A thesis submitted to the Department of Environmental Sciences and Policy of

Central European University in part fulfilment of the

Degree of Master of Science

Setting the priorities for threat reduction management in protected areas in Ukraine

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July, 2012

Budapest

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ABSTRACT OF THESIS submitted by: Olena KOVALENKO

for the degree of Master of Science and entitled: *Setting the priorities for threat reduction management in protected areas in Ukraine*

Month and Year of submission: July, 2012.

Conservation of biodiversity has been internationally recognized as one of the global problems of today. At the same time, protected areas are widely established as core territories for biodiversity conservation. Even though the number and size of protected areas (PA) is what is frequently cited to demonstrate the success of conservation policies, PA management is what matters for reaching global conservation objectives. However, the effectiveness of PA management remains rather low in developing and transition countries like Ukraine, *inter alia*, due to absence of monitoring of management performance. The modified version of the Threat Reduction Assessment (TRA) tool, enabling negative scoring, has been chosen from a variety of other methods to assess the effectiveness of managerial efforts in the reduction of anthropogenic threats in the two selected wetland protected areas in Polissya natural region in Ukraine: Shatsky National Nature Park (NNP) and Polissya Nature Reserve (NR). To facilitate threat identification, the International Union for the Conservation of Nature standard lexicon for biodiversity conservation was used. For the chosen reference period of 2002-2012, the results for Shatsky NNP demonstrated the TRA Index of -16% with the main negative impact related to recreation. For Polissya NR the reduction score of -26% was derived for the assessment period of 1981-2012, while the greatest negative contribution was due to forest fires. Based on the obtained results, relevant recommendations for prioritizing the management actions were given and, in particular, the modified TRA tool was advised to be included as a mechanism of self-monitoring of management performance.

Keywords: biodiversity, conservation, wetlands, Shatsk, Polissya, Ukraine, threat reduction assessment, management effectiveness.

Acknowledgements

I would like express my deep gratitude to all the people who supported me on the way to completing my research successfully. Foremost, I am sincerely grateful to my supervisor Prof. Brandon Anthony for his valuable suggestions and support from the very beginning and until the final step. Moreover, I wish to express my great appreciation to Diane Matar for her help and useful advices and to the managers of Shatsky National Nature Park and Polissya Nature Reserve for their help in completing the practical part and for being so cooperative and hospitable.

Also, I would like to thank Hryhorii Parchuk from the Ministry of Environment and Natural Resources of Ukraine for his guidance on the choice of protected areas and for giving a lot of valuable information on the research problem. I wish to acknowledge Yunona Videnina and Olena Marushevska for the opportunity to participate at the meeting related to the international project aimed at restoring the wetland ecosystems of the Ukrainian part of Polissya. Moreover, I am grateful to the Central European University Foundation for providing me with substantial funds to make the research possible.

Finally, I want to thank my family and my friends for their invaluable support and encouragement.

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List of Abbreviations

Abbreviation	Description
CBD	Convention on Biological Diversity
GIS	Geographic Information System
CMU	Cabinet of Ministers of Ukraine
EU	European Union
GEF	Global Environmental Facility
IUCN	International Union for Conservation of Nature
MDG	Millennium Development Goal
MEA	Millennium Ecosystem Assessment
MENRU	Ministry of Environment and Natural Resources of Ukraine
NECU	National Ecological Center of Ukraine
NGO	Non-Governmental Organization
NNP	National nature park
NPC	National Parks Commission
NRF	Nature Reserve Fund
PAME	Protected Area Management Effectiveness
RAPPAM	Rapid Assessment and Prioritization of Protected Area Management
RD	Recreational digression
SCBD	Secretariat of the Convention on Biological Diversity
SEO	State Employment Office
SEPA	Swedish Environmental Protection Agency
SFCU	State Forestry Committee of Ukraine

TRA	Threat Reduction Assessment
UN	United Nations
UNEP	United Nations Environment Programme
USPFMPA	Ukrainian State Project Forest Management Production Association
VRU	Verkhovna Rada of Ukraine (Parliament)
WCMC	World Conservation Monitoring Centre
WCPA	World Commission on Protected Areas
WDPA	World Database on Protected Areas

1. Introduction

1.1. Background

For already a few decades the significance of biodiversity conservation has been outlined by a number of international agreements (UNEP 1992; UNESCO 1971), while the overall state of the environment has been continuously worsening due to increasing anthropogenic pressure. The international efforts in creating a framework for guiding biodiversity conservation are represented by the Convention on Biological Diversity, the main principles of which imply conservation, sharing, and sustainable use of natural resources (UNEP 1992). Focusing on the ecosystem aspect, wetlands are recognized to be among the most valuable natural systems due to a high ecological value both for natural cycles and human needs (UNESCO 1971; MacKay *et al.* 2009; Bowman 2009). However, despite the importance of wetlands ecosystems, they currently undergo deterioration, primarily, due to overexploitation and conversion of lands for agricultural or industrial purposes. To overcome this problem, some wetlands were given the status of a protected area and/or a Ramsar site (Marushevsky and Zharuk 2006; UNESCO 1971).

Importance of protected areas and protection status in general has been recognized internationally (Matar 2009). However, even after a nature reserve or a national park is established, significant managerial efforts are required to keep the environment protected from both internal and external threats. To be effective, protected area management should include long-term vision and systematic conservation planning, as well as to be adaptive and participatory (Margules and Pressey 2000; Salafsky *et al.* 2002; Kothari 2004). Furthermore, being adaptive and strategic requires continuous self-monitoring (Salafsky *et al.* 2002; Tvedten and Hersoug 1992), which among other aspects implies the assessment of threat management performance. Recognizing that most of the natural threats are beyond human

control, a great share of existing tools for threat management assessment is focused on evaluation of anthropogenic threats existing within the protected areas (Kapos *et al.* 2008; Ervin 2003; Margoluis and Salafsky 2001).

As the scope of study will be framed to concentrate on the Ukrainian part of Polissya natural region (as a representative area for wetlands), reviewing the national context of ecosystem modification and degradation caused by humans, as well as conservation policy gaps (MENRU 1999), is an important constituent. In general, Ukraine has very similar threats to those existing internationally. However, the political instability in the country often leads to delaying anything which is not relevant to economic interests of the ruling parties. Therefore, the managers of protected areas have to utilize the available funds only for the most urgent needs, often omitting monitoring of management performance. The threat assessment has not until recently been carried out in Ukraine (Prots *et al.* 2010), while internationally it has been recognized as one of the ways to improve the management performance (Salafsky and Wollenberg 2000; Mugisha and Jacobson 2004; Anthony 2008; Matar 2009).

Thus, taking into account the problems existing within Ukrainian part of Polissya region, gaps in national conservation policies, and relatively weak experience regarding the monitoring of protected area management, importance of studying the effectiveness of threat management in wetland protected areas in Ukraine is evident.

