIIa), politicians, scientists and environmental bureaucrats. What I could glean from interviews and survey answers, these groups act as the ideal scapegoat for local forest owners (remember chapter 8), as "externals" they are accused of not being acquainted with/interested in local life realities (as farmers/foresters), of deciding over other people's livelihoods from behind their far-away desks: "We are the ones who live here, that is why *it is the way we see it* and not otherwise" (Interview XXIIIa, 00:28:30–32; italics by author). The same interviewee puts it even more polemically: "All these experts do is talk big, talk nicely,

[109] Albeit that is definitely an issue when we consider as an example that one concerned forest neighbor estimates the damage after Kyrill and, as he emphasizes, due to the national park at 1,000 cubic meters and a reduction in value of 30.000€ of that wood (Interview XXIIIa, 00:09:48–53).

but there is not much behind it […], maybe if I got money every month for doing nothing, I would become like that too" (Interview XXIIIa, 00:13:26–42). As we see, contradictory knowledge claims and epistemic violence in the sense of devaluing each other's knowledge and expertise run into different directions, with (institutional) power structures determining whose expertise, whose stance on how to deal with forest biodiversity prevails (Saberwal and Rangarajan 2003). From the conservationist, who claims to have ecology and conservation science on her side, to the local resident, who claims to have the only valid place-specific knowledge – epistemic battles over what to do about bark beetles in the NP (and why) are instigated by different actors, for very different purposes. What is undoubtedly interesting in these epistemic battles is a constant reference to and negotiation of the past and its (justifying) role for today's national park. While national park bodies and associated conservationists tend to denigrate the past and try to claim that the national park saved the forest from pending human destruction, local forest owners argue that the national park would "not have been able to protect anything, if locals had not worked so hard in the past" (Interview XXIIIb, 00:35:36-40), that the reason for why the national park could adorn itself with beautiful mixed forest stands and a low share of secondary spruce stands is

> "because the change has already happened a century ago, [...] and one honestly has to say, my great uncle, he worked for the federal forests, and they chased every single damaged tree on the south side of the Sengsengebirge, and that is the reason why the forest is so beautiful today, and so worth protecting, *because* it was *managed*, and also today you can see that *the managed forest is greener and more vital* (Interview XXIV, 00:07:21-55; emphasis by author).

This brings us to a central point of conflict between the national park and its critics (be it categorical NP opponents or forest owners simply unsatisfied with concrete bark beetle management measures), namely to questions of when and why to carry out (bark beetle) management, of whether the latter is at all necessary. Questions that are answered differently depending on one's economic expectations, cultural values, social standing and ecological ideas. Again related to the question of depicting the time before the national park, of portraying (a certain kind of) management as harmful, an interviewed forest manager from a large enterprise with forests all over Upper Austria describes why he thinks it is reprehensible

> "to portray the past so badly in national park tours and visitor centers. I mean managing the forest was a bitter part of everyday life, [...] that was a necessity, and it makes a difference whether I earn part of my living from woodworking, from wood harvesting, or whether I make my money *with a little mapping and photography*, 100 percent subsidized by the public, only following my conservationist ideals" (Interview X, L. 796pp.).

A concrete point as to why the park's bark beetle management is so heavily criticized, and that despite the latter's universally agreed-upon successes in recent years in reducing bark beetle damages (Interview I, II, XXIX, XXVI), relates to the park's apparent *inflexibility* in the face of outbreaks, in turn a consequence of what I have discussed as the *bureaucratization*[110] and *juridification* of nature conservation, here: the shifting (or "up-scaling") of problem-defining and -solving from a local to a higher decision-making level in the course of which treating bark-beetle-infested trees becomes a complex legal matter involving expert reports and official approval from authorities. It is this inflexibility rooted in the rigid legal procedures of conservation which not only locals perceive as an inability to react to bark beetle infestations quickly and pragmatically, but that even bothers the NP employees as it ties their hands when quick interventions are needed (Interview I). As an example, there is an officially established upper limit of how much infested wood is allowed to be removed within a three year period in the park's bark beetle management zone. This means that it can happen (and it has happened in the past) that if said threshold is reached in the middle of a bark beetle season (due to an unforeseeable intensity of outbreaks), all management

Fig. 85: Picture of Documents Needed for Nature Impact Assessment of Bark Beetle Measures in the NP. Source: Kammleitner 2022.

[110] In one evaluation meeting that I attended, the head of the NP forest enterprise presented a picture of the documents needed for the nature impact assessment of bark beetle measures, by that pointing to (and also complaining about) the bureaucratized character of a conservation-compliant bark beetle management (figure 85).

measures have to be stopped immediately, in turn calling critical neighbors into action, complaining that the national park is doing nothing at the most important time of the year. This shows that even if the national park (in the form of the forestry-savvy ÖBf NP enterprise) would want to take ambitious measures against bark beetles, it is not up to them to opt for that as the measures must comply with the applicable law and must be coordinated/approved by the authorities – a complex and time-consuming process, particularly so in a setting in which the national park also does not have unlimited resources for bark beetle control, as the head of the ÖBf NP enterprise stresses:

> "It is easy for the authorities, the authorities go out, detect a bark beetle infestation, issue a notice, boom. You have 14 days. They do not really see the fact that I have other things to do as well. And the fact that I do not have an infinite number of capacities just waiting to be deployed" (Interview I, L. 874pp.)

As I argue it is the rigidity and inertia of bureaucratized nature conservation with its laws, complex administrative processes, and expert reports which angers local forest owners, which comes in conflict with their fundamental credo, that is that care for the forest happens through forest management and not through conservation. A credo that, in the case of a private interviewee with a large forest estate, makes *forest care* the order of the day, with the latter analogized to the care of the human body:

> "From my point of view it is only logical that a managed forest has it easier, *it is like the human body, if you look after it, it is healthier.* [...] Accordingly, I am not a fan of putting forests out-of-use, that only makes the forest more vulnerable [...] And I can also push forward forest conversion more quickly if I manage the forest than if I wait a hundred years and do nothing […]" (Interview XXIV, 00:03:34–00:05:49)

Looking at the more-than-human dimension of what makes local forest owners and residents oppose the national park or at least the park's bark beetle management, we see that it is not just (lacking or allegedly incorrect) human forest- and national-park-making, but also certain more-than-human beings that are perceived as problematic or undesirable, that are considered to be in an alliance with opposed conservationists. One good example of such a contested being is the lynx, a being that divides opinions. Reintroduced in the 1990s and ever since then celebrated by pro-park stakeholders as one of the park's charismatic and emblematic lifeways (Lorimer 2015), the lynx has also caused uncertainty and distress among local forest owners, especially among local hunters. Coming back to the forest farmer and hunter from the beginning of the section of this chapter, the latter's opinion on the lynx is clear, namely that "it is a crime to release an animal like that […] If it had come by itself, OK, but to release it intentionally, and now it causes us damage [...] it eats away all the deer we have" (Interview XXIIIa 00:16:31-43). Others are able to overlook the lynx as a competitor, knowing that the national park with its regulated hunting regime contributes to a high "availability" of huntable game, irrespective of how much of this game is preyed upon by the lynx. As one of my interlocutors, a private large forest owner with an own hunting privilege, tells me on the phone, he thinks that albeit the national park is "a massive waste of tax money", he is happy, because "the fattest deer" always come from the national park into his forests and in front of his gun (pers. communication, F.S., 29.03.22). What is striking in all of these cases is the logic that assumes that forests and their inhabitants are to be treated as *human property*, a property that must be protected: Just like the national park would endanger neighboring forest *properties*, the lynx, portrayed as the park's henchman, endangers the *property* of huntable game. In the case of the rather recent debate about how to deal with the return of the wolf to the Kalkalpen (Fehringer 2020), this is no different, and here as well the wolf is treated as a threat to property, as a being that – not unlike the ESBB – has the potential to influence what humans think they own.

The chapter at hand has shown that today's national park has a charged past, a conflictual present and an uncertain future. A past that is invoked differently by different actors, particularly in the field of tension between 1) proponents of the conservationist status quo assuming that the establishment of the national park was needed in freeing the region's forests from *bad* human influence, and 2) proponents of traditional forestry claiming that it was historical forest management that made today's NP beautiful and worthy of protection, making forest management the method of choice to tackle the bark beetle issue in the park. A conflictual present in the sense that the national park and its highly bureaucratized bark beetle management is shaped by conflicts over whose world-making claims and rights count in the face of more frequent and severe bark beetle outbreaks. Conflicts that I have discussed as Multi-Species conservation conflicts, given the role that more-than-human actors play in the institutionalization of form and intensity of bark beetle management in the NP. Having spoken less about bark beetles than about the ones who oppose or embrace them, I have also touched upon the uncertain future of the NP, here pointing to the park's future in the face of the climate crisis as well as to the park's not yet foreseeable position in a (hostile) social environment. It is not far-fetched to argue that in times of increasing political polarization, in times of a tightening socio-ecological crisis, the question of the use, protection and restoration of *nature* has a tremendous potential for conflict, and that in a positive and negative sense. Positive insofar as said conflicts have the potential to re-politicize the question of how to share forests, of how to make convivial practices more just; negative insofar as these conflicts are likely to further disintegrate social communities, to increase the (political) polarization of different groups and their imaginaries of each other's life realities.

10. From Iron Curtain to Bark Beetle Buffer: Conflicting *Multi-Species Legacies* in the *Post-Borderland Borderscape* of the Upper Austrian *Bohemian Forest*

Fig. 86: (Both pictures) Impressions from the "Bark Beetle Combat Zone", the Czech-Austrian State Border and the Austrian Bohemian Forest. All © Author, 2022.

What an irony, I think, standing in the Southern Bohemian Forest, next to a "Pozor!" ("Attention!") sign indicating the Austrian-Czech border, in an area formerly known as the "death strip" of the "Iron Curtain"[lxxxiii]*. Around me, the green of spruce and fir, the small border stream babbling peacefully. It is hard to imagine that only a few decades ago guards were shooting at fleeing people in this forest idyll. A stone's throw away, on the Czech side, in today's Šumava national park, felled and finely debarked spruce trees, standing trees riddled with bark beetle drilling holes. On the Austrian side, tree stumps; signs of removed trees…*

What an irony, I think, that a small beetle makes the border visible (and deadly) again. Not to be cynical, the time of soldiers, fences and watchtowers is over (at least for now), today's victims are different, today's border reappears under different signs, with different consequences for human and more-than-human beings. Not as an Iron Curtain, but as a bark beetle buffer zone, not attempting to prevent humans, but bark beetles from moving freely, from spreading from the national park to Austrian commercial forests. That said, there are troubling parallels: Once again, there is a rhetoric of "us" and "them", there is talk of (in)security, of the incompatibility of state-mandated nature conservation (in Czechia) and privately operated forestry (in Austria); ascriptions of laziness, incompetence and intransparency are in the air – dynamics reminiscent of dark times.

I jump over the small stream, my feet land in the weary grass. With unease, I pass through what is now called the "bark beetle combat zone", next to me debarked spruce trunks, manifestations of the new border regime. How lucky, I think with some cynicism, that I am not a bark beetle…

(Vignette by author, based on forest walks in the Bohemian Forest in 2022, Upper Austria)

Taking us into the depths of the Upper Austrian Bohemian Forest[111], with its mighty spruces and slender firs, the following chapter looks at Multi-Species conflicts over bark beetles, bark beetle outbreaks and bark beetle management through a more-than-human historical lens (O'Gorman and Gaynor 2020)[112]. A lens based on the conviction that to understand current conflicts between, among and across Multi-Species assemblages, we need to consider these assemblages' shared histories, i.e., the intertwinement of human and more-than-human histories (O'Gorman 2017; Tsing *et al.* 2019). Only by doing so we realize that the decades-long forced absence of humans in the vicinity of the *Iron Curtain* allowed specific forest communities to thrive (as well as authorities to establish a national park there), that the tension between bark-beetle-related logging on the Austrian and *no* logging on the Czech side resonates with different narratives of conservation and forest management in a post-socialist context (Lawrence 2009; Sikor *et al.* 2009; Petrova 2014; Blavascunas 2020), that the recent establishment of a 500-meter-wide "bark beetle buffer zone" inside the national park is reminiscent of a time when *the border* between *East* and *West* was a life- and death-determining reality. Approaching the "bark beetle buffer zone" along the Austrian-Czech border as a biopolitically violent "post-borderland borderscape" (Cassidy *et al.* 2018, 171), I will look at how this *borderscape* has been and continues to be *made* as a *violent place* through the entanglement of human and more-than-human world-making (Pugliese 2020). In this sense, I consider place-making to be a historical and a more-than-human project, being produced by and producing uneven "more-than-human geographies", geographies "co-fabricated between more-than-human bodies and a lively earth"

[111] The specific area that my dissertation focuses on is a 20 km long and several kilometers wide forest strip that stretches along the Northwestern Upper Austrian-Czech border, encompassing parts of the Upper Austrian municipalities Aigen-Schlägl, Klaffer am Hochficht, Ulrichsberg and Schwarzenberg am Böhmerwald and parts of the South Bohemian municipalities Nová Pec, Horní Planá and Černá v Pošumaví. Whereas the forest on the "Austrian side" covers 8,400 hectares and is flanked in the North, West and East by the Czech and German state border and in the South by the Mühltal (NaLa BW 2007), the Czech part of my study area is a several hundred meter wide strip, situated north of the Austrian border (see figure 95, page 295).

[112] According to Emily O'Gorman and Andrea Gaynor (2020, 713) a more-than-human historical perspective at least "take[s] on three key commitments derived from the more-than-human and multispecies studies literature: co-constitution; the presencing of multiple species and multiple voices; and situated politics and ethics".

(Whatmore 2006, 603), geographies in which bark beetles, spruces, capercaillies, humans and others become “caught up within fields of power” (Barua 2014a, 916), in which they become part of a contested more-than-human border and (bio)security regime. In the first part of this chapter (10.1), I will highlight some key processes in the historical development of the Upper Austrian Bohemian Forest and sketch out those *socio-ecological legacies* that have had and continue to have an influence on the gathering and world-making (possibilities) of human and more-than-human beings in the face of bark beetle outbreaks (O’Gorman and Gaynor 2020; for the concept of *legacies* see Winiwarter *et al.* 2016). It is these legacies that help to understand the “contingent historical identity” (DeLanda 2016, 19) of Multi-Species assemblages and more-than-human (border) landscapes. In the second part (10.2), I will speak about Multi-Species conflicts around and because of bark beetles and their “management” in the Austrian-Czech border strip, and analyze how these conflicts are rooted in the overlapping of different beings’ world-making, in the conflictual, place-specific relationships between and across different Multi-Species interest coalitions. This translates into looking at the social, political and ecological processes constitutive of what I approach as a “more-than-human borderscape”, into considering the “bark beetle buffer zone” as a violent security infrastructure installed against the spread of certain more-than-human beings. In the third part (10.3), I will look at the class-mediated interplay of human struggles in and over Šumava and the enrolment of more-than-human actors into (instrumentalized) Multi-Species interest coalitions. Only by doing so, we can understand that the bark beetle buffer zone is not merely a matter of (Austrian) foresters protecting themselves from the spread of (foreign) bark beetles, but a complex configuration of nation states, political coalitions, interest groups, Multi-Species assemblages, material infrastructures, property regimes, security narratives and conservation/forestry traditions.

10.1 On the Use, Division and Protection of The Southern Bohemian Forest: Historical Legacies and Their Role for Human- and More-Than-Human World-Making

"On the midnight side of the little country of Austria, a forest stretches its twilight strip westward for about thirty miles, starting at the sources of the river Thaia and continuing to the border junction where the Bohemian country meets Austria and Bavaria. There, as needles often do in crystal formations, a mass of mighty yokes and backs pushed against each other, erecting a sturdy mountain range that now shows the three lands its forest-blue from far away" (Stifter 1882, 3; translated by author[lxxxiv]).

10.1.1 Using the Forest: The Southern Bohemian Forest from the Middle Ages to the World Wars

Inside. I am sitting at a massive wooden table in the office of the forestry administration of monastery Schlägl, together with their "Oberforstmeister", a Premonstratensian monk and the operative manager of one of the largest forest enterprises in the federal province. The monastery's church bells ring in the background. An institution with 800 years of history, 800 years of dealing with and living off forests, 800 years in which a lot has happened.

Outside. The green heart of Central Europe. A forest of enormous proportions, covering the Southwestern ranges of the Bohemian massif (Mentlík 2016).[lxxxv] Where mountain range and forest have become so inseparable that they bear the same name, we are in the *Bohemian Forest* – in a "Mittelgebirge" and forest area that stretches over 120 kilometers from the (German) Upper Palatinate through the (Czech) Southwestern Bohemia to the (Austrian) Mühlviertel[lxxxvi].

Already in the early Middle Ages, there is evidence of logging and hunting in what is the "Austrian part" of the Bohemian Forest in today's nation-state setting, and with the great deforestation period from the 10^{th} to the 15^{th} century (Sandgruber 1995; 2009) the Upper Austrian Bohemian Forest was pushed back onto the mountain ridge, with forests in the *Mühl* river valley being converted into hamlets, pastures and fields (Wohlmacher n.d.). This period saw the emergence of the mentioned monastery, an economic player that directs the fortunes of local forests to this day. Founded in 1218 as a clearing monastery ("Rodungskloster"), Schlägl expanded over the subsequent centuries and came into possession of most forest areas on said mountain ridge, partly through donations, partly through purchase, culminating into 6,500 hectares today, 5,000 of them in the Upper Austrian Bohemian Forest (Interview XIV, L. 170pp.). As the monasterial forests were used for multiple purposes throughout the Middle Ages, forestry in the sense of clear-cutting for maximizing timber yields remained insignificant. Only with the emergence of charcoal, glass and firewood production for *supra-local* markets in the 17th and 18th century, timber production became more important, gradually pushing back other forest functions/services. That said, the harvesting strategies and silvicultural treatments until the first half of the 18th century were different from those of later centuries, and while the glassworks around *Sonnenwald* were operating with small clearcuts or removal of individual trees, harvesting for firewood did not involve large-scale clear-cutting for the longest time (Wohlmacher n.d.; for a different depiction see Martan 2009, 14pp.). From a more-than-human perspective, forest communities benefited, and since the *natural* tree species composition (spruce, fir and beech *to equal parts*, with interspersed elm and maple) did not change much until the 18th century, the difficult-to-access forests on the mountain ridge from Plöckenstein to Hochficht remained relatively "untouched" (Wohlmacher n.d.).

All of this changed in the last decades of the 18th century, and with timber scarcity and an increasing demand for firewood, forest management became much more intensive (Bernau 1888; Killian and Schwabegger 2001; Johann 2007). As the monastery Schlägl was commissioned by the high monastery Passau to enter the race for firewood from 1767 to 1787 (Wohlmacher n.d.), this led to first larger forest devastations in the monasterial forests. At about the same time, Prince Schwarzenberg, a Czech nobleman with large forest properties north of the monasterial forests, sensed the deal of his life. His plan: To build an over 50-kilometer-long alluvial canal on which firewood could be drifted from North to South over the European watershed into the Great Mühl river, and from there into the Danube and all the way to Vienna (Mayer 1831; Trapp 1995; figure 87). Designed by engineer Joseph Rosenauer and completed in 1789, the establishment of the Schwarzenberg alluvial canal marked the beginning of a timber boom in the Southern Bohemian Forest and paved the way for the rise of the region to one of "forestry-wise most developed parts of the empire in terms of forestry[113]" (Wessely 1873, 13). In retrospect, the importance of the alluvial canal for the world-making successes of spruce

Fig. 87: The Schwarzenberg'sche Schwemmkanal now (left; picture by author) and then (right, post card from 1908. Source: Historische Datenbank Böhmerwald, https://www.bwb-ooe.at/hist-db/, © Otto Spitzenberger).

cannot be overestimated, and given that only spruce could be drifted due to its wood properties – due to its *specific materiality* (Bakker and Bridge 2006) –, the impact of the canal on the regional forest economy led to an unparalleled preference of spruce over other tree species (Wohlmacher n.d.; Bertlwieser 1999). In addition, the rationalization and industrialization of forestry gained momentum around that time, and increased logging in the form of clear-cutting, soil degradation, removal of (fir and beech) seed trees, and (to a lesser extent) aftereffects of forest pasturing and litter raking contributed to conditions that spruce could use to its advantage (Interview XIV, L. 209pp.). It is such historical processes that must be considered if we want to understand the legacies of entangled human and more-than-human histories, and here the successes of spruce at the expense of other tree lifeways. It is important to note that albeit *rational forestry* and its institutionalization in the Forest Act of 1852 has been the driving force for the rise of even-aged (pure) spruce stands throughout the Habsburg monarchy (Pichler *et al.* 2022), forests did not become spruce plantations overnight, without resistance und everywhere to the same extent. When asked about the continuous existence of beech and fir in the Austrian Bohemian Forest (in times when such tree lifeways had already disappeared in other regions),

113 "The northwest is in fact our forestry-wise most developed part of the empire, here we find the most sophisticated cultivation and utilization of the forest, the most careful administration and protection of this valuable property, forestry is here no less the work of people than agriculture and industry" (Wessely 1873, 13pp.).

and about the early emergence of plenter forestry in that area, the regional forest warden explains that on the mountain ridge

> "this net-yield-oriented-approach, that has supported spruce and has contributed to so many spruce monocultures, could not establish itself here so much, maybe because people here were stubborn, […] or maybe the Bohemian Forest is too far away from the scientists, from the centers of forest-scientific power" (Interview III, L. 987 pp.).

Fig. 88: Drawing of a damaged forest area due to bark beetles and storm in the 1870s in the Bohemian Forest. Source: Bernau 1888.

In addition, disturbances like the big storm of 1870 and the great bark beetle outbreaks in the years after that (culminating into 7 million cubic meters of damaged timber in the Bohemian Forest from 1868–1878; Vicena 1995), led to gaps and clearings in the Bohemian Forest (figure 88) and even to a temporary push back of spruce (Bernau 1888; Brůna *et al.* 2013; Čada *et al.* 2016). In retrospect, considering the different conclusions from what happened in the past is important because it helps us to understand the historicity, the deep roots of today's conflicts around the "pristineness" and "protection worthiness" of the Bohemian Forest as well as the disputed role that forest management played and should have played before, during and after bark beetle outbreaks (Riedl *et al.* 2018; Cudlínová *et al.* 2020). While national park critic and convinced forester Petr Martan (2009, 15pp.) emphasizes that the Bohemian Forest has always been used by humans, questioning whether there are *at all* old-growth forest patches left (after the events of 1870s), and that foresters planted spruce as an attempt to save an already devastated, because too little managed Bohemian Forest, ecologists and national park proponents claim that there would *still* be *primeval* forest patches worthy of protection, that forest management has *in-* and not decreased the share of secondary spruce stands and thus the forest's overall susceptibility to storm and bark beetles. One could see that when looking at how much harder commercial monocultural forests have been hit by the storms of 2007 and 2008 (Křenová and Hruška 2012; Bláha *et al.* 2013; Bláha and Kotěcký 2015).

Leaving aside these conflicting narratives for a moment, historical evidence suggests that the bark beetle years in the 1870s did not translate into the decline of the region, but on the contrary ushered in a golden era for forestry in Southern Bohemia. An era vividly described in Karel Klostermann's (2019 [1893]) partly real, partly fictional novel *Im Böhmerwaldparadies*, in which the author introduces us to the "golden bark beetle", to the historical fact that the great Bohemian bark beetle outbreaks in the 1870s created jobs and stimulated the local economy, leading to prosperity, but also to envy among forest residents:

> "And this unprecedented prosperity, this life full of work but also full of joy, had been brought to them by a little beetle, a real gold beetle, a blessed animal that destroyed the old Šumava and to which the scholars had given the name "bark beetle" (Klostermann 2019 [1893], 10)[lxxxvii].

Preliminarily summarized, we can say that until the establishment of the Schwarzenberg alluvial canal in the late 18th century, forests in today's border region between Upper Austria and Southern Bohemia, were spared form large-scale forest devastations with the exception of unregulated timber extraction for glassworks and charcoal production, mainly due to their remoteness and little economic importance for the monastery Schlägl. In the 19th century, this changed suddenly and decades of intensive forest use, planting of spruce and storm/bark beetle outbreaks led to ecologically disastrous forest conditions, in which the *natural* tree species composition was altered, and beech and fir were heavily marginalized. With tree species loss and soil degradation increasingly recognized as a problem, countermeasures were taken by the monastery in the early 20th century, and that in the form of switching from planting and clear-cutting to a "plenter system" with natural regeneration, multi-aged stands and selective logging (O'Hara *et al.* 2007), in turn leading to a partial recovery of fir, beech and other tree species along today's border (Wohlmacher n.d.).

10.1.2 Dividing the Forest: The Southern Bohemian Forests from the World Wars to the Fall of the Iron Curtain

As we have stressed, forests are socionatural arenas, they are enactments of practices, histories and power relations, and there is no way of understanding how the Bohemian Forest became divided and depopulated without considering historical events like the First World War and the collapse of the Habsburg monarchy. With Bohemia being the multi-ethnic, plurilingual and (early on) politically contested[114] region that it was at the time of the late monarchy, the latter's collapse and the founding of the ČSR radically altered the forest's social fabric, selectively mitigating specific ethnic, national, economic and political conflicts while aggravating others (Albrecht 2001). One pivotal point in many (post-monarchy) conflicts was the question of German-speaking minorities in Czechoslovakia, of the so-called "Sudeten Germans" whose growing self-determination aspirations were disregarded in the ČSR and conversely fueled by first Weimar, then Nazi Germany (Bahm 1999). The low point of the political instrumentalization of the Sudeten Germans was reached in 1938, with Nazi Germany – less interested in the rights of German minorities than in annexing Bohemia and undermining the Czechoslovakian state – openly threatening to invade the *Sudetenland* for supposedly protecting "German interests" (Gottlieb *et al.* 2021). With France, Italy and England giving in, the Munich Agreement of October 1938 forced the Czechoslovak government to cede the *Sudetenland* to Germany (Caquet 2018). However, the "self-determination" of German minorities in annexed ČSR was short-lived and with the restoration of Czechoslovakia after the Second World War, the setback came quickly, here in the form of the enforcement of the "Beneš Decrees", a number of decrees passed by the (exiled) Czechoslovak government ordering the expropriation and expulsion of German-speaking minorities in Czechoslovakia (Smelser 1996;

[114] Even if it is true that it was the end of the Habsburg monarchy that made the "powder keg" Bohemia explode, already the decades before the First World War were characterized by the increasing opposition between German and Czech nationalists, between German- and Czech-speaking (local) minorities/majorities (Cohen 2006).

Beer 2011). In the Bohemian Forest, with a high share of German-speaking communities, the forced resettlement that followed was particularly dramatic, and in the 1940s and 50s entire villages disappeared from the map (Petrova 2014). Moreover, the subsequent division of Europe through the Iron Curtain with its fences, watchtowers and death strips (figure 89) made big parts of the Bohemian Forest inaccessible and dangerous (Martan 2009, 19), it cut the forest in two, literally and metaphorically: Into a capitalist "modern" forest that was either logged in Austria and protected in Germany (since 1969 as the Bavarian Forest National Park), and a socialist, from "Westerners" as "underdeveloped" negotiated state forest that was either overexploited for the purposes of the communist command economy or that grew rampant because of not being cared for altogether (Peterson 1993; Staddon 2001; Schwartz 2006; Sikor *et al.* 2009; Blavascunas 2014; 2020, 17pp.). From a more-than-human perspective, the division of the Bohemian Forest had both positive and negative effects (Eckert and Šimková 2021, 131pp.). Positive insofar as forest communities in the shadow of the border were able to recover from human pressure – with bear, wolf and lynx as (in the 19th century exterminated) prominent returnees and beneficiaries of human absence (Müller *et al.* 2014). In this sense, the expulsion of Bohemian Forest residents as well as the forced division of Šumava became (negotiated as) a central condition for its "naturalness" and species diversity, for the survival of old-growth forest patches, for its "protection worthiness"[115] (Bláha *et al.* 2013; cf. Coates 2013). Yet, the Iron Curtain also fragmented more-than-human habitats, it hampered wildlife migration and

Fig. 89: Iron Curtain at the Austrian-Czechoslovakian Border. Source: Mühlviertler Schlossmuseum Freistadt, https://www.meinbezirk.at/freistadt/c-lokales/grenzueberschreitendes-kunstprojekt-ausgeschrieben_a3554361

[115] It is indicative of the still-prevalent approach within nature conservation to idealize *nature* as a "nature rid of humans" (Cronon 1996) when looking at the example of how "the death strip of the Iron Curtain" on the inner-German border is discursively elevated to "the lifeline of the Green Belt" (NABU n.d.). The bottom line of such a reading: Forests are ecologically better off when no humans live in or from them.

biological exchange, particularly of large mammals unable to cross the fenced border (Trouwborst *et al.* 2016). A remarkable study showed that the behavioral patterns of red deer are passed down through generations, as decades after the fall of the Iron Curtain, the animals still remember the border, balking at crossing areas where there used to be electrified fences (Fickel *et al.* 2012; BBC 2014; Heurich *et al.* 2015). In my view, there is no better example of how inextricably intertwined human and more-than-human histories are. For humans, the Iron Curtain left wounds as well, it killed, displaced, ripped apart families and communities, it shaped possibilities, identities and worldviews (Tilmar 2023), and as a part of that, created and/or consolidated different forest management and nature conservation legacies on both sides of the border (Petrova 2014; Eckert and Šimková 2022). It is these different pasts, pasts that were shaped by a genealogy of displacement and dispossession, by post-Socialist legacies, by processes of "othering" people as Eastern and state socialism as environmentally destructive[lxxxviii] (Peterson 1993; Schwartz 2006) that until today trouble forest management and nature conservation in the German-Czech-Austrian border region.

10.1.3 Protecting the Forest: The Southern Bohemian Forest in the Face of Epidemic Bark Beetle Outbreaks

Ever since the fall of the Iron Curtain in 1989 and the subsequent designation of Šumava National Park (IUCN category II) two years later[lxxxix], large parts of the first used, then divided Bohemian Forest became protected, more precisely 684 km², since 2020 falling into four different zones (A–D), with the two strictest zones ("nature zone" with no interventions and "near-natural" zone with partial interventions) directly on the Austrian state border and thus adjacent to the commercial forests of monastery Schlägl (NP Sumava n.d.; Interview XIV)[116].

[116] Known for its "old growth forest fragments, […] peat-bogs and peat meadows" (Bláha and Kotěcký 2015, 42), but also for flagship species like lynx (*Lynx lynx*), western capercaillie (*Tetrao urogallus*), Ural owl (*Strix uralensis*) and European elk (*Alces alces*), Šumava national park is a hotspot for species and habitat diversity (Janík 2020) due to its connectivity, extension and location it is not only the green heart of European forests, but also an essential stepping stone between North and South, Alps and Carpathians (Křenová and Kiener 2012).

Together with the 250 km² large German Bavarian Forest NP, Šumava NP forms a transboundary wilderness area (figure 90), in turn part of the European Green Belt initiative, a

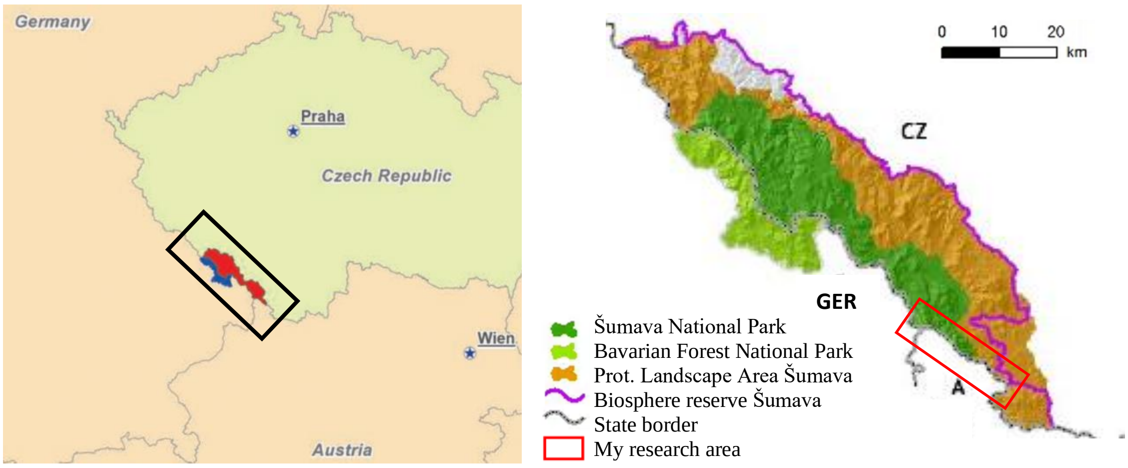


Fig. 90: (picture on the left:) Location of the Bavarian forest NP (blue) and Šumava NP (red) in Central Europe. (picture on the right:) Demarcations between the two NPs and other protected areas. Source (picture on the left): Bláha *et al.* 2015, 43. Source (picture on the right): https://www.npsumava.cz/en/np-administration/territory-administered-by-the-sumava-np/. Adapted and translated into English by author.

transnational network of protected areas and ecological corridors extending along the former Iron Curtain. Given that "the idea of the Green Belt is tied to the end of the Cold War like no other European nature protection effort" (Eckert and Šimková 2022, 130), Šumava NP is respectively framed as a post-Cold War project dedicated to "uniting both the continent's human and nonhuman inhabitants" (ibid.; cf. Zmelik *et al.* 2011). Yet the existence of the national park also perpetuates (pre- and post-) socialist injustices, and albeit most residents have come to accept the existence of the park, they often do not agree with its management decisions; they experience not having a say in them as a disenfranchisement and an interference with their histories, properties and identities (Petrova 2014; Jarský *et al.* 2018; Riedl *et al.* 2018).

Considering these charged legacies, the national park has been contested from the beginning, and even if we look past this historical dimension for a moment, the idea and practical consequences of "process-based conservation" (Dudley 2008), of "letting nature be nature" forced considerable resistance from local land users and residents (for general work on such tensions see Young *et al.* 2010; Mace 2014). In terms of bark beetle management, “letting nature be nature” for the NP administration translates into restricting or prohibiting countermeasures, particularly in the “nature zone” (zone A[117]), on 28% of the park’s area (Interview XXVIII). The effects of this non-intervention regime are not only visible in what parts of the NP look like today (figure 91), but are also reflected in the iconography of the NP, with the official logo showing a tree skeleton quite prominently in its center (figure 92). Meant to stand for “natural forests”, by that rendering the recent mass dieback of spruce as a *natural* and thus desirable process, the logo is insofar a daring depiction as many NP residents do not regard tree skeletons as emblems of forests, but as “marks of shame”, *caused and wanted by conservationists*, but not by them (e.g., ORF.at 2011; Riedl *et al.* 2018).

Fig. 91: The National Park and its First Impression when approached from Austria. © Author, 2022.

Fig. 92: Logo (bottom left) and display board on the border to the NP Sumava. The image of the tree skeletons (top left) is well in line with the mentioned iconography accompanied by the heading "Natural Forests" (Přírodní lesy). Picture by author. Source: NP Sumava n.d.

But first things first. In order to understand the dissatisfaction with the national park and the conflicts around the (non-)management of bark beetle outbreaks around the Czech-Austrian border, we need a bit more background information. And for that, we have to go back to the years before and after the great winter storms Kyrill (2007), Emma and Paula (2008). Already

[117] However, as an employee of the national park clarifies upon request, the recent national park law allows taking “differentiated measures” against bark beetle outbreaks in the “near-natural zone” (zone B, 25% of the NP) and classical bark beetle countermeasures like salvage logging and chemical/mechanical treatments in the “management” and “cultured zone” (zone C & D, 47%) (Interview XXVIII; Interview III).

before these storms, there were windthrow-induced bark beetle outbreaks in the NP close to the Austrian border (f.ex. in 1996), and that in an area with *natural (*or *primary) low subalpine spruce forests* (Brůna *et al.* 2013; Janda *et al.* 2014), representing the only greater autochthonous occurrence of *pure* spruce stands in Austria north of the Danube (Frank 2007). As the operative manager of the forest enterprise Schlägl points out, his forest enterprise

> "has always had to fight with the beetle, not only due to high temperatures and little precipitation [in recent years], but also because of the Sumava National Park that borders us, where they *try to create an old-growth forest* by putting large areas out of use. Provided that it takes time for this to happen, this *leads to the bark beetle taking over these things* when there are disturbance events" (Interview XIV, L. 440pp.; italics by author).

His telling statement, namely that the national park is trying to *create* (instead of preserve!) old-growth forest cells, because there would be none around the Plöckenstein, is not trivial as it contradicts conservationists' claims of the existence of such cells and the respective NP zoning:

> "A few zones along the state border with us and Bavaria were thus designated as so-called core zones, including the area around Lake Plöckenstein up to the Dreisesselberg. And this also includes the area around Hochficht-Reischelberg […], and *it has always been claimed* that these are old-growth forest cells. But *we know from history* that after 1850 this entire area was eaten by beetles, so it is far-fetched to speak of an old-growth forest there, there was none, you can read about that in the Dreisesselberger book" (ibid., L. 573pp.; italics by author).

What we can glean from these statements is that the monasterial forest enterprise with its ownership of the adjacent Hochficht ski resort was not particularly enthusiastic about the neighborhood to a national park from the start. Still, as long as the NP carried out bark beetle management measures (i.e., from 1996–2004), the monastery's bark beetle damages remained limited. The relationship between monastery and NP only came to a head with changes in the NP leadership/administration in 2004 and the practical manifestations of these changes after the storms of 2007 and 2008 (Martan 2009; Křenová and Hruška 2012; Bláha and Kotěcký 2015). Whereas the NP administration was relatively "pro forestry" until 2004 (Interview VI), and important positions were occupied with trained foresters (themselves convinced that bark beetle outbreaks need to be managed and prevented from spreading), according to my interview partners this all changed with a new NP director, "a biologist […], that explained to us in 2004 that along the border freshly-infested bark beetle trees would be no longer processed or harvested" (Interview XIV, L. 601pp.). Alluding to the role of the larger political climate for certain decisions inside the NP, the forest warden on the Austrian side points to the interconnections between government in power, Czech ministries, local authorities and the NP management regime:

> „In previous years, how should I put it, Šumava NP was in a certain way, now viewed from the outside, a political plaything, and every change in the political constellation in Prague also has led to a change in the management of the national park. In practice, that means the national park director was replaced, and then things simply went all different again" (Interview III, L. 653pp.)[xc]

It was also around this time that the environmental NGO *Hnutí DUHA*/*Friends of the Earth* directed its attention towards the south of the NP, rallying with the new NP director and campaigning against logging in the NP and the forestry practices (and ski resort extension plans) of the neighboring monastery (Bláha and Kotěcký 2015; Interview XIV). The storms of 2007/2008 with their thousands of cubic meters of damaged wood was the breaking point, and what did not fall victim to the storm was infested by the ESBB quickly spreading from the Dreisesselberg-Plöckenstein-Hochficht mountain ridge into the surrounding valleys:

> "Then in 2007 there was the storm Kyrill, and it caused a lot of damage on the Czech side, including in the Sumava NP in the core zone adjacent to us. There was no logging there, we have processed the damages on our side […] [see figure 99]. And in 2008 the *wave of bark beetles* came over and that led to us being extremely affected, I mean we had to take radical measures on our side, because if we had not done so, the bark beetle would have already been in Schwarzenberg [=further south]. On our side we had about 100 hectares [around the Plöckenstein] that were intensively infested, but the general strip where the infestations happened extends on the Bavarian side to the Dreisesselberg and on the Czech side encompasses the entire core zone, that is 1,200 hectares of infestation […]" (Interview XIV, L. 622pp.; italics by author).

The forest warden also shudders when he thinks back to how he experienced the events, that "it took us 90 hectares of [low] subalpine spruce forest, before we could stop the mass proliferation. And that was very impressive, at the peak basically every night another 5–6 hectares were infested" (Interview III, L. 572pp.). Over the years, the infested area expanded to a size of 150 hectares on the Austrian and now several thousand hectares on the Czech side, leaving a "lunar landscape" behind, as local foresters call it (Interview XX; figure 93–94).

Fig. 94: Storm- and bark-beetle-damaged area south of the border triangle, in the front half of the picture you can see cut tree stumps. Here the monastery and a little further to the west the Bavarian state forests have logged, i.e., removed infested trees to stop the spread of the ESBB. © Author, 2022.

Fig. 93: Two Satellite Images from the Bohemian Forest in the Austrian-Czech-German border triangle, one from 2006 before the large storm and bark beetle calamities (left) and the other from 2022 after those events have taken place (right). Source: Google Earth, adapted by author.

For some time after these happenings, no stone was left unturned in the Austrian-Czech Bohemian Forest. Newspapers reported (further in the Northwest, in Modrava, the TAZ (TAZ/Mostyn 2011) was speaking of a "civil war" between foresters, conservationists and local community members), local politicians saw themselves confronted with "eco-terrorists" (Nazeleno.cz 2011), the affected monastery demanded a damage compensation from the NP (Interview VI, XIV), the pros and cons of bark beetle management became part of election campaigns of local and supralocal politicians alike – in short, bark beetles became *good to do politics with*. Eventually, and not least because of the monastery's relationships up to the highest political circles, Austrian (federal) politicians got involved too, arguing that it cannot be the case that a forest enterprise suffers economic damage because of being located next to a national park, and putting pressure on the NP administration, local authorities and supra-regional policy-makers. As the (former) head of the forest protection department of the federal province remembers, "at some point even the responsible Upper Austrian state councilor got involved, and in 2009 we went to Prague to the Ministry of the Environment and there it was finally agreed that a state treaty would be put into practice" (Interview VI, L. 687pp.). A state treaty that postulated the establishment of a 500 meter-wide "bark beetle buffer/combat zone" inside the NP – a (from zone A to zone B downclassed) area in which it is legally permitted to treat and/or remove freshly-infested trees in order to prevent bark beetles from crossing the border and spreading southward:

> "In the end, an interdepartmental agreement between the Ministry of the Environment in Prague and Vienna […] was reached that stipulated that up to 500 meters into the park and along the state border freshly-infested bark beetle wood would be processed[118] [i.e., logged or mechanically-treated] […], except for that [already] treeless area up there where nothing will happen for the next 150 years anyway" (Interview XIV, L. 646pp.; reconsider figure 93, and see red area with "protective function" designation in figure 95, next page).[xci]

Even though, as interviewees report unanimously (Interview III, VI, XIV, XXVIII), said agreement has brought the *manifest* ("intrahuman") conflicts and *resistance* movements around the bark beetle (non-)management in Southern Šumava to an alleged standstill, and has contributed to a good working atmosphere and "mutual appreciation" (Interview III, L. 666) between Austrian (foresters) and Czech (NP) stakeholders (since then meeting twice a year to coordinate past and future measures), I argue that from a Multi-Species perspective the tensions that arise from the effects of the bark beetle combat zone are highly virulent and worth looking at. It is one thing to depoliticize the nowadays more latent or more *infrapolitically*[119] carried-

[118] With regards to the NP zoning this meant that an approximately 5-kilometer-long strip along the state border was redesignated from Zone A to Zone B (see brown-green checkered area in figure 95).
[119] In reference to James Scott (1985; 1990), I understand *infrapolitics* as encompassing „the realm of informal leadership and nonelites, of conversation and oral discourse, and of surreptitious resistance" (Scott 1990, 200), a resistance that as Scott famously demonstrated, comes in an „everyday form", not as a collective mobilization against one oppressor, but as everyday practices based on and unfolding through „hidden transcripts" (Scott 1985).

out (human) conflicts over forest management/protection in Šumava by declaring them over – with an employee of the NP Šumava stating that "in relation to the national park, the bark beetle is hardly perceived as a problem anymore, […] and that there are no conflicts with the neighbors if the interstate agreement is followed" (Interview XXVIII, L. 52pp.) –, but quite another to cut down trees in a national park in order to ensure the economic security of one specific actor group, while radically transforming/disrupting a more-than-human landscape and the world-making possibilities of its otherwise-protected inhabitants. As we will see, the bark beetle buffer zone is a good example for understanding how the *assembling* of human and more-than-human actors produce contested landscapes, *places* that are imbued with unexpected alliances, exclusions, inequalities and world-making incompatibilities.

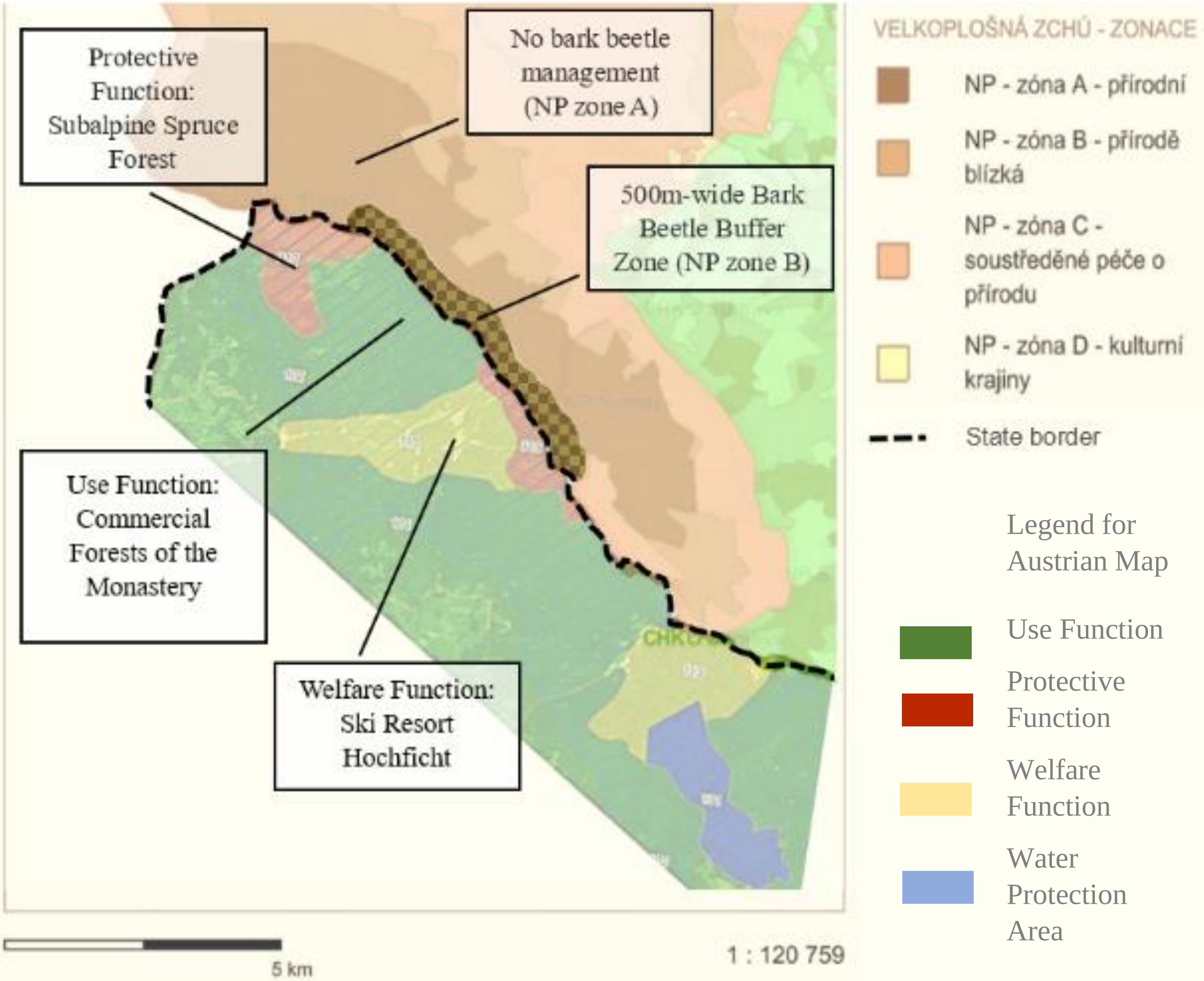


Fig. 95: Merger of Šumava NP zoning map (1) with the digital forest development plan of Upper Austria (2). Map 1 taken from: https://drusop.nature.cz/mapa/drusop/?c=-798729.3%3A-1181368.75&z=6&lb=cuzk_ags_zm&ly=vzchu_z%2Cvzchu_op&lbo=0.8&lyo= , Map 2 taken from: https://wo.doris.at/weboffice/synserver?project=weboffice&client=core&user=guest&view=forst. Adapted and translated by author.

10.2 On the (Un-)Making of a More-than-Human Borderscape: Bark Beetles, Belonging and (Bio-) Security in the Upper Austrian Bohemian Forest

"Bark beetles *do not know the border* and spill over to Austria" (Interview III, L. 571pp.)

"Yes, because the bark beetle *does not stop at the border*" (Interview IV, 754pp.)

There are few things I have heard as often in conversations with bark-beetle-affected foresters as the formulation that the bark beetle comes "from the neighbor", "from Czechia", "from the national park", in short: from somewhere else. Respectively, I have often carried out the thought experiment of how the bark beetle situation would look like if the bark beetle had been a rule-compliant citizen, if it had adhered to human-made political, territorial, and proprietary boundaries. In the middle of the flight, the beetle would stop its unallowed border crossing, it would retreat to where it "belonged" (Head *et al.* 2014; Jones 2011), to where it had the politically-agreed-upon "right to stay", here in the NP Šumava and *not* in the commercial forests of monastery Schlägl (Interview XIV; XXI). In line with the metaphor of *the bark beetle as a mobile world-maker, as a border-troubling migrant* of some sort (Olwig and Sørensen 2002), it is telling that the figure of the beetle's "unwanted migration" (consider the "illegalization" of free bark beetle movement through paragraph 44 and 45 of the Austrian Forest Act; RIS n.d.) characterizes how bark beetles, their *mobile* world-making and belonging are dealt with in the Austrian Bohemian Forest (Beisel *et al.* 2013). This puts us right in the middle of what Fry (2023, 2495) calls the "socio-spatial politics of [more-than-human] belonging", understanding the *belonging* of a particular being like the ESBB "as a socionatural relation [whose] constitution will take place via both the experiential, material imbrication with this world, and the geometries of power" (ibid., 2499). It is these geometries of power that need to be considered when examining how landscapes like the bark beetle buffer zone "become spatially bounded scenes that […] communicate what belongs and what does not, […] how landscapes are, in part, constructed through a territorialized politics of belonging" (Trudeau 2006, 422). While the bark beetle may have its own representation of how "being 'at home' in a place"

(Antonsich 2010, 645) feels like, foresters in the Austrian-Czech-German border triangle use belonging for a different purpose, namely as a "discursive resource that constructs, claims, justifies, or resists forms of socio-spatial inclusion/exclusion" (ibid.; cf. Head *et al.* 2014). In line with that, the statement that bark beetles belong in the national park – but outside of it represent what Mary Douglas (1985) may have called "beings out of place" – points to the demarcation lines between "human" and "animal spaces" (Philo and Wilbert 2000; Srinivasan 2013), to the social placing of bark beetles "as [non-]belonging through scientific classifications, socio-cultural representations and institutional management" (Fry 2023, 2498), to the "spatial ontologies" (Shaw *et al.* 2010) of forest management and bark beetle control. It is these spatial ontologies and their manifestation in bark beetle management and non-management zones that create and reinforce social and spatial boundaries, even more so in a "post-borderland borderscape" (Cassidy *et al.* 2018, 171)[120] like the post-Iron-Curtain Bohemian Forest. Corresponding to the categorization of bark beetles as non-belonging, the rendering of bark beetles as "borderland beings" reproduces (historically burdened) "borderland narratives" (Rajaram and Grundy-Warr 2007), it is charged with imaginations and terms like "invasion", "waves" and "colonization" (Beisel 2013, 7), making foresters speak of "combat zones", "pest control" and "hunting" bark beetles (figure 96, previous page). As Beisel (2013, 3) reminds us, "being attentive to ways of knowing with, about and through insects can shed considerable light on changing understandings of the natural

Fig. 96: „Please take care! We are hunting bark beetles". Information poster by the Bavarian State Forests on the German side of the Southern Bohemian Forest. © Author, 2022.

[120] In stressing the performative and everyday character of „bordering" (instead of borders as something stable and territorially fixed), Kathryn Cassidy and colleagues (2018, 171) define a "post-borderland borderscape" as "a space which remains embedded in its narratives of the border(land) in spite of a complex array of de- and rebordering processes, which have shifted social, economic and political relations" (cf. Brambilla and Jones 2019).

world and on promises of technocratic order involved in its control". Assuming that the domination of nature (here: of bark beetles) goes hand in hand with the domination of humans, as Horkheimer and Adorno have emphasized in the *Dialectics of the Enlightenment,* I argue that the bark beetle buffer zone depends on the institutionalization and normalization of a (biopolitical) border violence (Brambilla and Jones 2019), not towards humans (as it was the case with the Iron Curtain), but towards bark beetles and other forest inhabitants (Pugliese 2020). It is for this reason that I grasp said border strip as a "violent borderscape" (cf. Brambilla *et al.* 2015), with violence unfolding in the form of clearing, removing and debarking bark-beetle-infested spruce trees, of creating *spaces* without infestable trees, of *places* that bark beetles cannot and do not want to make livable (Emerson 2021). Yet violence is seldomly precise, fighting bark beetles through a collateral measure like salvage logging or debarking trees has negative impacts on other-than-bark-beetle beings. Thus, by obliging the Czech national park to "make life safe" (Hinchliffe and Bingham 2008, 1534) for Austrian foresters (a quite specific answer to the question of *whose safety and security counts*; Biermann 2016; Marzano *et al.* 2017), the bark beetle border regime rips apart Multi-Species assemblages, habitats and landscapes (figure 97). This is not trivial, and just to give an example, it has great implications for a lifeway like spruce on which side of the border it grows, whether it grows within the combat zone (and is cut down; figure 98, next page) or ten meters next to it, whether it ends up in the (forest-making) crossfire between bark beetles and humans, or remains untouched. If we commit to it, the historical analogies are telling. Similar to how the Iron Curtain was propagandized on both sides of the border as

Fig. 97: Violence in the making of the Bark Beetle Buffer Zone, here in the form of salvage logging and debarking in the NP Sumava. © Author, 2022.

protecting *us* from *them* (Schwell 2010), as a "security infrastructure" based on keeping people, systems and ideologies *where they belonged* (Lutterbeck 2005), the bark beetle buffer zone reproduces the talk of protecting "a certain way of life" (here: a certain way of doing forestry) from the influx of beings (potentially) undermining it. In line with that, bark beetles and their "mobile lives" become subjected to a "biosecuritization" agenda, to "the attempt to protect established and valued life [such as spruce trees] from emergent, transgressive and undesirable life [such as bark beetles coming from the NP]" (Clark 2013, 18) – from life that is thus declared "killable", or more accurately: not allowed to make (parts of its) worlds livable[121] (Braun 2007; Hinchliffe and Bingham 2008; Pugliese 2020). Interestingly, the question of the (geographical) origin of the outbreaks in the years after 2008 is in itself a matter of contestation. Accordingly, the operative manager of Schlägl told me that when the monastery demanded damage compensations in 2009, they were confronted with counterclaims stipulating that the bark beetle came from the monasterial forests and not from the national park (Interview XIV, L. 641pp.). Additionally, the monastery had to deal with accusations from certain Czech conservationists (f.ex. activists from *Hnutí DUHA*) arguing that the monastery planting "non-belonging" tree species would endanger the genetic diversity of trees in the national park (Interview XVI, L. 616pp.).


Fig. 98: Bordering and its violence. Cut-down spruce trees in the bark beetle buffer zone. © Author, 2022.

Taking one step back, we realize that the violence of the bark beetle borderscape depends on *knowing* (Beisel *et al.* 2013) bark beetles and their world-making (capacities). In our case, the "right" width of the bark beetle buffer zone is determined on basis of models on how far

[121] Considering how easily insects are declared killable, how easily they are imagined a biosecurity and "territorial integrity" issue (Carter 2008), insect-spaces are interesting for watching the interplay of power and place, for studying the relationship between governing insects and governing people (Beisel 2013, 8).

bark beetles can get on their dispersal flights (f.ex. Baier *et al.* 2007) – in other words, it is studies from forest scientists that allow to carry out forest protection efficiently, i.e., to use violence in a targeted manner. In (cynical) analogy to the barbed wire fence that is exactly so high that it makes it difficult for (most) humans to overcome it, the bark beetle combat zone is (as an ordering material infrastructure) exactly so wide that it makes it difficult for (most) bark beetles to traverse it (cf. Winner 1980). As Beisel (2013, 8) puts it, "insect knowledge informs not only the domination of insects in space; […] lands claimed in their name are also constituted as governable by the spatial conceptualizations and practices of […] pest control". This means that pest control (as a distinct form of human world- and place-making vis-à-vis bark beetle world-making) not only shapes the physical features and symbolic meanings of particular landscapes like the high ridge of the (Austrian) Bohemian Forest, but also the "politics of particular places" (Dawney 2013, 640) including boundary-making and the codifying of (more-than-human) belonging[xcii] (Trudeau 2006). With some trees standing, others cut down, the practical consequences of the politics of (bark beetle) border-making (figure 99) were all too visible on my forest walks.

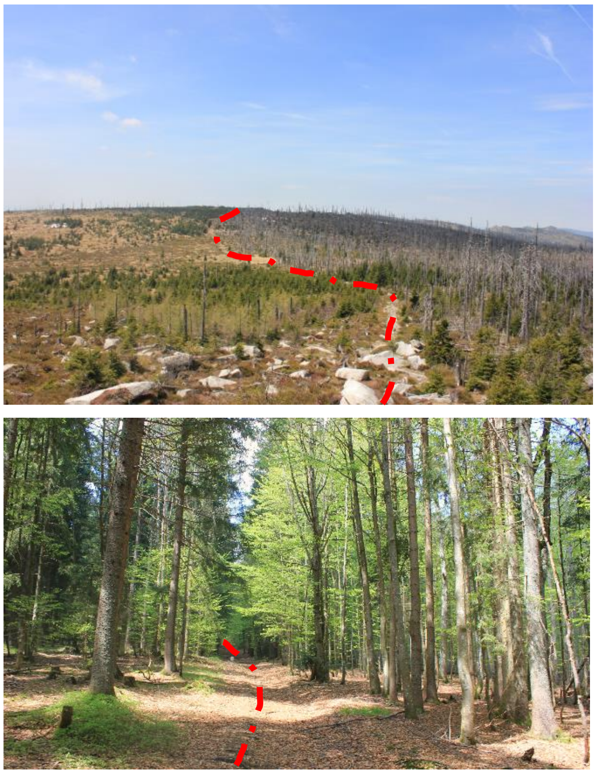


Fig. 99: "Walking the Border". Impressions from the forest walks. From the Dreiländereck towards Reischelberg. © Author, 2022.

10.3 From Human to Multi-Species Conflicts: On Conservation Elites and Multi-Species Interest Coalitions

10.3.1 Human Struggles in and over Šumava: Class, Hegemony, and the Role of the State

Looking at the constitutive elements of the bark-beetle-related conflict field in the Upper Austrian-Czech Bohemian Forest, we see that the diversity of actors, interests, institutions and narratives involved makes it difficult to sort out who opposes/supports whom in the making of the bark beetle borderscape as a politicized environment (Bryant and Bailey 1997). When we take the perspective of Czech conservationists and environmental activists in favor of the NP (and rallying against bark-beetle-related logging in Šumava) we see that the latter are confronted with multiple "oppositional" groups operating on different scalar levels, be it with Austrian foresters, forest politicians and forest authorities exerting pressure through political channels on a federal level, or be it with tourists, local residents and community leaders agitating against the NP and its (historical) non-intervention policy (Bláha and Kotěcký 2015; Riedl *et al.* 2018; cf. Nousiainen and Mola-Yudego 2022). Regarding the latter, a signature campaign against what was framed as the "disfigurement" of the Bohemian Forest and the "inaction" of the national park achieved 13,000 signatures in the years of 2010 and 2011, with the campaign spokesperson, the mayor of Horní Plana, declaring "that we cannot *leave* the forest to the bark beetles or *to the experiments of a small group of scientists"* (ORF.at 2011, n.p.; italics by author). Taking this statement as well as the media coverage of that time seriously (arguing that two thirds of the affected local communities would be in favor of a comprehensive bark beetle management; TAZ/Mostyn 2011), we see that the conflict practices of human actors are not to be understood without considering the actors' positions in the "social field" (Bourdieu and Wacquant 1992) – positions that are shaped by class membership, political alliances, management paradigms, and (social and economic) capital. In line with that, we can say that the bark beetle issue has a *class dimension*, and that insofar as rural residents and local foresters lament that they are externally determined by a *small group of internationally operating, anti-local urban experts*, that *elsewhere-made* political decisions on not-fighting bark beetles and protecting forests represent a ("land-grabbing-like") interference with their (after the fall of the Soviet Union regained) forest *properties* (Petrova 2014; for comparable cases in which "modernization" and conservation were experienced as interventions into local sovereignty see Cellarius 2001; Lawrence 2009; Sikor *et al.* 2009; Blavascunas 2014; Blicharska and Van Herzele 2015). Pejoratively grouped together under the term "conservation elites" (Von Essen *et al.* 2017), forest scientists, conservationists and environmental policy-makers serve as the (discursive) class enemy, they are held responsible for the alleged "destruction" of the Bohemian Forest, and their positions are criticized as "sentimental and ill-informed urban biases at odds with the realities of rural life" (ibid., 166; reconsider chapter 9). Following von Essen *et al.* (ibid.) in their definition of "class privilege […] [as] achieved when one social faction succeeds in effectively co-opting the coercive powers of the state to advance its particular interests and agenda, at the expense of other factions with conflicting interests and agendas", conservationist actors and environmental bureaucrats are associated with belonging to a *privileged political class* with a (growing) influence on (European) policy-making, and with a growing counter-hegemonic impact on state forestry and related state institutions. Counter-hegemonic insofar as the political ties between the (public) forest sector, the wood industry, the ruling government and the state apparatus are close-knit in the Czech Republic (as they are in Austria if we think of the relationships between chamber of agriculture, agricultural ministry and the ruling government; Salhofer *et al.* 2000). Among other things, this may be a consequence of the country's (post-)socialist past, manifest in the fact that the state owns 53% of total forest area (eAgri/Ministry of Agriculture of the Czech Republic 2022), with a mixed forest administration system that is – in comparison to Austria – still relatively centralized despite reforms, restitutions and privatizations (Jarský *et al.* 2018; Hrib *et al.* 2021). Given the dominance of public forest ownership and top-down approaches in forest management and governance, the Czech State Forest enterprise (Lesy České republiky/LČR) is something like the *hegemon* in the national forest sector, and as such continues to shape the public perception, (master-)frames and narratives regarding forestry, establishing what Gramsci (1992) called a certain "common sense" of how to think about forestry (Lawrence 2009). Following that, it is not surprising that despite resistance from conservationists and other civil society actors the state's "master frame" of using forests for timber production is still dominant in the public discourse, with the Czech republic being one of the countries with a high agreement rate to the approach of managing forests first and foremost for timber production (Purwestri *et al.* 2023). This falls together with the country being one of the largest roundwood exporters in Europe, with a high share of productive forests in the form of secondary spruce stands (eAgri/Ministry of Agriculture of the Czech Republic 2022). Worded exaggeratedly, when the Czech state sees forests, it sees trees, timber and money, to express what James Scott (1998, 46) once problematized as a form of "state simplification", as a narrow vision of how "modern states" see nature and by that the "nature of forests" (Whitehead *et al.* 2007). Yet speaking of state visions and the state's "strategic selectivity" (Jessop 2001), we should not forget that the state is not a monolithic entity, but a condensation of social relations – relations that have greatly changed since the fall of the Soviet Union. With the communist Czechoslovakian state having been the hegemonic forester for the longest time, it is remarkable how a (both socialist and post-socialist) productivist state forestry regime allowed the establishment of Šumava NP. While some say that after the fall of the Soviet Union, and the subsequent liberalization and reorganization of the Czechoslovakian forest sector (Jarský *et al.* 2018), the Czech state was afraid of an uncontrolled privatization and selling-out of former state and military forests in Šumava and thus transformed commercial forests into national parks to protect them from foreign investors (Interview XIV), others argue that the establishment of Šumava was the political success of post-socialist green parties that benefited from and supported the transition to a post-productivist social metabolism with less and less demand for wood. Comparable to Austria where the forest transition relieved forests from socio-metabolic pressure, the Czech Republic of the late 1990s "could afford" to protect forests, particularly in peripheral areas with low accessibility and high harvesting costs. It is structural changes like these that constitute the (conditions for the) current Šumava-related "field of conflict" (Dietz and Engels 2018; see figure 100), that have an influence on why formerly-used forests became protected areas, why foresters had to make way for ecologists and environmentalists. With structural changes come other actors that shape the fields of power, with other fields of power come other narratives and institutions – narratives, actors and institutions that as in the case of bark-beetle-shaped Šumava constitute a setting in which a national park becomes pretext, proxy and driver for conflicts happening between and fueled by (essentialized differences in) political, economic, and ideological systems.

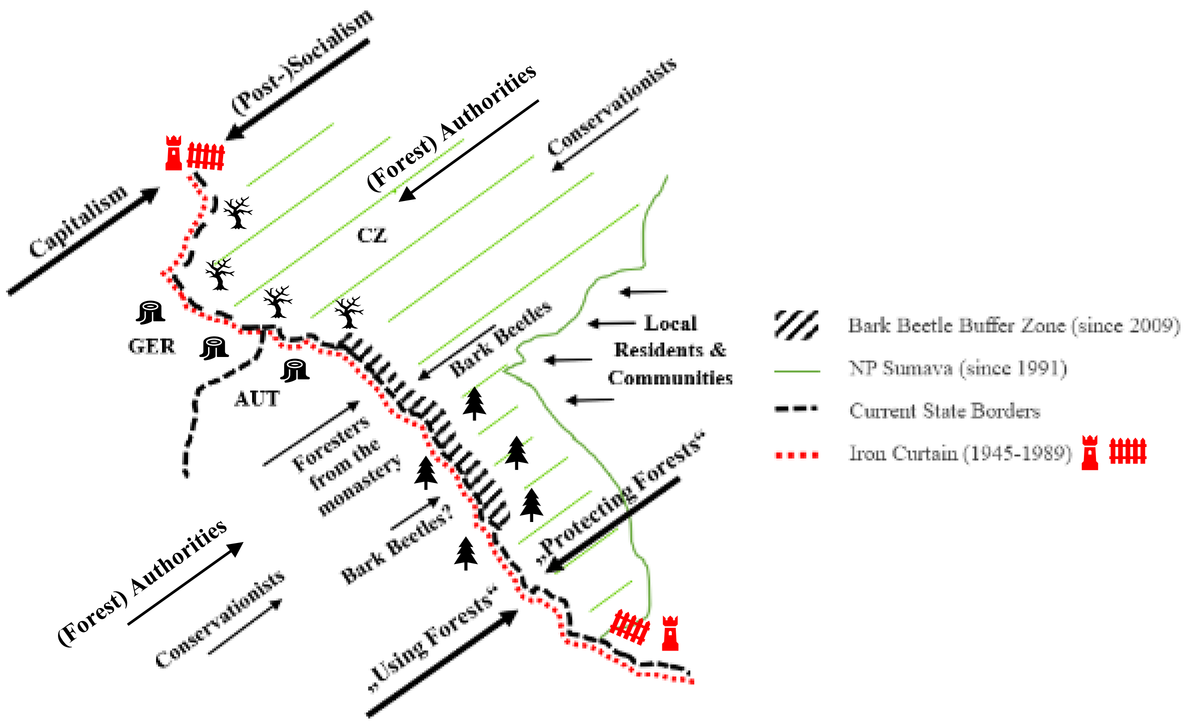


Fig. 100: Simplified, schematic depiction of selected actors, narratives, and specific fault lines in the bark-beetle-related "field of conflict" along the Austrian-Czech border. © Author, 2024.

10.3.2 On Multi-Species Conflicts: From the Bark Beetle-Capercaillie-Conservationist-Alliance to Other Multi-Species Interest Coalitions

As I have stressed at the beginning of this chapter, Multi-Species conflicts happen when world-making projects overlap, when Multi-Species interest coalitions bicker over the use, form, function and appearance of forests, over which part of the forest is made livable when, by whom, and at whose expense. As the Austrian-Czech Bohemian Forest comprises of much more lifeways than spruce, bark beetles and humans, there is no way of understanding who benefits (world-making-wise) from the bark beetle buffer zone without considering lifeways like the Western capercaillie, the lynx or roe deer. Apart from the more “typical” symbiotic partners that bark beetles and spruce trees share worlds and world-making interests with, I argue that there are a number of (usually less directly considered) lifeways that – in the face of forest and bark beetle management – enter into Multi-Species interest coalitions (figure 101, previous

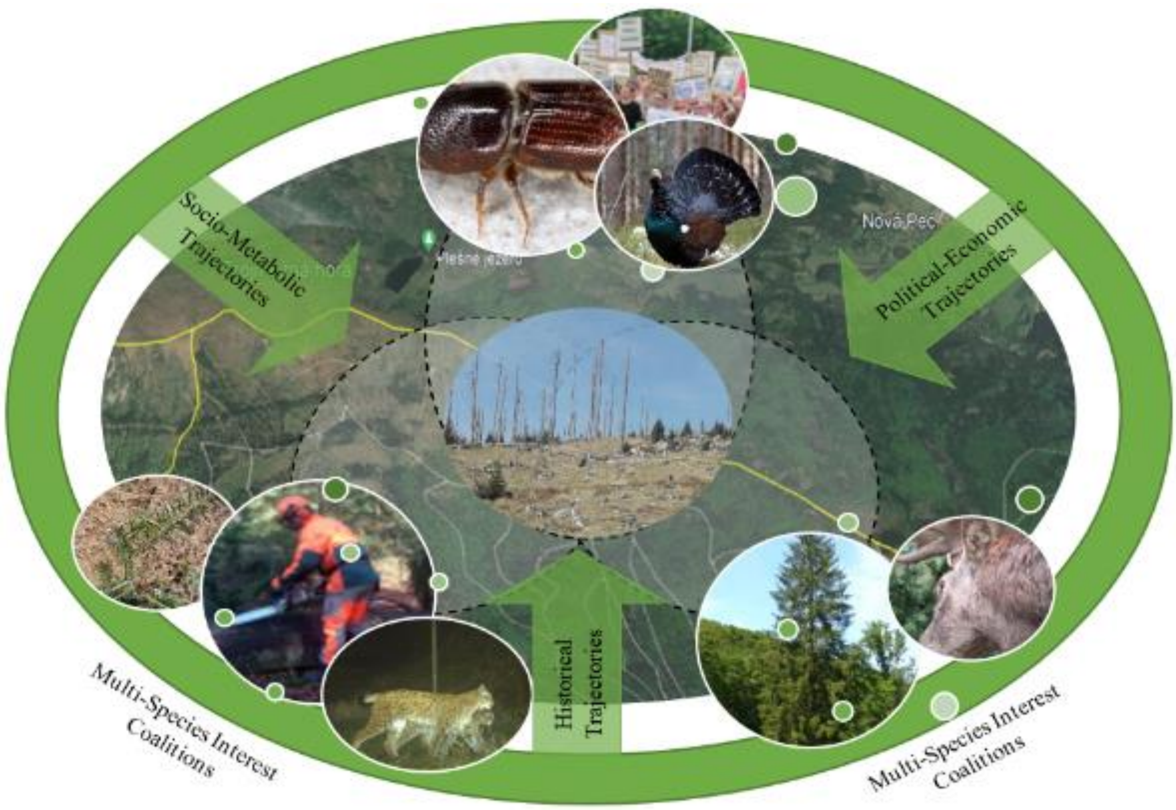


Fig. 101: Selected Multi-Species Interest Coalitions as identified by the author in the Bohemian Forest. Own depiction. Pictures of human, spruce, fir, bark beetle and tree skeletons © Author 2021-2024. Pictures of lynx, red deer, activists and capercaillie by Wikimedia Commons (CC 2.0) and taken from Bláha and Kotěcký 2015.

page), that – to speak the language of *Actor Network Theory* – "are enrolled and mobilized within specific socio-technical [and socio-natural] networks" (Staddon 2009, 165). In what follows, I will introduce some of these coalitions and their share in Multi-Species conflicts, emphasizing that identifying such coalitions is not the result of dividing different beings into fixed groups, but an analytical attempt to make sense of interactions of human and non-human actors in the Bohemian Forest.


Fig. 102: Male Western capercaillie. Source: Wikimedia Commons, https://commons.wikimedia.org/wiki/File:Capercaillie_(8751340764).jpg

The first being that comes to mind as an influential actor in Multi-Species conflicts in the bark beetle buffer zone of the Bohemian Forest is the Western capercaillie (*Tetrao urogallus*; figure 102, next page), an increasingly threatened large grouse with high habitat demands, only populating undisturbed montane and subalpine forests, with the largest Central European population in the Šumava NP (Storch 1995; Kortmann *et al.* 2018; Rösner 2022). There are many reasons for why the Western capercaillie is becoming rare, ranging from anthropogenically fragmented and disturbed habitats (Coppes *et al.* 2017) to a humanly-altered stand structure unsuitable for the grouse, relying on semi-open coniferous and mixed forest stands, with clearings and open spaces utilized for courtship behaviour (Jahren *et al.* 2016). In addition, capercaillies are repeatedly found dead in game fences, obstacles that they overlook during flight and in which they strangle or injure themselves (Baines and Andrew 2003). Given that these game fences have become necessary in many places due to excessive browsing by hoofed game, the result of too much feeding, too little hunting, and the absence of natural enemies such as wolf, lynx or bear, certain forms of human world-making turn out to be problematic when overlapping with the world-making of Western capercaillies (Jahren *et al.* 2016). The extent to which human and more-than-human histories are intertwined can be also seen when considering that capercaillies (esp. their clutches and eggs) are increasingly preyed upon by *mesopredators* such as foxes and martens, predators that are on the rise due to the human-caused extinction of *apex predators* such as bear, wolf and lynx (Feit *et al.* 2019). With regards to bark beetle management, Western capercaillies are important in the Bohemian Forest because their protection status (and their role as a flagstone species of almost *national significance*) shapes the form, legality and public perception of bark beetle measures in the Austrian-Czech border strips. As the forest warden on the Austrian side recalls, the situation regarding bark beetle measures in the adjacent Sumava NP is

> not so easy, because the capercaillie has established itself there, and now, in the Bavarian Forest National Park, Šumava National Park, and in the tiny Austrian part, around 500 capercaillies have been mapped, and they play a big role in the Czech Republic, they are under strict protection, they are almost like *sacred animals*, *they are not allowed to be disturbed at all*. And now it is the case that even if we have an interdepartmental agreement, and even though those responsible at the national park are willing to do something about bark beetles, there is still a national nature conservation law that questions whether capercaillies are disturbed by these measures (Interview III, L. 605pp.; italics by author).

In being such a "sacred animal", a "charismatic life" as Lousley (2016) puts it, the Western capercaillie receives a lot of attention and support, in recent years it has become an icon of the national park, an emblem for "undisturbed natural forests" (see figure 103). Institutionally, the Western capercaillie's popularity is reflected in its listing as an Annex I, II and III species of the European Council Directive on the protection of wild birds (79/409/EEC), as well as in its prominent position in the Czech (and Austrian) Nature and Landscape Protection Act. What makes the capercaillie have a say in the politics of the Austrian-Czech bark beetle border regime is its protection status as a being that is not to be disturbed under any circumstances (esp. not

Fig. 103: Male Western capercaillie prominently featured on a national park information board. © Author, 2022.

during rutting and mating season), meaning that the capercaillie's (*recognized*) world-making needs, spaces and temporalities have implications for the legality, form and extent of bark beetle countermeasures in the national park (see figure 104). Albeit the latter are allowed ever since the interdepartmental agreement and the changes of NP-related policies (in 2011), the Czech Nature Conservation Act stipulates that in the event of a disturbance to the Western capercaillie,

Fig. 104: Strictly Protected "Resting Areas" of the Western Capercaillie (purple) in Sumava NP right next to the Austrian border (red line). Source: NP Sumava, https://geoportal.npsumava.cz/mapa/klidove-uzemi-05112019/?c=-803146.35%3A-1185277.35&z=3&lb=osm&ly=hr%2Cad%2Cwms-2987%2Cwms-2988%2Cwms-2752%2Cwms-2750&lbo=1&lyo=

> bark beetle countermeasures become prohibited again, and it has even gotten to the point that […] the Šumava National Park had to pay a fine, […] because they had carried out a bark beetle management along the border, often anyway with a crazy effort […]. This means that it has gone so far that *standing* spruce trees infested by the bark beetle have been limbed and debarked […], but always only in teams of two, i.e., two-man teams, and only with hand tools, so that the whole thing is done quietly [not to disturb the capercaillie]. I mean that is really time-consuming, they climbed up into the treetops with ladders and then delimbed the trees from above with a hand saw, not a chainsaw, and then also debarked them by hand, really time-consuming. And not just a few trees, but thousands of trees (Interview III, L. 617pp.; italics by author).