1.2. Aim and objectives

The aim of the current research is to evaluate the existing and potential risks threatening selected wetland protected areas in the Polissya region in Ukraine and propose relevant measures for improving the effectiveness of threat reduction management. Defining such an aim lead to setting the following objectives:

1. Review available information on the current level of protected area management and identify the main gaps on international and national level.
2. Apply the modified TRA tool to identify the main threats and evaluate threat management effectiveness.
3. Collect the background information on threats by surveying relevant stakeholders.
4. Analyze results and propose relevant measures to improve threat management at the selected sites.

1.3. Research question

How can threat management performance be improved in wetland protected areas in the Polissya Region in Ukraine?

1.4. Methods used in the research

Methodology used in this paper includes data collection and analysis approaches. In particular, data collection includes an overview and analysis of the literature available in the field and interviews or follow-up discussions held after the workshops. Moreover, qualitative and quantitative surveys are conducted and consequently analyzed. Qualitative surveys include interviews and discussions, while quantitative part is completed by using the modification of Threat Reduction Assessment (TRA) tool for the selected protected areas (Margoluis and Salafsky 2001; Anthony 2008; Matar and Anthony 2010). Finally, mapping tools are used to visualize the results of the research.

1.5. Research contribution

This research will become the first case of application of the modified version of the TRA tool in Ukraine. In a broader context, only one assessment of threats using the Rapid Assessment and Prioritization of Protected Area Management (RAPPAM) method has so far

been carried out in Ukraine (Prots *et al.* 2010). However, due to time and resources required for holding the workshops make this method difficult for implementation and regular use. On the contrary, the materials distributed to the management teams and workshops held in the selected protected areas will enable them to use this tool on a permanent basis. Hence, the outcomes of this study can be included into the management plans and become a basis for further research in this field and in the region.

Apart from using the modified version of the TRA method, the research incorporates the standard lexicon for biodiversity conservation developed by the International Union for the Conservation of Nature (Salafsky *et al.* 2008), the TRA Excel® workbook developed by Matar (2009), and the ArcGIS® mapping tools to visualize the outcomes of the research.

1.6. Thesis structure

The paper contains five chapters. The first chapter contains introductory information regarding the background of the research problem, highlighting the aim and objectives of the study and the research question. It is followed by the description of the main definitions used within the research and the international and national context of the problem, provided in chapter 2. The third chapter gives an overview of the research design and the qualitative and quantitative methods used in the current research, while describing the use of mapping tools. The fourth chapter presents the outcomes of the research and recommendations derived from the obtained results. Finally, the fifth chapter includes a summary of the main findings, discussion on the limitations, and suggestions for the future research.

2. Literature Review

2.1. Introduction

The following chapter contains the description of the main terms further used in the paper. Also, it provides an overview of international and national policies regarding biodiversity conservation with a special accent on wetland ecosystems. Apart from that, justification on the area and subject choice is outlined. Finally, international and national classifications of protected areas according to the management purposes are given, and the baseline situation, as well as main policy achievements and constraints on the national level are described.

2.2. Defining the key terms

As this research is aimed at studying the threats and threat management in protected areas preserving wetland ecosystems, it is relevant to first define some key terms, which will further be used in the paper. Among those are 'biological diversity', 'conservation action', 'threat', 'wetland', and 'protected area'.

The first term 'biological diversity' is relatively young, as it became widely applied only after the National Forum on BioDiversity, which took place in Washington D.C. in 1986 (Thompson and Starzomski 2007). The definition of biological diversity most widely used in the international arena comes from the Convention on Biological Diversity and is described as "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems" (UNEP 1992, 3). Hence, it covers all types of ecosystems, but as this paper is focused on wetland ecosystems, it is relevant to explain the meaning of this term.

The choice of the definition for wetland ecosystem, as well as the selection of protected areas for analysis, was driven by the Convention on Wetlands of International Importance,

especially as Waterfowl Habitat (further Ramsar Convention). According to the Convention, wetlands are "areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres" (UNESCO 1971, 1). But apart from this definition, to classify a wetland as a Ramsar territory, additional criteria are used (see section 2.2.2).

For the purpose of the research it was decided to pick one unified definition of 'conservation actions' to make further analysis more consistent. Hence, according to Salafsky *et al.* (2008, 899), conservation actions are "[i]nterventions undertaken by project staff or partners designed to reach the project's objectives and ultimate conservation goals". This term was chosen particularly to delineate the scope of management recommendations as an expected result of the research.

One of the key prerequisites for the effective application of the Threat Reduction Assessment (TRA) tool (refer to section 2.2.5.2.) within the research was to interpret what a 'threat' is. Giving a direct definition to a threat has long been among the constraints to conducting analyses of conservation success similar to the TRA approach. For instance, apart from the variety of existing definitions, there were some attempts to classify the threats according to their importance, as: (1) removal of individual components from the protected areas (PAs) without major structural changes, (2) general depletion of the PA environment, (3) fundamental/cardinal alteration and deterioration, or (4) isolation of PAs by changes of land or water use in surrounding territories (Chape *et al.* 2005; Carey *et al.* 2000). However, it was decided to use the definition of 'direct threat' provided in the unified classification of threats (one of the first recognized attempts to create a comprehensive set of definitions for threat management), which is "[t]he proximate human activities or processes that have caused, are causing, or may cause the destruction, degradation, and/or impairment of biodiversity targets"

(Salafsky *et al.* 2008, 898). Providing this explanation, it is worth to mention that defining the necessary terms during the preparation stage was crucial to speak the 'same language' with the management teams (for details refer to section 3.4.2.3.).

Another important term to mention is "protected area". It has been defined in various ways by different organizations and conventions, but the most widely accepted definitions are provided below:

> *"An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means."* (IUCN 1994, 7)

> "*A clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values*." (Dudley 2008, 8)

> *"A geographically defined area which is designated or regulated and managed to achieve specific conservation objectives."* (UNEP 1992, 4)

All of the definitions of protected areas highlight their key attributes such as having a defined territory, being designed for maintenance/conservation of biodiversity and natural/cultural resources, and being managed. However, for this research the definition from Dudley (2008) was used as most thorough, recent, and widely used one.

2.3. International background

2.3.1. International conservation policies

Description of international conservation policies is based on the main two conventions fundamental for this research: the Convention on Biological Diversity and the Ramsar Convention. They are chosen from a variety of other international agreements due to their

relevance for the research problem and their framework role in conservation of biodiversity and, in particular, wetland ecosystems.

The path of conservation policy formulation has long been thorny and challenging. However, in the past few decades international conservation policy has demonstrated rather a substantial level of development and has gained much more attention comparatively to previous years. Mainly, this is due to the outcomes of the Earth Summit in Rio de Janeiro in 1992, where the Convention on Biological Diversity (CBD) was signed. At the moment, the CBD has 193 parties and a complex mechanism of implementation, which includes the Cartagena and the Nagoya protocols, convention bodies, agreements, action plans, and other mechanisms (SCBD 2012). Creating the Convention, the focus was on three main goals: (1) biodiversity conservation, (2) sustainable use of its components, and (3) the fair and equitable sharing of the benefits it may provide (UNEP 1992).