That capercaillies and bark beetles have common interests and shared world-making spheres is shown here not only by the fact that both actors thrive under the auspices of nature conservation (i.e., benefit from conservation laws and more generally from the advocacy of nature conservationists), but also by the fact that capercaillies benefit from bark beetles creating open spaces in dense conifer forests, enhancing understory growth and accelerating (certain forms of) forest succession (Kortmann *et al.* 2018). Given that capercaillies prefer semi-open coniferous over mixed stands (Braunisch and Suchant 2013), bark beetles are particularly then a beneficial companion when they contribute to a rejuvenation of spruce stands and not to a conversion of the latter into deciduous stands. Assuming that the ESBB has no interest in exhausting its own long-term food supplies (by sustainably ridding an entire area of spruce), thus depending as much as capercaillies on the existence of older spruce stands, capercaillies and bark beetles appear here as unconventional partners. Partners that both benefit from the circumstance that foresters are not allowed to carry out clear-cutting at certain times and in certain zones of the national park. As I argue, conservationists are also a part of said interest coalition, and that in the sense of being able to show (to foresters) that it "makes sense" to leave bark beetle-damaged areas untouched as bark beetles improve biodiversity and thus contribute to the conservation of flagstone species like the Western capercaillie or the Eurasian lynx (Bláha and Kotěcký 2015). Differently: Because the capercaillie has high habitat demands, conservationists use the latter's presence and reproduction as a proof for the forest's biodiversity, *naturalness* and "protection worthiness", and with that warrant the (continued) protection of forests. In line with that, capercaillies are *used* as a kind of "biodiversity proxy" (Caro 2010), with biodiversity in turn "employed […] to justify and frame interventions *in* and actions *upon* the 'natural' world" (Breithoff and Harrison 2020, 39; cf. Heise 2016), and that on basis of a depiction of capercaillies as an animal whose preservation is of "public interest" (as opposed to the "commercial interests" of a *few* foresters) (Bláha and Kotěcký 2015, 46). It is exactly this drawing of other beings (and their world-making) into interest coalitions, into "a network of relationships in which social and natural entities mutually control who they are and *what they want"* (Callon 1984, 203; italics by author) that shapes Multi-Species conflicts.[xciii]

Another being drawn into and formative for Multi-Species conflicts in the Bohemian Forest is the Eurasian lynx (*Lynx lynx*), a being whose appreciation has changed quite considerably over the last hundreds of years (see figure 105, next page). Wiped out in the 19th century as "man's competitor" (Breitenmoser 1998), and fiercely fought by local farmers and hunters immediately after its successful reintroduction in the 1980s (Breitenmoser 1998; Wölfl *et al.* 2001), the lynx has long since developed into an integral part of local Multi-Species interest coalitions, with the largest Central European population in the transboundary wilderness area of the Bavarian and Šumava NP. Benefitting human foresters more than harming them (Interview III), lynx prey on roe deer (*Capreolus capreolus*) and in doing so have a regulatory influence on the latter's distribution and population size/density (Heurich *et al.* 2012), contributing to reduced browsing pressure on trees like fir or beech – trees that foresters want to establish as alternatives to spruce. Albeit "the influence of lynx on its prey can differ significantly and can be subject to a high degree of variance depending on the initial conditions" (ibid., 574), the lynx's world-making limits and shapes the world-making scopes and possibilities of roe deer, particularly after a time span of almost hundred years in which roe deer populations in many parts of the Bohemian Forest and Central Europe highly increased due to the lack of natural enemies, the increase in feeding and the reduction in human hunting (Andersen *et al.* 2000; Burbaitė and Csányi 2009). Regarding the lynx's beneficial impact on deer population, natural regeneration (esp. of fir), tree species composition and forest economics, the regional forest warden emphasizes that

Fig. 105: Eurasian lynx in the Bohemian Forest. Source: https://www.europarc.org/case-studies/transboundary-research-ecology-eurasian-lynx-ungulate-prey-bohemian-forest-ecosystem/

> you can clearly see that on the Bohemian Forest side, the fir trees are now actually growing [because of reduced browsing pressure due to lynx, wolves and intensive hunting] […] That means we have a much higher share of fir in the natural regeneration, and I am convinced that fir […] will play a major role in the next generation of trees. There are nice studies that show that these combined spruce and fir stands are more productive and economically more interesting than pure spruce stands" (Interview III, L. 382pp.).

Of course, if one asks hunters what they think of the lynx in the Bohemian Forest, of a predator that kills one of their most valued and most "cared for" game species, many of them are not particularly enthusiastic. This is because lynxes not only contribute to a reduction, but also a displacement/relocation of game populations, thus making hunting less productive and more difficult (Interview III). If we look at changes in the lynx's popularity in the Bohemian Forest, we see that hunters "not being enthusiastic" definitely represents an improvement in comparison to how the lynx was negotiated in the 1980s and 1990s, with

> "voices in the hunting community back then saying that if a lynx comes before my eyes, I will shoot it down and that is it. But now with the appearance of the wolf the lynx is somewhat of a lesser [evil] […], you no longer hear that someone wants to kill a lynx, but the voices go in the direction of saying, yes the lynx, we have come to live with it, this animals *suits us*, we have sort of accepted it, but *the wolf is the problem now*" (Interview III, L. 535pp.; italics by author).

This as well is a feature of Multi-Species coalitions and conflicts, namely that some lifeways rise in the respect of humans because comparatively "worse", i.e., "more feral" lifeways appear, because environmental narratives and related "languages of valuation" (Martínez-Alier 2002) change. While a few decades ago the lynx was portrayed as the primary threat to local game (and livestock; e.g., Stahl *et al.* 2001), today lynxes are increasingly recognized as ecological partners in reducing game numbers and facilitating the natural regeneration of marginalized tree species like fir or beech[122]. That said, we need to be aware of the fact that interest coalitions are characterized by differences in how long and for what purposes world-making interests are shared. At the example of fir, we see that *who benefits when species assemble* clearly depends on context, perspective and timeframe: Accordingly, fir may benefit from reduced game numbers, but only under certain conditions, meaning that without seed trees or enough crown cover/shade, fir has little chance of making it (no matter how low browsing is). The same holds true for the impact of the ESBB's world-making on the world-making of non-spruce trees, an impact that depending on timeframe can be both positive and negative[xciv], that plays out

[122] Related to that, lynxes and conservationists have a lot to thank each other for. Whereas lynxes can stroll through today's Bohemian Forest because of being reintroduced by nature conservationists, because of being protected by certain laws, because of finding large undisturbed habitats in the form of national parks, conservationists can adorn themselves and their protection successes with lynxes.

differently depending on who gathers when and under which (ecological) circumstances. In other words, the complexity of how and why world-making practices overlap, and which Multi-Species interest coalitions benefit from these processes of overlapping, entangling and re-assembling, is a question of perspective, and context, it is ultimately a question of how species assemble in place, space and time.[xcv]

To summarize, I have argued in this chapter that human and more-than-human histories are intertwined in the Bohemian Forest, that the border strip between today's Upper Austria and Southern Bohemia is contested because of historical world-making legacies and the current projects of humans, bark beetles, spruce trees, capercaillies and lynxes making worlds and claiming forests. In sketching out the processes that transformed the *Iron Curtain* into a *Bark Beetle Buffer Zone,* I have explored the political-economic and more-than-human dimension of land use trajectories in and around Šumava, specifically looking at the contestations around the alleged spread of bark beetle infestations from the NP Šumava to the commercial forests of the monastery Schlägl. Albeit different stakeholders from the monastery over the Austrian forest authorities to the national park itself argue that the conflicts around a missing bark beetle management are over, that the interstate agreement between Austria and the Czech Republic has brought peace to a burdened border region, visiting the area tells us something different, namely that the bark beetle buffer zone comes as a biopolitically potent security infrastructure, as a violent more-than-human borderscape in which trees are killed, bark beetles are prevented from moving freely, and capercaillies are protected at great cost. As I have shown with this chapter, bark-beetle-related Multi-Species are rooted in and feed into a complex politics of world-making, belonging, (bio)security, responsibility, and conservation – despite all the emphasis on transboundary conservation projects, disturbances like bark beetle outbreaks repoliticize the question of how different beings want, can and must live together.

V. What Remains *When Species Assemble*: A Conclusion for Ecological Justice in Forests

> "My idea is that every specific body strives to become master over all space and to extend its force (its will to power) and to thrust back all that resists its extension. But it continually encounters similar efforts on the part of other bodies and ends by coming to an arrangement ("union") with those of them that are sufficiently related to it: thus they then conspire together for power. And the process goes on" (Nietzsche 1968, 340/§636).

What Friedrich Nietzsche has famously coined as *the will to power* fits both the conclusion and the outlook of this work. The conclusion insofar as this dissertation has shown that different beings such as bark beetles, humans and spruce trees never act alone, but only attain their power through "arrangements" (through assemblages as I would put it); that precisely because of encountering others (and their power efforts), there are limits to one's world-making. In other words, every creature's *will to power* (here: its *will to make worlds livable*) has limits that lie in its relationships with others, and if living beings want to achieve anything at all, they need to "conspire *together* for power" (ibid.). Having familiarized ourselves with bark-beetle-related Multi-Species conflicts and their constitutive effect on forest landscapes and assemblages in Upper Austria, we realize that there are no alternatives to togetherness. Adhering to the "master model" or "master rationality", as Plumwood (1993, 195) has called it, we can try as much as we want to detach ourselves from the "web of life", to deny or even counteract our entanglements with and dependencies on others (by transforming mixed forests into spruce plantations, by catching and poisoning bark beetles, by discrediting and/or killing those who stand in the way of "human progress"), but in the end always "fall back" on the fact that human world-making alone is not enough to sustain ourselves or our conditions of livability (Haraway 2016). As Marilyn Strathern (1988) once put it, we are "dividuals", and not independent individuals. Bark beetle outbreaks are so interesting because as feral happenings they show how limited and incomplete humans' control (over forests) is (Tsing 2016). As a contingent constellation of actors, assemblages and world-making (practices), outbreaks are an impressive example of what happens when the *Plantationocene* (establishing and normalizing pure spruce stands), *Capitalocene* (perpetuating capitalist forestry and its market fixation) and *Proliferationocene* (making bark beetles thrive through feral ecologies) coalesce. When spruce plantations are wiped out in droves, when forest owners sell their forests due to excessive demands, when bark beetles produce three filial generations per year, we see that bark beetle outbreaks are more than just an apolitical one-off gathering of different beings. They are a call to rethink how we treat forests and practice forestry; as a disturbance, they "realign[s] possibilities for transformative encounter" (Tsing 2015, 152), and in the wake of these possibilities, we may cultivate hopes for a more just forest *for all*.

What is left for me to do as the last step of this journey is to look back at where the winding forest path has led me and to reconsider whether I have answered all the questions with which I have embarked on the journey. This is followed by a proposal for "ecological justice" in forests, for a different way of thinking about and practicing forestry and forest conservation.

V.A Looking Back: Answering My Research Questions

One aspect of answering my first and my second research question was to determine the economic, ecological, political, social and historical <u>conditions</u> *under* and *through* which bark beetles, humans and spruce trees gather and constitute relationships that are formative for bark beetle outbreaks. It is not without reason that in my three entry point chapters (4-6) – in those chapters that were dedicated to providing a description of who assembles with whom and for what purpose – I discussed different beings' world-/forest-making projects under the auspices of the *Plantationocene*, *Capitalocene* and *Proliferationocene*. Here, my aim was to show that the specific constellation of actors and assemblages that makes spruce trees *susceptible*, humans (economically) *vulnerable* and bark beetles *proliferating*, was and is driven by

> 1) the *plantationocenic* establishment of pure spruce forests as part (and result) of the historical and ongoing process of the human domination and simplification of Multi-Species forests; of plantations that, once in place, are appropriated and continued by spruce (f.ex. chapter 4.3.1);
>
> 2) the *capitalocenic* subjection of multi-functional forestry practices to a market-driven, yield- and spruce-fixated timber production system (f.ex. chapter 5.2), and
>
> 3) the *proliferationocenic* rise of bark beetles as feral actors, thriving as unintended consequences of human world-making (and their manifestations in climate change and respectively susceptible forest stands) (f.ex. chapter 6.4).

A second aspect then was to show *how* these conditions shape *how* beings assemble, and to scrutinize in how far this "how" depends on many things. In the chapter on spruce's forest-making, I have emphasized that spruce's practices of making worlds livable as well as its relationships with others play out very differently depending on whether spruce grows in a plantation setting (beyond the tree's natural range), or whether spruce, as part of a mixed forest, has to share space and resources, i.e., world-making opportunities, with others. While we have seen that spruce has the power to change the local (forest-ecological) conditions to an extent that makes it difficult for other-than-spruce assemblages to prevail, we have also seen that certain sites are either not suitable for spruce or come at the cost of great susceptibility to disturbances such as storms or forest insects. What we here refer to as disturbances are, especially in the case of biotic agents, simply (necessary) opponents of spruce, constitutive parts of the spruce assemblage, and it is the different relationships of spruce to say nun moths and pathogenic fungi that shapes how spruce can position itself in relation to humans and bark beetles. Despite the *Plantationocene*, *Capitalocene* and *Proliferationocene*, I have also pointed out that the fate of spruce in Upper Austria is by no means a lost case, where higher temperatures and more aggressive bark beetles would lead to an ever-increasing suffering of spruce. Despite all pessimists and nay-sayers, it is not unlikely that spruce will find ways to continue to play an important role in certain regions – a role that it *must play* if we think of humans' dependence on spruce.

In the second chapter on the assembling and interactions of selected outbreak participants, I have turned to humans and their relationships with one another, as well as to the forest they own/manage. While I have tried to reconstruct the historical processes that made human forest users "spruce foresters", that is timber producers, I have also shown that despite the rationalization and capitalization of forestry, the personal connection to forests has most often remained intact and intimate, shaping the way that forest-making plays out as something that means both effort and leisure. Of course, there are significant differences in how foresters manage their forests, and in how they use that forest: as the main source of income, as a hobby, or as an "additional income" as in the case of many farm-forestry enterprises. In line with that, I have discussed selected modes and strategies of human forest-making in Upper Austria (and beyond), and what these forest-making practices mean for humans' relationships with spruce, bark beetles and others. In terms of how forest management affects how different beings assemble through bark beetle outbreaks, we can say that humans' silvicultural and management-related decisions have a huge influence on who can be present and make worlds in a particular forest area, in other words: on who can gather at all. In the last part of the chapter, I have pointed out that human forest-making does not happen in an economic, political and historical vacuum, but that the (timber) market as an agentic assemblage of assemblages shapes the form, extent and the distribution of the benefits of human forest-making. As I have stressed, the market is not a neutral entity, but a consolidation of power relations, of historically grown inequalities, and we can take from the conflicts between sawmill industry and forest owners/managers that the damages and benefits from the production, purchase and processing of bark beetle-related damaged wood are very unevenly distributed.

Finally, we have looked at how different forest beings assemble through bark beetle outbreaks from the vantage point of the European spruce bark beetle. We have seen that the lifecycle and lifeway of Ips typographus with its voltinism is both vulnerable to setbacks, but also predestined for rapid population growth. We have also seen that although we constantly speak of outbreaks, these are the exception rather than the rule, and that many factors and organisms have to coincide for single infestations to become epidemic outbreaks. In the case of the dependence of bark beetles on ophiostomatoid fungi, the cooperation goes so far that we can ask ourselves whether we can at all speak of the bark beetle as an independent organism, so much does the success of infestation and survival of bark beetles depend on the symbiosis with these fungi. Moreover, we have seen that world-making comes with a rhythm, that the way in which different beings make worlds livable is synchronized with the world-making practices of others. For example, populations of bark beetle antagonists such as ant beetles or parasitoid wasps tend to increase as bark beetle populations increase. Where spruce trees have shown us the *place-making dimension* of world-making in the continuation and active creation of "spruce places", the (short- and long-term) interactions of bark beetles and their assemblage partners have sensitized us to the temporal dimension of *world-making as time- or legacy-making*. Part of *how* beings assemble is *the order in which beings appear* at the scene, as well as the "time it takes" for certain beings to make worlds livable. As we saw when studying the dynamics of why bark beetle outbreaks come with conflict, messing with the time expectations and temporal horizons of different actors, for instance with the temporality of human planning, is a fundamental part of why overlapping world-making projects produce conflict, of why foresters have problems with bark beetles. In the last part of the chapter, I have dealt with the feral power of the ESBB, its ability to disrupt the (forestry) order of things and to become a political actor – an ability that is only so pronounced under the conditions of the *Proliferationocene*.

Having moved from the more general description of the assembling of bark beetles, humans and spruce trees to a more explicitly political-ecological analysis of what makes this assembling controversial, of what lets the (human) sense-making regarding the assembling differ, I have used chapter 7 to arrive at first answers for my third research question – that is how human forestry stakeholders negotiate the relations between and among different forest assemblages (particularly the human-bark-beetle-spruce nexus), and how this is related to power relations in (Upper) Austria's forest sector. Based on that, I have shown that the bark-beetle-spruce crisis comes from and contributes to the re-politicization of forests, that the question of what to do with forests in the face of proliferating bark beetles and ailing spruce has the potential to produce and/or increase (existing) contestations over/around political forests. For heuristic purposes, I have situated contrasting human perspectives on bark beetles and spruce along a continuum from "forest use" to "forest protection", arguing that those who promote intensive, human-oriented forestry perceive bark beetles primarily as an economic threat, as a threat to the human control of forests. In contrast, those who criticize business-as-usual forestry (and lean towards the protection of forests), portray bark beetles as ecological partners and hail them as drivers of a long-needed forest conversion. In terms of how the juxtaposition of these different perspectives helps to answer my third research question, I have made the point that the different positions that forestry stakeholders take (or are structurally assigned to) shape their ideological standing, their bark beetle response strategies, their economic vulnerability, sociocultural understanding of forestry etc., and by that people’s takes on bark beetles and spruce. Precisely because the (discursive) negotiation of the aggravating factors/reasons for the recent frequency and severity of epidemic bark beetle outbreaks involves examining one's own actions or those of predecessors, many representatives of relevant interest groups find themselves in dissonance; they have their problems admitting that they or their predecessors may have made mistakes that now haunt them (remember answers in appendices A29).

The question of who is to be held responsible for the way in which humans, spruce trees and bark beetles have recently gathered in and beyond Upper Austria is linked to the question of who disproportionately benefits and suffers from this gathering. As much as we have seen that the way in and through which species assemble depends on ecological conditions, political economies, historical legacies, cultural processes and larger socio-metabolic trajectories, we have found that the question of how Multi-species conflicts look like and how they unfold as a consequence of how species assemble cannot be answered uniformly – the conflicts are different from place to place, from assemblage to assemblage. Yet, there are parallels and commonalities, and some of the fields of conflicts that we have encountered in our research sites are manifestations of conflicts that affect forests and forestry throughout the entire country, if not continent – fields of conflict that are shaped/driven by the fault lines between forestry and nature conservation, between land use and nature protection/restoration, between productive and welfare forest functions. Having focused on the second part of my first research question in chapter 8–10, namely on the exploration of *how bark beetle outbreaks trigger and/or exacerbate conflicts across, between and among* (forest) *assemblages*, one conclusion here is that the way in which a landscape is inhabited and used by different living beings gives rise to (intra- and) inter-species solidarities and Multi-Species interest coalitions, and that these solidarities and coalitions play a role in who is “on whose side” and why in the case of incompatible world-making practices and projects. Given that the way in/through which landscapes are inhabited, shaped and claimed by different assemblage coalitions is not only structured by the different beings' (biological, social and ecological) world-making requirements, their assemblage positions and their relationships with one another, but on the part of humans also by Forest Acts, conservation laws, land use customs, hunting regulations, environmental narratives etc. (i.e., by institutions and discourses that are biopolitical in that they propose who gets to live and who gets to die, in that they create specific semiotic-material connections between humans and more-than-humans), we have done well to approach forests as "politicized environments", as "political forests", as arenas of (bio-)political ecologies. Only this way have we been able to recognize that the conflicts over bark beetle outbreaks in the Sauwald, the Kalkalpen National Park and the Bohemian Forest are only partly about bark beetles, but that they are rooted in and feed into a complex politics of world-making, belonging, (bio-)security, responsibility, and conservation, i.e., into the messy politics of the coexistence of different living beings, assemblages and interest groups.

In the Sauwald (chapter 8) with its largely peasant-owned and fragmented forest patches, we have seen how bark beetle outbreaks undermine existing bonds of trust and solidarity (between human neighbors), how a complex blame game unfolds around the question of who is "response_able" (i.e., able of responding) and responsible for them. This is well in line with earlier findings of researchers that have demonstrated how forest insect disturbances such as bark beetle outbreaks have the potential to "expose vulnerabilities and challenge relationships, trust, and confidence" (Flint *et al.* 2009, 1174), particularly so in rural-farming contexts where, due to a specific moral economy characterized by social proximity, a tight network of mutual obligations and a certain skepticism towards "non-traditional" modes of forest-making, relationships are subject to great demands, and are thus, as I have argued, particularly susceptible to disruption.

In the Kalkalpen National Park (chapter 9), Upper Austria's only national park with huge relatively undisturbed (mountainous) forest areas, my focus was less on neighborly relationships (albeit the neighborship to a national park is one aspect of why world-making practices in and outside of the park appear incompatible), but more on the Multi-Species interest coalitions that form through, but also exacerbate "Multi-Species conservation conflicts" over the question of who and what is being protected from whom and for what purpose – humans from spreading bark beetles, or forest communities from the influence of humans. Following that, I have organized my discussion of bark-beetle-related fields of conflicts around two larger interest coalitions – coalitions that fall into proponents and beneficiaries of what I grasp as the "conservationist status quo" on the one hand, and opponents and (alleged) victims of the latter including the park's compromise-oriented bark beetle management on the other hand. Whereas I have shown that the conservationist status quo is upheld by and beneficial to conservation scientists, environmental bureaucrats and their more-than-human coalition partners such as golden eagles or certain beetle species, opponents and more-than-human losers of the park, its bark beetle management, or of nature conservation in general, have a shared interest in extending the bark beetle management, or even in bringing back "good old" forestry. As I have shown, conservation conflicts are not limited to humans fighting about what to protect and what not, but are based on the assembling and enrolment of different beings through and into Multi-Species interest coalitions – conservation such as the creation, maintenance and management of a national park is a contested Multi-Species project.

Finally, I have turned to bark-beetle-related Multi-Species conflicts on the high ridge of the Upper Austrian Bohemian Forest, and here to dynamics around the establishment of a "bark beetle buffer zone" along the Austrian-Czech state border, a biopolitically-powerful more-than-human borderscape that recharges the former Cold War death strip with essentialized attributions of difference. Even though some of the involved conflict actors and dynamics appear comparable to those that characterize the fields of conflict in the Kalkalpen National Park – because here too the supposed inaction of a national park leads to discontent among conservation-critical forest neighbors –, what makes the Bohemian Forest case specific is that at the height of tensions due to the beetle's "border crossing" entire nation states were set against each other, and ministry delegations travelled back and forth between Linz, Prague and Vienna. What we have also seen through the Bohemian Forest is that human and more-than-human border histories are more intertwined than we think; that the border is more than a construct in people's minds, but a material limit to and a manifestation of more-than-human world-making. Revived as a security infrastructure, now against spreading bark beetles, relationships between human and more-than-human actors have made the border deadly again – at least for infested spruce trees and their bark beetle inhabitants.

What all three chapters have shown is that Multi-species conflicts are rooted in specific assemblage and relationship constellations; that in a "world of many worlds" in which world-making practices and projects constantly overlap, conflicts never originate from and never affect just one single being. Bark beetle outbreaks trigger Multi-Species conflicts insofar as the highly preconditional gathering of proliferating bark beetles (challenging existing forest assemblages in their composition and function), susceptible spruce trees (dying when they are needed by humans and others), control-obsessed humans (relying on spruce whilst being societally undecided on what to do with forests in the age of the climate crisis), browsing deers (shaping tree communities), conservation-relevant/protected species (such as capercaillies or lynxes) and many others has consequences for how forests unfold as Multi-Species landscapes. These consequences are insofar political as they affect the power-laden coexistence of different beings; they are driven and accompanied by inequalities and injustices in terms of how certain beings make worlds at the expense and benefit of others.

In terms of the *theoretical contribution* of my dissertation, I have proposed and implemented a viable and comprehensive approach to re-thinking and re-configuring political ecology, to extending its focus and analytical toolkit beyond the conventional anthropocentrico-Marxist categories of class, capital, and human politics. Having operationalized concepts like assemblage, world-making[123], interest coalitions and ecological justice (and having outlined ways to link these concepts through a "field of conflict" analysis), I have designed my Multi-Species Political Ecology framework to be applicable to all kinds of cases in which different beings come together under the imprint of power relations, structural inequalities, conflicting interests and overlapping world-making practices, in short: to all kinds of cases in which there are tensions *when species meet*[124]. At my own example of bark beetle outbreaks, I have shown that good multi-species (or more-than-human) political-ecological research depends on crossing and synthesizing disciplines; it can only succeed if it takes on the challenge of extending a power-critical, discursive and ethnographic approach to the (often apolitical) natural sciences, and of "ecologizing" the sociocentric and sometimes overly abstract humanities, that is of re-opening the latter to (socio-)ecological questions (without reducing them to crude "socio-biologism"). In addition to systematizing and repositioning existing concepts and approaches from more-than-human geography, political ecology and Multi-Species ethnography, I have been one of the first Central European environmental anthropologists to look at biotic forest disturbances from an explicitly political ecology perspective, and to take forest insect pests as a starting point for an analysis of conflicts in, around and over forests. Although my work was confronted with numerous limitations (lack of

[123] Having found a common ground to communicate to and be taken seriously by both social and natural scientists, my dissertation has put world-making at the center of inquiry, a category that is biological, ecological, social, cultural and historical all at the same time, that offers a way to focus on the making of material-semiotic networks in which all beings, things and ideas are suspended.
[124] Just to mention a few examples: An MSPE of the kind that I developed in this thesis could be used to analyze the conflicts surrounding the return of the wolf in Central Europe, the emergence of zoonotic virus epidemics such as Covid-19, the struggles over the displacement of native by invasive species etc. (cf. Steiner *et al*. 2022).

implementation of a “truly” multi-sited approach through largely limiting myself to Upper Austria; reduction of the complexity of assemblage configurations for analytical purposes; methodological deficiencies due to the non-representativeness of the survey and too few ethnographic long-term stays), I am hopeful to have made a significant contribution to the study of the contested nature of changing forests. If my dissertation has succeeded in sensitizing the reader to the fact that world-making does not mean that individual beings are able to make worlds as they please, but that world-making depends on a being’s position in webs of relations, and if it has managed to convey that these webs are shaped by an asymmetrical distribution of world-making powers, possibilities, risks, resources and benefits, I am already satisfied.

V.B Looking Ahead: Towards a Call for Ecological Justice, “Convivial Conservation”, and a "More Mindful Silviculture"

The fact that there are conflicts and (short-term) winners and losers when beings gather is neither bad nor unusual, and conflict is as an essential and productive part of cohabitation, of how we *become with* each other as cosmopolitical beings. Ant beetles appear to be winners when they prey on bark beetles, bark beetles when they colonize a spruce tree, roe deers when they feast on young fir trees – albeit all of these relationships are characterized by power disparities and (deadly) violence, they are not a priori unjust as they represent a necessary condition for the survival and *becoming-with* of the involved relationship partners, they do not lead to the permanent extinction of either partner at a population level. I argue that it becomes problematic (and interesting for political ecologists) when unequal relationships between different beings become structural, when relationships (re-)produce permanent forms of oppression and subjugation. If humans are always the ones who have the upper hand in the making of forests (and enforce this making through systemic violence such as the simplification and domination of forest landscapes), if spruce is always the tree species that manages to outdo other tree species, in short: if certain beings get into structurally secured positions that enable them to systematically suppress, kill and displace others, to overtake entire ecological spaces, and to destroy others’ social and biological refuges, then a one-time world-making conflict becomes a question of ecological (in-)justice. Even though I have hardly taken a normative position on matters of justice so far, it is an aim of this dissertation to go beyond the description of bark-beetle-related Multi-Species conflicts and to offer a proposal for how a more just, more mindful and less structurally violent coexistence of spruce, humans, bark beetles and others could look like. Here, the ecocentric principle of “ecological” or “interspecies justice” as formulated by Wienhues (2020; see again chapter 2.2.4) is promising because it provides guidance for a fair (re-)distribution of world-making spaces, for how worlds could be shared more equally. Following that, the basic idea of ecological justice is to make space for more-than-human actors and their assemblages, that is to *let* more-than-humans have and make worlds in ways and to an extent that causes the least possible harm to the greatest number of beings, assemblages, ecosystems and habitats. Giving (back) space to more-than-human assemblages (similar to “rewilding” (Carver *et al.* 2021), or approaches grouped together under the signifier of “nature restoration”) does not necessarily require the establishment of enclosed protected areas without any human influence. The many injustices and atrocities committed in the name of conservation (as well as the reservations and tensions that I have traced in this dissertation around local foresters feeling excluded or disadvantaged by national parks) should have shown us that ecological and environmental justice can only be achieved together (Wienhues 2020, 4). In line with that, it cannot be an option to exclude people from more-than-human world-making spaces, especially not those who are already marginalized or those who, as former land users, are emotionally attached to and know how to live in and through these places without causing much harm. Rather, what we need is a different understanding of conservation as “convivial conservation”; a form of conservation that puts ecological and environmental justice at the center, that acts as a counter-program to the capitalist enclosure and commercialization of “nature”, that involves (instead of excludes) residents by reconciling conservation and local value creation through “promoted (instead of protected) areas” (Büscher and Fletcher 2019). Instead of employing a handful of people as scientists, administrators and rangers, offering paid tours and letting experts make the important decisions, “promoted areas” allow for cohabitation and for the (limited) use of the area’s Multi-Species communities for subsistence and public welfare purposes. Ultimately, “convivial conservation” is based on an acknowledgment (and not a negation) of the mutual dependencies between human and more-than-human beings and their world-making projects. Striving for ecological justice (in conservation as well as in forestry) is thus all about finding compromises between human and more-than-human world-making (demands), between human land use and nature conservation;

ecological justice is essentially about the question of how different beings inhabit their surroundings without depriving (all) others of their world-making opportunities. Where legal constructs, socio-cultural customs, forest policies and land use traditions prevent such compromises, because people are coerced by the Forest Act to remove every single tree infested by bark beetles (and thus to rip apart Multi-Species communities, to kill bark beetles *and* their antagonists etc.), or because people are forced (knowledge-wise, economically as well as in terms of seed plant availabilities) to plant (only) spruce, ecological justice becomes difficult. We also see in the existing subsidy schemes, in the political proposals from diverse interest groups (with their vested interests such as the Chamber of Agriculture, the Austrian biomass association etc.) as well as in the political economy of the forest sector that homogeneity and simplicity is still preferred over diversity and complexity, that economic and technical feasibility is given priority over ecologically just and biodiversity-rich forests. If justice is to be achieved for more-than-human forest dwellers, if bark beetle outbreaks are to be understood as a legitimate cosmopolitical gathering of different beings, then capitalist forestry, with its narrow gaze on capitalizing *Cheap Nature*, must better change today than tomorrow. Against this background, we must recognize that ecologically just interspecies-compromises regarding a fair distribution of world-making spaces/possibilities are only possible when (certain) human groups reduce their exorbitant pressure on ecosystems, when people tackle what they should have been doing for decades, namely to degrow a materially-eutrophicated capitalist social metabolism (Kallis *et al.* 2018), to dismantle the (Global North's) imperial mode of living (Brand and Wissen 2021), and to live within societal (planetary) boundaries (Brand *et al.* 2021). We can talk about other (non-alienating) ways of relating to one another as much as we want, about understanding power as relational and individual actors as assemblages, but as long as the capitalist mode of production (and other growth-based mode of productions such as "state socialism") has forests and forestry in its extractivist clutches, ecological justice and less violent forms of relationships between humans, bark beetles and spruce trees are next to impossible (cf. Büscher 2022).

With regards to forest management and silviculture in the face of and challenged by bark beetle outbreaks, the path to ecological justice must not mean the abolition of all forms of forestry, as some might glean from what has been said so far. In fact, humans may continue to use forests, but only in a way that preserves spaces and possibilities for more-than-human world-making, and only to an extent that allows more-than-human communities to deal with, adapt to and recover from human interventions. If humans can guarantee that their forest-making does not (drastically) reduce biodiversity, destroy niches and fragment habitats, there is no reason why they should not be allowed to plant trees and (carefully) harvest those (in ecologically reasonable quantities). However, human forest-making cannot and should not mean making other beings' world-making impossible, and people who strive for ecological justice in the forest will have to get used to bark beetles infesting trees, to other-than-spruce trees getting their share in the forest, to rot-inducing fungi colonizing spruce stems, to game feeding on the natural regeneration, to large predators roaming forests. In short, human forest-makers would do well to accept that they are just one among many forest-makers, that their demands on forests are no more important than those of other beings. With that in mind, humans' (new) role in and for the forest is not that of an omnipotent master, but that of a humble steward and an astonished observer. One strategy for nourishing humbleness and astonishment is to challenge anthropocentrism and *human exemptionalism* whenever it determines how we see and for whom we make worlds, to decenter ourselves (and our claims) vis-à-vis other living beings, to understand others neither by belittling/demonizing nor by anthropomorphizing them. Moore and Kosut's (2014, 5) call for "intra-species mindfulness" is here helpful, with intra-species mindfulness as "a practice of speculation about non-human species that strives to resist anthropomorphic reflections. It is an attempt at getting at, and with, another species in order to move outside of our human selves – while also recognizing that both ‘human’ and ‘other’ are cultural constructions”. Applied to silviculture, mindfulness is key as well, and not without reason renowned forest ecologist Suzanne Simard (2013, n.p.) has many times called for a more “mindful silviculture”:

> “In the practice of silviculture, [mindful silviculture] means integrating observation, learning, knowledge, understanding and monitoring to make holistic management decisions in an uncertain environment. It means practicing silviculture with our minds rather than our guidebooks or institutional memes. It is similar to adaptive management in that it is based on a learning process to improve management outcomes. However, practicing mindful silviculture also requires intentional and holistic integration of the socio-ecological-economic system so that it remains adaptive and harmonious in its functioning. Mindful silviculture is responsive to uncertainty, working with it for the flexibility and diversity it brings rather than reducing it for short-term outcomes”

It is this embracing of change and uncertainty, and with it the embracing of conflict and the subsequent search for compromises regarding the sharing of habitats and living arrangements, that requires humans to develop and advance certain (ethical) skills and abilities: The ability to treat fellow creatures with respect and awe (even if they may drive us crazy, oppose our world-making, or occasionally threaten our lives); the skill to *make forests usable* while remaining sensitive to the forest-making needs of others; and ultimately the ability to tell ourselves different stories in and about the forest – stories in which bark beetle outbreaks are not grim economic catastrophes, but, as this work has tried to show, wonderfully complicated gatherings of many different assemblages, actors, interests, and powers.

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Formal (Recorded) Interviews

For a full list of (anonymized) interview partners see appendices, A6, p. 398

Personal Communication/Informal Interviews

pers. communication, H.R., 28.02.22: Conversation with Hubert Renner, forest manager, Location: Natternbach.

pers. communication, F.S., 29.03.22: Conversation with Forest Owner on the Phone.

pers. communication, N.R., 23.04.22: Conversation with a Forest Warden. Location: Close to Hartberg, Styria.

pers. communication I.O., 04.11.22: Conversation with Iris Oberklammer, Forest Scientist. Location: NP Thayatal.

pers. communication, H.P., 14.11.22: Conversation with Forest Authority on the Phone and via Email.

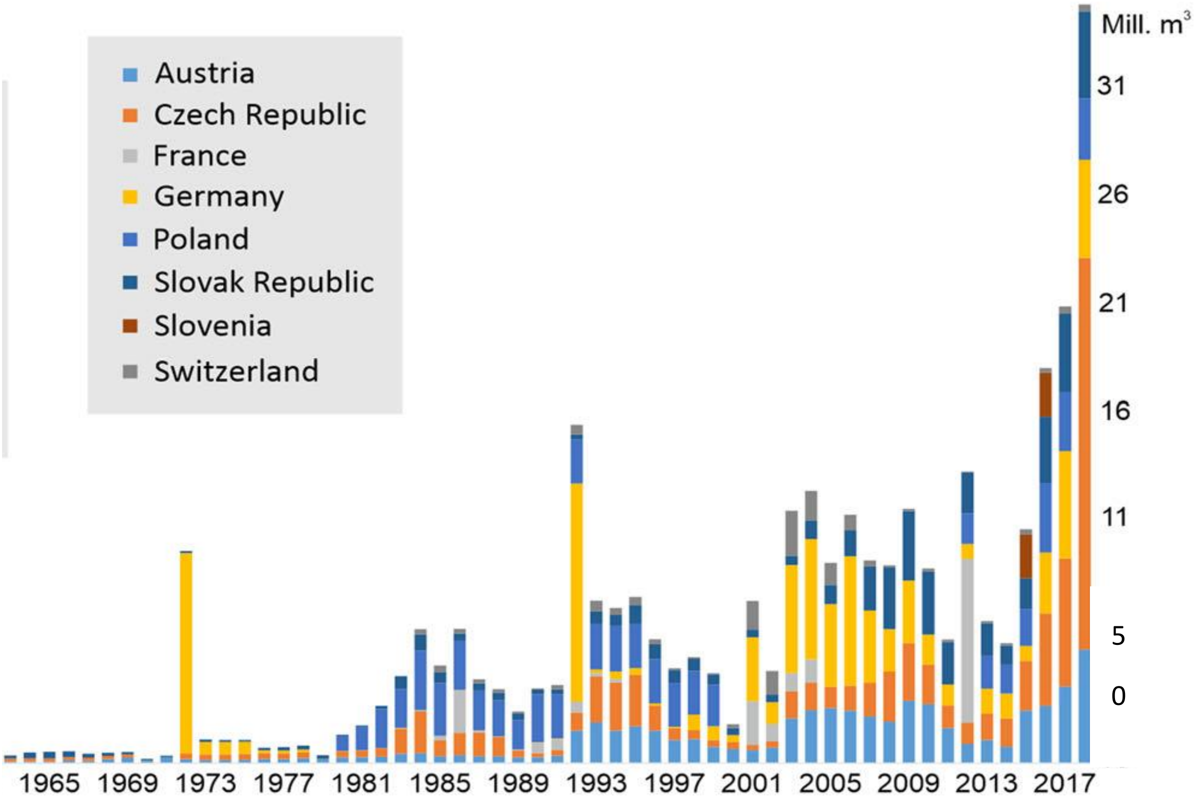
pers. communication, J.W., 21.04.23: Conversation with Forest Owner (Anonymous). Location: Wernstein.

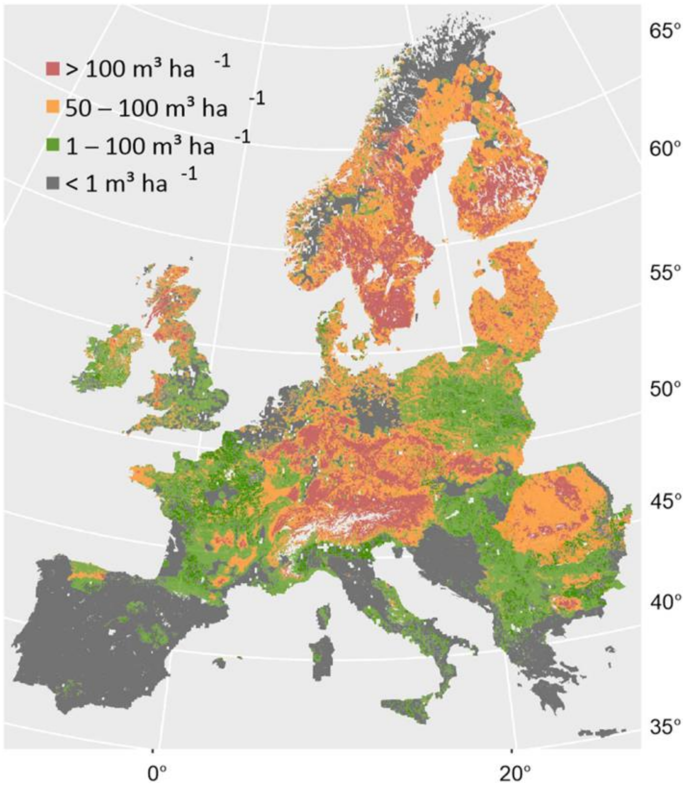
pers. communication, M.D., 31.05.23: Conversation with an Environmental Authority as part of a stakeholder meeting. Location: Reichraming, NP Center.