The general framework of the Ramsar Convention was developed almost two decades before the CBD. The Convention on Wetlands of International Importance, especially as Waterfowl Habitat was adopted in Ramsar, Iran in 1971, at that moment aiming primarily on protection of waterfowl species (UNESCO 1971). First it was signed by 18 nations and entered into force four years later, but currently the Convention has 160 parties (the latest who joined was Lao People's Democratic Republic in 2010) (Ramsar Secretariat 2012). Moreover, after the adoption of the Convention a series of amendments were accepted, among which of a particular interest are those regarding the criteria for identifying wetlands of international importance. In comparison to the first version, which was based mostly on waterfowl species, now the requirements include 9 criteria in two groups: group A (related to representativeness and containing rare or unique wetland types) and group B (regarding the site importance for conserving biodiversity). The criteria from the second group are based on: (1) species and ecological communities, (2) waterbirds, (3) fish, and (4) other taxa (Ramsar Secretariat 2008).

In addition to these clarifications, after the establishment of a new Ramsar site, the member states should report to the Ramsar Bureau on any actual or potential alterations related to the site (Bowman 2009).

2.3.2. Protected areas as core areas for the conservation of biodiversity

From ancient times humans tend to designate particular areas for preservation of specific natural and cultural values (Margules and Pressey 2000). Specifically in the period of romanticism the perception of wilderness shifted from its being a source of danger to becoming something which needed protection. The endangered status of nature was linked to rapid losses of intact nature due to the development of industries and progress in general. Later the idea of protecting nature became widespread especially in the Occident (Kupper 2009).

One of the turning moments in the history of protected areas were the early 1960s, when the International Union for Conservation of Nature (IUCN), the National Parks Commission (NPC), and the UN General Assembly brought the importance of protected areas to the attention of the international community (Chape *et al.* 2005). Nowadays protected areas are recognized as key areas for the conservation of biodiversity; moreover, they are used as one of the principal measures of compliance with global conservation objectives (Chape *et al.* 2005; UNEP-WCMC 2007). However, according Chape *et al.* (2005), the areal extent of PAs (as their contribution is frequently perceived only in spatial dimension) can be an effective indicator of conservation success only in relation with information on 'effectiveness of coverage' (including location and design) and management performance of protected areas. For instance, some studies demonstrate that ~1/4 of the assessed species were absent in PAs of IUCN categories I-IV with territory >1000 ha (Chape *et al.* 2005), which indicates the need of having reliable background information apart from the area size.

2.3.3. Management of protected areas

2.3.3.1. The main PA management approaches

PA management is an essential component of conservation success and it generally consists of 3 steps – planning, implementation, and monitoring. As the concept of PA management was developing, first there were attempts to separate various approaches into different management streams, however now the holistic approach both for management planning and monitoring is gaining attention from management teams (Hjortsø *et al.* 2006; Granderson 2011). As one of the essential conditions for achieving conservation objectives, management should possess characteristics such as 'strategic', 'systematic', 'adaptive', and 'participatory' (Margules and Pressey 2000; Salafsky *et al.* 2002; Tvedten and Hersoug 1992; Kothari 2004).

A strategic component of protected area management incorporates long-term vision and systematic conservation planning among its crucial parts (Margules and Pressey 2000). As also mentioned by Margules and Pressey (2000), the main features of systematic planning include clear choice of biodiversity surrogates, setting explicit goals and operational targets, defining a framework for evaluation and monitoring conservation effectiveness and clear principles for designation of complementary protected areas (if needed). In order for management to be a consistent and self-checking process, efforts should also be directed to using the adaptive approach. It is achieved by systematically testing the outcomes of management design and implementation for continuous learning, improvement, and adaptation, which is done through a measure-response system (Salafsky *et al.* 2002; Tvedten and Hersoug 1992). One of the key assumptions of this approach is that our knowledge about management is never complete and therefore the management process is always experimental (Tucker *et al.* 2005). In line with other components, the participatory approach stipulates participation of key stakeholders (e.g. involvement of local communities) and experts from different fields in the management process through *inter alia* regular focus group discussions

(Manaran 2012). As defined by Kothari (2004), there are two main trends in participatory conservation: (1) collaborative management of PAs (by involvement of indigenous and local people in decision making) and (2) so-called 'community conserved areas' (those territories managed primarily by locals). Both of these trends, however, are encouraging ecologically sound livelihoods, hence inducing the conservation success (Kothari 2004).

2.3.3.2. Classification of PAs by management types

There are numerous classifications of protected areas around the world, but probably the most widely adopted is the one developed by IUCN. This classification (IUCN 1994) defines 6 main management categories of protected areas, where apart from conservation purposes the human activities allowed are specified (see Table 1).

Table 1. Management categories of protected areas

Category	Description
Ia	Strict nature reserve: human visitation, use and impacts are strictly controlled; these areas serve mainly for science and monitoring purposes
Ib	Wilderness area: managed primarily for wilderness protection, permanent or significant human habitation is prohibited
II	National park: can be open for spiritual, scientific and recreational purposes
III	Natural monument: conservation of specific natural features, open for visitors
IV	Habitat/species management area: conservation of particular species or habitats, regular management interventions are needed to fulfill the goal
V	Protected landscape/seascape: managing landscape/seascape conservation and recreation
VI	Managed resource protected area: conserving natural and associated cultural values within ecosystems and habitats

Data source: IUCN 1994; Chape et al. 2005; Matar 2009

This classification helped to categorize protected areas globally and assisted in structuring the monitoring and inventory databases (e.g., World Database on Protected Areas (WDPA)), which became an important source of analytical information for the Millennium Development Goals (MDG), the Millennium Ecosystem Assessment (MEA) and the CBD purposes (Chape

et al. 2005). However, apart from the international classification, often it is possible to find different national versions of classifications (e.g., see Ukrainian example, section 2.3.3.)

2.3.4. Threat management: international perception

2.2.5.1. Threat management concept

Threat management typically includes both threats of anthropogenic and natural origin (Thomas and Middleton 2003). The analysis of threats, at the same time, is rather complex, as threats are dynamic and not always obvious, while the obvious ones are not necessarily the most serious (Dudley and Stolton 1999). The concept of threat management is closely linked to strategic planning and adaptive management. The application of a strategic approach to any conservation projects helps to predict the outcomes of particular actions and hence distinguish between specific areas of interest according to the conservation goals, as well as define the 'entrance points' for evaluation and monitoring of management effectiveness (Kapos *et al.* 2008).

Among the main aims of threat management is to assist stakeholders (e.g., policy makers and practitioners) in identification of the most effective and time- and resource-efficient approaches to conservation. However, a unified framework for measuring of threat management success is still lacking (Kapos *et al.* 2008). So far the inputs and short-term outputs of PA management were seen as more indicative, easy to measure, and thus desirable to be considered. Nonetheless, recently the project reporting focus has shifted from inputs and initial project interventions to the quality of project outputs and implementation performance (Kapos *et al.* 2008). In terms of these changes, threat management (in the case of continuous monitoring of conservation success) can become a complementary instrument for the assessment of long-term and intermediate outcomes of project interventions. Besides identifying the optimal approaches and assessing the outcomes of the projects, threat

management should include self-monitoring. However, to do that managers should try to overcome fundamental problems, including an unclear statement of conservation objectives, information management gaps, time-related issues (e.g., results of project interventions are seen only after the project is over), use of scarce resources, and limited incentives for conducting evaluations (Kapos *et al.* 2008).