Appendices

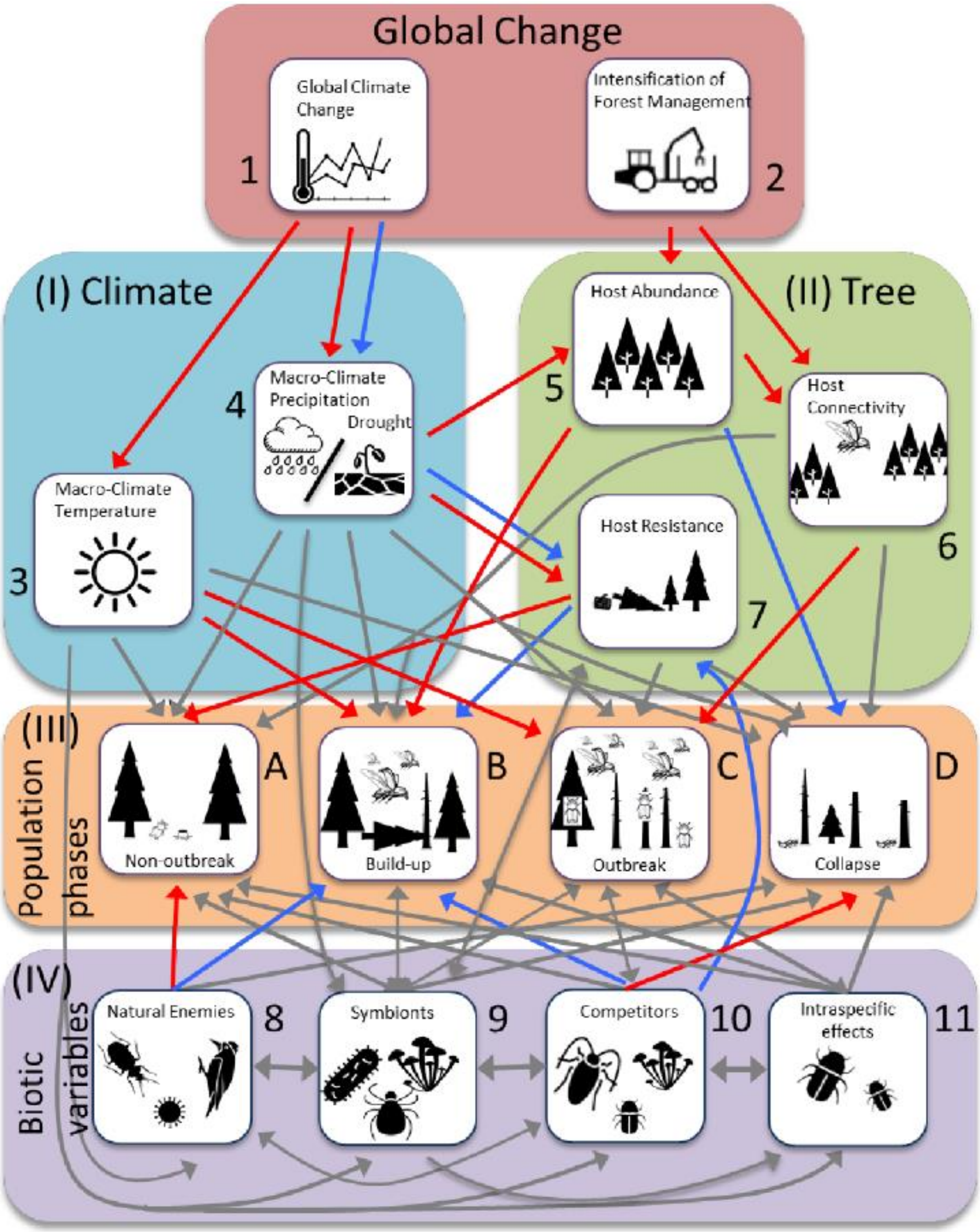
A1: (above) "Volume of Norway spruce killed by Ips typographus (and other bark beetles) in selected countries in Europe since 1945". Source: Hlásny *et al.* 2021, 141, adapted by author.

(below) "The current geographical distribution and growing stock of Norway spruce, the main host of Ips typographus". Source: Hlásny *et al.* 2021, 142.

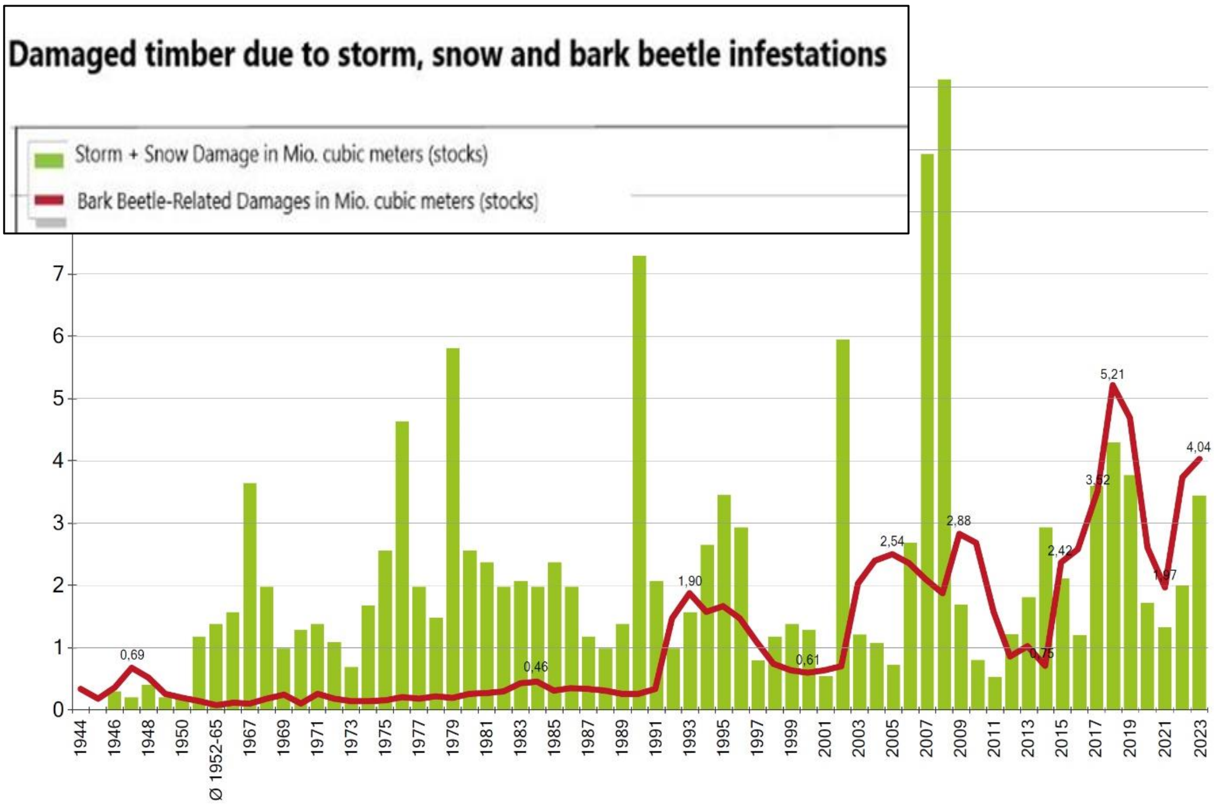




A2: "Overview of Variables Affecting Eruptive Forest Insects and Their Known or Unknown Effects in the European Spruce Bark Beetle (ESBB) (Ips typographus) System". Source: Biedermann *et al.* 2019, 918.



A3: Damaged timber due to storm, snow and bark beetle infestations. Source: BFW 2024. Taken from: https://www.bfw.gv.at/wp-content/uploads/BK_SturmSchnee_bis2023_Oe_ai_rgb_rot.jpg, adapted and translated by author.



Total annual logging; numbers issued by the Federal Ministry for Agriculture, Forestry, Regions and Water Management (2023). Source: https://info.bml.gv.at/dam/jcr:abfbe7c5-5ba8-47d7-8190-14201cdfc011/Holzeinschlag%202023.xlsx

	% SHARE	**2023**
Total Annual Logging (in cubic meters)		
Total Logging	**100,00**	**19.018.004**
Conifer	83,29	15.840.777
Deciduous	16,71	3.177.227
Raw Wood/Roundwood - Material Use	70,18	13.346.546
Conifer	65,15	12.389.541
Spruce/Fir	41,80	7.949.984
Deciduous	5,03	957.006
Raw Wood/Roundwood - Energetic Use	29,82	5.671.458
Conifer	18,15	3.451.236
Deciduous	11,67	2.220.221
Previous Use/"Vornutzung"	21,39	4.068.248
Conifer	17,18	3.267.583
Deciduous	4,21	800.665
Damaged Timber	**47,41**	**9.016.825**
Conifer (4 million: spruce bark beetle)	42,95	8.169.106
Deciduous	4,46	847.719

A4: Observation Scheme for Forest Walks, created by author

1. General Information	
1.1. Name of study plot	
1.2. Part of research site…	○ Hochsauwald (RS 1) ○ Böhmerwald (RS 2) ○ Bewahrungszone Nationalpark Limestone Alps (RS 3)
1.3. Abbrevation and number (for the record)	
1.4. Date of *Forest Walk*	
1.5. Length and duration of *Forest Walk* through the study plot (in km and hours)	
1.6. Conditions at the day of *Forest Walk* (weather, temperature etc.)	
1.7. Participants	
1.8. GPS coordinates and map of study plot/polygon as part of the *Forest Walk*	*(insert coordinates and map of study polygon here)*
1.9. Size of the inspected study plot (i.e., polygon) (in ha)	
1.10. Administrative belonging (municipality and district)	
1.11. Responsible forest authorities	
1.12. Responsible Owners and Managers	*(Question for Orientation: Who is the owner? Who manages the forest plot? Is the plot part of a larger forest property? How big is this total property? etc.)*

2. Forest Stand and Silvicultural Parameters	
2.1. Prevailing Forest Communities in the study plot	
2.2. Potential Natural Forest Communities (PNF) in the study plot	
2.3. Primary or Secondary Forest	o Primary/ Old-Growth o Secondary
2.4. Forest Type/stand composition in the study plot	o Single-Species forest/Pure stand (> 80% of the trees in the main canopy are of single species) o Mixed Coniferous forest (> 80% of the trees in the canopy are different coniferous trees) o Mixed Broadleaved forest (> 80% of the trees in the canopy are different broadleaved trees) o Mixed forest (more than two different tree species, each with more than 10% area share)
2.5. Tree Species Composition in the study plot (name of all observed tree species and estimated area share in % of total plot area)	

2.6. Age Classes ("Wuchsklassen") in the study plot (different categories' area share in % of total base area) and estimated tree species share with regards to the respective age class (in % of base area)	*(<u>young stand</u> [Anwuchs bis 130 cm Höhe]; <u>thicket</u> [young and very dense stand: vom Kronenschluss bis zur Schichtung mit Kronenraum und begehbarem Stammraum; mean DBH ≤ 10 cm]; <u>pole wood/Stangenholz</u> [schwächere bis stärkere Jungbestände, mean DBH: 10-20 cm]; <u>Baumholz</u> [older stands with a mean DBH of above 20 cm]; <u>matured stand/Altholz</u> [very old stand, no or little increment; low vitality])* **Young Stand**: __________% (total area), Tree Species Composition: (1) ________, ____ %, (2) ________, ____ %, (3) __________, ____ %, (4) ________, ____ %, (5) ________, ____ % **Thicket**: __________% (total area), Tree Species Composition: (1) ___________, ____ %, (2) ___________, ____ %, (3) _________, ____ %, (4) ________, ____ %, (5) _________, ____ % **Pole Wood**: __________% (total area), Tree Species Composition: (1) ___________, ____ %, (2) ___________, ____ %, (3) _________, ____ %, (4) ________, ____ %, (5) _________, ____ % „**Baumholz**": __________% (total area), Tree Species Composition: (1) ___________, ____ %, (2) ___________, ____ %, (3) _________, ____ %, (4) ________, ____ %, (5) _________, ____ % **matured stand/"Altholz"**: __________% (total area), Tree Species Composition: (1) ___________, ____ %, (2) ___________, ____ %, (3) _________, ____ %, (4) ________, ____ %, (5) _________, ____ %
2.7. Stand Form	o Even-Aged Stand o Uneven-Aged Stand Two-Aged Stand
2.8. (Estimated) Mean Age of Stand	
2.9. (Estimated) Average Diameter at Breast Height of the stand (DBH, in cm)	
2.10. (Estimated) Mean height of stand and of the hundred biggest trees (h_{100}) (based on "Ertragstafel" and own estimation based on angle measurement technique)	

2.11. Standing Timber Stock (unit: solid cub. m/ha) Categories are relative to the average standing stock in Austria in 2013 → 337 solid cub. m/ha = 1.017 trees)	○ Very low stock (< 100 solid cub. m/ha) ○ Low Stock (100-300 solid cub. m/ha) ○ Average Stock (300-500 solid. cub. m/ha) ○ High stock (500-700 solid. cub. m/ha) ○ Very high stock (> 700 solid. cub. m/ha)
2.12. (Estimated) Amount of Deadwood in the study plot (in solid cub. m/ha)	
2.13. Density ("Bestandesschlussgrad") of the stand	○ Very-dense/Overstocked ("gedrängt": geringe Abstände zwischen Stämmen sowie Verzahnung der Kronen; Kronen einseitig/deformiert; Unterdrückung von Bäumen) ○ Closed/Fully-Stocked ("geschlossen"): normal development of tree crown; no or very little overlapping ○ Loose ("locker/licht": Kronen regelmäßig verteilt, Einschieben von weiteren Kronen möglich) ○ Very loose/Understocked ("räumig/lückig": Kronen regelmäßig verteilt bis hin zu größeren Unterbrechungen und unbestandenen Flächen) ○ Clear-cutting (no tree stocking/tree crown coverage)
2.14. Layeredness/Stand Strata	○ One-Layered (stand-consituting trees forming the general level of the corwn cover → "horizontal" canopy) ○ Two-Layered (Gaps in the canopy; there is an identifiable upper- and mid-/lower stratum) ○ Multi-Layered/"Stufig" (stand-constituting trees belong to several different strata are difficult or impossible to distinguish; f. ex. in Plenterwald systems)
2.15. Silvicultural System, if visible at the stand level	○ High forest/"Hochwald": originated from seed ("schlagweise" or "Plenterwald") ○ "Mittelwald" (coppice-with-standards forests) ○ "Niederwald" (i.e., simple coppice forest)
2.16. Remarks on the continuity of the stand and potential barriers (veterinary fences, built infrastructures, roads, rock formations, rivers/creeks etc.)	

2.17. Further Remarks on Particularities of Forest Stand and Forest Communities (particular tree communities, forked growth, specific micro-biotopes, specific pattern of extension of tree groves etc.)	
3. Multi-Species Assemblages, Encountered Species and Biocoenosis	
3.1. List of Observed Species on Top Layer (+ description of habitat and "world-making practices)	
3.2. List of Observed Species on Mid-Layer (+ description of habitat and "world-making practices")	
3.3. List of Observed Species in the Lower Strata (+ description of habitat and "world-making practices)	
3.4. List of Observed Species on the Shrub Layer (1,3 – 5m) (+ description of habitat and "world-making practices)	
3.5. List of Observed Species on the Herb Layer and Belowground (< 1,3m) (+ description of habitat and "world-making practices)	

3.6. List of Observed IUCN Red-Listed Species, List of Endemic Species (only to be found in the respective area)	
3.7. Observed Symbiotic Relationships	
3.8. Observed Antagonistic/Parasitic Relationships	
3.9. Species specifically assembled with/specialized on Norway Spruce	
3.10. Species specifically assembled with/specialized on bark beetles (*Ips typographus*)	

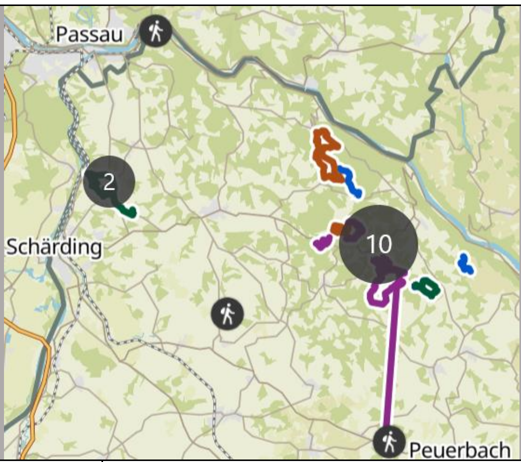
4. Bark-beetle related observations	
4.1. Visible <u>Past</u> Bark Beetle Infestations, their estimated extent in ha and location (visible through formerly infested standing deadwood/snag trees, former brood galleries etc.)	
4.2. Visible <u>Current</u> Bark Beetle Infestations, their estimated extent in number of infested trees/per ha and the stage of attack ("green attack stage" or "brown attack stage") Endemic or epidemic phase? (Hlásny et al. 2019, 10)	*(potential indicators: boring dust on stem, small circular drilling holes, woodpecker activity and presence of antagonists, bright stains on stem, in a later stage: discolored needles, bark falling off etc.)*
4.3. General availability of potential brooding material (dense spruce stand, > 20 cm DBH, weakened/injured, windthrow, signs of drought stress etc.)	o <u>Yes</u> o <u>No</u> Remarks:
4.4. Approximate number of encountered larvae and beetle individuals (per observed tree) and stage of brood development Remark: On every forest walk (depending on season) **5 newly-infested trees** (evenly distributed over the whole area!) are examined for infestation and brood development	

5. Management Goals and Human Interventions	
5.1. Current Guiding Function (as defined in the respective "Waldentwicklungsplan" or in the respective national park legislation)	o "Nutzfunktion" o "Schutzfunktion" o "Wohlfahrtsfunktion" o "Erholungsfunktion" o Other function
5.2. Further classification of given study plot (f. ex., national park, biosphere park/reserve, Natura 2000, FFH-area, RAMSAR, UNESCO, cultural/nature heritage, other IUCN categories etc.)	
5.3. Predominant Rejuvenation Type	o Natural Rejuvenation o Artifical Rejuvenation
5.4. Success of Rejuvenation (situation regarding pruning and browsing due to game); Status Quo regarding existence and health of seedlings and saplings	
5.5. Applied Rejuvenation and (Visible) Harvesting Techniques	*(f. ex., clear-cutting, "Saumschlag", "Schirmschlag", "Femelschlag", Plenterwald etc.)*

5.6. Signs of past and current Human Interventions (Forest roads, skid trails, skidding damages, huts, high seats/hunting, deeryards/feeding sites, machinery etc.)	
6. Interactions with Humans/Historical, social, political dimensions	
6.1. Encountered People and their stories	

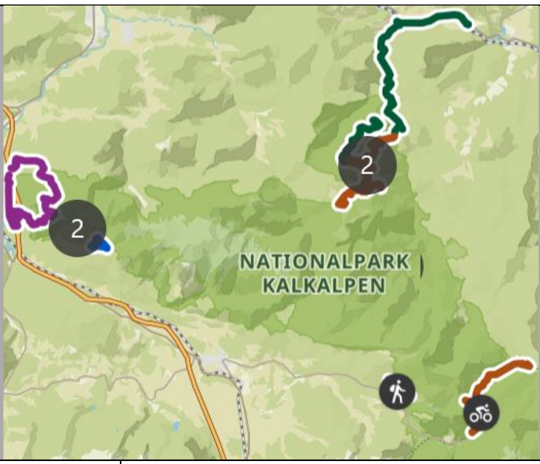
6.2. Historical, social and political elements (historical buildings, built infrastructure, signs and warnings, info tables etc.)	

A5: List of recorded forest walks and go-alongs based on observation scheme



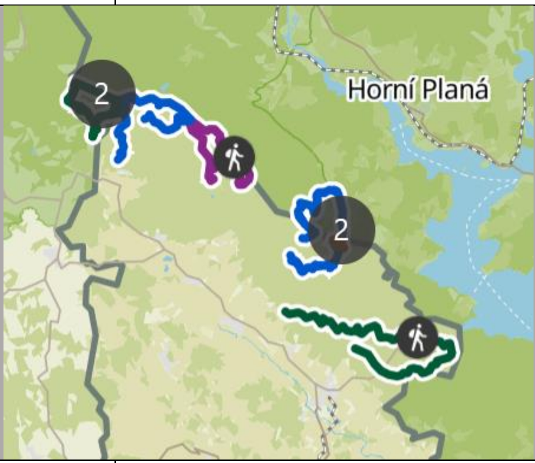
Sauwald		
1	Forest Walk 1_130422_SW	13.04.2022
2	Forest Walk 2_**Go Along 1**_190422_SW	19.04.2022
3a	Forest Walk 3_**Go Along 2**_190422_SW	19.04.2022
3b	Forest Walk 3_**Go Along 2**_190422_SW mit Bilder	19.04.2022
4a	Forest Walk 4_200422_SW mit Bilder	20.04.2022
4b	Forest Walk 4_200422_SW	20.04.2022
5	Forest Walk 5_**Go Along** 3_210422_SW mit Bilder	21.04.2022
6	Forest Walk 6_060722_SW	06.07.2022
7	Forest Walk 7_080722_SW	08.07.2022
8	Forest Walk 8_**Go Along 4**_080722_SW	08.07.2022
9	Forest Walk 9_010822_SW	01.08.2022
10	Forest Walk 10_010523_SW	01.05.2023
11	Forest Walk 11_200723_SW	20.07.2023
12	Forest Walk 12_**Go Along 5-**Wernstein_030823_SW	03.08.2023
13	Forest Walk_13_**Go Along 6**_Atzersdorf_150624_SW	15.06.2024

Kalkalpen NP



1	Forest Walk 1_291021_NPK	29.10.2021
2	Forest Walk 2_**Go Along 1**_030522_NPK-Eval	03.05.2022
3a	Forest Walk 3_**Go Along 2**_NPK_130622 (1)	13.06.2022
3b	Forest Walk 3_**Go Along 2**_NPK_130622 (2)	13.06.2022
4	Forest Walk 4_**Go Along 3**_NPK_140622	14.06.2022
5	Forest Walk 5_170622_NPK	17.06.2022
6	Forest Walk 6_Go Along 4_070722_NPK Eval	07.07.2022

Bohemian Forest



1	Forest Walk 1_100522_BW	10.05.2022
2	Forest Walk 2_110522_BW	11.05.2022
3	Forest Walk 3_120522_BW	12.05.2022
4	Forest Walk 4_**Go Along 1**_130522_BW	13.05.2022
5	Forest Walk 5_180722_BW	18.07.2022
6	Forest Walk 6_190722_BW	19.07.2022

A6: List of formal (i.e., recorded and transcribed) problem-centered and expert interviews

Nr.	Research Site	Interview Type	Interviewee (Function/ Position)	Date, Time and Place	Length (of recorded interview)
I	RS 2 (Kalkalpen NP)	Problem-Centered Interview	Head of the Austrian federal forest enterprise (ÖBf) in the NP	25.11.2021, 14:00 - 15:30, online	01:28:46
II	RS 2 (Kalkalpen NP)	Problem-Centered Interview	(Former) NP Director	25.11.2021, 16:30 - 17:35, online	00:57:00
III	RS 3 (Bohem. Forest)	Problem-Centered Interview	Forest Warden	10.01.2022, 13:30-15:30, for anonymity reasons not specified	01:13:37
IV	RS 1 (Sauwald)	Problem-Centered Interview	Head of Federal District Forest Authority	12.01.2022, 9:00 - 10:30, Schärding	01:15:03
V	RS 1 (Sauwald)	Problem-Centered Interview	Forestry Advisor	20.01.2022, 9:30-11:00, Ried	01:12:14
VI	expert, forest protection, federal province level	Expert interview	Forest Authority, Federal Province Level	20.01.2022, 14:15-15:45, Linz	01:18:31
VII	RS 3 (Bohem. Forest)	Problem-Centered Interview	Forestry Advisor	21.01.2022, 9:30-11:00, Rohrbach	01:05:06
VIII	expert, forest economy, federal level	Expert interview	Forestry Interest Group Representative , Federal Level	10.02.2022, 14:00-15:00, online	00:50:20
IX	expert, sawmill industry, federal level	Expert interview	Sawmill Industry Representative	17.02.2022, 15:00-16:30, online	01:13:41
X	expert, federal level	Expert interview	Forest Historian	24.02.2022, 15:00-16:30, online	1:19.46
XI	RS 1 (Sauwald)	Problem-Centered Interview	(Smallholder) Forest Owner	28.02.2022, 11:30-12:30, Kopfing	00:45:11

XII	RS 1 (Sauwald)	Problem-Centered Interview	Forest Manager (Large Forest Enterprise)	28.02.2022, 14:00-15:30, Natternbach	01:13:17
XIII	RS 1 (Sauwald)	Problem-Centered Interview	(Smallholder) Forest Owner	01.03.2022, 10:00-11:30, Waldkirchen/ Wesen	00:51:16
XIV	RS 3 (Bohem. Forest)	Problem-Centered Interview	Forest Manager (Large Forest Enterprise)	07.03.2022, 9:00-10:30, Aigen	01:06:50
XV	expert, spruce and forest ecology, general	Expert interview	Forest Ecologist	10.03.2022, 11:00-12:30, online	01:24:51
XVI	RS 1 (Sauwald)	Problem-Centered Interview	(Smallholder) Forest Owner & “Waldhelfer”	28.03.2022, 11:30-13:00, not specified	00:51:52
XVII	RS 1 (Sauwald)	Problem-Centered Interview	(Smallholder) Forest Owner	28.03.2022, 14:30-16:00, St. Roman	01:04:36
XVIII	RS 1 (Sauwald)	Problem-Centered Interview	Forest Manager (Large Forest Enterprise)	19.04.2022, 9:15-10:20, for anonymity reasons not specified	01:04:38
XIX	expert, bark beetles	Expert interview	Forest Entomologist	05.05.2022, 9:30-10:30, online	01:15:43
XX	RS 3 (Bohem. Forest)	Problem-Centered Interview	(Smallholder) Forest Owner & “Waldhelfer”	10.05.2022, 9:30-10:15, Ulrichsberg	00:45:00
XXI	RS 3 (Bohem. Forest)	Problem-Centered Interview	Sawmill Owner and Forest Owner	11.05.2022, 18:00-19.00, Ulrichsberg	00:47:56
XXII	RS 1 (Sauwald)	Problem-Centered Interview	Sawmill Owner and Forest Owner	20.05.2022, 18:00-19.00, St. Roman	00:47:26
XXIII	RS 2 (Kalkalpen NP)	Problem-Centered Interview	Forest Owner	15.06.2022, 8:30-9:30, St. Pankraz	00:37:53
XXIV	RS 2 (Kalkalpen NP)	Problem-Centered Interview	Forest Owner	15.06.2022, 10:30-11:30, St. Pankraz	00:33:07
XXV	RS 1 (Sauwald)	Problem-Centered Interview	(Smallholder) Forest Owner	06.07.2022, 11:00-12:00, Engelhartszell	00:45:00

XXVI	RS 1 (Sauwald)	Problem-Centered Interview	Forest Warden	01.08.2022, 11:30-12:20, Schärding	00:47:11
XXVII	expert, nature conservation, federal province level	Expert interview	Nature Conservation Authority, Federal Province Level	02.08.2022, 9:00-11:15, Linz	01:59:11
XXVIII	RS 3 (Bohem. Forest, CZ)	Problem-Centered Interview	Employee NP Šumava	05.10.2022, sent via email	Document
XXIX	RS 2 (Kalkalpen NP)	Problem-Centered Interview	Head of Federal District Forest Authority	02.08.2023, 11:00-12:00, Kirchdorf	00:45:17
XXX	RS 2 (Kalkalpen NP)	Problem-Centered Interview	Artist and Activist	19.08.2021, 14:00-14:30, Weyer	00:25:26
XXXI	expert, bark beetles, general	Expert interview	Forest Entomologist	18.08.2021, 16:50-17:30, for anonymity reasons not specified	00:34:18

A7: Loose List of Interview Questions [in German, English translation in square brackets, with question/code category in bold]

1) Persönliche Informationen and Hintergrund [**Personal Information and Background**]

- Können Sie sich kurz vorstellen? Wie heißen Sie, wie alt sind Sie, wo leben Sie derzeit, was arbeiten Sie/welche Position bekleiden Sie in Ihrem Unternehmen? (**Vorstellung + persönliche Daten) [**Can you briefly introduce yourself? What is your name, how old are you, where do you currently live, what do you do for a living/what position do you hold in your company? **Introduction and Personal Data**]
    - Welche Tätigkeiten- und Zuständigkeitsbereiche umfasst Ihre Tätigkeit? Mit welchen Themen setzen Sie sich in Ihrer Forschung auseinander? Was begeistert Sie an diesen Themen? (**Beruf/Schwerpunkte**) [What areas of activity and responsibility does your job include? What topics do you deal with in your research? What excites you about these topics? (**Professional Focus**)]
    - Welche Rolle spielt der Wald in Ihrem finanziellen Auskommen/Überleben? Sind Sie auch Landwirt*in, wie ergänzen sich in Ihrem Fall Forst- und Landwirtschaft? **(ökonomische Rolle der Forst- und Landwirtschaft/ökonomische Vulnerabilität)** [What role does the forest play in your financial livelihood/survival? Are you also a farmer, how do forestry and agriculture complement each other in your case? (**economic role of forestry and agriculture/economic vulnerability**)]
    - Wie sind Sie (oder Ihre Familie) zur Forstwirtschaft (zu Ihrem Job im Forstsektor) gekommen? Welche Beziehung haben Sie zu Ihrem Wald? Welche Rolle spielt die Forstwirtschaft und/oder eine Tätigkeit im Forstsektor in Ihrer Familie/Familiengeschichte? Haben Sie Wälder stark geprägt? (**Biografie, kulturelle Tradition und Identität) [**How did you (or your family) get into forestry (your job in the forestry sector)? What is your relationship with your forest? What role does forestry and/or a job in the forestry sector play in your family/family history, in your region? Have forests had a strong influence on you? **(Biography, cultural tradition and identity)]**

2) Bezug zum Wald allgemein, zum eigenen Wald und zur Forstwirtschaft [Relation to the forest in general, to one's own forest and to forestry]

- *[allgemein - global]:* Was kommt Ihnen in den Sinn, wenn Sie allgemein an Wälder/an Waldökosysteme denken? (**Assoziationen**) [[general - global]: What comes to mind when you think of forests/forest ecosystems in general? (**Associations**)]
- *[allgemein]:* Was kommt Ihnen in den Sinn, wenn Sie an den Zustand der Wälder bzw. der Forstwirtschaft in Oberösterreich denken? Wie würden Sie die Situation bewerten, in der sich Oberösterreichs Waldbesitzer*innen derzeit befinden/befindet? Was zeichnet die oberösterreichische Forstwirtschaft aus? (**Assoziationen II** und **Situation für Waldbesitzer*innen**) [[*general*]: What comes to mind when you think about the state of the forests or forestry in Upper Austria? How would you assess the situation in which Upper Austria's forest owners currently find themselves? What characterizes Upper Austria's forestry industry? (**Associations II and situation for forest owners**)]
- *[persönlich]:* Wie viele Hektar Wald bewirschaften Sie, Ihre Familie oder Ihr Unternehmen derzeit (oder vormals)? Wie sieht die Baumartenzusammensetzung, der Bestand und dessen Struktur (Dichte, Schichtigkeit, Alter) aus, in welcher Lage, welche Auswirkungen haben diese Parameter auf die Art und Weise, wie Sie diesen Wald bewirtschaften? (**Beschreibung des eigenen/bewirtschafteten Walds**) [*personal*]: How many hectares of forest do you, your family or your company currently (or previously) manage? What is the tree species composition, the stand and its structure (density, layering, age), in which location, what impact do these parameters have on the way you manage this forest? (**Description of own/managed forest**)
  - Was gefällt Ihnen an Ihrem Wald oder den von Ihnen/Ihrem Unternehmen bewirtschafteten Wald besonders? (**„positiver“ Bezug zum eigenen Wald I**) Was stört Sie, was bereitet Ihnen Sorgen im eigenen, in dem von Ihnen mitbewirtschafteten Wald? (Haben sich diese Sorgen in den letzten Jahren verändert und/oder verstärkt? Warum?) (**„negativer“ Bezug zum eigenen Wald II**) [What do you particularly like about your forest or the forest you/your company manage? **(“positive” relationship to one’s own forest**) What bothers you, what worries you about your own forest or the forest you co-manage? (Have these worries changed and/or increased in recent years? Why?) (**“negative” relationship to your own forest**)]
- *[für Expert*innen-Interviews:]* Was begeistert Sie als Dendrolog*in bzw. als Entomolog*in an Fichten bzw. an Borkenkäfern? Wie würden Sie in aller Kürze das Subjekt/Objekt Ihres Interesses beschreiben? Was zeichnet diese Lebewesen biologisch aus? Was macht diese Lebewesen spannend und für das Ökosystem wichtig? **(fachliche Beschreibung des jeweiligen Waldlebewesens)** [[*for expert interviews*:] What excites you as a dendrologist or entomologist about spruce trees or bark beetles? How would you briefly describe the subject/object of your interest? What are the biological characteristics of these creatures? What makes these creatures exciting and important for the ecosystem? (**technical/professional description of the respective forest creature**)]

3) Waldmanagement und Management-/Schutzziele [Forest management, forest functions and management/protection objectives]

- Welche Ziele verfolgen Sie (oder Ihr Unternehmen) mit Ihrem Wald? (**Management-, Nutzungs- und Schutzziele allgemein**) [What goals do you (or your company) have for your forest? (**General management, usage and/or protection goals**)]
  - Haben Sie eine Strategie, mit der sie diese Ziele erreichen wollen? Wie sieht diese Strategie aus? [Do you have a strategy to achieve these goals? What does this strategy look like?]
  - (wenn bewirtschaftet) Folgen Sie einem spezifischen Waldbausystem? (Hochwald – Niederwald – Plenterwald; welche Art von Verjüngung?) Welche Überlegungen stehen hinter Ihren Eingriffen? [(if managed) Do you follow a specific silviculture system? (high forest – coppice – coppice forest; what type of regeneration?) What considerations are behind your interventions?]
  - Welche Rolle spielt die **Fichte** in Ihrem Wald? Wie zufrieden sind Sie mit dieser und mit anderen Baumarten? [What role does spruce play in your forest/silvicultural system? How satisfied are you with this and other tree species?]
- Was tun Sie im Wald? Wie bewirtschaften Sie Ihren Wald/den von Ihrem Unternehmen betrauten Wald? (Waldbausystem, Betriebstyp, Verjüngung, Hiebverfahren etc.) (Hat sich das im Laufe der letzten Jahre/Jahrzehnte verändert?) Mit welchen Geräten (Traktor, Seilwinde, Rückewagen, Forwarder etc.),

mit welchen Eingriffen arbeiten Sie in diesem Zusammenhang? (**menschliche „forest-making"-Praktiken**) [What do you do in the forest? How do you manage your forest/the forest entrusted to your company? (Silviculture system, type of operation, regeneration, felling method, etc.) (Has this changed over the last few years/decades?) What equipment (tractor, cable winch, logging trailer, forwarder, etc.) do you use and what interventions do you use in this context? (**human "forest-making" practices**)]

- [*an den*die Expert*in*]: Aus Perspektive der Fichte/des Borkenkäfers gesprochen: Unter welchen topo-klimatischen Bedingungen, im Rahmen welcher Bestände und Baumzusammensetzungen gedeiht Fichte „ideal"? Was braucht die Fichte/der Borkenkäfer, um zu prosperieren? Welche symbiotischen Partner/Symbiosen? Wie verändern/prägen diese Lebewesen ihre Umwelt? Was schadet ihnen, mit welchen Spezies stehen sie in Wechselwirkung/Konkurrenz? (**„forest-making" der jeweiligen Art**) [for the expert: From the perspective of spruce/bark beetle etc.: Under what topo-climatic conditions, within which stands and tree compositions does spruce thrive "ideally"? What does spruce and/or the bark beetle need to prosper? Which symbiotic partners/symbioses? How do these creatures change/shape their environment? What harms them, with which species do they interact/compete? (**"forest-making" of specific beings**)]
- Welche Funktionen muss der Wald für Sie bzw. für Ihr Unternehmen erfüllen? (**Waldfunktionen)** [What functions must the forest fulfil for you or your company? (**Forest functions**)]
    - Bsp.: Wertholzproduktion, Energieholz, Biodiversität, Kohlenstoffspeicherung etc. (Schutzfunktion, Nutzfunktion, Wohlfahrtsfunktion, Erholungsfunktion) Konflikt zwischen „Außer-Nutzung-Stellen" und Nutzen; zwischen Naturschutz und Wirtschaftswald? [E.g.: wood production, energy wood, biodiversity, carbon storage etc. (protective function, utility function, welfare function, recreational function) → Conflict between "non-use" and use; between nature conservation and commercial forestry?]
- Mit welchen Herausforderungen sind Sie derzeit in Ihrem Wald/in Ihrer mit Wald zusammenhängenden beruflichen Praxis konfrontiert? (Verjüngung, Verbiss, Kostensituation etc.) (**Herausforderungen**) [What challenges are you currently facing in your forest/in your professional practice related to forests? (Rejuvenation, browsing, cost situation, etc.) (**Challenges**)]

4) Borkenkäfer: Bedeutung, Einschätzung und Management [Bark beetles: significance, situation assessment and management]

<u>**Allgemein [general]**</u>

- Was kommt Ihnen in den Sinn, wenn Sie an den Borkenkäfer/an Borkenkäferausbrüche denken? Wie nehmen Sie die derzeitige Borkenkäfersituation in Oberösterreich wahr, wie würden Sie diese bewerten? (**Assoziationen zum Borkenkäfer**) [What comes to mind when you think of bark beetles and/or bark beetle outbreaks? How do you perceive the current bark beetle situation in Upper Austria, how would you assess it? (**Associations regarding bark beetles and bark beetle outbreaks**)]
- Wie schätzen Sie die Art und Weise ein, wie in den Medien, im öffentlichen Raum und in Ihrem Umfeld über den Borkenkäfer gesprochen wird? (**Borkenkäfer-Diskurs)** [How do you assess the way in which the bark beetle is discussed in the media, in public spaces and in your social environment? (**Bark beetle discourse**)]
- Was (bzw. „wer") steckt Ihrer Meinung nach hinter den zunehmenden Borkenkäferschäden? Welche Entwicklungen, welche verschärfenden Faktoren machen Sie für den Anstieg im Ausmaß und in der Häufigkeit von Borkenkäferkalamitäten verantwortlich? (**„Sense-Making": Ausmaß und Häufigkeit; Erklärung von BK-Ausbrüchen**) [What (or "who") is behind the increasing bark beetle damage? What developments, what aggravating factors do you think are responsible for the increase in the extent and frequency of bark beetle calamities? **("Sense-making": extent and frequency; explanation of bark beetle outbreaks**)]

<u>**Persönlich oder indirekt über Unternehmen [Personally or indirectly through employment in company]**</u>

- In welchem Ausmaß und in welcher Form sind Sie selbst von Borkenkäferausbrüchen betroffen (Welche Schadholzmengen? Welche finanziellen Verluste und wie sehr treffen Sie diese?) und wie geht es Ihnen emotional dabei? (**persönliche/ökonomische Betroffenheit**) [To what extent and in what way are you personally affected by bark beetle outbreaks (what amounts of damaged wood? What financial losses and how much do they affect you?) and how do you feel emotionally about it? (**personal/economic impact/ "affectedness"**)]

- Wenn Sie jemand fragen würde, wie Sie Ihre Beziehung zum Borkenkäfer beschreiben würden, was würden Sie antworten? (**Beziehung zum BK**) [If someone asked you how you would describe your relationship with the bark beetle, what would you answer? (**Relationship with the bark beetle**)]
- Wie gehen Sie in Ihrem Wald mit dem Borkenkäfer bzw. mit Borkenkäferausbrüchen um, was unternehmen Sie gegen diese(n)? Welche Maßnahmen setzen Sie? Betreiben Sie Prävention, wie reduzieren Sie das Risiko? **(Bekämpfungs-Maßnahmen und „coping strategies") [**How do you deal with bark beetles or bark beetle outbreaks in your forest? What do you do to combat them? What measures do you take? Do you practice prevention? How do you reduce the (infestation) risk and/or susceptibility? (**Control measures and coping strategies)]**
- Inwiefern haben Borkenkäferausbrüche Ihre Waldbewirtschaftung verändert? Sehen Sie jetzt Ihren Wald in einem anderen Licht? (**Veränderung und BK) [**To what extent have bark beetle outbreaks changed your forest management? Do you now see your forest in a different light**? (Management Changes and Bark Beetles)**]

Konflikthaftigkeit [Conflict Dimension]

- Glauben Sie, dass gewisse Gruppen von Borkenkäferausbrüchen profitieren? Welche Gruppen sind das und warum ist das so? (**Verlierer*innen/Gewinner*innen**) [Do you think that certain groups benefit from bark beetle outbreaks? Which groups are they and why is that so? (**Losers/Winners**)]
- Glauben Sie, dass aufgrund des Borkenkäfers Konflikte ausbrechen (bzw. haben Sie solche Konflikte schon selbst erlebt und/oder beobachtet)? (**Konflikte und „Sense-Making"**) [Do you think that conflicts could arise due to the bark beetle (or have you experienced and/or observed such conflicts yourself)? (**Conflicts and "sense-making"**)]
    - Warum kommt es zu solchen Konflikten? Was sagt das über die soziale, politische und ökonomische Verfasstheit der oberösterreichischen Forstwirtschaft aus? [Why do such conflicts arise? What does this say about the social, political and economic structure of Upper Austrian forestry?]
- Wie zufrieden sind Sie mit den derzeitigen rechtlichen Rahmenbedingungen in Hinblick auf den Umgang mit Borkenkäferkalamitäten? Wie zufrieden sind sie mit den bestehenden Unterstützungsangeboten (Waldfonds, Katastrophenfonds etc.)? (**Forstgesetz und politische Unterstützungsangebote**) [How satisfied are you with the current legal framework in dealing with bark beetle outbreaks? How satisfied are you with the existing funds and financial support tools (forest funds, disaster funds, etc.)? (**Forest Act and political support**)]
- Was könnte Ihrer Ansicht nach verbessert werden, um dem Borkenkäfer besser entgegenzusteuern? Welche (sonstige) Unterstützung wünschen Sie sich von der Politik? Fühlen Sie sich unterstützt, verstanden und gehört? (**Maßnahmen und politische Repräsentation**) [What do you think could be improved to better combat the bark beetle? What (other) support would you like from politicians? Do you feel supported, understood and heard? (**Countermeasures and political representation**)]

6) Ausblick [Outlook/Future]

- Wie wird sich die Situation rund um den Borkenkäfer Ihrer Einschätzung nach in den nächsten Jahren entwickeln? [How do you think the situation surrounding the bark beetle will develop in the next few years?]
- Wie blicken Sie der Zukunft entgegen, welche Hoffnungen und Ängste haben Sie diesbezüglich? Wie wird Ihr Wald im Jahr 2050 aussehen? [How do you view the future, what hopes and fears do you have in this regard? What will your forest look like in 2050?]