2.2.5.2. Main management monitoring approaches

As the current paper's aim was articulated as the evaluation of threat management effectiveness of selected protected areas in Ukraine, relevant literature on the most widespread and appropriate monitoring tools were examined. A brief overview given below illustrates that a lot of tools diverse in their methodology can be used for this type of research. However, the analysis of the main strengths and weaknesses of the selected methods justifies the choice of the tool used for this paper.

Cambridge Conservation Forum framework

The framework and scorecard for approaching the common limitations to assessing conservation success was created by the Cambridge Conservation Forum to help overcome the fundamental problems mentioned previously (related to objectives, information, resources, etc.). Based on the classification of conservation actions developed by Salafsky *et al.* (2002, 2008) and IUCN, the approach refers to seven main types of conservation activity, which further can be allocated into two groups related to straightness of management influence on conservation targets (Kapos *et al.* 2008). Another component of the framework is a questionnaire-based scorecard designed to facilitate assessment of the project effects and outcomes. As mentioned by Kapos *et al.* (2008), the questionnaire contains questions with four answers for each related to the degree of achievement of a particular activity type. The worksheet also contains sections for providing evidence for selected answers and for giving

background information on the project. Using this information in complex, the framework identifies the fundamental outcomes crucial for making predictions regarding the conservation success (Kapos *et al.* 2008). However, limitations of the method might include the following: 1) subjectivity and uncertainties in choosing between quite similar answers (e.g., 'Yes, to a limited degree' and 'Yes, largely'); 2) difficulties with providing supporting information to avoid subjectivity; 3) providing consistency in the surveys is still challenging (Kapos *et al.* 2008).

Rapid Assessment and Prioritization of Protected Area Management (RAPPAM)

The RAPPAM tool was developed by the World Wildlife Fund (WWF) between 1999 and 2002, originally to assess networks of PAs (Belokurov and Ervin 2008). The tool is based on the Protected Area Management Effectiveness (PAME) framework developed by World Commission on Protected Areas (WCPA). The purposes of using this tool are defined by Belokurov and Ervin (2008) as 'prioritization and resource allocation', 'raising awareness and support', and 'improving [adaptive] management at system level'. Moreover, the tool is aimed rather at conducting comparative assessments of management effectiveness, than giving site-level guidance, though it can be a basis for creating a site-level monitoring framework (Ervin 2003).

The methodology includes five steps: (1) determination of assessment scope, (2) assessing available information on PAs, (3) conducting Rapid Assessment Questionnaire, (4) analyzing the results, and (5) drawing recommendations and defining next steps (Ervin 2003). This tool is usually applied through interactive workshops, which take on average three days. According to Ervin (2003), a big size of focus group is beneficial for this method; however, conducting a meeting with many stakeholders requires substantial costs, making this method unavailable for PAs with scarce financing. The scoring system for most questions consists of a 4-selection scale: yes=5 (an ideal situation), mostly yes=3, mostly no=1, no=0 (Belokurov

and Ervin 2008). As highlighted by Belokurov and Ervin (2008), among the most significant results are lists and graphs of the most important threats, the assessment of strong and weak sides of management, and the list of parks arranged according to vulnerability and importance criteria. However, considering the importance of such results, the limitations of this tool, like subjectivity of scoring, need to engage a wide range of participants, and thus being time- and resource-consuming, also need to be noted (Matar 2009; Ervin 2003).

Threats Reduction Assessment (TRA)

The TRA tool was developed by Margoluis and Salafsky (2001, 3) as a "low-cost, practical alternative to more cost- and time-intensive approaches" aimed at the evaluation of management performance in PAs. The method also positions itself as a way to resolve the limitations of using biological indicators such as difficulties with results interpretation, their further application, and making comparisons between different sites. Among the key assumptions, this approach assumes the following:

1) Degradation of biodiversity is human-induced;
2) All threats can be identified by area, intensity, and urgency at any given point in time;
3) Changes in these threats can be assessed or measured at any given time.

The evaluation process consists of 10 steps, the main outcome of which is the TRA Index, which reflects the degree to which management planning and conservation actions are succeeding in reducing the threats. Moreover, while deriving the TRA Index, participants are asked how they define the 100% threat reduction (which is important as a benchmark for assessment).

The advantages of the method (Margoluis and Salafsky 2001) are listed below:

- It is sensitive to short-time changes (1-5 years) in entire PA territory, which makes it a useful tool for regular and comprehensive evaluation of effects of applied decisions.
- Design of the tool allows to use it both for site-level management and for comparison of different PAs and different types of projects.
- Data collection does not require excessive efforts and can be done through simple techniques as a part of typical project activities, while not losing comprehensiveness of obtained information.
- Guidelines are easy to use and comprehend, which makes the tool accessible for PAs without high-level administrative capacity.
- Analysis can be done retrospectively.
- The result is compact and clear, being expressed as percentage of threat reduction over the reference period.

Limitations of the method include (Margoluis and Salafsky 2001; Anthony 2008):

- The tool is vulnerable to subjectivity, as the decisions on ranking are done based solely on perception of management team.
- It does not include questions regarding identification of the reasons for threats to appear.
- Option for negative scoring is not provided.

To optimize the use of this tool, utilizing its advantages and overcoming the limitations, the following measures can be taken (Margoluis and Salafsky 2001; Anthony 2008; Matar and Anthony 2010):

- Justifying documentation on threats can be collected and added to the results of assessment to overcome the possible bias.

- The modified version of TRA can be applied to provide negative scoring in the case of management failures, new and/or worsening threats.

2.4. National background

2.4.1. Justification for the area choice

The choice of wetlands as a focus for the research was briefly outlined previously, when mentioning the Ramsar Convention as a sign of international recognition of their importance. The significance of these ecosystems is related not only to their ecological value (as a habitat for wildlife or a part of natural water cycle), but also to the services and supporting role they play for humans (flood control, retention of toxic substances and sediments, etc.) (MacKay *et al.* 2009; Bowman 2009).

The ecosystem value of wetlands particularly in Ukraine is defined by several factors (Marushevsky and Zharuk 2006):

- transcontinental importance of wetlands as a place for molt and wintering of birds migrating between Europe and Africa;
- high level of landscape diversity (lakes, firths, marshes, saline steppe, virgin steppe patches, forest lakes and swamps, artificial landscapes (e.g., fish ponds));
- high biotic diversity;
- significant capacity as a feeding base for migratory birds and birds that nest in Ukraine;
- availability of non-freezable areas of Black and Azov Seas that encourages the formation of bird aggregations for wintering.

Apart from that, wetlands have the socio-cultural importance. They facilitate the needs of amateur and commercial fisheries, sport hunting, tourism, and other recreation needs. In the

case of smart organization of hunting, substantial funds can be created for the purposes of environmental protection (Marushevsky and Zharuk 2006). However, more frequently we can see cases of wetlands degradation due to overexploitation or modification of ecosystems for industrial, agricultural, and other purposes. Therefore, the significance of an overarching international agreement, namely the Ramsar Convention, is hard to overestimate. It can be rightfully regarded as the first step toward the creation of relevant national legislation and action plans for many countries, one of which is Ukraine.

Polissya was chosen, first of all, as a natural region rich in wetlands. The legislation of Ukraine provides the criteria for territories which belong to Polissya region (CMU 1998, 1):

> *"Polissya territories are those territories of Ukraine located in natural and agricultural zone of Polissya, which includes Northern and part of Western Ukraine, and is characterized by specific soil-climatic conditions."*

The same decree provides a list of regions and districts belonging to Polissya. It is worth mentioning that Polissya wetlands provide water purification and climate forming services not only for Ukraine, but also for the neighboring countries, as it contains several major water arteries of the region. In addition, after the review of appropriate sources it became clear that wetlands located near the Black Sea and the Azov Sea are the most studied ones (Marushevsky and Zharuk 2006). At the same time, wetlands of Polissya were given less attention from both scientists and politicians, hence making this region even more attractive for research.

2.4.2. Conservation policies in the Ukrainian context

As during the last century Ukrainian landscapes and habitats have undergone significant modification and degradation by humans, biodiversity conservation has become crucial in the

national policy agenda (MENRU 1999). However, current conservation policies of Ukraine were formed not only by national developments, but also by international conventions the country is a part of.

2.3.2.1. International policies adopted by Ukraine

A significant part of the national legislation on biodiversity conservation comes from international agreements signed by Ukraine (MENRU 1999). Among the most significant ones are the CBD and the Ramsar Convention. CBD was signed and ratified by Ukraine in 1992 and 1994 accordingly. As a consequence, the Ukrainian parliament has adopted several laws regarding compliance with the Convention requirements and protection of biological and landscape diversity. On the state level implementation of related laws and programs is monitored by the National Commission on biodiversity conservation and the Ministry of Environment and Natural Resources, while local action plans and programs are mainly guided by National biodiversity conservation program for 2005-2025 (NECU 2007; CMU 2004b). But even though CBD has triggered the creation of several laws and national programs related to biodiversity conservation, it was still rather a general document, and more specific directions were expected to appear in conservation policy, including policies related to protection of wetlands.

Proceeding to the topic of wetlands protection, nowadays a complex approach to protection and conservation of wetlands as one of key ecosystems carrying crucial ecosystem functions is missing in Ukraine. It is important to mention that even though Ukraine has officially joined the Ramsar Convention in 1996, first 4 Ukrainian wetlands (Yagorlyts'ka bay, Tendrivs'ka bay, Karkinits'ka bay, and Danube Delta - 2110 km^2 in total) were given the status of Ramsar sites back in 1975, when Ukraine was a part of the Soviet Union (Marushevsky and Zharuk 2006). Complying with the Ramsar Convention requirements,

Ukraine has established 33 sites (~ 6762.5 km^2 in total), 29 of which are within protected areas of different categories; hence they are under a relevant regime of protection and use (Malysheva and Dupont 2009; Marushevsky and Zharuk 2006). However, for the others Ukrainian legislation does not provide any clear legislative concept regarding conservation and sustainable use. In 2004 the Ukrainian government cancelled the approach of dividing wetlands into those of international, national, and local importance, while this regime previously defined differentiated sets of measures for exploitation of these areas (CMU 2004a). In addition, proper comprehensive inventories of wetlands have never been carried out; the only existing evaluations are given for particular components, which are valuable as resources. Moreover, not all wetland borders are described in details and mapped, as it is required by Part 1, Article 2 of the Ramsar Convention (UNESCO 1971; Malysheva and Dupont 2009).

2.3.2.2. National policies (laws, programs, and actions)

Since Ukraine became an independent country, a number of legal documents related to environmental protection and conservation were adopted. One of the 'cornerstone' laws is the Law of Ukraine on Environmental Protection (*ZU 'Pro ONPS'* 1991), which outlines the main national policy objectives and describes the legal, economic, and social basis of environmental protection for the present and future generations as "a matter of state concern" (MENRU 1999). There is also a law particularly providing a legal basis for functioning of protected areas, namely the Law of Ukraine "On nature reserve fund (NRF) of Ukraine" (*ZU 'Pro PZFU'* 1992). It defines the main aspects of establishment, management, and sustainable use of natural resources within protected areas. Also, it contains the classification of protected areas, forms of ownership, regime of governance, conduction of the research and other activities, and other important details. More specific details on land and water objects, the protection of flora and fauna, etc. are provided in Land, Forest, and Water Codes and various

laws of Ukraine (*Lisovy kodeks Ukrainy* 1994; *Vodny kodeks Ukrainy* 1995; *Zemelny kodeks Ukrainy* 2002; MENRU 1999).

As CBD is a summarizing document regarding biodiversity conservation on the international level, the National strategy for conservation of biological diversity outlines the main strategies and objectives on the subject on the national level. This document was created with support from the Global Environmental Facility (GEF) and was adopted in 1997. Among the first outcomes of this strategy was the National action plan for 1999-2015 (later partially developed in the National biodiversity conservation program for 2005-2025) (MENRU 1999). Following these frameworks, a number of action plans, initiatives, and projects were initiated and implemented.

Consequently, examining the subject closer, wetlands in Ukraine can be under different land use categories. Some of them belong to protected areas or are located in protected zones outside nature reserves. There are also wetlands that are a part of recreation zones, areas used for health or forestry purposes, some are used as hunting areas, but most Ukrainian wetlands belong to the Water Fund of Ukraine as water protection zones or coastal protection zones around and/or along the water bodies. Hence, it becomes clear that wetlands are differentiated according to the land category, rather than based on their ecological value (SEPA and MENR 2011-2012).

2.4.3. Protected areas management in Ukraine

The existing composition of the PAs categories was established by the Law of Ukraine on Nature Reserve Fund of Ukraine (*ZU 'Pro PZFU'* 1992). As mentioned by Andriyenko *et al.* (2001), some categories (e.g., regional landscape park) were introduced by this law for the first time, while others (e.g., biosphere reserves) at that time just appeared in the international arena. Currently there are 11 categories of protected areas in Ukraine. Seven of those belong

to the natural areas and objects and 4 - to the artificial objects. The allocation of territories and objects to certain categories of protected areas (NRF) determines their regime, a range of allowed activities, and the order of protection, use, and restoration of natural systems (see Table 2). All these parameters are defined in the law on NRF of Ukraine (Andriyenko *et al.* 2001).

Apart from these categories, which are national analogues to IUCN classification, protected areas are also classified according to their functional purpose: scientific block (1, 2), multifunctional block (3, 4), natural diversity protection block (5-7), and collection block (8-11) (Andriyenko *et al.* 2001).