A8: Long Version of the Office-Forms Survey (n= 60, 40 questions, for details and English version see https://forms.office.com/r/6LBgfpstki)

Die oberösterreichische Forstwirtschaft in Zeiten des Borkenkäfers (Langversion)

Sehr geehrte*r Untersuchungsteilnehmer*in!

Zunächst ein herzliches Danke, dass Sie sich die Zeit nehmen, diesen Fragebogen als Teil meines umweltanthropologischen Dissertationsprojekts zu **Mensch-Borkenkäfer-Fichte-Beziehungen** in Oberösterreich auszufüllen. Diese Umfrage richtet sich an **Menschen mit direktem und indirektem Waldbezug in Oberösterreich** (OÖ). Zu diesen zählen derzeitige und ehemalige (borkenkäferbetroffene) Waldbesitzer*innen in OÖ/Familienmitglieder einer Familie mit Wald in OÖ; Beschäftigte in einem oö. Forstbetrieb bzw. im weiteren Sinne im oö. Forstsektor/in der oö. Säge- und Papierindustrie; Forstwirt*innen/-wissenschaftler*innen; Förster*innen/Forstorgane; Mitarbeiter*innen/Mitglieder von forstlich relevanten Beratungsstellen sowie Mitarbeiter*innen/Mitglieder von waldrelevanten Interessens- und Naturschutzverbänden. Im Kern zielt die folgende Umfrage auf die Erhebung Ihrer **Wahrnehmung von Borkenkäferbefällen** (an Fichte; mit Augenmerk auf Buchdrucker und Kupferstecher) ab. Um den Fragebogen somit vollständig ausfüllen zu können, sind Sie idealerweise selbst borkenkäferbetroffene*r Waldbesitzer*in. Wie weiter oben erwähnt, sind Sie aber auch mit einem indirekten (beruflich/familiär bedingten) Forstwirtschafts-/Wald-/Borkenkäferbezug eingeladen, diesen Fragebogen auszufüllen.

Der Fragebogen unterteilt sich in drei Abschnitte. **Im ersten Abschnitt (9 Fragen)** wird es um Ihre Wahrnehmung bezüglich Wälder, Forstwirtschaft und Borkenkäfer in Oberösterreich insgesamt gehen. **Der zweite Abschnitt (11 Fragen)** widmet sich den politischen und gesellschaftlichen Rahmenbedingungen von Borkenkäferausbrüchen

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und **in einem dritten Schritt (12 Fragen)** geht es um Ihre persönliche Wahrnehmung des Borkenkäfers bzw. um Ihre etwaige persönliche Betroffenheit.

Alle Angaben, die Sie im Rahmen dieser Befragung machen, werden vertraulich behandelt, nicht an Dritte weitergegeben und ausschließlich zu wissenschaftlichen Zwecken verwendet. Die Daten werden anonymisiert, ein Rückschluss auf Ihre Person ist dadurch nicht möglich. Durch das Ausfüllen des Fragebogens bestätigen Sie, dass Sie diese Informationen gelesen haben und sich zu der Teilnahme bereit erklären. Die Teilnahme an der Umfrage kann ohne Angabe von Gründen zu jedem Zeitpunkt und ohne dadurch entstehende Nachteile abgebrochen oder zurückgezogen werden.

Das Ausfüllen des Fragebogens wird **ca. 30-35 Minuten** in Anspruch nehmen. Füllen Sie bitte bis **spätestens 31.12.2022** den Fragebogen vollständig und entsprechend der Reihenfolge der Fragen aus.

Zusatz: In den Regionen **Sauwald**, **Böhmerwald** und **rund um den Nationalpark Kalkalpen** bin ich auf der Suche nach Waldbesitzer*innen, die bereit wären, ein Interview zu geben oder mich durch ihren Wald zu führen. Wenn Sie also noch stärker in die Forschung eingebunden werden oder einfach zusätzliche Informationen zu diesem Forschungsprojekt erhalten möchten, melden Sie sich jederzeit. Sie erreichen mich unter: Thalhammer_Martin@phd.ceu.edu (mailto:Thalhammer_Martin@phd.ceu.edu) oder in besonderen Fällen unter: 0680/3151711

Besten Dank,
Martin Thalhammer, MA MSc
Doktorand, Central European University Wien

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* Erforderlich

Zu Ihrer Wahrnehmung zu Wäldern, Forstwirtschaft und Borkenkäfersituation in Oberösterreich

1. Was kommt Ihnen in den Sinn, wenn Sie an den **ökologischen Zustand der oberösterreichischen Wälder** denken? *

2. Mit welchen zentralen Herausforderungen sind Ihrer Ansicht nach heutige **Waldnutzungssysteme** bzw. **Waldökosysteme** in Oberösterreich konfrontiert? (Mehrfachnennung möglich) *

- ☐ mit fehlender/nicht funktionierender Naturverjüngung
- ☐ mit falscher oder unzureichender Bewirtschaftung
- ☐ mit ökonomisch motivierter Übernutzung
- ☐ mit einem zu hohen Wilddruck (Verbiss etc.)
- ☐ mit Biodiversitätsverlust und Lebensraumzerstörung
- ☐ mit zunehmenden abiotischen Schad-/Störereignissen (Schneebruch, Windwurf)
- ☐ mit zunehmenden biotischen Schad-/Störereignissen (bspw. Borkenkäferausbrüchen etc.)
- ☐ mit Extremwetterereignissen
- ☐ mit Trockenheit und der Zunahme an Hitzewellen
- ☐ mit einer unangepassten/problematischen Baumartenzusammensetzung
- ☐ mit waldbaulichen Fehlern in der Vergangenheit
- ☐ mit Bodenverdichtung und Rückeschäden
- ☐ mit menschengemachtem Klimawandel
- ☐ mit dem Ausfall/Schwächeln wichtiger Baumarten (bspw. Fichte, Eschen oder Tanne)
- ☐ mit einer instablien/zu monotonen Bestandsstruktur (in Bezug auf Baumalter, Bestandesdichte, Schichtigkeit etc.)
- ☐ mit sonstigen Herausforderungen: ________________

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3. Bewerten Sie auf einer Skala von 1 bis 10, für wie **klimawandelangepasst** Sie insgesamt die **oberösterreichische Forstwirtschaft** halten? (1= überhaupt nicht klimawandelangepasst, 10 = vollkommen klimawandelangepasst) *

1 ◯ 2 ◯ 3 ◯ 4 ◯ 5 ◯ 6 ◯ 7 ◯ 8 ◯ 9 ◯ 10 ◯

4. Wie wichtig sind Ihrer Ansicht nach die folgenden **Waldfunktionen in Oberösterreich?** Reihen Sie diese der Wichtigkeit nach mittels "Drag-and-Drop" (wenn online) oder schreiben Sie eine Zahl von 1-10 neben die entsprechende Funktion (wenn offline) (wichtigste = 1= ganz oben; unwichtigste = 10 = ganz unten). *

jagdliche Nutzung/Wildfleisch

Schutz vor Lawinen, Hochwasser und Bodenerosion

Holzzuwachs und Holzgewinnung (stoffliche Nutzung)

Klimaschutz, Kohlenstoffspeicher, Sauerstoffproduktion, Luftfilter und Immissionsschutz

Energieholz (energetische Nutzung)

Einkommensquelle und Arbeitsplätze

Biodiversität (tierische/pflanzliche Vielfalt) bzw. Biotop- und Artenschutz

Wasserfilter, Trinkwasserschutz und Regulation des Wasserhaushalts

Erholungs-/ästhetische Funktion (Tourismus, Spaziergänge etc.), Tradition und kulturelles Erbe

Sammeln von Beeren, Pilzen, Kräutern

5. Mit welchen politischen und ökonomischen Herausforderungen sind Ihrer Einschätzung nach **Waldbesitzer*innen** in Oberösterreich konfrontiert? Vor welchen Herausforderungen steht die **Forstwirtschaft** bzw. der **Forstsektor** in Oberösterreich insgesamt?

6. Bewerten Sie auf einer Skala von 1 bis 10 **die Borkenkäfersituation** in Oberösterreich in den letzten Jahren (1 = der Borkenkäfer ist in Oberösterreich weder Thema noch Herausforderung, 10 = der Borkenkäfer ist das zentrale Thema und eine sehr große Herausforderung) *

1 ◯ 2 ◯ 3 ◯ 4 ◯ 5 ◯ 6 ◯ 7 ◯ 8 ◯ 9 ◯ 10 ◯

7. Was sind aus Ihrer Sicht zentrale **verschärfende Faktoren für die Zunahme an Borkenkäferausbrüchen** in Oberösterreich in den letzten Jahrzehnten? (Mehrfachnennung möglich)
*

- ☐ anfällige Bestandsstruktur (zu alte Bestände, zu hohe Dichte, Reinbestände etc.)
- ☐ Waldbewirtschaftungsfehler bzw. Fehler im Waldbau in der Vergangenheit
- ☐ fehlende/unzureichende Pflege seitens der Waldbesitzer*innen (keine rechtzeitige Entnahme, Schlampigkeit etc.)
- ☐ Windwurf- und Schneebruchereignisse
- ☐ höhere Temperaturen, Trockenheit und Hitzewellen
- ☐ menschengemachter Klimawandel
- ☐ Verlust von naturnahen Wäldern
- ☐ zu viele und zu starke menschliche Eingriffe
- ☐ zu wenige und zu geringe menschliche Eingriffe
- ☐ nicht-standortgerechte/-angepasste Fichtenmonokulturen
- ☐ fehlende politische und finanzielle Unterstützung für betroffene Waldbesitzer*innen
- ☐ fehlgeleitete Forstpolitik auf nationalstaatlicher und EU-Ebene (EU-Waldstrategie etc.)
- ☐ Entwicklung auf den Holzmärkten (instabile Preise, Preisdruck, Konkurrenz etc.)
- ☐ fehlendes Bewusstsein/Wissen seitens der Waldbesitzer*innen
- ☐ Baumverletzungen bei Ernte (bspw. durch Harvester)
- ☐ Waldbewirtschaftungsfehler bzw. Fehler im Waldbau in der Gegenwart
- ☐ Sonstiges: ____________________
- ☐ Kann ich so nicht beurteilen.

8. **Welchen folgenden Argumenten** in Bezug auf Borkenkäferausbrüche würden Sie zustimmen?
*

	stimme überhaupt nicht zu	stimme eher nicht zu	stimme eher zu	stimme voll und ganz zu	kann ich nicht beurteilen
Borkenkäferausbrüche sind natürliche Störereignisse und wichtig für die Dynamik im Wald.	○	○	○	○	○
Borkenkäferausbrüche sind in ihrem derzeitigen Ausmaß menschenverschuldet und Resultat eines fehlgeleiteten Waldbaus.	○	○	○	○	○
Borkenkäferausbrüche müssen möglichst früh und unter Einsatz aller möglichen Mittel bekämpft werden.	○	○	○	○	○
Borkenkäferausbrüche sollten am besten gar nicht bekämpft werden, da sich die Natur von selbst reguliert.	○	○	○	○	○
Borkenkäferausbrüche sind existenzgefährdend und eine große Belastung für Waldbesitzer*innen.	○	○	○	○	○
Borkenkäferausbrüche haben uns gezeigt, dass auf vielen Standorten Fichte (in Reinkultur) nicht funktioniert.	○	○	○	○	○
Borkenkäferausbrüche ziehen mittlerweile den gesamten oberösterreichischen Forstsektor in Mitleidenschaft.	○	○	○	○	○
Viele Borkenkäferausbrüche könnten verhindert werden, wenn Waldbesitzer*innen ihren Wald besser pflegen/bewirtschaften würden.	○	○	○	○	○

Zu Ihrer Wahrnehmung der gesellschaftlichen Dimension von Borkenkäferausbrüchen in Oberösterreich

9. Vervollständigen Sie den folgenden Satz: Die **mediale Berichterstattung und die öffentliche Diskussion betreffend Borkenkäfer** halte ich für... (Mehrfachnennung möglich)
*

- ☐ ...wichtig und richtig.
- ☐ ...längst überfällig.
- ☐ ...zu wenig lösungsorientiert.
- ☐ ...zu weit von den Lebensrealitäten der Menschen entfernt.
- ☐ ...oberflächlich.
- ☐ ...übertrieben emotional.
- ☐ ...informativ und sachlich.
- ☐ ...nicht wirklich vorhanden.
- ☐ ...zu wenig faktenbasiert.
- ☐ ...einseitig.
- ☐ ...ideologisch aufgeladen.
- ☐ ...zu abstrakt/zu wenig greifbar.

10. **Wer kommt** Ihrer Meinung nach in der Forstwirtschaft und im Forstsektor durch Borkenkäferausbrüche **am stärksten (finanziell) zu Schaden**? Nennen Sie 1-3 Akteursgruppen (gewisse Berufsgruppen, gewisse Branchen und Gewerbesektoren etc.), die am stärksten unter Borkenkäferausbrüchen zu leiden haben.
*

11. **Wer profitiert** Ihrer Meinung nach in der Forstwirtschaft und im Forstsektor von Borkenkäferausbrüchen **am meisten**? Nennen Sie 1-3 Akteursgruppen (gewisse Berufsgruppen, gewisse Branchen und Gewerbesektoren etc.), die am meisten von Borkenkäferausbrüchen profitieren.
*

12. Haben Sie den Eindruck, dass Borkenkäferausbrüche in den letzten Jahrzehnten in Ihrer Umgebung **das Aussehen des Waldes** verändert haben?
*

- ○ Ja, in einem großen Ausmaß
- ○ Ja, in einem geringen Ausmaß
- ○ Nein
- ○ Kann ich nicht beurteilen.
- ○ In meiner Umgebung hat es in den letzten Jahrzehnten keine Ausbrüche gegeben.

13. Haben Sie den Eindruck, dass Borkenkäferausbrüche in Ihrem Umfeld für **Veränderungen bzw. Anpassungen in der Waldbewirtschaftung** (Baumartenwahl, Hiebverfahren, Umtriebszeit etc.) gesorgt haben?
*

- ○ Ja, zu großen Veränderungen
- ○ Ja, zu geringen Veränderungen
- ○ Nein
- ○ Kann ich nicht beurteilen.
- ○ In meiner Umgebung hat es in jüngster Vergangenheit keine Ausbrüche gegeben.

14. (Wenn ja): Welche Veränderungen bzw. Anpassungen sind das?

15. Halten sich Waldbesitzer*innen in Ihrem Umfeld **an die rechtlichen Vorgaben** bezüglich der verpflichtenden Entnahme von Borkenkäferbäumen? (Forstgesetz 1975 [2002], § 44-45: https://www.jusline.at/gesetz/forstg/paragraf/44 (https://www.jusline.at/gesetz/forstg/paragraf/44))
*

- ○ Ja
- ○ Nein
- ○ Kann ich so nicht beurteilen

16. (Wenn nein:) Warum halten sich manche Waldbesitzer*innen **nicht** an diese Vorgaben? (Mehrfachnennung möglich)
*

- ☐ Weil manche nicht die **zeitlichen** Ressourcen haben, alle Befälle/Schäden rasch und vollständig aufzuarbeiten.
- ☐ Weil manche nicht die **technischen** Ressourcen (Maschinen, Infrastruktur etc.) haben, alle Befälle/Schäden rasch und vollständig aufzuarbeiten.
- ☐ Weil manche nicht die **finanziellen** Ressourcen haben, alle Befälle/Schäden rasch und vollständig aufzuarbeiten oder von Externen aufarbeiten zu lassen.
- ☐ Weil manche Waldbesitzer*innen weit weg von ihrem Wald wohnen und dadurch nur **selten im Wald anzutreffen sind**.
- ☐ Weil es manchen Waldbesitzer*innen **egal** ist.
- ☐ Weil die **Vorgaben** so streng sind, dass sie gar nicht erfüllt werden können.
- ☐ Weil manche den Wald **als Anlage** sehen und ihnen nicht bewusst ist, dass ein Wald viel Arbeit bedeutet.
- ☐ Weil manche Waldbesitzer*innen den **Ernst der Lage nicht erkennen** und es am **entsprechenden Wissen im Umgang mit Borkenkäferbefällen mangelt**.
- ☐ Weil manche Waldbesitzer*innen auf ihren Wald **ökonomisch nicht angewiesen sind** und es sich leisten können, nicht zu reagieren.
- ☐ Weil manche Waldbesitzer*innen die **Vorgaben** und ihre entsprechenden **Pflichten** nicht kennen.
- ☐ Weil manchen **nicht bewusst** ist, dass ein Ausbruch auch **Konsequenzen für Grundnachbar*innen** haben kann.
- ☐ Weil manche Waldbesitzer*innen **bewusst wenig** in den Wald **eingreifen** wollen und die Vorgaben für überzogen halten.
- ☐ Weil manche in gewissen Bereichen **von den Vorgaben ausgenommen sind** (etwa Nationalparks etc.).
- ☐ Weil sehr **unterschiedliche Vorstellungen** existieren, wie eine "richtige" Waldbewirtschaftung auszusehen hat.
- ☐ Aus sonstigen Gründen: ______________________
- ☐ Kann ich so nicht beurteilen.

17. Haben Sie den Eindruck, dass Borkenkäferausbrüche in Ihrem Umfeld zu **Spannungen** bzw. zu **Konflikten** führen?
*

- Ja
- Nein
- Kann ich so nicht beurteilen.

18. (Wenn ja:) **Zwischen welchen Gruppen** beobachten Sie diese Spannungen/Konflikte? (Mehrfachnennung möglich)

- Zwischen Grundnachbar*innen (zwischen solchen, die auf einen Befall rechtzeitig reagieren und solchen, die das nicht tun)
- Zwischen Nationalparkverwaltung und Anrainer*innen/Grundnachbar*innen eines Nationalparks
- Zwischen Waldbesitzer*innen dies- und jenseitig einer Landes- oder Staatsgrenze
- Zwischen alteingesessenen und zugezogenen/"neuen" Waldbesitzer*innen
- Zwischen Waldbesitzer*innen und Forstbehörden/-organen
- Zwischen Waldbesitzer*innen, Holztransportunternehmen und Sägewerken
- Zwischen Waldbesitzer*innen und Naturschützer*innen
- Zwischen großen Forstbetrieben und Kleinwaldbesitzer*innen
- Zwischen jüngeren und älteren Waldbesitzer*innen
- Zwischen Mensch, Borkenkäfer und Fichte
- Zwischen sonstigen Gruppen:_______________________

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19. Bewerten Sie die folgenden **Maßnahmen hinsichtlich ihres Beitrags zu einem "besseren" Umgang mit Borkenkäferausbrüchen und deren Folgen.**
*

	stimme überhaupt nicht zu	stimme eher nicht zu	stimme eher zu	stimme voll und ganz zu	kann ich nicht beurteilen
Abnahmepflicht von heimischem Schadholz für Unternehmen im Forstsektor (Sägewerke, Papierindustrie, Baugewerbe etc.)	○	○	○	○	○
Aufstockung und Ausbau des Waldfonds	○	○	○	○	○
Abänderung des Forstgesetzes	○	○	○	○	○
Mehr Unterstützung bzw. Förderungen für Kleinstwaldbesitzer*innen (<10 ha)	○	○	○	○	○
Intensiveres Monitoring und eine aktivere Forstaufsicht	○	○	○	○	○
Bessere Beratungs- und Schulungsmöglichkeiten	○	○	○	○	○
Erhöhung der Zahlungen aus dem Katastrophenfonds	○	○	○	○	○
Etablierung genauerer Prognose- und Messsysteme	○	○	○	○	○
Erweiterung von Schutzgebieten	○	○	○	○	○
finanzielle Anreize für innovative Waldbau-Methoden	○	○	○	○	○
Regulierung des Holzpreises seitens des Staates	○	○	○	○	○
Entwicklung und stärkere Anwendung von effektiveren Insektiziden	○	○	○	○	○
finanzielle Anreize für den Erhalt von verschiedenen Waldfunktionen	○	○	○	○	○
Subventionen für den Anbau bestimmter Baumarten	○	○	○	○	○
Umdenken im Waldbausystem und Umbau von anfälligen Beständen	○	○	○	○	○

20. Abseits der genannten Maßnahmen, welche **sonstigen Maßnahmen in puncto Prävention** und **Management von Borkenkäferausbrüchen** wären aus Ihrer Sicht wichtig?

Zu Ihrer persönlichen Beziehung zum Borkenkäfer, zu Borkenkäferausbrüchen und zur Forstwirtschaft

21. In welchem **Eigentumsverhältnis** bzw. in welcher **beruflichen Beziehung** stehen Sie zu Wald, Forstwirtschaft und/oder Forstsektor? (Mehrfachnennung möglich)
*

- Ich bin **Waldbesitzer*in** (Besitzer*in einer Waldfläche > 1 ha).
- Ich bin Waldbesitzer*in und Landwirt*in im **Haupterwerb** (Waldfläche > 1 ha + landwirtschaftliche Nutzfläche).
- Ich bin Waldbesitzer*in und Landwirt*in im **Nebenerwerb** (Waldfläche > 1 ha + landwirtschaftliche Nutzfläche).
- Ein **Familienmitglied** oder mehrere **Familienmitglieder** sind im Besitz einer Waldfläche.
- Ich war Waldbesitzer*in, habe den Wald aber im Laufe der letzten zehn Jahre verkauft, übergeben oder vererbt.
- Ich arbeite haupt- oder nebenberuflich als **Wald-/Forstarbeiter*in.**
- Ich arbeite als **Förster*in** und/oder **Forstorgan**.
- Ich bin **Jäger*in** und/oder **bei Jagden regelmäßig aktiv**.
- Ich arbeite in einem **Unternehmen im Forst-/Holz-/Papiersektor** (Forstbetrieb, Sägewerk/-industrie, Holztransport-, Holzverarbeitungs- und Papierindustrie, Tischlerei etc.).
- Ich bin **Forstreferent*in**, **Forstwissenschaftler*in** und/oder beeidete (r) **Forstgutachter*in.**
- In sonstiger Beziehung
- Keine Angabe

22. **Wie groß ist die Waldfläche**, die Sie besitzen bzw. **wie groß ist der Forstbetrieb**, in dem Sie beruflich tätig sind?
*

- Unter 5 Hektar
- 6-15 Hektar
- 16-30 Hektar
- 31-50 Hektar
- 51-200 Hektar
- über 200 Hektar
- Keine Angabe zur Größe
- Ich besitze weder einen Wald noch bin ich in einem Forstbetrieb beruflich tätig.

23. Welche **drei Baumarten** sind in Ihrem Wald bzw. in dem von Ihnen bewirtschafteten Wald am häufigsten? Beginnen Sie mit der **häufigsten Baumart** und **schätzen Sie jeweils deren Flächenanteil in Prozent.**
*

24. **Warum** bzw. **aufgrund welcher Motive** besitzen/bewirtschaften Sie einen Wald bzw. warum arbeiten Sie in einem Wald? (Mehrfachnennung möglich)
*

- Liebhaberei/Hobby
- Pflege der Kulturlandschaft
- aus ökonomischen/betrieblichen bzw. beruflichen Gründen
- aufgrund von familiären Verpflichtungen
- aus Interesse an ökologischen Zusammenhängen; eigener Beitrag zu Klima-/Naturschutz/Artenerhalt
- zur Selbstversorgung (mit Bau-, Wert- und Energieholz)
- Verpflichtung gegenüber Familie und früheren Generationen
- Erhalt und Fortführung der lokalen kulturellen Tradition
- sonstige Gründe: ____________________

25. Sind Sie oder Ihre Familie auf Einkünfte aus dem Wald/der Forstwirtschaft für Ihr **finanzielles Auskommen** angewiesen?
*

- Ja, in einem extremen Ausmaß (**bereits kleine Einbußen bei Einkünften** aus dem Wald/der Forstwirtschaft stellen mich und/oder meine Familie vor große finanzielle Herausforderungen)
- Ja, in einem moderaten Ausmaß (**größere Einbußen bei Einkünften** aus dem Wald/der Forstwirtschaft stellen mich und/oder meine Familie vor finanzielle Herausforderungen)
- Ja, in einem geringen Ausmaß (**ein Totalausfall bei Einkünften** aus dem Wald/der Forstwirtschaft würden mich und/oder meine Familie finanziell treffen)
- Nein, keine Angewiesenheit
- Nein, weder ich noch meine Familie besitzen einen Wald und/oder sind in der Forstwirtschaft beruflich tätig.
- Keine Angabe

26. In den letzten fünfzehn Jahren: Sind Sie **in Ihrem Wald** von Borkenkäferbefällen **betroffen** gewesen?
*

- Ja, in Form von mehrmaligen großflächigen Befällen mit hoher Schadenswirkung
- Ja, in Form von wiederkehrenden kleinflächigen/lokal begrenzten Befällen mit geringer Schadenswirkung
- Ja, in Form von wenigen und ökonomisch unbedeutenden Befällen von Einzelbäumen
- Nein
- Ich besitze (derzeit) keinen Wald.

27. Bitte schildern Sie im Detail, **in welchem Ausmaß** Sie von Borkenkäferbefällen in den letzten fünfzehn Jahren betroffen gewesen sind. (Bsp.: Größe der jährlichen Befallsfläche, Höhe der geschätzten Schäden in €, Anzahl an betroffenen Bäumen, geographische Lage und Bestandsstruktur Ihres Waldes, Betriebsart etc.).

28. Fühlen Sie sich als borkenkäfergeschädigte*r Waldbesitzer*in von der Politik (Ministerium, Landesregierung etc.) und den zuständigen Forstbehörden **gehört, verstanden und ausreichend unterstützt**?
*

- Ja, voll und ganz
- Ja, zumindest teilweise
- Nein
- Kann ich so nicht beurteilen.

29. In den letzten fünfzehn Jahren: Sind **in Ihrer Familie und/oder in Ihrem beruflichen Umfeld und/oder Bekanntenkreis** Waldbesitzer*innen, Waldarbeiter*innen und/oder entsprechende Unternehmen durch Borkenkäferausbrüche finanziell zu Schaden gekommen? *

- Ja
- Nein

30. Beschreiben Sie in aller Kürze, **was Ihnen in den Sinn kommt**, wenn Sie an den Borkenkäfer (Buchdrucker, Kupferstecher und andere) denken? Welche **Emotionen** sind im Spiel?

31. Sofern zutreffend: Beschreiben Sie in aller Kürze **Ihre Beziehung zum (eigenen oder Familien-) Wald: Warum ist Ihnen Ihr Wald wichtig?**

32. Wenn Sie heute an das Jahr 2050 denken: **Welche Zukunft** sehen Sie für Ihren eigenen Wald bzw. für Wälder in Oberösterreich? **Welche Rolle** wird der **Borkenkäfer in Zukunft** spielen?

Persönliche Daten

33. Geschlecht *

- ◯ Männlich
- ◯ Weiblich
- ◯ Divers
- ◯ Keine Angabe

34. Alter *

- ◯ unter 16
- ◯ 16-30
- ◯ 31-45
- ◯ 46-60
- ◯ 61-75
- ◯ über 75 Jahre
- ◯ keine Angabe

35. In welcher **Gemeinde** leben Sie/haben Sie Ihren Lebensmittelpunkt? Bitte schreiben Sie **entweder den Gemeindenamen oder** die jeweilige **Postleitzahl** in das Antwortfeld. *

36. Über welche **Ausbildung** bzw. über welchen **höchsten (Hoch-)Schulabschluss** verfügen Sie? (Mehrfachnennung möglich) *

- ☐ Bin derzeit noch Schüler*in
- ☐ Schule beendet ohne Abschluss
- ☐ Abschluss einer Volks- und/oder Neuen Mittelschule und/oder Polytechnischen Schule
- ☐ Abschluss einer berufsbildend mittleren Schule (Handelsschule, Fachschule)
- ☐ Abschluss einer allgemeinbildend (Gymnasium) oder berufsbildend höheren Schule mit Matura (HTL, HAK etc.)
- ☐ Abschluss einer Berufsschule
- ☐ Gesellen- und/oder Meisterprüfung (ohne vorheriger Berufsschule)
- ☐ Forst-/landwirtschaftlicher Facharbeiter
- ☐ Ausbildung zum Förster/zur Försterin
- ☐ Hochschulabschluss (Universität, Fachhochschule)
- ☐ Anderen Schulabschluss/sonstigen Abschluss
- ☐ Keine Angabe

37. **Arbeits-/Erwerbssituation:** Was trifft für Sie hauptsächlich und zum jetzigen Zeitpunkt zu? (Mehrfachnennung möglich) *

- ☐ Vollzeit erwerbstätig
- ☐ Teilzeit erwerbstätig
- ☐ Geringfügig beschäftigt (weniger als 475 € Verdienst/Monat)
- ☐ Lehrling, Schüler*n, Student*in
- ☐ Zurzeit arbeitslos
- ☐ in beruflicher Weiterbildung/Ausbildung
- ☐ in Umschulung bzw. Umschulungsmaßnahme
- ☐ Pensionist*in
- ☐ Hausfrau/Hausmann
- ☐ Zivildienst/Wehrdienst/Freiwilliges soziales Jahr/Praktikum
- ☐ Elternkarenz
- ☐ Sonstige Situation
- ☐ Keine Angabe

38. Meine derzeitige **Berufsbezeichnung** lautet: *

39. Haben Sie zusätzlich die **Kurzversion** des Fragebogens ausgefüllt?
*

- Ja
- Nein

40. Anmerkungen/Was Sie an dieser Stelle noch anmerken möchten:

Dieser Inhalt wurde von Microsoft weder erstellt noch gebilligt. Die von Ihnen übermittelten Daten werden an den Formulareigentümer gesendet.

Microsoft Forms

Short Version of the Office-Forms Survey (n= 22, 14 questions, for details and English version see https://forms.office.com/r/P96CUCAU5t)

Die oberösterreichische Forstwirtschaft in Zeiten des Borkenkäfers (Kurzversion)

Sehr geehrte(r) Untersuchungsteilnehmer*in!

Zunächst ein herzliches Danke, dass Sie sich die Zeit nehmen, die **Kurzversion** meines Fragebogen als Teil meines umweltanthropologischen Dissertationsprojekts zu **Mensch-Borkenkäfer-Fichte-Beziehungen** in Oberösterreich auszufüllen. Sollten Sie Interesse am Ausfüllen der **Langversion** dieses Fragebogens haben, so finden Sie diesen hier: https://forms.office.com/r/6LBgfpstki (https://forms.office.com/r/6LBgfpstki)

Die folgende Umfrage richtet sich an Menschen mit **direktem und indirektem Waldbezug in Oberösterreich** (OÖ). Zu diesen zählen derzeitige und ehemalige (borkenkäferbetroffene) Waldbesitzer*innen in OÖ/Familienmitglieder einer Familie mit Wald in OÖ; Beschäftigte in einem oö. Forstbetrieb bzw. im weiteren Sinne im oö. Forstsektor/in der oö. Säge- und Papierindustrie; Forstwirt*innen/-wissenschaftler*innen; Förster*innen/Forstorgane; Mitarbeiter*innen/Mitglieder von forstlich relevanten Beratungsstellen sowie Mitarbeiter*innen/Mitglieder von waldrelevanten Interessens- und Naturschutzverbänden. Im Kern zielt die folgende Umfrage auf **Ihre Wahrnehmung von Borkenkäferbefällen** (an der Fichte; mit Augenmerk auf Buchdrucker und Kupferstecher) ab.

Alle Angaben, die Sie im Rahmen dieser Befragung machen, werden vertraulich behandelt, nicht an Dritte weitergegeben und ausschließlich zu wissenschaftlichen Zwecken verwendet. Die Daten werden anonymisiert, ein Rückschluss auf Ihre Person ist nicht möglich. Durch das Ausfüllen des Fragebogens bestätigen Sie, dass Sie diese Informationen gelesen haben und sich zu der Teilnahme bereit erklären. Die Teilnahme an der Umfrage kann ohne Angabe von Gründen zu jedem Zeitpunkt und ohne dadurch entstehende Nachteile abgebrochen oder zurückgezogen werden.

Das Ausfüllen des Fragebogens wird rund **5 Minuten** in Anspruch nehmen. Füllen Sie bitte bis **spätestens 31.12.2022** den Fragebogen vollständig und entsprechend der Reihenfolge der Fragen aus.

Zusatz: In den Regionen **Sauwald**, **Böhmerwald** und **rund um den Nationalpark Kalkalpen** bin ich auf der Suche nach Waldbesitzer*innen, die sich vorstellen können, ein Interview zu geben oder mich durch ihren Wald zu führen. Wenn Sie also noch stärker in die Forschung eingebunden werden oder einfach zusätzliche Informationen zu diesem Forschungsprojekt erhalten möchten, melden Sie sich jederzeit. Sie erreichen mich unter: Thalhammer_Martin@phd.ceu.edu (mailto:Thalhammer_Martin@phd.ceu.edu) oder in besonderen Fällen unter: 0680/3151711

Besten Dank,
Martin Thalhammer, MA MSc
Doktorand, Central European University Wien

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* Erforderlich

Zu Ihrer persönlichen Beziehung zum Borkenkäfer, zu Borkenkäferausbrüchen und zur Forstwirtschaft

1. In welchem **Eigentumsverhältnis** bzw. in welcher **beruflichen Beziehung** stehen Sie zu Wald, Forstwirtschaft und/oder Forstsektor? (Mehrfachnennung möglich) *

- ☐ Ich bin **Waldbesitzer*in** (Besitzer*in einer Waldfläche > 1 ha).
- ☐ Ich bin Waldbesitzer*in und Landwirt*in im **Haupterwerb** (Waldfläche > 1 ha + landwirtschaftliche Nutzfläche).
- ☐ Ich bin Waldbesitzer*in und Landwirt*in im **Nebenerwerb** (Waldfläche > 1 ha + landwirtschaftliche Nutzfläche).
- ☐ Ein **Familienmitglied** oder mehrere **Familienmitglieder** sind im Besitz einer Waldfläche.
- ☐ Ich war Waldbesitzer*in, habe den Wald aber im Laufe der letzten zehn Jahre verkauft, übergeben oder vererbt.
- ☐ Ich arbeite haupt- oder nebenberuflich als **Wald-/Forstarbeiter*in.**
- ☐ Ich arbeite als **Förster*in** und/oder **Forstorgan**.
- ☐ Ich bin **Jäger*in** und/oder **bei Jagden regelmäßig aktiv**.
- ☐ Ich arbeite in einem **Unternehmen im Forst-/Holz-/Papiersektor** (Forstbetrieb, Sägewerk/-industrie, Holztransport-, Holzverarbeitungs- und Papierindustrie, Tischlerei etc.).
- ☐ Ich bin **Forstreferent*in, Forstwissenschaftler*in** und/oder beeidete (r) **Forstgutachter*in.**
- ☐ In **sonstiger** Beziehung:______________________
- ☐ Keine Angabe

2. **Wie groß ist die Waldfläche**, die Sie besitzen bzw. **wie groß ist der Forstbetrieb**, in dem Sie beruflich tätig sind? *

- ○ Unter 5 Hektar
- ○ 6-15 Hektar
- ○ 16-30 Hektar
- ○ 31-50 Hektar
- ○ 51-200 Hektar
- ○ über 200 Hektar
- ○ Keine Angabe zur Größe
- ○ Ich besitze weder einen Wald noch bin ich in einem Forstbetrieb beruflich tätig.

3. Bewerten Sie auf einer Skala von 1 bis 10 **die Borkenkäfersituation in Oberösterreich in den letzten fünfzehn Jahren** (1 = der Borkenkäfer ist in Oberösterreich weder Thema noch Herausforderung, 10 = der Borkenkäfer ist das zentrale Thema und eine sehr große Herausforderung) *

1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○

4. In den letzten fünfzehn Jahren: Sind Sie **in Ihrem Wald** von Borkenkäferbefällen **betroffen** gewesen? *

- ○ Ja, in Form von mehrmaligen großflächigen Befällen mit hoher Schadenswirkung
- ○ Ja, in Form von wiederkehrenden kleinflächigen/lokal begrenzten Befällen mit geringer Schadenswirkung
- ○ Ja, in Form von wenigen und ökonomisch unbedeutenden Befällen von Einzelbäumen
- ○ Nein
- ○ Ich besitze (derzeit) keinen Wald.

5. Was sind aus Ihrer Sicht zentrale **verschärfende Faktoren für die Zunahme an Borkenkäferausbrüchen** in Oberösterreich in den letzten Jahrzehnten? (Mehrfachnennung möglich) *

- ☐ anfällige Bestandsstruktur (zu alte Bestände, zu hohe Dichte, Reinbestände etc.)
- ☐ Waldbewirtschaftungsfehler bzw. Fehler im Waldbau in der Vergangenheit
- ☐ fehlende/unzureichende Pflege seitens der Waldbesitzer*innen (keine rechtzeitige Entnahme, Schlampigkeit etc.)
- ☐ Windwurf- und Schneebruchereignisse
- ☐ höhere Temperaturen, Trockenheit und Hitzewellen
- ☐ menschengemachter Klimawandel
- ☐ Verlust von naturnahen Wäldern
- ☐ zu viele menschliche Eingriffe
- ☐ zu wenige menschliche Eingriffe
- ☐ nicht-standortgerechte/-angepasste Fichtenmonokulturen
- ☐ fehlende politische und finanzielle Unterstützung für betroffene Waldbesitzer*innen
- ☐ fehlgeleitete Forstpolitik auf nationalstaatlicher und EU-Ebene (EU-Waldstrategie etc.)
- ☐ Entwicklung auf den Holzmärkten (instabile Preise, Preisdruck, Konkurrenz etc.)
- ☐ fehlendes Bewusstsein/Wissen seitens der Waldbesitzer*innen
- ☐ Baumverletzungen bei Ernte (bspw. durch Harvester)
- ☐ Waldbewirtschaftungsfehler bzw. Fehler im Waldbau in der Gegenwart
- ☐ Sonstiges: ______________________
- ☐ Kann ich so nicht beurteilen.

021 11/26/2021

Persönliche Daten

6. Haben Sie den Eindruck, dass Borkenkäferausbrüche in Ihrem Umfeld zu **Spannungen** bzw. zu **Konflikten** führen? *

- ○ Ja
- ○ Nein
- ○ Kann ich so nicht beurteilen.

7. (Wenn ja:) **Zwischen welchen Gruppen** beobachten Sie diese Spannungen/Konflikte? (Mehrfachnennung möglich) *

- ☐ Zwischen Grundnachbar*innen (zwischen solchen, die auf einen Befall rechtzeitig reagieren und solchen, die das nicht tun)
- ☐ Zwischen Nationalparkverwaltung und Anrainer*innen/Grundnachbar*innen eines Nationalparks
- ☐ Zwischen Waldbesitzer*innen dies- und jenseitig einer Landes- oder Staatsgrenze
- ☐ Zwischen alteingesessenen und zugezogenen/"neuen" Waldbesitzer*innen
- ☐ Zwischen Waldbesitzer*innen und Forstbehörden/-organen
- ☐ Zwischen Waldbesitzer*innen, Holztransportunternehmen und Sägewerken
- ☐ Zwischen Waldbesitzer*innen und Naturschützer*innen
- ☐ Zwischen großen Forstbetrieben und Kleinwaldbesitzer*innen
- ☐ Zwischen jüngeren und älteren Waldbesitzer*innen
- ☐ Zwischen Mensch, Borkenkäfer und Fichte
- ☐ Zwischen sonstigen Gruppen:________________________

8. Geschlecht *

- ○ Männlich
- ○ Weiblich
- ○ Divers
- ○ Keine Angabe

9. Alter *

- ○ unter 16
- ○ 16-30
- ○ 31-45
- ○ 46-60
- ○ 61-75
- ○ über 75 Jahre
- ○ keine Angabe

10. In welcher **Gemeinde** leben Sie/haben Sie Ihren Lebensmittelpunkt? Bitte schreiben Sie **entweder den Gemeindenamen oder** die jeweilige **Postleitzahl** in das Antwortfeld. *

11. Über welche **Ausbildung** bzw. über welchen **höchsten (Hoch-)Schulabschluss** verfügen Sie? (Mehrfachnennung möglich) *

- ☐ Bin derzeit noch Schüler*in
- ☐ Schule beendet ohne Abschluss
- ☐ Abschluss einer Volks- und/oder Neuen Mittelschule und/oder Polytechnischen Schule
- ☐ Abschluss einer berufsbildend mittleren Schule (Handelsschule, Fachschule)
- ☐ Abschluss einer allgemeinbildend (Gymnasium) oder berufsbildend höheren Schule mit Matura (HTL, HAK etc.)
- ☐ Abschluss einer Berufsschule
- ☐ Gesellen- und/oder Meisterprüfung (ohne vorheriger Berufsschule)
- ☐ Forst-/landwirtschaftlicher Facharbeiter
- ☐ Ausbildung zum Förster/zur Försterin
- ☐ Hochschulabschluss (Universität, Fachhochschule)
- ☐ Anderen Schulabschluss/sonstigen Abschluss
- ☐ Keine Angabe

12. **Arbeits-/Erwerbssituation:** Was trifft für Sie hauptsächlich und zum jetzigen Zeitpunkt zu? (Mehrfachnennung möglich) *

- ☐ Vollzeit erwerbstätig
- ☐ Teilzeit erwerbstätig
- ☐ Geringfügig beschäftigt (weniger als 475 € Verdienst/Monat)
- ☐ Lehrling, Schüler*n, Student*in
- ☐ Zurzeit arbeitslos
- ☐ in beruflicher Weiterbildung/Ausbildung
- ☐ in Umschulung bzw. Umschulungsmaßnahme
- ☐ Pensionist*in
- ☐ Hausfrau/Hausmann
- ☐ Zivildienst/Wehrdienst/Freiwilliges soziales Jahr/Praktikum
- ☐ Elternkarenz
- ☐ Sonstige Situation
- ☐ Keine Angabe

13. Meine derzeitige **Berufsbezeichnung** lautet: *

14. Haben Sie zusätzlich die **Langversion des Fragebogens** ausgefüllt? *

- ○ Ja
- ○ Nein

Dieser Inhalt wurde von Microsoft weder erstellt noch gebilligt. Die von Ihnen übermittelten Daten werden an den Formulareigentümer gesendet.

Microsoft Forms

A9: Research Ethics (taken from the *updated* section "C. Participants" from the CEU Annex 2 to the Ethical Policy on Research)

1. Does the study involve human subjects, and how? [Who will participate in the research? How will the subject/respondent group be chosen, what sampling techniques will be deployed? In which ways the participants will be involved? (2.1)
Yes, the study will involve human subjects, and these will participate as research and interview partners. While the unstructured, semi-structured, and expert interviews will be held with selected representatives of different forestry stakeholder groups (forest owners/managers, representatives of interest groups, representative of ministries, federal forest agencies etc.) chosen on basis of a quota sampling strategy (in combination with a snowball sampling strategy), interested forest owners and forest experts (scientists, foresters etc.) are invited for joint forest walks on their forest properties (=go-alongs/participant observation). These walks will be recorded and photographed (only with the consent of the respective research partner). The semi-structured online survey is disseminated via email, newsletters and through personal contact. Participation is voluntary and can be withdrawn at any time; at the beginning of the survey, participants are fully informed about their rights and the researcher's responsibilities.
2. Are there potential benefits and hazards for the participants? [Are there risks to the subject entailed by involvement in the research? Have procedures been established for the care and protection of subjects? Will the participants be informed of possible risks and hazards?] (2.2 – 3.4)

I assume that most participants benefit from the project's multiple insights. Generally, the researcher obliges himself to be sensitive of the needs and wellbeing of all research participants involved, especially of vulnerable and/or marginalized participants.
Risks and hazards for research participants are related to the fact that partaking in a research process is time-consuming, unremunerated and in some cases not welcomed by skeptical peers. In this sense, there is a risk of becoming stigmatized within the local community for working together with an unknown researcher – a risk that will be communicated to the research partner prior to obtaining consent and that will be minimized by securing confidentiality and anonymity throughout and beyond the whole research process. In case the participant develops the impression that negative consequences occur in his/her life due to his/her ongoing involvement in the research process, the participant has the right to withdraw from participating/to withdraw consent at all times. Here, it is the researcher's duty to inform the participants of this possibility.
Finally, in the times of Covid-19 participants are to be informed prior to participation (ideally as part of the consent form) of the potential risk of infection with the virus. Insofar as the researcher is fully vaccinated, will follow all relevant health and safety guidelines, will test himself regularly before interviews and will carry a mouth-nose-protection, the risk of infection is heavily minimized. In addition, the researcher will follow any relevant local and supralocal Covid-19 regulations. In case research participants feel uncomfortable with face-to-face interactions, interviews will be held via encrypted video conference tools.

3. Does the research involve any risks or pose danger to the researcher(s)?
[If yes, what procedures will be adopted to minimize the risks? Have the health and safety guidelines relevant to the area and character of the research been consulted and implemented?] (4)

Yes, the research involves the risk of infection with the Covid-19 virus. This risk is minimized through the researcher's full vaccination and through carrying a mouth-nose-protection mask when needed.

4. Will all procedures ensuring that consent is informed be followed?
[Including the possibility for withdrawing consent] (5.1)

Yes, all requirements/conditions as listed in CEU's Ethical research guidelines (5.1.1-5.1.4) are to be complied with. Recorded oral informed consent is prioritized over non-recorded consent. Prior consent is prioritized over obtaining consent after a researched situation.

5. Are the recruitment procedures well planned, and risks of coercion considered?
[Is there any sense in which subjects might be "obliged" to participate – or are volunteers being recruited? Does the participation of research involve financial or other remuneration?] (5.2)

Yes. All "recruitment procedures" (i.e., procedures for finding/choosing interview partners) involve personal, telephone or email contact and are based on voluntariness (if not harming other participants and only when compliant with data protection regulations, the researcher obligates himself to declare where the contact details come from). Only subjects who have consented verbally or in written form to be interested in participating in the research process, are considered potential research partners. Before every further step (doing an interview, meeting etc.), participants are informed on the use of the data, on the right to always withdraw consent, on potential risks, and hazards; including all other points from CEU's Ethical Research Guidelines (5.1.1-5.1.4). There will be no financial or other renumeration for participants.

6. Does the research involve incompetent adults, children or contexts where obtaining consent is impossible (i.e., public context, groups)?
[Which "consent"-procedures will be applied instead?] (5.3 – 5.5)

No "incompetent" adults, no children involved. Unavoidably, there may be small group settings (depending on the research situation). Unless the research is not carried out in a public context, consent in small groups is to be obtained from every single individual.

7. Does the research involve deception? [This will not be applicable to many studies. In case deception of participants is involved: how is the impossibility to employ alternative non-deceiving method of research justified? How is the deception integral to the viability of research? Will debriefing be employed and how will the participant's reactions influence the use of the data obtained?] (5.6 – 6)
No
8. Will confidentiality and anonymity be secured?(8)
Yes, confidentiality and anonymity will be secured throughout and beyond the whole research process. Unless expressly permitted, participants will not be called by their real names, but by altered names or numbers. Generally, all measures are to be taken that protects the confidentiality of participants and their data. Whenever direct quotes from interview transcripts are incorporated into the dissertation, these quotes are to be selected in a way that makes it impossible to draw inferences about the identity of the interview partner. As part of obtaining consent, participants are to be informed for which purposes the provided information is to be used.

A10: Short Description of Survey Sample

Gender (n=82)

- Male: 76 (93%)
- Female: 4 (5%) → in reality: 32% female forest owners in Upper Austria
- Diverse: 2 (2%)

Property-related/professional relationship to forests (n= 82; overlapping!):

- 68 forest owners (26 of them are full- or part-time farmers!)
- 30 forest wardens and/or forest authorities (including forestry advisors from LK etc.)
- Forest scientists, hunters, forest workers, wood industry reps. (...)

Ownership: Size of Owned/Managed Forest (n=82):

- <5 ha: 18 (22%)
- 5-9 ha: 12 (15%)
- 10-29 ha: 14 (17%)
- 30-99 ha: 7 (8%)
- 100-199 ha: 0 (0%)
- ≥200 ha: 18 (22%)
- Not specified: 5 (6%)
- I do not own a forest/do not work in a company that owns a forest, and Other: 8 (10%)

Education/Training (n=82; overlapping!):

- 32 academic background (university, FH) → in reality: much lower!
- 25 qualification as forest warden or forest supervisor (Forstaufstriction, Förster etc.)
- 21 forestry/agricultural skilled worker (…)

Affectedness by bark beetle infestations in the last 15 years (n= 82):

- 63 (76%) affected
  - 20 by multiple large-scale infestations with high damage
  - 28 by moderate/confined infestations with little damage
  - 15 by very little, economically negligible infestations

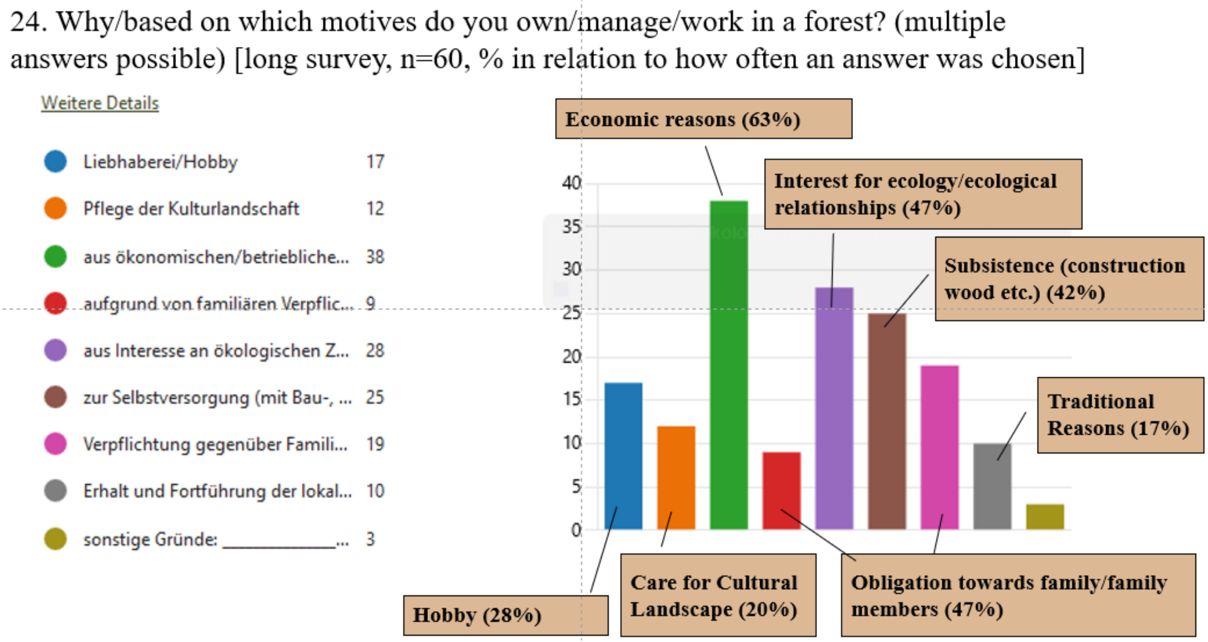
A11: Forest Area Share of Spruce and Other Tree Species in a Historical Perspective

Forest area shares of selected tree species/groups in Austria (in Upper Austria) in%, rounded up or down; limited comparability due to different calculation methods!			
	1000 years ago (Numbers based on Firbas 1949, Kral, Mayer 1988/89 and Kral 1994, 31)	**1926** (Numbers based on Forststatistik 1928 in Weigl 2002, 620)	**2016-2021** (Numbers based on BFW 2022; shares in relation to total *productive* stocked and unstocked forest = "Ertragswald")
Total Forest Area	ca. 6 mio. ha	3.137.185 ha	4.015.000 ha
Tree Species			
Norway Spruce (*Picea abies*)	36	57 (57)	48 (49)[125]
Silver Fir (*Abies alba*)	26	7 (9)	3 (3)
European Larch (*Larix decidua*)	2	7 (2)	4 (2)
Scots Pine (*Pinus sylvestris*)	4	10 (9)	4 (2)
Other Conifer Trees	n.a.	2 (0)	1 (0)
Conifer Trees	68	84 (77)	60 (56)
European Beech (*Fagus sylvatica*)	20	10 (18)	11 (18)
Oak (different species)	8	2 (1)	2 (1)
Common Ash (*Fraxinus excelsior*)	n.a.	n.a. (n.a.)	n.a. (n.a.)
Other Deciduous Trees	4	4 (4)	12 (13)
Deciduous Trees	32	16 (23)	25 (32)
Other Forest Areas (Bare spots, clearings, shrubs etc.)	n.a.	n.a.	14 (12)

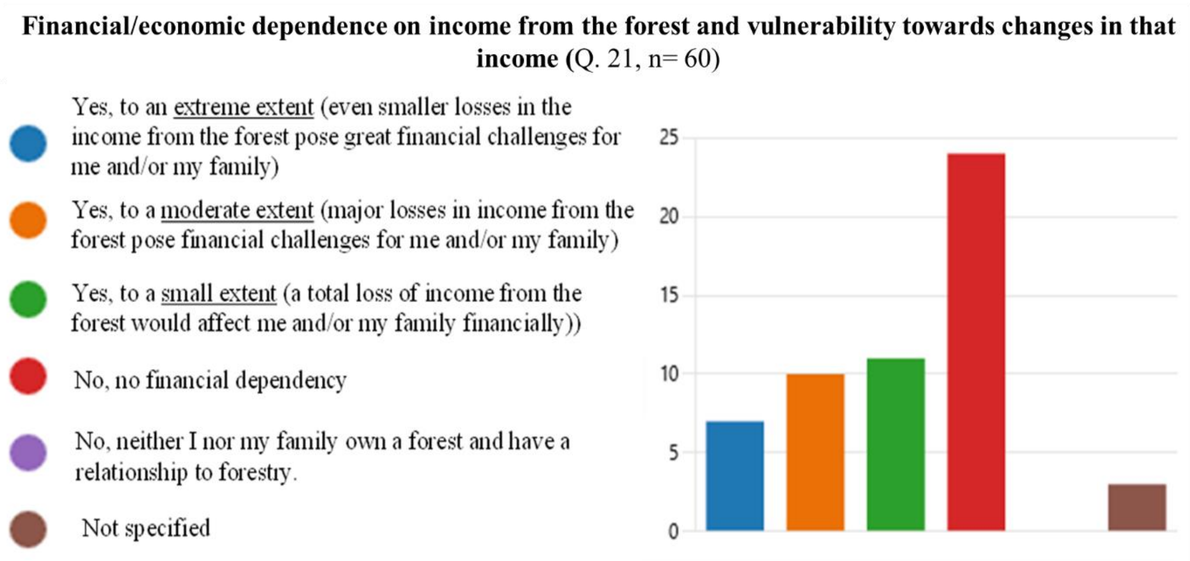
Remark: As the table shows, the forest area share of Norway spruce in Austria increased from (an estimated) 36% around the year 1000 (when forests are believed to have resembled the *natural* forest communities) to 57% in 1926. After a peak in the 1990s with a 70% spruce area share (Schieler and Schadauer 2011), disturbances and silvicultural changes led to a decrease of the share to around 50% today (BFW 2022). Albeit the comparison should be treated with caution (due to different calculations and different reference values), the table illustrates that the rise of spruce mainly happened at the expense of fir (from 26% to 7% in 1926, and 3% in 2021), beech (from 20% to 10% and 11%) and oak (from 8% to around 2% both in 1926 and today).

[125] The Austrian Forest Report (BFW 2023) works with slightly different numbers – spruce has here a federal area share of 46.2%.

A12: Insights from Question N. 24 from the Survey: Motives for Managing/Owning Forests (created by author)



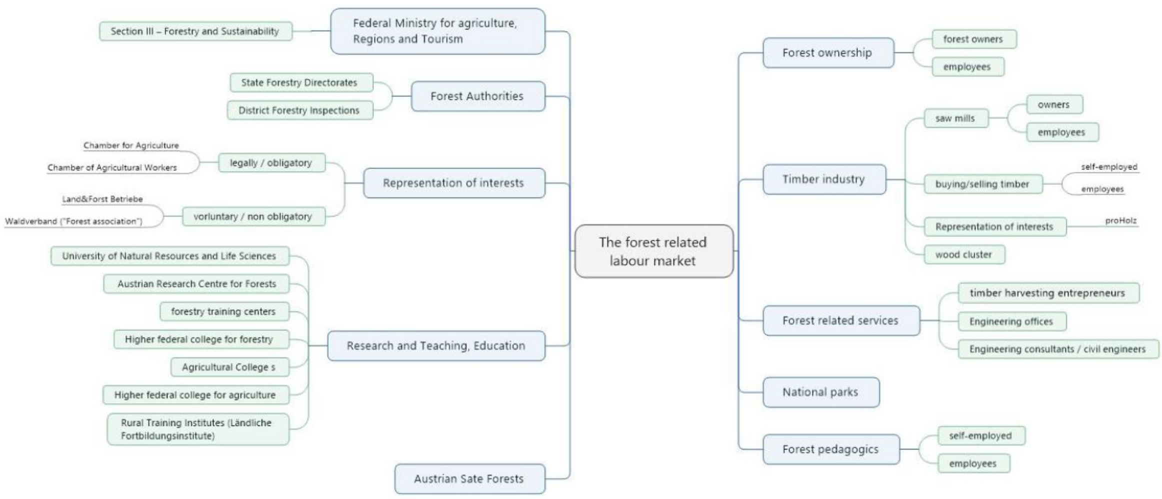
A13: Insights from Question N. 21 from the Survey: Financial/Economic Dependency on Income from Forests/Forestry (created by author)



A14: Insights from Question N. 4 from the Survey: Ranking of Forest Functions/Forest Ecosystem Services (created by author)

Forest Function/Ecosystem Service	**Ranked 1st**	**Ranked 2nd**	**Ranked 3rd**	**Total Top 3 Rankings**
Water Protection, Water Filter and Regulation of Water Cycle	**17**	13	9	**39**
Protection against Avalanches, Floods and Erosion	11	**13**	**15**	**39**
Climate Protection, Carbon Sink and Production of Oxygen	10	12	10	**32**
Timber Growth and Production (material use)	7	10	8	**25**
Source of Income and Jobs	12	4	5	**21**
Biodiversity and Biotope Preservation	2	6	8	**16**

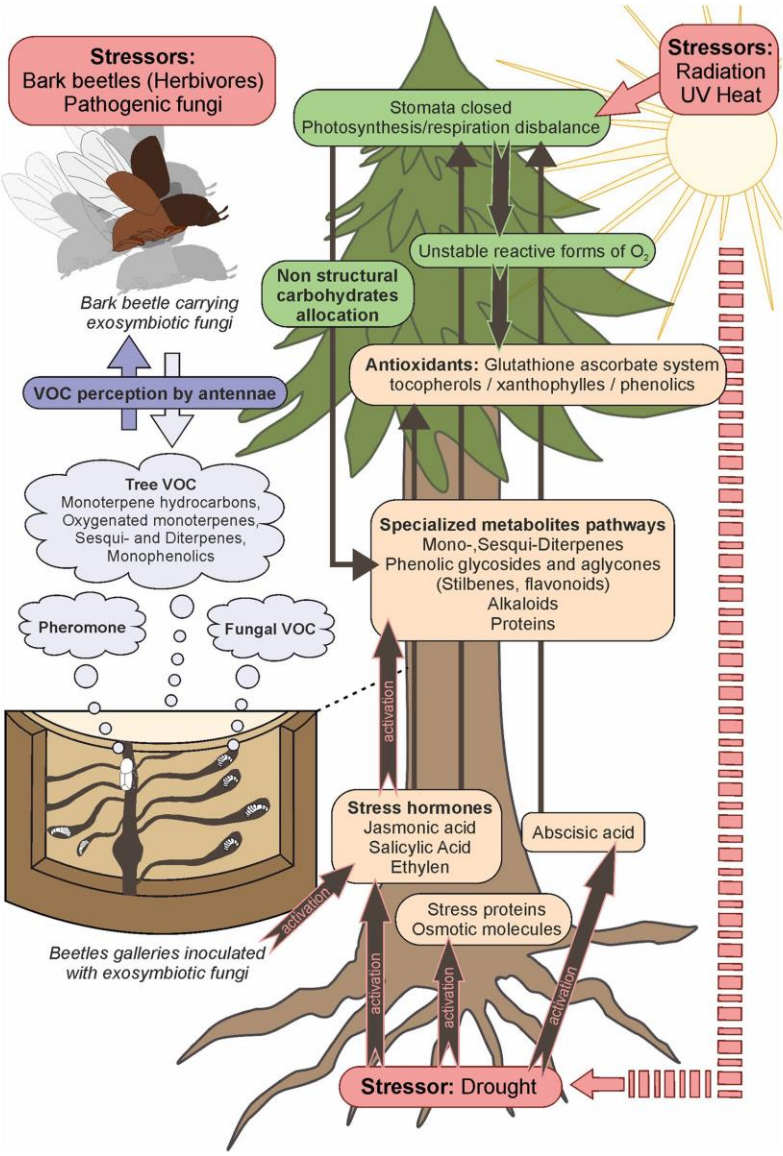
A15: Different Forestry Stakeholders. Source: Hafner *et al.* 2021, 18, Fem4Forest-Report.



A16: Insights from Question N. 11 from the Survey: Alleged Beneficiaries of Bark Beetle Outbreaks (Mentions of specific actor groups; Q. 11, n = 60; created by author)

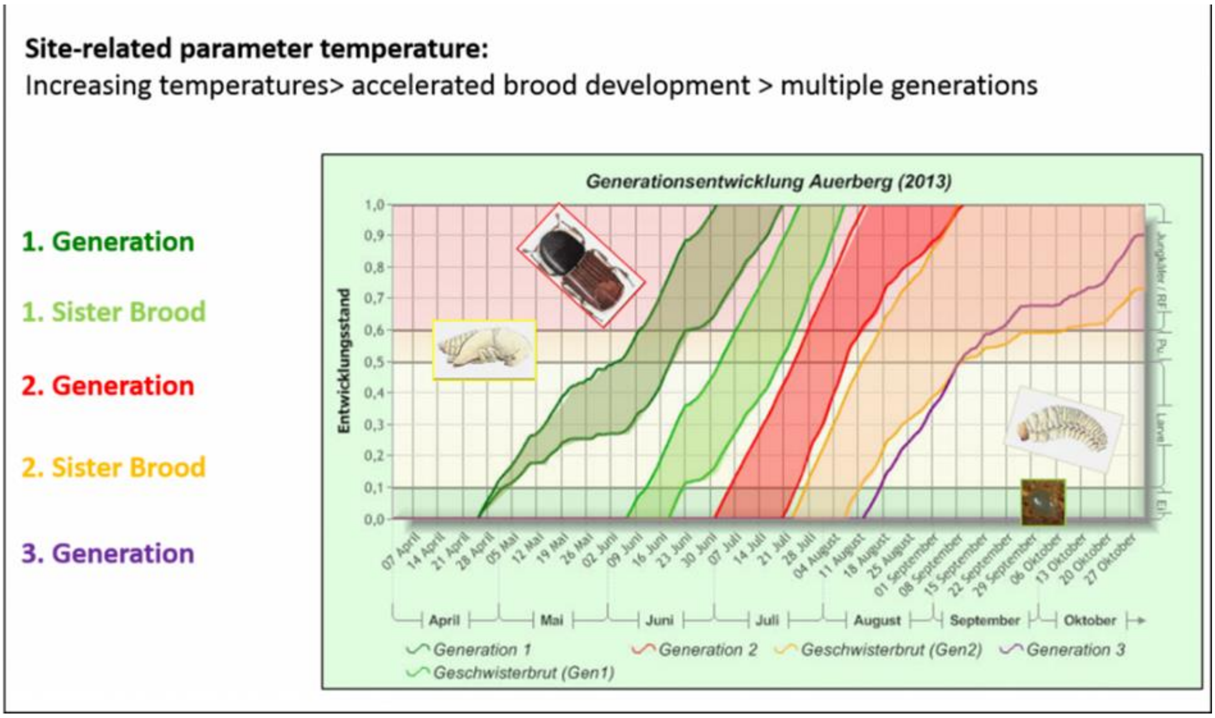
In your opinion, who benefits most from bark beetle outbreaks in the forestry and forestry sector?
Sawmill Industry/Sawmill Companies (53 mentions)
Forestry companies/forest service providers (16 mentions)
Wood Processing Industry (7 mentions)
Paper-, Pulp and Board Industry (5 mentions)
Forest plant breeders and sellers (3 mentions)
National parks (2 mentions)
NGOs (1 mention)
The Forest (1 mention)

A17: Conceptual scheme of interactions among Norway spruce, Ips typographus and symbiotic ophiostomatoid fungi under drought conditions. Source: Netherer *et al.* 2021, 594.

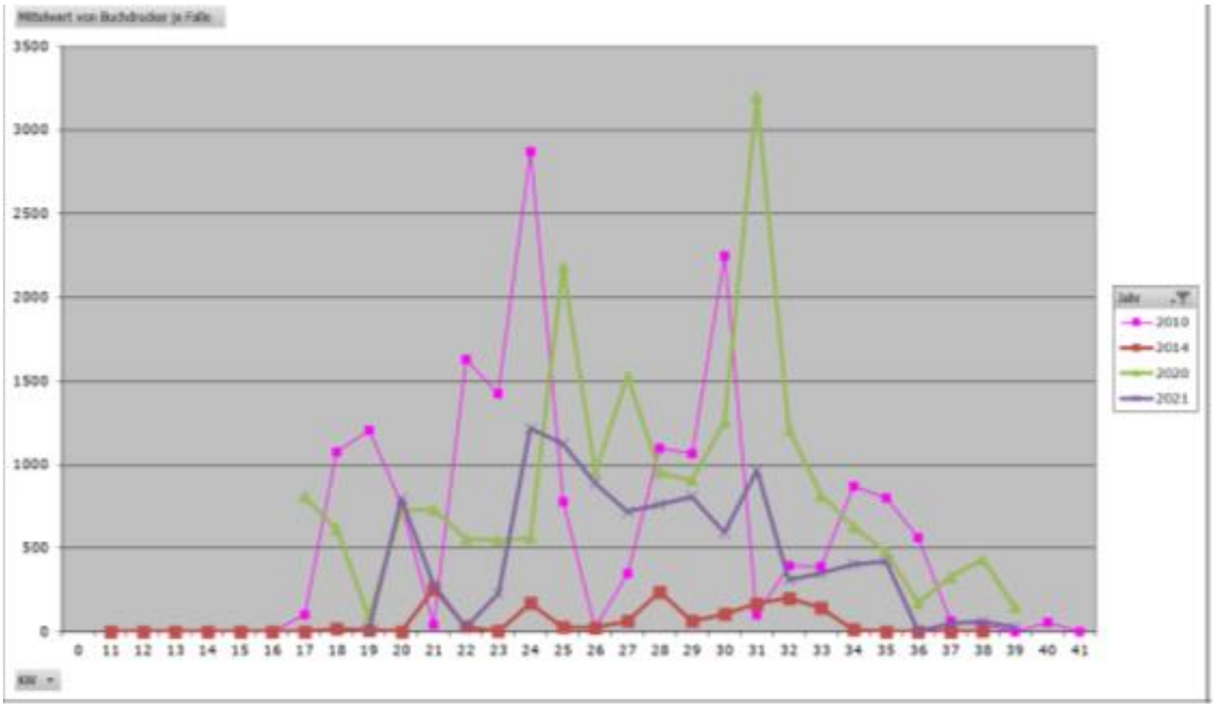


A18: Size Difference between ESBB and Cooper Engraver, Picture by Author, © 2022.

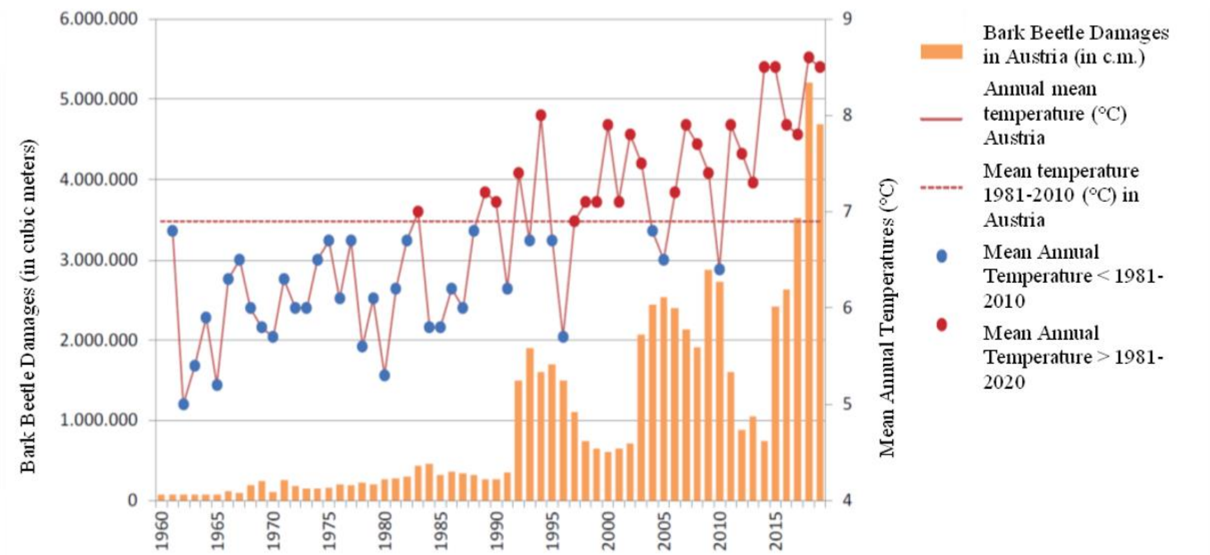
A19: PHENIPS-Model: Brood Development Scheme with Different Generations. Source: PHENIPS n.d.



A20: Catch numbers (average per trap) shown by calendar week. Source: Kammleitner 2021 (used with kind permission)



A21: Annual Bark Beetle Damages (until 2020) and Annual Mean Temperatures in Austria. Source: Hoch and Steyrer 2020, 1.



A22: Key Ecological Effects of Bark Beetles. Source: Raffa *et al.* 2008, 503.

Box 1. Key ecological effects of bark beetles: Ecosystem engineers at multiple scales.

Scale	Processes
Gallery (square centimeters)	Establish network of galleries throughout subcortex Establish and maintain microbial flora Alter histochemistry: induce changes in terpenoid and phenolic composition and concentration Physically drain resin and sever resin canals; induce traumatic duct formation and autonecrosis
Tree (square meters)	Kill tree or large portions of tree Serve as food resource for a diverse guild of arthropod and vertebrate predators Create habitat for a diverse guild of microorganisms, arthropods, and vertebrates Alter chemosphere around trees and groups of trees: emit pheromones and release host compounds (plumes attract conspecifics, other phloeophagous herbivores, and predators)
Forest stand–mesoscale (hectares)	Thin forest canopy; create gaps in continuous forest and alter understory composition Change host age and size class distributions; alter primary productivity Accelerate or reinitiate succession Introduce a pulse of organic matter input to soil and produce coarse wood; alter stream flow
Landscape (square kilometers)	Alter biogeochemical and biophysical processes, including carbon, water, nutrient cycling, and albedo Reduce isoprene emissions Alter landscape mosaic of stand age, stand structure, and forest community composition Create template for future bark beetle outbreaks and other disturbances

A23: Insights from Question N. 17 & 18 from the Survey: Conflicts related to Bark Beetle Outbreaks (n= 60; created by author)

17. Haben Sie den Eindruck, dass Borkenkäferausbrüche in Ihrem Umfeld zu **Spannungen** bzw. zu **Konflikten** führen?

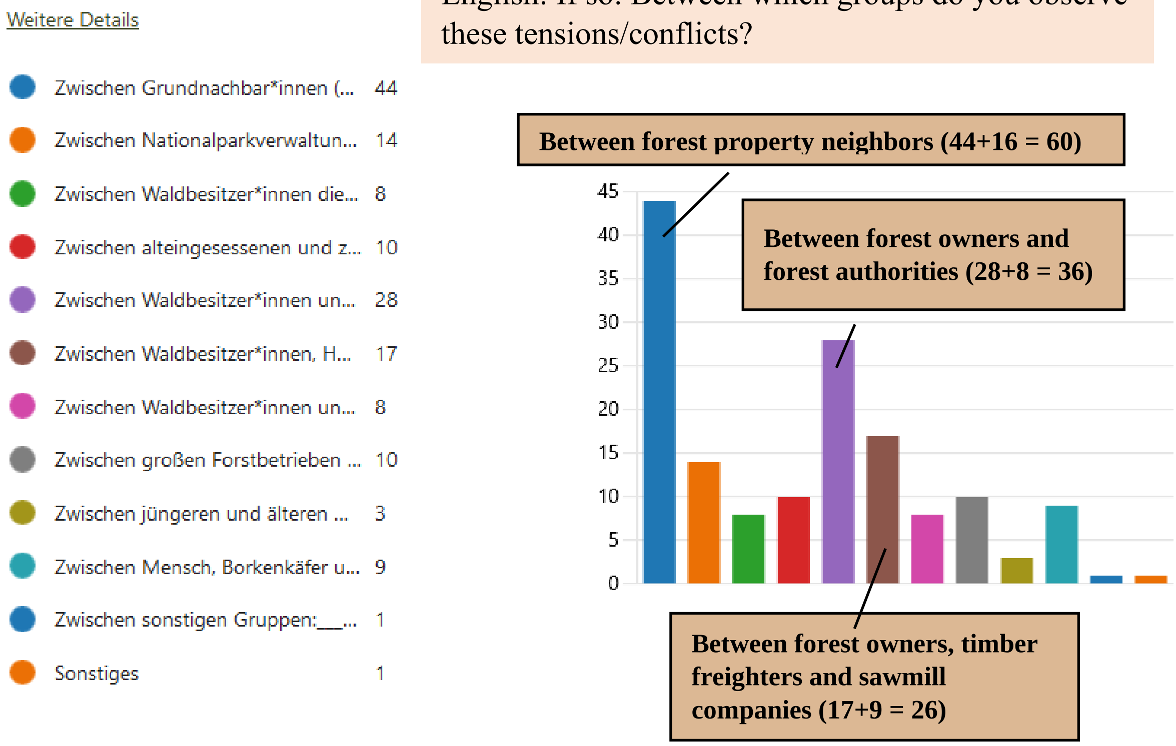
English: Do you have the impression that bark beetle outbreaks in your area lead to tensions or conflicts?

Weitere Details   Einblicke

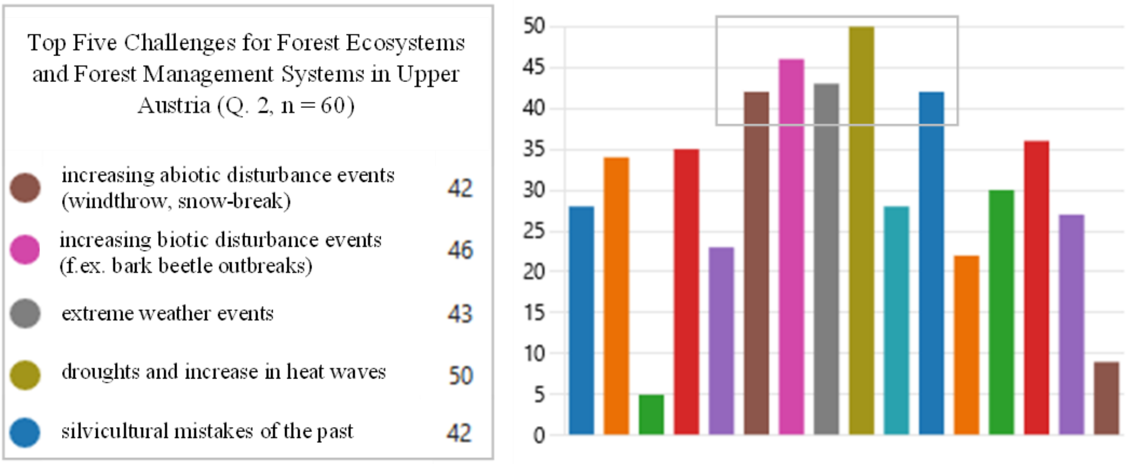
Yes	61
No	14
I do not know	7

18. (Wenn ja:) **Zwischen welchen Gruppen** beobachten Sie diese Spannungen/Konflikte? (Mehrfachnennung möglich)

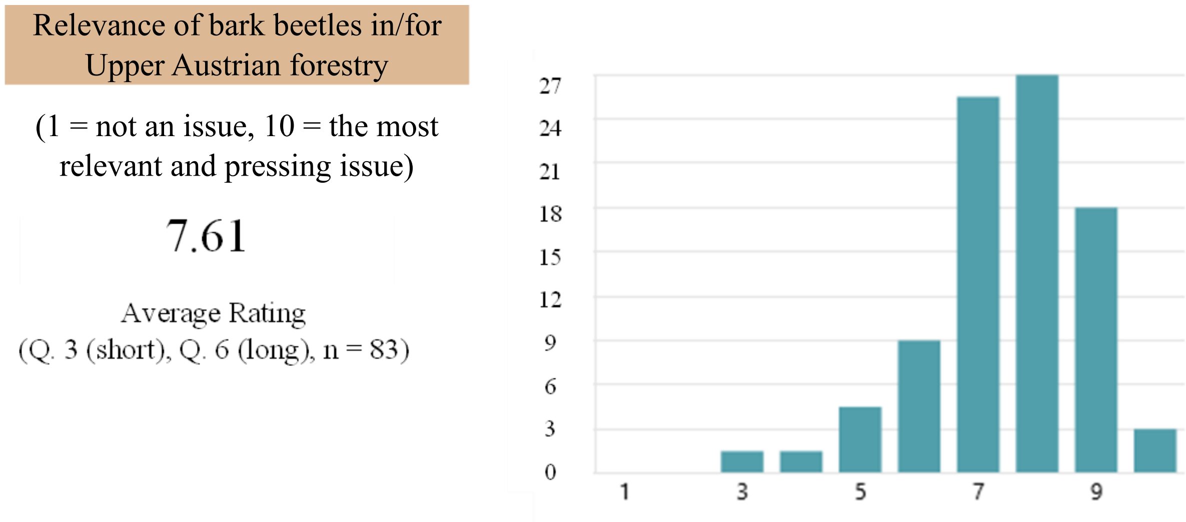
English: If so: Between which groups do you observe these tensions/conflicts?