Table 2.Management categories of protected areas in Ukraine

Ukrainian category	**Description**	**IUCN category**
1. Nature Reserve	Preservation of natural systems and objects, carrying out researches and studies on dynamics of environment, consequent development of environmental guidelines. National importance.	Analogue of category I. However, conservation regime in some of nature reserves does not correspond to this category, attributing these reserves to category IV.
2. Biosphere reserve	Preservation of the most common natural systems of the biosphere in their original state, implementing background environmental monitoring, studying environment and its changes under the influence of anthropogenic factors. International importance.	IX (biosphere reserve).
3. National Nature Park	Preservation, reproduction, and wise use of natural systems and objects that have special conservation, health, historical, cultural, scientific, educational, and/or esthetic value. National importance.	Analogue of category II, but as most of national nature parks in Ukraine do not have a strict enough protection regime, they often are attributed to category V.
4. Regional Landscape Park	Preservation of typical or unique natural complexes and objects in their original state, as well as providing conditions for recreation and public education. Local importance.	Category V.
5. Preserve	Preservation of natural systems and their components.	Most of Ukrainian preserves are analogue of category IV.
6. Monument of nature	Some unique natural formations with special environmental, scientific, aesthetic, and cognitive value that should be kept in their natural state.	Category III.

Ukrainian category	Description	IUCN category
7.Urochishche	Forest, steppe, marsh and other separated integral landscapes with important scientific, environmental and aesthetic value that should be retained in their natural state.	Formally analogue of category I. The actual regime in most of these areas corresponds to category IV.
8. Botanical garden	Preservation, studying, acclimatization, breeding in specially created conditions, and efficient economic use of rare and common species of local and world flora.	~ Category IV.
9. Dendrology park	Conservation and study of different species of trees and shrubs and their compositions in specially created conditions for the most effective scientific, cultural, recreational and other uses.	~ Category IV.
10. Zoological garden	Organization of environmental education, creating expositions of rare, exotic and local species, conservation of their gene pool, studying wild fauna and development of scientific bases of its captive breeding.	~ Category IV.
11.Monument of park architecture	Protection and use of the most prominent examples of park construction for aesthetic, educational, scientific, environmental and recreational purposes.	~ Category IV.

Data source: Andriyenko *et al.* 2001

2.4.4. Main issues with conserving biodiversity

Human-induced threats to biodiversity are regarded as the most significant ones not only in Ukraine, but also all around the world. The anthropogenic threats concerning the Ukrainian background can be classified and described as follows (USCME 2005):

- Destruction of natural habitats of animals and plant is caused by plowing of land, industrial and residential construction, deforestation, drainage, and irrigation. Huge territories of arable lands were developed during the Soviet times notorious for the policy of extensive land exploitation, resulting in ecosystems degradation, loss of land fertility, and chemical pollutions (Voznesensky 1948). Loss of wetlands due to drainage accounts for 80% of original area.

- Fragmentation of habitats, landscapes, and ecosystems happens due to fragmentation of integral ecosystems by transportation network construction (roads, motorways, pipelines, reservoirs and related irrigation facilities (dikes, dams, pumping stations),

etc.). Geographical location of Ukraine between Central and Eastern Europe contributes to its transformation into a major transport corridor of international importance, which raises the potential of significant threats to biodiversity, disrupts animal migration routes and ecosystem integrity.

- Degradation of natural habitats of animals and plants happens due to pollution, leading to the inclusion of contaminants into biogeochemical chain of plants and animals and causing chronic intoxication. Significant nutrient and heavy metal pollution occurs as a result of imperfections of technological processes in agriculture and industry. In addition, radioactive pollution from the Chernobyl accident caused contamination of forests, water bodies, and lands.

- Unsustainable use of species, populations and plant formations: related to poor forest management, hunting, and fisheries, causing a steady tendency of reduction in the number of major game species.

- Spread of alien species has a negative influence on ecosystems, native species, and health of natural ecosystems; alien species are often unintentionally brought with imported goods or ballast water.

- Spread of disease, pests and parasites: related to uncontrolled experiments in genetic engineering and lack of control of transboundary movement of modified organisms and alien species.

- Low level of environmental training and environmental awareness at all levels: related to lack of measures for the development of environmental education, training and raising public awareness regarding the environment. Most educational programs are fragmented and have limited resources for spreading information.

Apart from the mentioned threats, these days there are significant complications to normal functioning of conservation policies in Ukraine. They are related to political instability in the country, owing to kaleidoscope-like changes of governments, a high level of corruption and insufficient administrative capacities. For example, during the past 10 years Ukraine has seen 10 prime ministers and 9 ministers of environment, and certainly with such changes every following official belonged to different party, hence often promoting policies conflicting with the existing ones (IRWU [2010?]). Moreover, in general environmental policies in Ukraine were characterized by the United Nations (UN) and the European Union (EU) as declarative and unspecific; the absence of time frames for implementation, as well as responsible executives and financing details, were criticized. And finally, the already mentioned national legislation is primarily focused on conservation of biodiversity within the ecological network, often omitting the other valuable territories (SEPA and MENR 2011-2012). Hence, statement of the policy priorities and introduction of continuous self-monitoring system, while following an overarching goal of conserving biodiversity, are crucial.

2.5. Conclusion

The overview of international and national policies on biodiversity conservation shows that despite a number of international agreements Ukraine is a part of and the variety of national laws and programs adopted during the past two decades, the situation with environmental protection still remains lamentable. Even though Ukraine in many ways has problems similar to those in other countries, the improvement of the current conditions is easily pulled back by political instability. At best, the attention of the government gets lopsided toward the protection of only ecological network patches; but more often problems with the formulation and implementation of relevant policies are related to rapid changes in government composition and focusing primarily on economic policy agendas, rather than environmental

direction. Taking the latter into account, the management of protected areas has to utilize the scarce funds they obtain from the state in the most efficient way possible. Hence, the monitoring of threat reduction effectiveness is necessary for prioritizing management actions and the allocation of available resources, confirming the relevance of using the TRA method for this purpose.

3. Methodology

3.1. Introduction

This section includes details on how the research was conducted, giving a concise overview of the applied methods and providing justification for choosing them for the current research. Organization of methodology was based on two main approaches, which are data collection and analysis. First, it included an analysis of literature in the field in order to get a comprehensive picture on the current situation and conditions of the problem. As the next step, qualitative and quantitative (TRA tool) surveys were conducted and their results were analyzed. Finally, mapping tools were used to facilitate the communication process and to consequently provide additional information for management decisions.

3.2. Research design

The research process was conducted using qualitative and quantitative toolkits. From the preliminary stage the necessary agreements on holding the meetings with management teams and plans concerning the interviews with other stakeholders were made in order to obtain relevant information on threat management in each of the protected areas. The approach used for conducting this research was to become familiar with the background information related to the research question in order to create a conceptual framework, carry out the TRA analysis in the selected protected areas, collect additional data regarding the background of threat management and introduction of conservation policies in the country through interviews, analyze the derived results, and provide relevant recommendations for future management planning.

3.3. Qualitative methods

3.3.1. Data collection

The data used in this paper was obtained from literature research, interviews, and field notes taken during the TRA meetings. Prior to conducting the field research, a thorough review of the literature concerning the research problem was made. Types of information sources included reliable online sources (primarily, official websites of international organizations or Ukrainian government institutions), books, journals, and official documentation (obtained from the management teams and other stakeholders as a justification for the stated threats and related conservation actions taken).

3.3.2. Interviews

In addition to the supporting questions asked during the meetings with management teams, supplementary information for the research was obtained during personal communication with the Ukrainian government representatives and experts. A good opportunity for interviewing the government representatives was used through getting permission from the Ministry of Environment and Natural Resources.

Interviewees were chosen based on their availability for interview, experience, and relation to the selected protected areas. However, the aim of the interviews was not to survey a statistically representative sample of all potential stakeholders relative to each protected area for further generalization of the results, but to receive the most reliable and comprehensive information on the background situation that the chosen stakeholders could provide.

The interviews were semi-structured and consisted of a set of closed- and open-ended questions constructed in a way to obtain justification or refutation and/or additional data on the issues and threats and their drivers in the chosen protected areas. When permitted, interviews were recorded on dictaphone. The questions primarily focused on the same main

topics, but varied depending on the interviewees' relation to the protected area and his\her professional background and experience. Consequently, the government representatives were asked about how they assess the existing effectiveness of PA management and what are the future plans concerning development of management effectiveness and introduction of new or development of existing conservation programs. Moreover, they were asked about the threats as a part of post-workshop communication. The experts working in the field of conservation and PA management in particular were surveyed about their perception of the role of, in particular, international projects in improving the effectiveness of management in protected areas in Ukraine in general and about their assessment of the current management success. Finally, representatives of the management teams that are directly engaged in planning and monitoring of management performance were asked about their perception of the effectiveness of conservation actions, as well as about the dynamics of existing or their prognoses regarding the potential threats.

3.3.3. Data analysis

The results of the interviews were analyzed and summarized in chapter 4. Where necessary, interview coding was used to facilitate structuring of the information for analysis. Some of the interviews were held to direct the flow of research, while the others were used to support the conclusions or to clarify some contradictory information.

3.4. Quantitative methods

3.4.1. Defining system boundaries

The quantitative part of the research was completed by using the modified Threat Reduction Assessment tool (Anthony 2008), which was applied for the selected protected areas. The latter were chosen in two steps. First step included such selection criteria:

- Being a protected area focused on conservation of wetland ecosystems;
- Having a status of a recognized Ramsar site;
- Having recent major changes in the management plan;
- Management team of the protected area who will participate in the TRA workshop should consist of representatives that have experience and knowledge relevant to evaluation of changes during the reference period selected for the TRA;
- Protected area should be a representative territory of Polissya natural region;
- Being cooperative and willing to facilitate the research.

After using the above mentioned measures, 8 protected areas were chosen. Due to time and resource constraints, the second step of selection was made by consulting with the Head of Development Division of the Nature Reserve Fund (NRF) of the Department of Reserve Management (Parchuk pers. comm. 2011). After this communication the following protected areas were selected based on their perceived priority for consideration and the history and current level of threat management:

- *Shatsky National Nature Park;*
- *Polissya Nature Reserve.*

The necessary preliminary agreements were made with directors of the protected areas and the requested documentation concerning the purpose of the current research, basic information about the researcher and supporting letters from the Central European University were provided prior to arrival.

3.4.2. TRA tool

3.4.2.1. Description

The research was conducted in accordance with the modified TRA method (Anthony 2008) and the basic definitions of the threats and conservation actions were adopted from the unified classification of threats and actions developed by Salafsky *et al.* (2008). The tool itself comprises ten main steps (Margoluis and Salafsky 2001):

1. Define the Project Area in Space and Time
2. Develop a List of All Direct Threats
3. Define the Threats and What 100% Reduction Means for Each
4. Rank Each Threat for Area
5. Rank Each Threat for Intensity
6. Rank Each Threat for Urgency
7. Add Up the Ranking Scores
8. Determine the Degree to Which Each Threat Has Been Reduced
9. Calculate Raw Scores
10. Calculate the TRA Index

Validity of the method was proven by its approbation in a number of protected areas (Salafsky and Wollenberg 2000; Mugisha and Jacobson 2004; Matar 2009), as well as the feasibility of using the modifications of the scoring system (Anthony 2008; Matar and Anthony 2010), which were applied at step 8 from the list above.

Reliability of the method was mainly dependent on the key assumptions and availability and quality of information, as well as and its appropriateness for the chosen scope of study (for more information on limitations and advantages of using the approach refer to section 2.2.5.2).

Moreover, according to Margoluis and Salafsky (2001), reliability of the tool will improve when it is applied on a regular basis, while complementary use of other approaches will allow cross-checking and calibrating of the methods for measuring the management success.

3.4.2.2. Justification

The aim of the current research to evaluate effectiveness of threat management in the chosen protected areas determined the need for a time- and cost-effective tool, which is easy to administer, apply, and comprehend, which resulted in choosing the TRA approach. Apart from the noted advantages of the method (see section 2.2.5.2), choice was driven by such factors as the fact this tool does not demand a previously established database of reports on management performance of protected areas or excessive preparations for conducting the assessment. Moreover, this tool is free, and its 'user-friendly' design makes it attractive for wide application in particular in developing countries like Ukraine, where sophisticated and costly evaluations would create a barrier for establishing a management monitoring system.

3.4.2.3. TRA tool application: preliminary preparations

Using the TRA tool required engagement of management teams of the selected protected areas. In order to make the meeting and process of evaluation smoother, some materials for preliminary preparation were sent to the managers of protected areas. It included a Ukrainian translation of Salafsky *et al.* (2008), and translated and summarized guidelines for the TRA workshop (Margoluis and Salafsky 2001). Introduction to the modifications of threat assessment was provided during the TRA workshop. Even though the meeting itself was designed as an interactive and guided evaluation process, participants were asked to familiarize themselves with the terms 'direct/indirect threat', 'conservation action', 'stress', and main categories of threats in advance. Moreover, prior to the meeting they were asked to think about the definition of 100% threat reduction and to collect justifying documentation for the threats they perceived as significant ones. In particular, it was important to stress that this tool identifies only direct anthropogenic threats and they would be the focus during the meetings.

3.4.2.4. TRA tool application: assessment procedure

At the beginning of each meeting participants received handouts containing a summary of information provided within an introductory presentation about the TRA method and the main definitions used during the assessment process. As a next step, participants were asked to follow step-by-step guidelines on defining the TRA index (Margoluis and Salafsky 2001; Anthony 2008). During the process of ranking the threats according to different criteria, additional questions on location of the threats and their potential sources were asked and the information derived was noted on site maps provided.

A significant facilitation for the index calculation process was achieved by application of the Excel® workbook developed by Matar (2009). It was created as a unified tool for an instant calculation of the TRA index. The workbook contains 4 sheets, namely: (1) TRA index calculation; (2) threat definition (where threat definition and explanation of 100% reduction is to be provided); (3) attendance sheet; (4) site map. Using this workbook allowed to quickly collect information, calculate it and provide the results to the management teams on-site.

3.5. GIS approach

3.5.1. Description of the tool

For visualizing the territory of protected areas and location of main threats GIS techniques were used. Outlining the territory of protected areas was done by using a dataset 'Protected areas international – All International Sites (Polygons)' (UNEP 2009) and further consulting with the management teams whether there have been any recent changes in the extent of boundaries. For mapping water bodies and other natural features the datasets were obtained from Vasylenko (pers. comm.), and Turych (pers. comm.). Among the tools for creating the maps, a variety of instruments available from the ArcGIS® software was used.