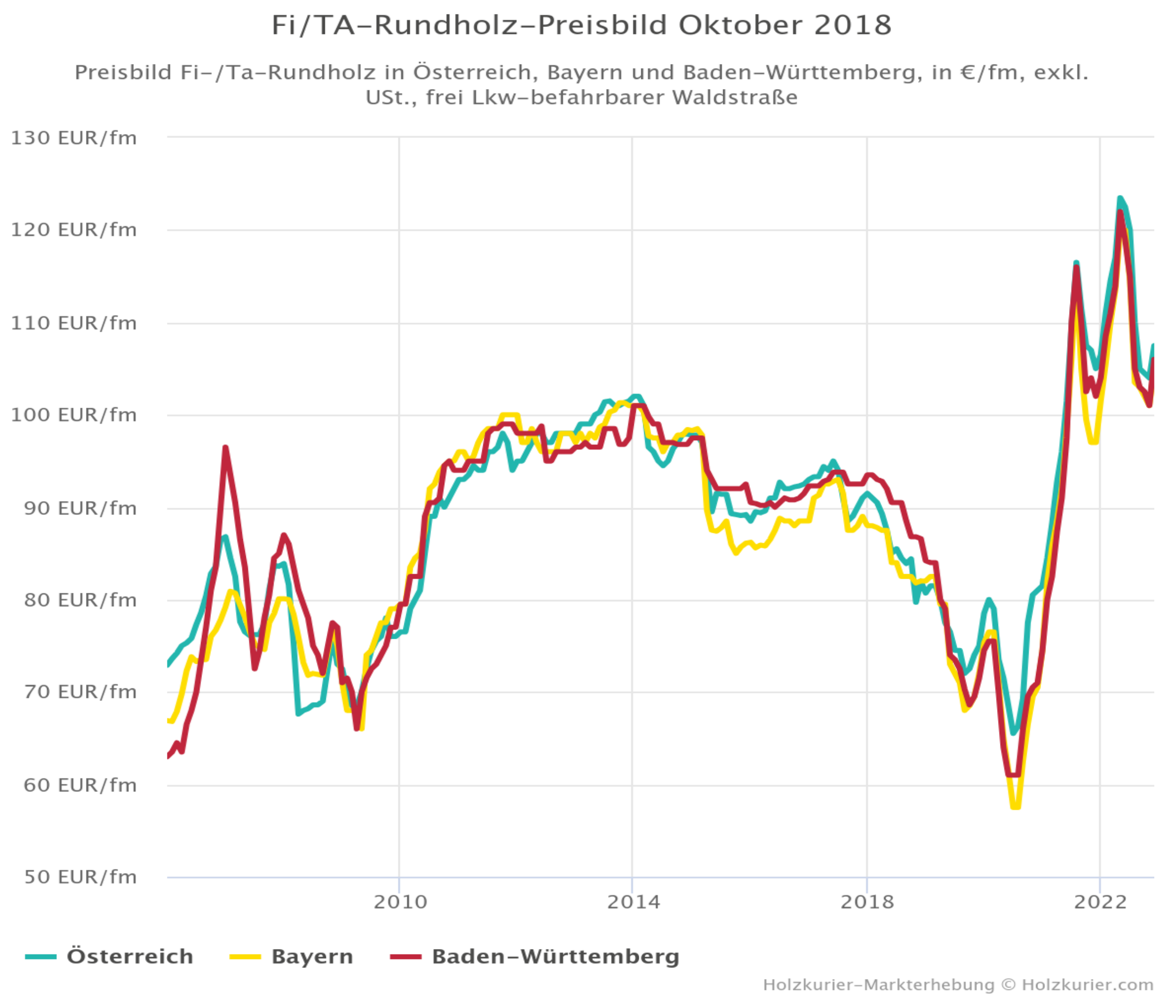
A24: Insights from Question N. 2: Challenges for Forest Ecosystems and Forest Management Systems in Upper Austria (n=60; created by author))



A25: Insights from Question N. 3 (short) and N. 6 (long) from the Survey: Relevance of Bark Beetles on a Scale from 1–10 (n=60; created by author)



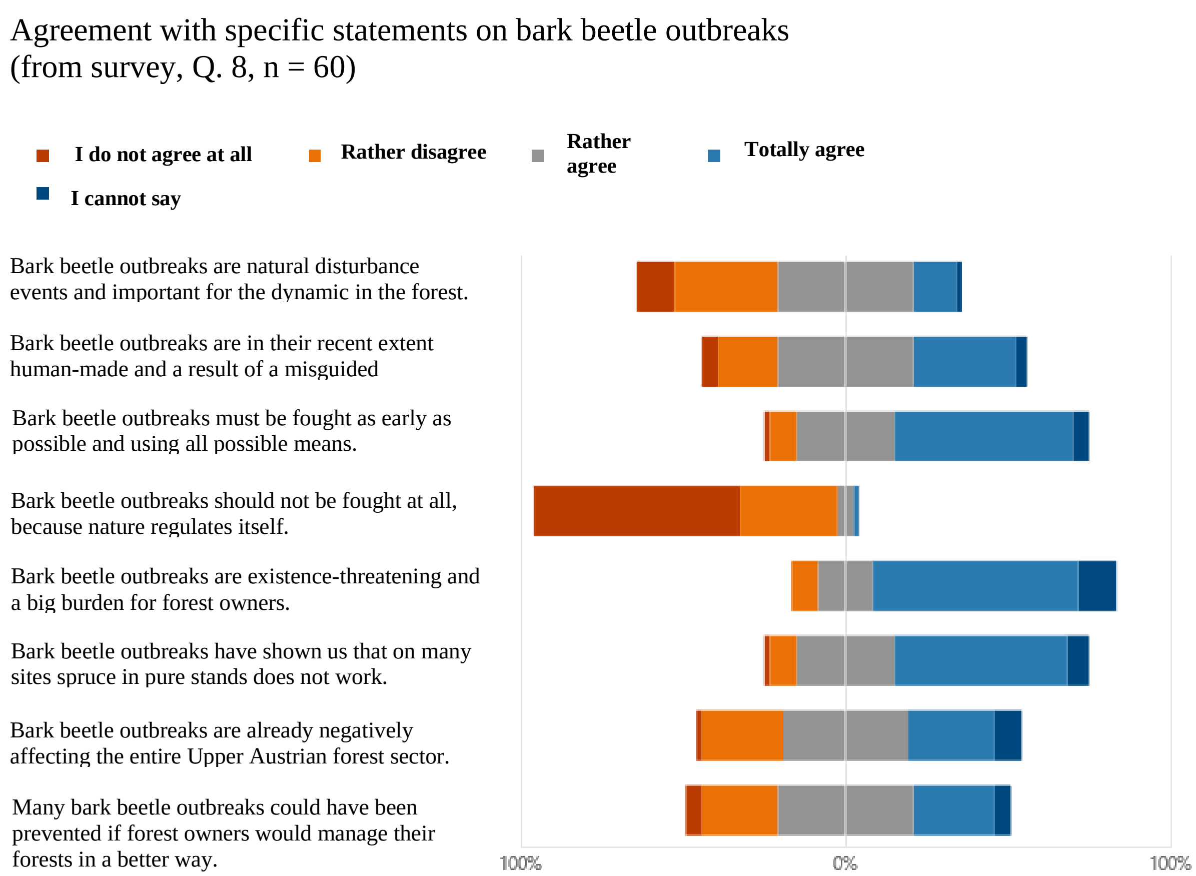
A26: Average Price for Spruce/Fir B 2b Leading Assortment for Austria, Bavaria (Germany) and Baden-Würtemberg (Germany). Source: Ebner and Holzkurier n.d.; Holzkurier 2020



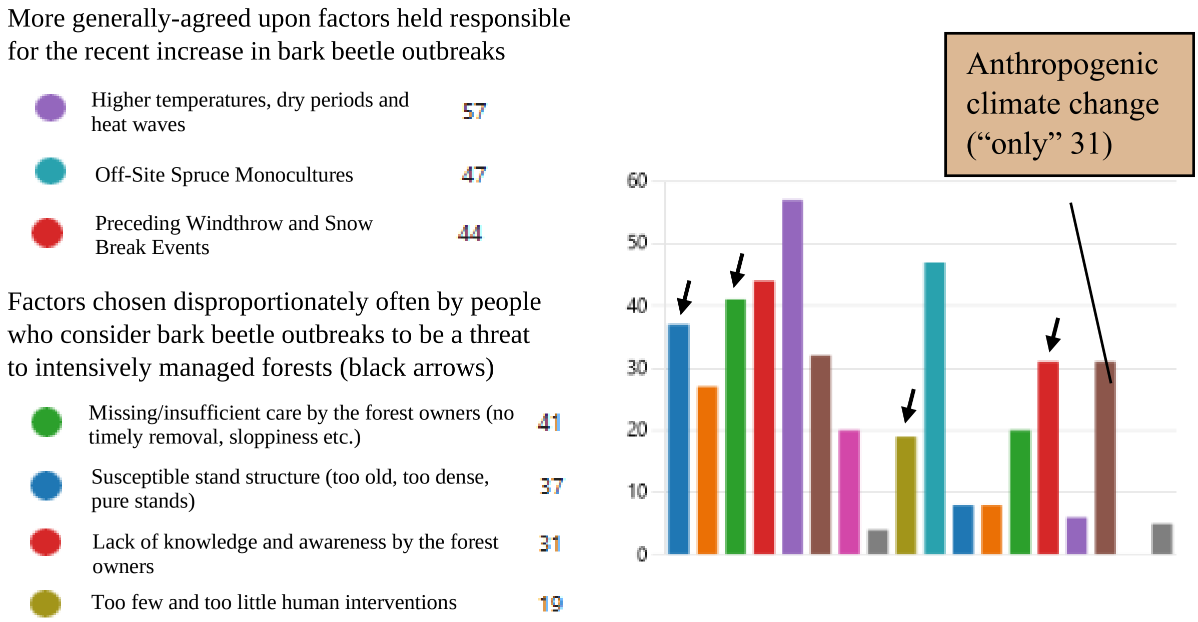
A27: Insights from Question N. 30 from the Survey: Emotions/Associations regarding Bark Beetles (created by author)

Briefly describe what comes to your mind when you think of bark beetles (European spruce bark beetle, copper engraver and others). What emotions are at play? (selected statements, from Office Forms Survey, Q. 30, n = 60)	
1	Helplessness, powerlessness
4	Fear, powerlessness
9	Torment of the enormous summer forest work when there is additional harvesting work in agriculture
11	Anger and tiredness
12	Danger for the entire forest; spruce trees are dying which generations before me have cared for
22	Stress, anger, inappropriate time for high workload, please not again…
28	Stress, helplessness, resignation, frustration, a lot of work, higher costs, lower income […]
33	Loss of entire tree age groups, existence-threatening
36	Constantly increasing danger for forest stands. When outbreaks occur in July to September, fear of going out into the woods and finding beetle nests again and again […]
47	Trouble, stress
49	Bark beetle is an animal that really no one needs

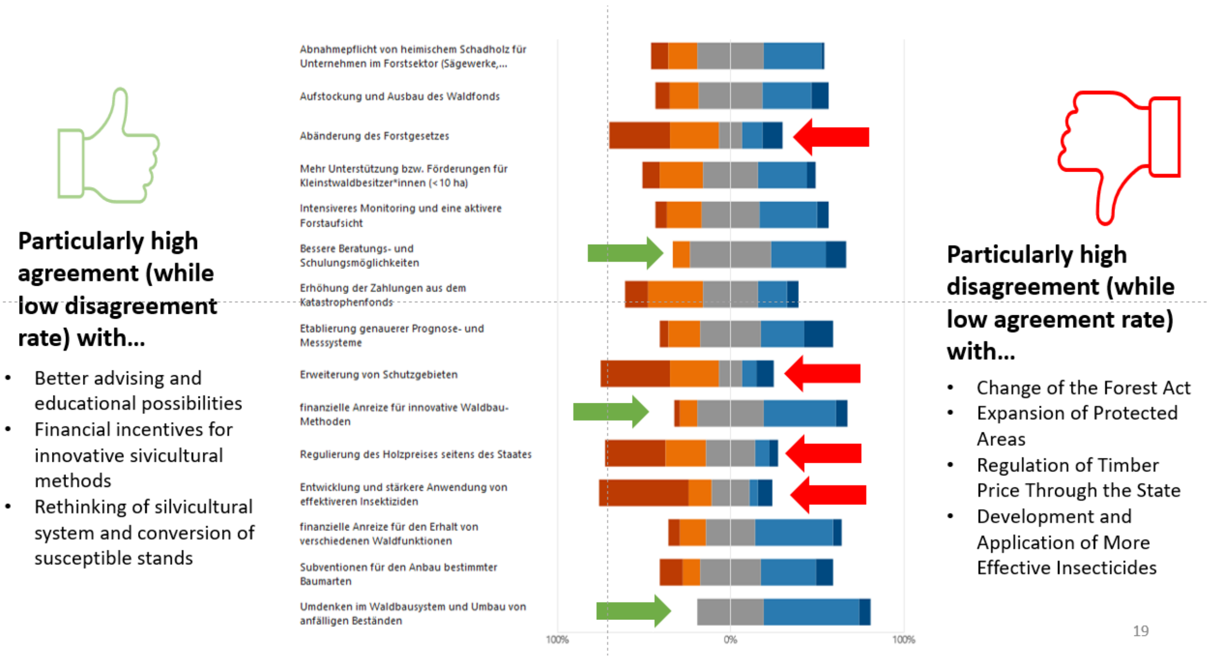
A28: Insights from Question N. 8: Statements on Bark Beetle Outbreaks (created by author)



A29: Insights from Question N. 7: Aggravating Factors for the Increase in Bark Beetle Outbreaks as Seen by Respondents, and Cross Analysis along the Management and Conservation Spectrum (n=60; number indicates how often answer was chosen; created by author)



A30: Insights from Question N. 19: Assessment of different measures regarding their contribution to a "better dealing" with/prevention of bark beetle outbreaks (n=60; dark blue: I cannot say, blue: totally agree, grey: rather agree; orange: rather disagree; red: I do not agree at all; figure created by author))



A31: Memorial Stone "Waldsäge" with respective inscription after storm event in 1921. Source: https://www.baysf.de/de/wald-erkunden/ausflugsziele-tipps/der-gedenkstein-waldsaege.html

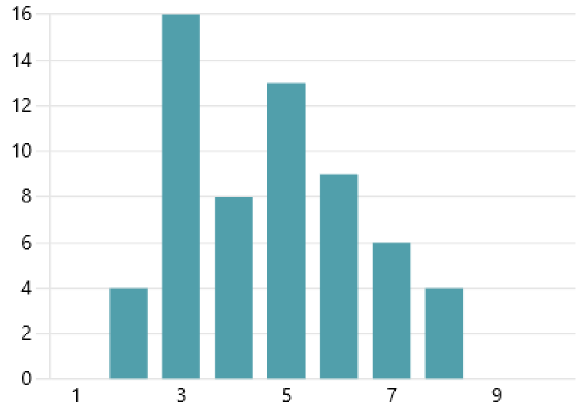
A32: Employee of the "Fichte Plus" project climbing a "plus tree". Picture by Author, © 2022.

A33: Insights from Question N. 3 from the Survey: Assessing the climate-change adaptedness of forestry in Upper Austria on a scale from 1 to 10 (created by author)

Adaptation of Upper Austrian forestry to climate change on scale 1-10 (1 = not at all adapted, 10 = totally adapted)

4.68

Average Rating
(Q. 3 (long), n= 60)



A34: Insights from Question N. 10 from the Survey: Alleged Losers of and/or Disproportionate Sufferers from Bark Beetle Outbreaks (created by author)

Who do you think suffers the most (financial) damage in the forestry sector from bark beetle outbreaks? Name 1-3 actor groups (certain occupational groups, certain branches etc.) who suffer the most from bark beetle outbreaks. (List of how often specific actor groups were mentioned; from Office Forms Survey, Q. 10, n = 60)
Forest Owners (36 mentions) – unspecified in size
Small Forest Owners (12 mentions)
Forest Enterprises (10 mentions) – unspecified in size
Peasants and *Peasant* Forest Owners (5 mentions)
Large Forest Owners and *Large* Enterprises (2 mentions)
Entire Forestry Sector/Entire Wood Value Chain (2 mentions)

Endnotes

Chapter 1

[i] The works currently emerging in relation to these "human dimensions" encompass a range of themes. One of them is how stakeholders – local communities, public authorities, scientific experts etc. – differently perceive and make sense of forest insect disturbances, their impacts and consequences, and how these perceptions, knowledges, values and attitudes shape "the actions and behaviours of stakeholders and publics"[i] (Urquhart *et al.* 2018). Prentice and colleagues (2018), in turn, approach the multiple ways in which communities perceive and react to forest insect disturbances through the concept of "ecological imaginaries". Here, the authors discuss how insect disturbances function "as a site for the emergence and deployment of various environmental narratives, and how these narratives are nested within broader institutional and power arrangements" (Prentice *et al.* 2018, 83; see chapter 7). Other studies, such as Porth' and colleagues' (2015) research on people's responses to a longhorn beetle outbreak in Kent, England, show in turn how the interactions between disturbance-affected local communities, forest management agencies and public authorities make and unmake relations of (dis-)trust. Another central theme circles around questions of the governance and the institutionalization of (responses to) forest insect disturbances. According to Urquhart and colleagues, "key questions include, for instance, how international trade regulation and national legislation across multiple sectors may influence what can be regulated and what mechanisms can be used to reduce the risk of invasive pest introductions" (Urquhart *et al.* 2018, 10).

Chapter 2

[ii] „It matters what matters we use to think other matters with; it matters what stories we tell to tell other stories with; it matters what knots knot knots, what thoughts think thoughts, what descriptions describe descriptions, what ties tie ties. It matters what stories make worlds, what worlds make stories" (Haraway 2016, 12).

[iii] Within the discipline of social anthropology, political ecology originated as a critique and advancement of cultural ecology and its neo-evolutionist (i.e., functionalist) approach of explaining local communities as isolated homeostatic entities perfectly adapted to a specific natural environment (Bryant and Bailey 1997, 11p.; Paulson *et al.* 2005, 27). In contrast to cultural ecology, early political ecologists like Eric Wolf (1972; 1982) or Michael Watts (1983) emphasized that local communities are never isolated, but integrated into the capitalist world-system, their social, cultural and economic organization is not to be reduced to be a mere outcome of the adaptation to a natural environment, but is shaped by conflicts and power relations, by spatially specific and historically contingent processes of capitalist valorization and accumulation (Trimbur and Watts 1976).

[iv] Not until the term underwent a radical turn in the 80s, political ecology was mainly associated with Neo-Malthusians such as Paul Ehrlich (1971) and Garrett Hardin (1968) who used the phrase "political ecology" to polemize against population growth and to propagate a global authoritarian state fighting the latter (Bryant and Bailey 1997, 10p.). Radical or critical political ecologists not only criticized the simplistic claims of Ehrlich and colleagues (showing that in per-capita-terms overpopulation (in the Global South) was not the driving force behind the overshooting of planetary ecological boundaries, but the "mode of living and production" of specific groups in the Global North, cf. Robbins 2012, 17p.), but also accused the "eco-doomsayers […] of ignoring the political obstacles to, and implications of, the global authoritarian state that they argued was needed to solve the world's environmental crisis" (Bryant and Bailey 1997, 10p.).

[v] Along with these two phases, attempts exist to classify political ecology's contemporary history along its main regional focus: Whereas the structuralist Neo-Marxist approach came with a focus on rural areas in the Global South making early political ecology a "Third World Political Ecology" (Bryant and Bailey 1997), the 2000s witnessed a move towards bringing political ecology ("back") to the (urban) "centers" of capital (in the Global North), paving the way for a "First World" (McCarthy 2002) or "Global Political Ecology" (Peet *et al.* 2011).

[vi] Following that, local ecological "problems" are not to be understood as the mere result of the overuse and mismanagement of resources by allegedly irrational local land users, but consequences of the intrusion of the capitalist accumulation principle and its translation into economic pressure on and/or disposession of land users (Blaikie 1985; cf. Greenberg and Park 1994; Biersack 2006, 7p.).

[vii] Even if these scholars may argue that the distinction is purely analytical and not ontological, the talk of relationships between categories like *nature* and *humans* (as if they were not part of the same process) is a good example of the *ethno-*, *euro-*, *anthro-* and *androcentrism* that still prevails in parts of the political ecology research community. Even more so when considering that many "non-Western", non-naturalistic ontologies do not provide for categories and bifurcations like "human-animal", "culture-nature", "matter-mind", "subject-object" etc.

(Latour 1993; Descola 2013; Kohn 2013; Viveiros de Castro 2015; De La Cadena 2015). At closer look, the often taken-for-granted Cartesian dualism of *res cogitans* and *res extensa*, of mind and matter, of culture and nature is more than a system of ideas, it is the justification and manifestation of the colonization and exploitation of *Nature* and all those who are subsumed under the latter through the *European Christian Man* (Plumwood 1993, 42). In the words of Kate Soper: "'Nature' is the concept through which humanity thinks its difference and specificity. It is the concept of the non-human" (Soper 2000, 125). In this sense, nature is a metaphor for dominance, it is the condition through which *Man* constitutes himself as different and superior from the more-than-human (Merchant 1980, 3).

[viii] In her book *The Mushroom at the End of the World*, Anna Tsing (2015, 140pp.) shows convincingly how the scientific discovery of chromosomes and genes (plus the assumption that in the context of sexual reproduction of vertebrates genetic inheritance is merely a matter of the germ cells' chromosomes, irrespective of the history of ecological encounters a species had) matched the modernist attempt to present life as stable, self-replicating and scalable: "This is the heart of the species self-creating story: Species reproduction is self-contained, self-organized, and removed from history. […] Self-replicating things are models of the kind of nature that technical prowess can control: they are modern things. They are interchangeable with each other, because their variability is contained by their self-creation. Thus, they are also scalable. Inheritable traits are expressed at multiple scales: cells, organs, organisms, populations of interbreeding individuals, and of course, the species itself" (Tsing 2015, 140).

[ix] In contrast to evolutionist scholars of the "New Synthesis" assuming that allegedly independent organisms are forced to cooperate or compete "selfishly" not to perish in the struggle for survival, Margulis, Haraway and others argue that holobionts become-with one another *sympoietically,* that *earthlings* exist *because of* being entangled with other beings *and* their environments. In other words, "critters do not precede their relatings; they make each other through semiotic material involution, out of the beings of previous such entanglements" (Haraway 2016, 60). Donna Haraway has borrowed the term sympoiesis for "collectively-producing systems that do not have self-defined spatial or temporal boundaries" (Dempster 1998 quoted in Haraway 2016, 33) from Master student M. Beth Dempster. For Haraway (2016, 58) „sympoiesis is a simple word; it means ‚making-with', […] it is a world for worlding-with, in company. Sympoiesis enfolds autopoiesis and generatively unfurls and extends it".

[x] Prior to and in parts interchangeably with the concept of assemblage, Deleuze and Guattari speak of the *rhizome* as characterized by the principles "connection and heterogeneity" as well as "multiplicity" (Deleuze and Guattari 1987, 7). In this sense, a rhizome "is composed not of units but of dimensions, or rather directions in motion" (ibid., 21). Like an assemblage, a rhizome is an ongoing performance of worlding. Not a pre-structured network, but a network in constant motion: "There are no points or positions in a rhizome, such as those found in a structure, tree, or root. There are only lines." (ibid., 8).

[xi] According to DeLanda (2016, 22) "territorialization refers not only to the determination of the spatial boundaries of a whole – as in the territory of a community, city, or nation-state – but also to the degree to which an assemblage's component parts are drawn from a homogenous repertoire, or the degree to which an assemblage homogenises its own components". Coding in turn "refers to the role played by special expressive components in an assemblage in fixing the identity of a whole" (ibid.).

xii Coming from a slightly different vantage point, scholars from and inspired by *Science and Technology Studies* (STS) have as well incorporated the concept of assemblage into their toolkits. Here, the question is debated whether "assemblage thinking" and "actor-network theory" are compatible (M. Müller and Schurr 2016), and whether there are legitimate reasons to use the concepts "assemblage" and "actor-network" interchangeably. John Law (2009, 147), for instance, states that "there is little difference between Deleuze's agencement and the term 'actor-network'", and Latour as well concedes at one point that ANT scholars have been inspired by a very similar "brand of active and distributed materialism of which Deleuze, through Bergson, is the most recent representative" (Latour 2005, 129). Generally, what ANT scholars and assemblage theorists share is their interest in the socio-material ordering of human and more-than-human entities as well as the assumption that different beings become assembled and co-constituted through relations. Jonathan Murdoch, for instance, acknowledges the affinities between the concepts of assemblage and actor-network (Murdoch 2006, 86pp.), and scholars such as Bennett (2010) or Whatmore (2002) do not hesitate to draw from both traditions. Other scholars in turn, such as Nigel Thrift, stress the differences between "assemblage thinking" and ANT, emphasizing that the latter does not leave room for speculative storytelling, for "the virtual" as Deleuze would call it, for things that have not yet happened (Thrift 2000; cf. Haraway 2016). In fact, Latour's understanding of the social "not as a special domain, a specific realm, or a particular sort of thing, but only as a very peculiar movement of re-association and reassembling" (Latour 2005, 7) presupposes an emphasis on the actual, it implies to explore "the social" against the background of identifiable networks and in doing so runs the risk of reducing interactions to being pre-structured by the network as a chain of specific associations (Anderson *et al.* 2012). A similar criticism of mistaking assemblages for networks is put forward by Anna Tsing who rejects the equation of assemblage with the Latourian actor-network by arguing that "assemblages gather ways of being without assuming [like Latour] [an] interactional structure [of associations structuring further associations]" (Tsing 2015, 292, FN 8). Here, Tsing's objection hints at ANT's neglect of what DeLanda terms relations of exteriority, her criticism expresses that "entities in relations are not fully determined by these relations, but always exhibit a surplus, something that is outside relations, and enables them to plug into other assemblages" (Müller and Schurr 2016, 220).

xiii Of course, the specific ways in and through which world-making unfolds varies from assemblage to assemblage, and particularly so from living to non-living entities. With regards to that distinction, I am divided myself. Although I find Bennett's vital materiality of non-living beings convincing and greatly sympathize with (and draw from) object-oriented philosophies, I am hesitant whether my definition of world-making (as including sense- or significance-making) applies well to "inanimate matter" like stones. While I agree that non-living beings are materially agentic through having "the power to transform the world" (Ogden *et al.* 2013, 16) and that they are part of diverse ontological "webs of significance" (with a mountain literally *being* a person; De La Cadena 2015), non-living entities are not using signs to represent, as far as we know they do not make sense of the world, they do not "experience" their own world-making, and are thus no "thinking selves" in the strict sense. Eduardo Kohn (2013, 9) puts it like this: "What differentiates life from the inanimate physical world is that life-forms represent the world in some way or another, and these representations are intrinsic to their being. What we share with nonhuman living creatures, then, is not our embodiment, as certain strains of phenomenological approaches would hold, but the fact that we all live with and through signs. We all use signs as 'canes' that represent parts of the world to us in some way or another. In doing so, signs make us what we are" (for a persuasive disagreement see the book review of Giraldo Herrera and Palsson 2014 in which they argue that the distinction between living and non-living, but particularly the distinction between humans as symbol users and more-than-humans as non-symbolic beings reproduces the very dichotomies that an "anthropology beyond the human" wanted to overcome initially).

xiv Even David Harvey (1996, 55) who is not known for being a great proponent of posthumanism or postmodern thinking is convinced that agency "can be found anywhere and everywhere in the physical, biological and social world".

xv While political ecologists such as Bryant and Bailey (1997) have early on developed an explicit framework for looking at the role of agency regarding human-environment relations, many political ecologists abstain from dealing with/theorizing agency, not least because of their overly structuralist political economy outlook. It is noteworthy that it is this very political economy perspective that has both enriched and hindered the advancement of the concept of agency in political ecology. Enriched as structuralist political ecology's emphasis on political economy has contributed to questioning the liberal notion of agency as "held" by independent rational individuals, but linking agency to class membership and agency as shaped by power structures. Yet hindered as the overestimation and totalization of structures and structural explanation subsumes agency under structure, or at all replaces agency with power. Thus, there are still many Neo-Marxist political ecologists who do not see much scope of action beyond the influence of historically formed structural relations and if they do agency remains restricted to humans (Kipnis 2015). That is not to say that for Neo-Marxist political ecologists more-than-humans are wholly without the ability to affect, but rather that "their" agency is fundamentally different in kind, that "their" agency is articulated within "nature" and not of capitalism as a "world-ecology". Following that, Hornborg, a prominent proponent of a more structural-historical branch of political ecology states provocatively that – with regards to agency – "the crucial difference between humans and baboons is capital" (Hornborg 2017, 102).

xvi Albeit political ecologists can agree that power (re-) produces and is (re-) produced by relationships, there are differences in how (Neo-Marxist) structuralist and (Post-Marxist) post-structuralist political ecologists approach power. Whereas the former speak of power in the context of structural relationships inherent to capitalism (Watts 1983), poststructuralist political ecologists tend to focus on "power as forming the subject" (Butler 1997, 2) and on power as precondition and product of discursive formations (Forsyth 2008).

xvii Moore (2011, 110) is here another inspiration for a scholar that manages to see capitalism as part of *nature*, as an outcome and beneficiary from Multi-Species relations: "As we move from the logic of capital to the history of capitalism, the multiform tension between the internalization and externalization of nature comes to the fore. The logic of capital compels it to ignore nature as historically variant webs of life; the history of the capitalist era reveals the dynamism and degradations inscribed in this logic as it reorganizes human- and extra human nature, liberating and limiting accumulation in successive eras. Capital's dynamism turns on the exhaustion of the very the webs of life necessary to sustain accumulation; the history of capitalism has been one of recurrent frontier movements to overcome that exhaustion, through the appropriation of nature's free gifts hitherto beyond capital's reach".

xviii The aspect of the contingency of world-making and world-making conflicts is important. Even though there are biological and ecological patterns of what bark beetles, humans, woodpeckers, and spruces trees (are) usually (able to) do, world-making projects change over time due to transformations in the biophysical, societal, cultural, and economic conditions. Also, incompatibilities (and the discourses regarding them) change over time, meaning that while the overlapping of world-making projects of humans and bark beetles was once regarded as unproblematic (as the competition over forest landscapes was within socially accepted boundaries), certain developments have intensified contacts and conflicts between the lifeways.

[xix] Connecting interests to world-making stands here in the tradition of the animal welfare movement. One of its icons, philosopher Peter Singer (1975, 5), argues for example that the "interests of every being affected by an action are to be taken into account and given the same weight as the like interests of any other being". Precisely because living beings want to avoid suffering and want to make their worlds livable, they are endowed with interests. Yet these interests can only be pursued in cooperation with others, making interests a group matter.

Chapter 3

[xx] Critical realism is best described as a philosophy of science associated with philosopher Roy Bhaskar (2008) and political economist Andrew Sayer (1992), assuming that realities exist in a context-dependent sense, that albeit there are no objective truths of how the world works, there are still structural necessities and quasi-causal relationships in the world.

[xxi] For several years now, the nature conservation department of the province Upper Austria (*Naturschutzabteilung Land OÖ*) publishes nature-conservation-related "spatial development models" (in German: Naturschutzfachliche Leitbilder für Oberösterreich) for altogether 41 spatial units in Upper Austria. So, to be geographically most specific, the research site that I define here as *Sauwald* represents in fact the *Hochsauwald*. While my second site, the *Kalkalpen* national park, matches the spatial unit *Sengsengebirge* and *Windischgarstner Becken*, the third site, here called: *Böhmerwald*, only relates to a 5-10-kilometer-wide forest strip alongside the Austrian Czech border.

Chapter 4

[xxii] From an evolutionary perspective, it is a long way from the earliest plant cell to a symbiotic network, a bacteria-plant-fungi assemblage like Norway spruce – to a being that comes in the form of an evergreen coniferous tree, native to Northern, Eastern and Central Europe (Schütt *et al.* 2013, 341). A whole lot had to happen: Plants had to move from sea to land, a process that was only made possible by early partnerships with fungi (Küster 2022, 54p.), by what we know as *mycorrhiza*. Ever since then, mycorrhizal symbiosis is the rule, not the exception, and it is estimated that over 90 percent of today's vascular plants are associated with mycorrhizal fungi (Brundrett 2009). In being assembled with bacteria, fungi and others, plant assemblages formed vegetation covers, produced oxygen, built up soils, and grew upwards in competition for sunlight, thus causing the vertical stratification of plant ecosystems – they made worlds as we know them. Around 390 million years ago, first forest-like formations emerged consisting of non-seed-bearing ferns and oversized horsetails with lignified stems and leafy crowns (Küster 2013, 14-19; Peh *et al.* 2015, 1). Forests comprised of seed plants evolved only later, with spruce's conifer ancestors believed to have originated in the Carboniferous and diversified from the Permian to the Cretaceous age (Morris *et al.* 2018b). Falling into that period, a 136-million-year-old fossilized seed cone was recently discovered, providing the earliest record for a member of the Picea genus (Klymiuk and Stockey 2012). Wood-dwelling insects such as bark beetles entered the stage at around the same time, and over millions of years conifers and bark beetles survived despite and because of one another (Cognato and Grimaldi 2009). Given that "the morphology of conifers has changed relatively little" since that time (Nystedt *et al.* 2013, 579), it is likely (and humbling to imagine) that a conifer from the age of the dinosaurs was not so different from a Norway spruce today, from a being that (together with bark beetles) has shaped forest landscapes long before *Homo sapiens*.

[xxiii] Whereas the primary growth of trees is vertical and occurs above- and belowground, secondary growth describes the horizontal increase in the diameter of branches, roots and stem. This happens through the division and "enlargement of cells in the vascular cambium" (Grebner *et al.* 2022, 232), translating into the production of 1) lignified xylem cells (of what we call *wood*) transporting water and dissolved minerals from bottom to top, and 2) non-lignified phloem cells that transport the sugar compounds produced through photosynthesis from top to bottom. As we will see, what happens in the case of bark beetle infestations is the destruction of this life-sustaining phloem tissue (Raffa *et al.* 2015).

[xxiv] The root growth comes from the root meristem in which cells divide, enlarge and differentiate. In the context of vertical growth via the primary root meristem not only parenchyma cells are formed, but also cells of the outer layer of the root, the *rhizodermis* (Küster 2022, 62p.). In contrast to the outer cell layer of spruce needles and the spruce trunk, the rhizodermis is not a contained tissue, but open for water and dissolved nutrients, and complemented by trichoblasts, fine root hairs, that by increasing the root surface absorb nutrients and water efficiently (Bejan *et al.* 2008). Generally, root hairs uptake nutrients via an ion exchange mechanism – the plant has to dispense hydrogen protons to be able to take up potassium, calcium and magnesium ions (Küster 2022,

65p.). It is this accumulation of hydrogen protons that contributes to the acidification of the soil – something that always happens in forests, but even more so in (pure) spruce forests on alkaline-poor parent rocks such as granite or gneiss (Cremer and Prietzel 2017). Other than potassium, calcium, magnesium and sulfur, our spruce needs phosphorus and nitrogen (Paré *et al.* 2015) – nutrients that it mainly gets through symbiosis with bacteria and mycorrhizal fungi.

[xxv] In comparison with deciduous trees, spruce can deal comparably well with cold temperatures and frost droughts as its stomata lie in hollows that exist because of limited intercellular space in-between the parenchyma cells of needle leaves (Küster 2022, 88). This specificity is one of the reasons why spruce is that successful in making worlds, in inhabiting cold climates where deciduous trees would not be able to prevail, as these sunken stomata (together with a more cavitation-resistant xylem) make spruce better adapted to situations when the water supply is limited due to frozen water and/or conductivity problems (Moran *et al.* 2017).

[xxvi] The German term “Fichte” comes from the Old High German "fiutha" or "fietha” meaning “red” (Häne 2017).

[xxvii] The concept of the ecological niche dates back to the ecologist Evelyn Hutchinson and refers to “the position of a species within an ecosystem, describing both the range of conditions necessary for persistence of the species, and its ecological role in the ecosystem” (Polechová and Storch 2019, 72).

[xxviii] Even though it is common to speak of “spruce antagonists”, of beings that damage/weaken spruce, we should not forget that – even in the scenario of spruce being killed by an antagonistically-acting Multi-Species assemblage – the death of an individual is at best a temporary rearrangement in the gathering of assemblages. In this sense, there is a difference between an antagonist’s short- and its long-term impact on spruce (populations). Short-term relationships with antagonists undoubtedly happen at the expense of (the single) spruce tree, while in the long-term (and on the population level) spruce antagonists like pathogens and pests act as “drivers of forest competition, succession and evolution […]” (Bernier and Smith 2015, 227), they define the health and stability of (spruce) forests.

[xxix] As biologist Joseph Reichholf (2022, 131p.) highlights, it is telling for the anthropocentrism of foresters that for the longest time animal humus-creators and decomposers were one of the few forest animals regarded as useful, in contrast to megafauna species such as mice and cervids that have easily been declared forest pests or a problem for forest regeneration (ibid.). In line with this selective logic of what is not harmful to trees is categorized as “good”, red wood ants (here esp. *Formica rufa*) are particularly popular among foresters, not only as they prey on bark beetles and other forest insect pests, but also play an important role in the distribution of seeds, and in the ventilation and fertilization of the soil (Wermelinger *et al.* 2019). This popularity has even translated into foresters attending “ant-keeping” courses. As valuable these courses may be for becoming attuned to more-than-human beings, it is remarkable that while other forest inhabitants are killed, poisoned or robbed of their habitats, it is common for an anthill to be safely relocated and considered worth a detour for a harvester driver. Beyond their usefulness for foresters, beyond their portrayal as the “forest (health) police”, could it be that ants’ “human likeness” (in world-making) as state-building animals, as aphid farmers makes them somehow more adorable? Given foresters’ appreciation of ants, it is not surprising that ant predators such as the European green woodpecker (*Picus viridis*) or the Black woodpecker (*Dryocopus martius*) have a less popular standing among foresters. This may have to do with the circumstance, that albeit woodpeckers prefer dead or weakened trees, they also excavate tree holes in healthy trees and are often believed to be the cause of rotting diseases (Reichholf 2022, 132). That is remarkable as woodpeckers are just as ants effective predators of insect pests, and generally considered important keystone species, creating habitats for others and contributing to the decomposition and forest succession process. Some, such as the white-backed woodpecker (*Dendrocopos leucotos*), are even considered an indicator species for old-growth and/or undisturbed forest ecosystems with high shares of deadwood (Roberge *et al.* 2008).

[xxx] As it is the case with other spruce antagonists, *Armillaria* benefits from situations in which its (potential) host tree is weakened and/or wounded, be it through drought stress, storm events or mechanical injuries. Under such conditions, it is not surprising to encounter Armillaria, bark beetles, pathogenic fungi and viruses concurrently, an antagonist coalition “destined” to bring down the weakened tree. Next to Armillaria infestations, heart rot (often called “red rot”) caused by the fungal pathogen *Heterobasidion annosum* can be economically challenging for foresters. What happens here is that the rot-inducing fungus grows from within the heartwood upwards through the trunk, decreasing the wood’s quality and monetary value. Other fungi pathogens such as the bleeding conifer parchment (*Stereum sanguinolentum*) only manage to enter the tree through wounds – wounds often produced by humans (due to harvesting damages) or deer (due to bark peeling and fraying) (Triebenbacher *et al.* 2017).

[xxxi] So as legitimate as it may be to only focus on some of those insects, as much is this pre-selection always shaped by a “human perspective” meaning that when one speaks of insect inhabitants of spruce, one mostly just speaks of those insects that are significant to humans (as they allegedly damage, inhibit or colonize spruce in (to-humans-)visible or intelligible ways).

[xxxii] In similar heights, and as well subsisting on needles are the larvae of the (spruce) web spinning sawfly (*Cephalcia abietis*). Less widespread than the nun moth, mainly occurring in submontane spruce forests from 600 to 1000 meters above sea level, the larvae of the web spinning sawfly feed on spruce needles in the late summer and in the course of that form characteristic cocoon-like webs (in German: "Gespinste"). Not associated with the formation of webs, but another member of the sawfly family and a potent forest pest is the little spruce sawfly *(Pristiphora abietina)* whose larvae feed on spruce may shoots (Arnold *et al.* 2018, 111p.). By far smaller than the just-described moth and sawfly larvae are sap-sucking spruce aphids. From a forest protection perspective, *Elatobium abietinum* and *Sacchiphantes viridis* and *abieties* are here of relevance. Relevant insofar as aphids consume a tree's "lifeblood", they vector viruses, and in the case of the green spruce gall aphid damage needles by producing so-called galls, aphid-saliva-induced blisters in which the larvae develop (Wermelinger 2022).

[xxxiii] Again, we should realize that what appears to be a "challenge" for the tree (i.e., to be attacked/eaten/nibbled upon), may in the long term be beneficial for all parties. In fact, one could say that – as long as that does not lead to the extinction of one of the groups – almost all long-term relationships between eater and the eaten are important, and they are as much a part of messy symbiotic evolutionary processes as allegedly unequivocal mutually-symbiotic relationships.

[xxxiv] As crucial the relationship between tree and fungus obviously is, one should be careful when determining its (sole) purpose and functionality. This is due to the circumstance that albeit the relationship between plant and fungus seems like a reasonable tradeoff for both parties (Kiers *et al.* 2011), the boundaries between parasitism and symbiosis are blurry, and, according to mycologist Merlin Sheldrake (2021, 204-208), it always depends on *which plant* is *when*, *where* and *in which situation* associated with *which fungus***.**

[xxxv] Lingonberry as well as other plants are indicators of processes of "Verhagerung", i.e., processes of nutrient loss and soil degradation Other plants, such as the common rush (*Juncus effusus*) occur on compacted, water-logged soils, they often grow on former logging trails and on sites where heavy machinery has contributed to soil compaction and poor drainage. Another quite widespread spruce forest inhabitant is the common cow wheat (Melampyrum sylvaticum), a semi-parasitic plant that gathers around and proliferates at the expense of spruce and blueberry.

[xxxvi] "[for the full definition:] The trees should be able to reach a minimum height of 5 meters (m) at maturity in situ. May consist either of closed forest formations where trees of various storeys and undergrowth cover a high proportion of the ground; or open forest formations with a continuous vegetation cover in which tree crown cover exceeds 10 percent (FAO 1998, n.p.).

[xxxvii] According to Küster (2013, 48pp.), it is in the nature of forests to expand, pushing forest edges ever further into the environs, with trees not always visible, but ever present. Ever present in the sense that once a single (forest) tree has established itself in an area where trees can potentially grow, a forest is often only a matter of time. Against this background, it is not surprising that – under the relative absence of human interventions into forest ecosystems from the last Ice Age until the neolithic revolution, and in fact well into the Middle Ages – Central Europe was almost completely covered by its "potential natural vegetation" (following Tüxen, see Leuschner 1997), that is forests. Yet with the difference that most of these historical forests did not look like today's forests – relatively uniform stands with high growing trees and a closed canopy. Rather, it is believed that premodern forests did not have sharp edges, but were shaped by a mosaic structure in which closed forest areas were – under the influence of grazing by megafauna herbivores – interspersed with open woodlands, glades and swamps (Reichholf 2022, 78).

[xxxviii] In fact, these are only two of three relevant factors that, according to Bartsch and Röhrig (2016, 94p.), shape the abundance and structure of plant communities in forests. The third factor relates to inter- and intraspecific interactions, and here specifically competition. So albeit spruce is in Upper Austria naturally associated with beech, fir, larch and others, it also competes with them, not so much in the sense of *competitive exclusion* in which only one of two competing entities survives (Kimmins 2004), but rather in the form of an (often mutually bearable) overlapping of world-making projects in the course of struggles for same (limited) resources and/or habitats. What usually follows from competition is physiological *stress*, a process in the course of which vital functions and structures of a lifeway like spruce are (temporarily) de-stabilized or suspended (Larcher 2001). In the case of spruce, stress due to interspecific competition over water, nutrients, light and space is particularly pressing in the tree' early years, and even more so in the context of spruce rejuvenation on clearcuts and glades where ferns, grasses, *Rubus* species and fast-growing softwood pioneer trees (birch, sorbus etc.) are overpowering competitors. Once spruce has outgrown or outlived the latter, competition expresses itself in struggles over good spots in the canopy, making dominance, canopy position and shade tolerance the lines along which climax vegetation members compete (Bartsch and Röhrig 2016, 153pp.). Next to physiological stress from interspecific competition, forest trees are also pressured by members of their own kin. Keeping the population density compatible with the *carrying capacity* of an environment is here an important matter, and in many natural or non-managed forest communities

a process called "self-thinning" takes place. Self-thinning means that an increase in the number of trees per hectare comes with a decrease in the average tree trunk diameter (ibid., 148). Where self-thinning and the natural dieback of redundant trees do not make the ecologically-needed impact, or are even counteracted by human interventions, diseases, antagonists and biotic disturbance agents such as bark beetles are likely to perform the task of reducing population density (see chapter 5).

Chapter 5

[xxxix] If we think about capitalism for a moment, we might associate the latter with factory halls and industrial workers before even imagining agriculture and forestry. This is insofar misleading as we see that (the foundations of) capitalism emerged centuries before the industrialization (Moore 2015), and that through a key device, not only re-organizing market, class and property relations, but providing the blueprint for scalability: the *plantation* (Tomich 2011). Playing an important role in terms of creating the conditions needed for capitalism qua displacing and dispossessing Indigenous peoples as well as (native) rural communities, the plantation is the ideal (salvage) accumulation device for exploiting "cheap nature" (Moore 2015).

[xl] In the longue durée, the fall of the Mesopotamian civilization as described in the Gilgamesh epos, the collapse of first the Greek and then Roman empire are among other things outcomes of continued deforestation and its "consequences […] for soil stability and regional hydrology" (Farrell *et al.* 2000, 7). In the light of the circumstance that most of these collapsed civilizations first overexploited forest resources and only later (often already too late) sought to conserve them (such as by putting draconic penalties on the use of forests), we might, following Radkau (2000) and Farrell *et al.* (2000), even speak of a common pattern throughout history. As we will see later, it is not surprising that scientific forestry, the enclosure and privatization of forest resources and (modern) statehood emerged jointly, that power was concentrated in the hands of those that could control and manage forest resources (Scott 1998; Rajan 2006).

[xli] I for one consider it questionable to hold small-holder forest users responsible for the "unregulated exploitation of local forests" (Kimmins 1992 quot. after Farrell *et al.* 2000, 6) all the more so since it is known that local forest users usually cared for the forest (as commons) and were most often aware of the local ecological carrying capacities (Johann 2007, 57). Distinguishing between small-scale everyday interventions like firewood collection and the large-scale deforestation and "cultivation" of land orchestrated by feudal lords, states and princedoms, I argue that the deforestation of Central Europe was as much a result of supra-local than of local pressures on forests, and with all the (intentional) blaming of small forest owners we must not forget that the economic needs of cities, princedoms, states and empires (for mining, warfare, fleet-building etc.) had a great impact on forest landscapes (Perlin 1991; Scott 1998; Johann 2007).

[xlii] Many names of villages that I visited in the course of my fieldwork, such as place names with the German suffix "-schlag", "-reith" or "-schwend", bear witness to these times of "cultivation" and forest clearance ("Urbarmachung" in German). More than an economic necessity and a precondition for new settlements, the clearances were culturally charged, religiously motivated, politically encouraged and societally recognized as forests were considered the counterpart to culture, imagined as a threatening wilderness that needs to be civilized – for a reason, the German term "Wald" is derived from the word "wild", as opposed to the term "Forst" that represents a tidy stand managed by humans (Bartsch and Röhrig 2016, 5).

[xliii] Along this line, one could argue that the motives behind the *sustainability* concept, as developed by the Saxonian mineworker captain Hans Carl von Carlowitz in his *Sylvicultura oeconomica*, were less ecologically motivated, but in fact the manifestation of the claim to a continued timber supply for the mining industry, often at the expense of local forest owners (cf. Kilian 1998; Hölzl 2010).

[xliv] Already in the years before that act, particularly with the (failed) march revolution in 1848, a number of political changes had happened in the Austrian monarchy, such as land reforms and the abolition of serfdom. In theory, it was from then on possible for peasants to buy forests, in practice that did not happen as peasants were heavily indebted from previous relations of dependence (Pichler *et al.* 2022).

[xlv] Conversely, Gingrich and colleagues show "that the absence of any of the identified forest relief processes would have not only reversed the forest transition in Austria in the observed time period, but would have even resulted in a complete depletion of forest biomass before the end of the observation period [in 1910]" (Gingrich *et al.* 2021, 18). In this sense, one could say forestry's narrative of "sustainable forestry", of forests regrowing was enabled by the availability of fossil fuels. Society could *afford* to let forests regrow and wherever that happened, it was often Norway spruce that was artificially rejuvenated (Johann 2007).

[xlvi] The high share of small-scale farm forest owners in Austria is also indebted to institutions like the land transfer commission ("Grundverkehrskommission"), a local land purchase commission that has the final say in who can

and cannot acquire forest plots in a particular area and that is required to prioritize (local) farmers over non-experienced/non-local buyers, over so-called "new forest owners" (Weiss *et al.* 2019).

[xlvii] Of the group of private forest owners, 32% are women (Hafner *et al.* 2021) – a high share given the (systematic) underrepresentation, invisibilization and marginalization of women in a sector almost entirely dominated by men (ibid.). That women are legal forest owners, but only seldomly forest workers and forest managers, and even rarer forestry officials and forest-political decision-makers, has a number of reasons (Follo *et al.* 2017). The reason for women being (at least) forest owners (but not forestry officials) relates to a specificity in inheritance customs, meaning that within an Upper Austrian farmer family with several children the oldest son often inherits the farm(stead), whereas the daughter gets the forest (Nonic *et al.* 2006). Since the actual management is due to gender-specific roles carried out by male family members, the connection of women to their forest is often of a purely legal nature (pers. communication, I.O., 04.11.22).

[xlviii] Also, clear-cutting comes with high reforestation costs. This is because removing all trees in an area includes removing seed trees, making natural regeneration more difficult and – given that the Austrian Forest Act obliges forest owners to reforest – forcing one to spend a lot of money on the purchase, planting and protection of seedlings.

[xlix] "No, I do not want to support this development [of resorting to market interventions] […] When you asked whether we had managed to process and remove all the wood, I answered, yes, and that is only possible, […] when you are a reliable partner [of the sawmill industry], also in *times of peace*, in terms of compliance with the delivery schedule, in terms of compliance with the agreed qualities, […] if you are reliable over the years, then you can also count on the reliability of the counterpart" (Interview X, L. 1019pp.; italics by author).

Chapter 6

[l] Here, I am just thinking of a picture taken by a forest worker that an interviewed forest manager from Sauwald showed me. It shows an ESBB boring into the forest worker's banana, mistaking the sugary pulp for the phloem tissue of a tree. "If this is not direct competition for food, then I do not know what is" the manager says with a laugh, only to stress the serious dimension of that picture: Bark beetles would eat away people's trees (pers. communication, H.R., 28.02.22).

[li] Considering, for example, fruit flies (*Drosophila melanogaster*) and their history as laboratory animals, we can say that it is through insects that humans have come to understand parts of the world around them, and without insects as "companions of science" (Beisel *et al.* 2013), as "model organisms", as "epistemic beings" (Rheinberger 2010), knowledge on evolutionary genetics would not be where it is today.

[lii] What is particularly special about bark beetles is the rear portion of the elytra, the elytral declivity, which, among other things, is used to distinguish bark beetles from one another based on form, armature and vestiture, and which is also reflected in the names of various bark beetle species. In the case of the ESBB, one can detect eight small bumps, so-called "teeth" at that declivity, giving our beetle its second name, the (Larger) *Eight-Toothed* Spruce Bark Beetle.

[liii] Regarding the hibernation (success) of *Ips typographus*, it can be said that adult beetles can survive temperatures down to -30 °C, whereas eggs, larvae and pupae already die off at less than -5 °C (Schopf *et al.* 2019, 24-27).

[liv] Next to exhausting tree defence and detoxifying defence substances, a more recent hypothesis says that ophiostomatoid fungi provide bark beetle larvae and callow beetle with certain nutrients (nitrogen and phosphorus) that they concentrate around the tunnels and galleries (Six and Elser 2020).

[lv] In addition to blue-stain fungi, *Ips typographus* is associated with yeast fungi. Inhabiting bark beetles' gut, thus being provided with habitat, food and transportation, yeast symbionts "facilitate the colonization of plant tissues as they play a role in the detoxification of plant secondary metabolites, degrade plant cell wall and ameliorate beetle's nutrition" (Cheng *et al.* 2023, 1).

[lvi] Next to ant beetles, there are a number of other, usually less virulent predatory beetles, the most common from the group of hunting beetles (*Trogositidae*) is *Nemozoma elongatum* (Kenis *et al.* 2004). Being comparatively small and unable to hunt for adult beetles on the tree surface, *Nemozoma* is with its thin, elongated body perfectly adapted to entering bark beetle tunnels and galleries, preying on larvae and eggs. In addition to the only millimeters-large *Monotomidae* with different *Rhizophagus* species counting as antagonists of bark beetle larvae, members of the *Staphylinidae* family such as *Placusa depressa* are known to be bark beetle predators (Wermelinger and Mathis Schneider 2021, 3). Further important predatory insects come from the Diptera (two-winged insects, f. ex. flies), Neuroptera (net-winged insects) and Raphidioptera (snakeflies) order, mainly comprising of species whose larvae prey on the larvae of bark beetles. After having mated on the bark surface, the female fly lays over 100 eggs under bark scales close to the tunnel entrances, and once the larvae have hatched,

they move into the breeding galleries for feeding there on bark beetle eggs and larvae (Wegensteiner *et al.* 2015). With ten different species considered bark beetle antagonists, the long-legged flies from the Medetera genus are one of first antagonists to arrive at a fresh bark beetle infestation site (Wermelinger and Schneider Mathis 2021, 3). Apart from predators, a big group of lifeways assembled with bark beetles falls into the category of parasitoids, that is beings that develop at the expense of their host, and in the process of that also kill the latter (Wegensteiner 2019, 100). In the context of bark beetles, important parasitoids are parasitic wasps (Wermelinger and Schneider Mathis 2021). Unsettling and fascinating at the same time, the larvae of the former live ectoparasitically on bark beetle larvae or pupae. For getting there in the first place, adult wasps pierce through the tree cortex with their ovipositor (=egg-laying spine). Having found a bark beetle larva, they paralyze it with a toxic injection from their spine and then lay an egg onto the larva's body. After hatching, the parasitic wasp larva eats its host and leaves the tree through the bark beetle breeding gallery (ibid., 4p.). Material of a good horror story, these wasps have a significant antagonistic impact, with high parasitization rates in certain phases of population development (Kenis *et al.* 2004). The third group of lifeways that usually gather with bark beetles are bacteria, viruses and pathogenic fungi. Among those, the most common pathogenic fungus on the ESBB is *Beauveria bassiana*. With its spores sprouting on the beetle's surface and its hyphae growing through the beetle's shell, an infestation with Beauveria is not only lethal, but can wipe out an entire bark beetle population (Wegensteiner *et al.* 2015).

[lvii] The in-Austria-developed phenology model PHENIPS (Baier *et al.* 2007) uses topo-climatic and eco-physiological parameters "to model swarming activities, host tree infestation, rates of brood development, the incidence of sister broods and filial generations, and development status for successful hibernation at the end of the season" (PHENIPS n.d., n.d.), and based on these variables creates table-like illustrations of the bark beetle brood development including the time of appearance of different generations on a specific site (appendices A19).

[lviii] Even if several thousand beetles per week can be caught with a pheromone-baited trap during an ongoing population eruption, it is highly unlikely that such traps can be used to stop an ongoing population eruption. Whereas I met forest owners who were convinced that they could *prevent* a bark beetle outbreak by using pheromone traps (pers. communication, J.W., 21.04.23), most foresters stressed that setting up pheromone traps improperly actually fuels the problem as traps would lure beetles into (undesired) directions (Interview XXVI).

[lix] To illustrate the difference (and seasonal variety) in bark beetle numbers from a non-outbreak to an outbreak year, we can look at the catch numbers in one of my research sites, the bark beetle management zone of the Kalkalpen NP (appendices A20). In the figure, the pink line shows us that in the massive outbreak year of 2010 – two years after the storm events Kyrill and Emma-Paula, causing a 130.000 cubic meters of bark beetle damaged timber only in the national park in that year – in *each* of the twelve pheromone traps in the National Park up to 3000 bark beetles were trapped per week, especially many in the middle of June. Since most of the traps are located at around 1000 meter above sea level, we can assume that the first peak in catch numbers reflects the dispersal flight of generation zero, with the second peak in week 30 showings us when the fully-developed first generation took off for their dispersal flight. As a contrast, we can see that in the non-outbreak year of 2014 (with a total of only several hundred cubic meter of damaged timber in that year), the catch numbers are low indicating low population density and by that an endemic population stage.

[lx] Given that the kind of institutionalized bark beetle management stipulated in the Forest Act is largely based on a short-term oriented, one-size-fits-all approach, on "a unified set of measures across diverse environments and management objectives" (Hlásny *et al.* 2021, 151), not allowing a differentiated and context-dependent treatment of trees, there are recurring criticisms of institutionalized bark beetle management. Beyond that, in the case of outbreaks, short-term response measures usually obtain priority and bark beetle management lacks a more long-term prevention (and preparedness) perspective, and that in terms of problem awareness, silvicultural changes, better governance and more effective forest policies (Morris *et al.* 2018; Dobor *et al.* 2020; Hlásny *et al.* 2021).

[lxi] Put differently, "in the absence of windthrow, a combination of ample host availability, favorable temperature conditions for bark beetle development, and acute disposition of trees to attack caused by drought stress can intensify population growth and very likely lead to bark beetle mass outbreaks" (Netherer *et al.* 2019, 1). The historically unprecedented bark beetle damages of 2018 and 19, happening in the North of Austria, in the Mühl- and Waldviertel, show that high temperatures (accelerating bark beetle brood development) and precipitation deficits can be enough for a large-scale multi-year bark beetle mass propagation to unfold and to persevere (Hoch and Steyrer 2020). Accordingly, an interview partner, CEO of an Upper Austrian forest enterprise in the Mühl- and Hausruckviertel, describes the main drivers behind the big bark beetle outbreaks of 2018 and 19 as follows: "[All of these damages] were related to the ESBB, that was not induced by windthrow, that was not a result of snow-break, that was the bark beetle, following after drought and extreme heat. We have in the years of 18 and 19, already beginning in 2015 and lasting until 2020, precipitation deficits of at least a third, and we have a deviation with regards to mean annual temperature of at least two degrees plus. This is a discrepancy that spruce can no longer stand" (Interview X, L. 940pp.).

[lxii] Next to anthropogenic climate change and its impact on tree health, bark beetle outbreak severity and frequency, forest management including silvicultural strategies and shaped by the global economics of forestry play an important role in the creation of forest stands that are susceptible to bark beetle outbreaks (Biedermann *et al.* 2019). We have talked at greater length in chapter 4 about how the large-scale plantation of spruce in even-aged pure stands outside of the tree's natural range translates in the age of climate change into reduced tree health (and reduced tree resistance) and by that into a high susceptibility to biotic and abiotic disturbance events. Next to susceptibility, a high host abundance and high degree of host connectivity (given in pure spruce forests) positively effects the build-up and continuation of bark beetle outbreaks.

Chapter 7

[lxiii] It makes sense to speak of the climate crisis as the actually overarching challenge, and that insofar as most of the challenges that are assessed as particularly pressing are related to and/or coming from climate change. From the top five challenges chosen by the respondents in the survey (see appendices A24), the first four are all directly related to climate change (Marini *et al.* 2017), and only challenge number five, "silvicultural mistakes of the past", points explicitly to past and current forest-making practices (see chapter 7.2). Having said that, it is surprising that in the survey "anthropogenic climate change" has only been explicitly identified as a central challenge by 30 (50%) or as an aggravating factor for the increase in bark beetle outbreaks by 31 respondents (52%), pointing to something that I have experienced several times in the field, namely that many forest owners do not establish a connection between an increase in disturbances, dry periods, heat waves, mean temperatures and what is commonly conceptualized as "climate change" (see also appendices A29). I can only speculate about the reasons behind that. One of them could be that many rural forest owners associate themselves with conservative and/or right-wing political positions including the denial or relativization of anthropogenic climate change: "I think that climate change, a lot of that is made up by the media, I mean because we have had climate change before, so I think it is being built up a bit and that people are being driven crazy, and then panic sets in among people who do not really grasp the whole thing. Climate change, it already happened thousands of years ago, […] it has always existed like that" (Interview XI, L. 466pp.).

[lxiv] One aspect of why it makes sense to use the term "crisis" is related to the dominant way of how bark beetle outbreaks are discursively framed through the notion of crisis and a specific kind of "crisis reporting […]. And then the question of who is to blame always comes up, why is this happening now. Climate change is to blame, the foresters are to blame, in between are the forest managers and owners, who are then portrayed as if it were very dramatic for them. For some it is certainly very dramatic, but most manage it more professionally, I would say, if it is a forest enterprise, it is just a catastrophe after which you have to continue" (Interview XV, L. 943pp.).

[lxv] It is striking that the willingness to use insecticides against bark beetles is comparatively strongest in the group that experiences bark beetles as a threat to their claim over "business-as-usual" intensive forest management, and that despite only 26% of all respondents having considered this measure as a meaningful response to bark beetle outbreaks. When looking at countermeasures on the side of proponents of the "forests need to be managed" and "bark beetles need to be counteracted" approach, we see that three (indirect) measures proposed in the survey are met with particularly strong resistance, that is 1) the "extension of protected areas", 2) "the amendment of the Forest Act" and 3) "the regulation of the timber price by the state" (see chapter 5.2).

[lxvi] When grasping ideology as something pejorative Eagleton (1991, 2) stresses that "nobody would claim that their own thinking was ideological […]. Ideology, like halitosis, is in this sense what the other person has. It is part of what we mean by claiming that human beings are somewhat rational that we would be puzzled to encounter someone who held convictions which they acknowledged to be illusory".

[lxvii] Given that this acting upon has power implications and an institutional dimension, that "ecology underpin[s] the establishment of government conservation institutions, provid[es] intellectual strategies for classifying and objectifying nature, and […] the knowledge base for the control and management of nature" (Adams 1997, 277), the conservation ideology is itself a product of modernization and rationalization and thus in its genesis and functioning not so different from the "ideologies" it opposes.

[lxviii] Based on negative experiences with nature conservation officers, a forest owner, dairy farmer and former forest helper tells me about how he became alienated from nature conservation: "For a long time, I have been the first to stand up for everything related to nature conservation, but today I must say that the majority of conservationists are just chaotic people […], most of them have no idea about the practice" (Interview XIII, L. 586–640).

[lxix] That ideology is a dividing line in how to make sense of bark beetles is also stressed by the operative manager of the forest enterprise in the Kalkalpen National Park. Caught between two ideological stools, he tells me how difficult it would have been for him at to conciliate "the different ideologies. I mean, if you look at how my colleague [biologist] thinks about and discusses the bark beetle, and how this is different from what I [as a trained

forester] would say when I do an excursion. This is different, not only in terms of [forest use] objectives, […] it is a question of the underlying *ideology*" (Interview I, L. 406pp.; italics by author; see chapter 9).

[lxx] In fact, the last 20 years have already given us an impression of where things are going. Given that spruce is a tree species of the nemoral climate zone (Bartsch and Röhrig 2016) and seeing how quickly this zone has retreated to inner alpine areas, we realize that many of the ongoing changes *happen too quickly* for spruce to adapt.

[lxxi] That said, I was not startled when a Styrian forest warden told me that when he was doing a forest tour with laypeople in a mixed forest comprised of spruce, fir and larch at 1000 m a.s.l (in a forest that he is particularly proud of), several participants complained about the "bad monoculture" that he was leading them through, mistaking other conifer tree species for spruce and concluding that the forest would be an off-site spruce plantation doomed to soon collapse (pers. communication, N.R., 23.04.22).

[lxxii] It is interesting to mention here that albeit many of these stakeholders refuse to speak of silvicultural mistakes, most of them would consider "off-site spruce monocultures" to be a central part of the problem – in the survey, 47 out of 60 respondents chose off-site spruce monocultures to be a factor for the increase in recent bark beetle outbreaks (see appendices A29). This is insofar remarkable as it is undoubtedly specific silvicultural systems that have brought about off-site spruce monocultures. Pointing to spruce monocultures, but not to the system that have produced the latter seems like a diversionary tactic to avoid having to admit that perhaps forestry as such (in its extractive and maximum-yield-oriented form) could be a driver of recent problems.

[lxxiii] One "proof" for such an early existence of this kind of knowledge can still be visited today, namely in the form of a memorial stone in a forest in the Bavarian Breithenthal with the inscription: „In a stormy night, the forest lost its might. If it is the forest you want to lose, make sure to plant nothing but spruce" (Original: "In Sturmes Nacht sank des Waldes Pracht. Willst Du den Wald bestimmt vernichten, so pflanze nichts als reine Fichten", translated by author; see appendices A31). The stone itself was part of the foundations of two steam sawmills constructed after a heavy storm event in 1921 destroyed the local spruce forests – in my view a quite unequivocal evidence that already 100 years ago people were aware of the storm susceptibility of pure spruce stands.

[lxxiv] How much effort goes into searching for drought-resistant seed material became clear to me when visiting project employees of the "Spruce Plus" project in the course of which so-called "plus trees" were climbed (trees that were the only ones in a stand to survive drought and bark beetle infestations) to collect seeds for testing and reproduction (see appendices A32).

[lxxv] Following that, it would not make much sense for an owner with a few hectares to convert his/her spruce forest all of a sudden into an uneven-aged mixed forest. This is because forest owners might not have the knowledge, time and resources to accomplish such a maintenance-intensive conversion, not to speak of the fact that the effort put into that conversion easily outweighs the (short-term) benefits from their "easy-to-manage" conifer forests (Interview IV, VII, XIV).

Chapter 8

[lxxvi] One driving force for major harvesting in these "reserve forests" is also the domestic need for wood for the renovation and construction of agricultural buildings, and as father and son of a farm forestry enterprise with 15 hectares of forest recall, damages due to Kyrill-induced windthrows and bark beetle outbreaks did not unsettle, but rather encouraged them to "simply use the wood for ourselves, to build up the farm a bit, and yes, already in the 80s we built the first stable with our wood, then we built the machine hall afterwards, so everything with our own wood, and yes, in 2009 we built the cattle stall, so we needed another 200 cubic meters, […] because this is where you can use the big logs, the large trees that no one else will buy from you […], we were lucky that we were able to reuse a bit of our damaged wood" (Interview XI, L. 65pp.). In the case of one visited farm forestry enterprise with an inbuilt sawmill, this goes so far that – without needing intermediary service providers or specialized craftsmen – peasant forest owners harvest the wood from their own forest, transport it to the farm, cut it into rafters and boards, and directly use those for construction purposes, and that without ever bringing the wood onto the market, without entering the capitalist process of producing exchange values. Although not the norm (also because small sawmills are becoming fewer and fewer due to cost pressure and competition), this example shows that the forest sector in the Sauwald is in comparison to other regions more focused on self-sufficiency and subsistence security, that forestry supply and processing structures are oriented and organized in a (more) direct way without many intermediaries, making a large part of the added value remain in the region (NaLa OÖ SW 2007). As a precondition and manifestation of that, there are still several small and medium-sized (family-run) sawmills in the region that aim to cut local wood and sell it back to the roundwood suppliers (Interview XXV).

[lxxvii] Albeit having concluded that, we should not forget that the sudden loss of additional income has the potential to cause serious problems for an enterprise that is already economically ailing or privately challenged. In other

words, bark beetle outbreaks reduce a forest enterprise's resilience to economic shocks and to other disturbance events.

[lxxviii] There are those of course, such as an interviewed forestry advisor from the Chamber of Agriculture, that present themselves to be more self-critical, concluding that forest authorities have played their role in the drive for spruce plantations: "I like to begin like that, for sure, forestry has made mistakes in the past, like betting only on spruce and so forth, where we have come to the point of plantations and forests far away from nature. And now the people see that this has failed and that this is failing, and I mean if you look at the big forest enterprises, I mean the whole forest sector is not innocent, they still work into the direction of plantations" (Interview V, L. 434pp.).

Chapter 9

[lxxix] On basis of a random inventory study, Kirchmeier and Jungmeier (2014) estimate that around 23% of the NP forests are moderately or strongly humanly-altered, 26% are considered *natural* forests and the remaining 50% are classified as "close to nature" ("naturnahe").

[lxxx] An effort, says an otherwise NP-critical resident, "that I do not want to deny. I have to say, they are trying really hard ever since we [=affected forest owners] went to the federal governor, they really try to get the situation under control, in some cases they have even expanded the management zone and that is helping us" (Interview XXIV, 00:09:21-52).

[lxxxi] To give more concrete examples, at certain times of the year no tree may be felled within a radius of one kilometer around a golden eagle's nest, or there is the requirement that in the case of a contiguous intervention area of more than 0.5 hectares at least 50 cubic meters of debarked timber must remain as dead wood (Kammleitner 2023).

[lxxxii] Those readers who have in the past followed the developments around the Stuttgart train station (i.e., the struggle around project stops, construction delays, environmental impact assessments etc.) know all too well that a small black beetle like the Hermit beetle (*Osmoderma eremita*) has the potential to halt a billion euro project, that as much as we belittle these beings, they have a powerful place in our legal, political, and ecological systems.

Chapter 10

[lxxxiii] When I refer in the following to the "Iron Curtain", I grasp the latter as a historical (*Cold War*) arrangement of institutional, material-infrastructural, symbolic and discoursive border(ing) devices dividing Europe into a Western and Eastern part (Wright 2007; Komska 2015). Acknowledging that the Iron Curtain is much more than a physical structure and a symbolic diving line, that there are (esp. in times of the Russian-Ukrainian war) legacies, continuities and political dynamics that revive (elements of) the historical Iron Curtain and the Cold War, I agree with McWilliams (2013, 17) that the "Iron Curtain can be described in many different ways both metaphorically and geographically, and can be seen to stretch throughout the world and across different time periods".

[lxxxiv] Original: "An der Mitternachtseite des Ländchens Österreich zieht ein Wald an die dreißig Meilen lang seinen Dämmerstreifen westwärts, beginnend an den Quellen des Flusses Thaia, und fortstrebend bis zu jenem Grenzknoten, wo das böhmische Land mit Österreich und Bayern zusammenstößt. Dort, wie oft die Nadeln bei Kristallbildungen, schoß ein Gewimmel mächtiger Joche und Rücken gegeneinander, und schob einen derben Gebirgsstock empor, der nun den drei Landen weithin sein Waldesblau zeigt" (Stifter 1882, 3). Since the days of Adalbert Stifter, the famous 19th century Bohemian Biedermeier poet, the Bohemian Forest has undergone great changes. From the collapse of the Habsburg monarchy over two world wars to the erection of the Iron Curtain and the establishment of the Czech national park Šumava in 1991 – changes took place that the monarchist Stifter would have probably never imagined. Still, there are things that Stifter would recognize. He would be able to walk along the "Schwarzenberg'sche Schwemmkanal", an around 50-kilometer-long alluvial canal, built in the 18th century for drifting (fire)wood over the European watershed. He would encounter a regional forest economy that has lost little of its good reputation. Ultimately, Stifter would appreciate the company of spruce, fir and beech, tree lifeways that he so vividly described in his texts and that have been dominating the ridge of the Austrian Bohemian Forest for the longest time (Dunzendorfer 1974; NaLa OÖ BW 2007).

[lxxxv] The Bohemian massif is best described as a geomorphological formation that – much older than the Alps – rests upon crystalline bedrocks and encompasses a number of "Mittelgebirge" mountain ranges.

[lxxxvi] Together with the (Upper) Bavarian Forest and its southeastern foothills in the Austrian Mühl- and Waldviertel, the Bohemian Forest is the largest contiguous forest area in Central Europe. How much larger this forest area had to be before people began to push it back in the course of the large clearings in the High and Late Middle Ages is difficult to imagine (Bernau 1888). And this despite the fact that the Bohemian Forest, or "Northern

Forest" ("Nordwald") as it was long called, unlike other large pre-medieval forest areas that quickly shrank under human influence, remained extensive and to this day sparsely populated (Martan 2009).

[lxxxvii] Original: "Und diesen unerhörten, einmaligen Wohlstand, dieses Leben voller Arbeit aber auch voller Wonnen, hatte ihnen ein kleines Käferchen beschert, ein richtiger Goldkäfer, ein gesegnetes Tierchen, welches den alten Böhmerwald vernichtete und dem die Gelehrten den Namen "Borkenkäfer" gegeben hatten"

[lxxxviii] This is not to say that the socialist ČSR would have been enthusiastic about nature conservation. What I intend to say is that "even" (note the already-pejorative framing here) under communist regimes there were options for nature conservation (Weiner 1988). That said, those options were limited, and the Bohemian Forest was still needed for timber extraction. The declaration of the Bohemian Forest to a protected landscape in 1963 did not stop state forest companies from large-scale clear-cutting in the 1970s and 80s (Martan 2009, 20).

[lxxxix] According to the head of the monasterial forest enterprise Schlägl, himself a Premonstratensian monk, "one of the founding motives of the NP was that [after the fall of the Iron Curtain] there was the fear that the country would be sold out. These forests bordering us, they used to belong to Prince Schwarzenberg, […] [and then] it was all the Czech state forestry administration" (Interview XIV, L. 561pp.). A significant first step towards today's NP was taken in 1963 with the designation of the Šumava landscape protection area. I want to add that it is likely that the national park could only be proclaimed because of being located in a little-frequented, depopulated, economically peripheral and in parts militarily restricted border area – in an area to which comparably few societal demands were placed.

[xc] An employee of the forest protection department of the federal province of Upper Austria sees this process of similarly: "At the beginning we actually had a very good basis for discussion with the representatives of the national park, they were all people with a forestry training, and there was a time when this forestry team in the national park was replaced, by, I have to say that, or at least the director was replaced by nature conservation fundamentalists, and subsequently of course we had massive problems with bark beetles, and we were actually, one has to say that very openly, very helpless, because if the NP did not do anything on the Czech side, then the problem just continued and we had no opportunity to intervene" (Interview VI, L. 671pp.).

[xci] At the same time, conflicts around bark beetle (non-)management flared up in other parts of the NP due to (another) new national park director ordering tree felling in bark-beetle-affected areas in 2010 and 2011, "culminating in an open conflict between the proponents of wilderness and the government when hundreds of active citizens, tourists and scientists attempted to block tree felling in the ancient spruce forest habitats around Bird Creek (Ptačí potok)" (Bláha and Kotěcký 2015, 51). Even though the felling was stopped, the next setback for conservationists followed in 2013, here with the discussion about altogether downgrading the national park from an IUCN category II to a category IV area to promote logging and regional economic development. Even though this step was never implemented, and a new, conservation-wise more ambitious nature and landscape protection law was passed in 2017, the national park remains contested to this day.

[xcii] In the case of the Austrian-Czech Bohemian Forest, the negotiation of belonging not only implies the question of which lifeways belongs where, but ultimately also *to whom the forest belongs*, *which services the forest serves* (for whom) (cf. Blicharska and Van Herzele 2015) and – in line with the political-ecological *Theory of Access* – *who* has the access to and the "ability to derive benefits from" these services (Ribot and Peluso 2003, 154).

[xciii] This should not give the impression that more-than-human actors are merely instrumentalized and acted upon. Rather, bark beetles and capercaillies benefit from being instrumentalized as flagstone and "keystone species" (Bláha and Kotěcký 2015), here from *becoming protected* or from *serving as partners in protection* (Kortmann *et al.* 2021); in our case, their agency (in the sense of world-making possibilities) *expands* (and not shrinks) through being called upon as a biodiversity marker (capercaillie) and a biodiversity enhancer (bark beetle).

[xciv] For instance positive in that spruce bark beetles accelerate natural succession and create possibilities for other trees to replace spruce, negative in that spruce bark beetles lead to gaps in the forest canopy making successional plants grow there long before fir or beech has the chance of doing so. In all of that, spruce pulls the strings as well, on the one hand as the "bread tree" for foresters and bone of contention for conservationists, on the other hand as an actor that by constituting forest landscapes, by giving forests a face, changes the conditions in which the world-making of other interest coalitions play out. In the Bohemian Forest, spruce's position with regards to bark beetle outbreaks is, as I would argue, particularly complicated. This is because spruce is in the Bohemian Forest both a naturally dominant/well-adapted tree species (f. ex. at the high ridge of the Austrian-Czech Bohemian Forest) *and* a planted, overrepresented human companion in the lower lying areas. With some of these trees being older than spruce is allowed to get in commercial forests, with some of them having vanished while other survived both the outbreaks of the 1870s and the early 2000s with some of them swiftly re-colonizing the damaged areas around the Dreisesselberg and the Plöckenstein (and that without support from humans), spruce does not fit in any drawer, it is neither a victim nor the cause of the problem, neither good and "fitting" nor bad and "non-belonging". It is the

specific configuration of actors, assemblages and interest coalitions, and with it the interplay of world-making practices, narratives, and institutions, that shapes the making of the Bohemian Forest.

[xcv] When coming back to the lynx, we see that the latter is part of many assemblages and interest coalitions at once, be it the conservationist-bark beetle-capercaillie interest coalition or the forester-fir coalition, and even with a hostile group like human hunters lynxes share the interest of having well-fed game.