3.5.2. Limitations

The preliminary idea was to create a detailed map of threats particularly in relation to the wetlands, but completing this task encountered significant limitation: due to a very dynamic (seasonal and sporadic changes) and fine-scale nature of wetlands it was extremely difficult to create an accurate map layer, as wetlands are sometimes attributed to other classes of vegetation (Chape *et al.* 2005). Therefore, it was taken into consideration while making conclusions regarding the impact of threats. Moreover, for one of the protected areas a very limited amount of maps in image format only was available. Therefore, the analysis of threats was done according to the results of the follow-up communication.

3.5.3. ArcGIS tools used for mapping

Most of the maps used in the current paper were created using ArcGIS®, while others relevant were only translated in English. Among the main instruments used in ArcGIS® software are: 1) Analysis tools (e.g., 'Statistics' and 'Extract'); 2) Conversion Tools (e.g., 'From KML' and 'To Shapefile'); 3) other (e.g., selection and classification of the relevant features by attributes).

3.6. Conclusion

Hence, taking into consideration the limitations of the described tools and collected information, using of qualitative and quantitative methods, as well as GIS approach, allowed meeting the research objectives and providing the relevant recommendations.

4. Results and interpretation

4.1. Introduction

This chapter begins with a brief description of natural features of the chosen protected areas with the focus on the ones used as criteria for the selection process for the current research (see 3.4.1.). An overview of the management systems in both territories is also provided. The description section is followed by the results of the workshops and interpretation of threats identified by the management teams.

4.2. General information on the selected protected areas

4.2.1. Shatsky National Nature Park: Description

Shatsky National Nature Park (Shatsky NNP) of the State Forestry Committee of Ukraine (SFCU) is located in the northwestern part of Volyn region, in the Shatsky administrative region (AR). The area of NNP borders in the north-west and the north with Belarus, in the west - with Poland, in the east - with Starovyzhivskiy AR, and in the south - Liuboml AR of the Volyn region (Mateychyk *et al.* 2011) (see Fig. 1).

Fig. 1. Scheme of Shatsky NNP

Source: Turych pers. comm. (with amendments)

The total area of Shatsky NNP is 48,977 ha. Regarding the administrative division of the territory, the park consists of three forestry, which are directly subordinated to the national park administration, four forest plots of the State Enterprise "Shatsk education and research forestry", lands of four villages and one village council, and some parts of motor roads (Mateychyk *et al.* 2011). The park was created on April 1, 1984 on territories assigned from the Shatsk education and research forestry and collective farms of Liuboml AR (12,022 ha in total). Later the area of the NNP was expanded at the expense of kolkhoz lands and the state land reserve (Mateychyk *et al.* 2011; Horun 2008).

The National Park is located on the main European watershed of the Black Sea and the Baltic Sea. The uniqueness of this area lies in a combination of forest, lake, wetland, and dune complexes (Nayda 2008). All activities of the national park are aimed at protecting and

preserving biodiversity, restoring natural ecosystems of Shatsk lakes, and the sustainable use and conservation of natural resources of the NNP. The main regulations that define conservation strategy of Shatsky NNP are the 'Regulations on Shatsky National Nature Park' and 'Project of territory organization and protection, restoration, and recreational use of natural complexes and objects of Shatsky National Nature Park'. Given the tasks entrusted to the park, five main vectors of environmental protection can be distinguished, namely: protection of natural complexes, research, international cooperation, cooperation with the authorities and local communities, and environmental education (Nayda 2008). Among the strategic directions of restoration of natural systems, the following can be defined: restoration of forest and wetland ecosystems, active protection of the Red Book species and rare plant communities, restoration of fauna, and re-naturalization of wetlands (Nayda 2008).

To achieve its initial goals, Shatsky NNP is divided into 4 functional zones, namely: the protected zone, the area of controlled recreation, the area of permanent recreation, and the household area (see Fig. 2). In accordance with this zoning, differentiated protection, restoration, and exploitation regimes are set (Kliestov *et al.* 2005). The white areas within the borders on the figure also belong to Shatsky AR, but are not a part of Shatsky NNP.

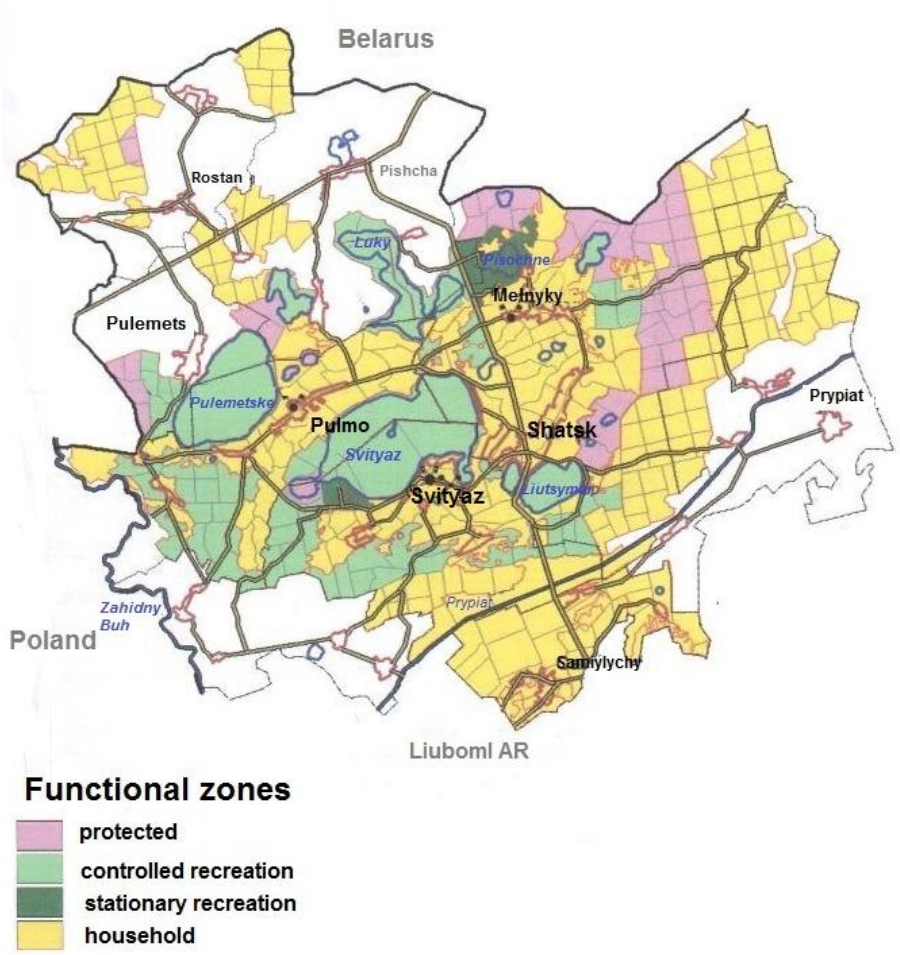

Fig. 2. Functional zoning of Shatsky NNP

Source: Turych pers. comm. (with amendments)

Based on the area size, Fig.3 displays the distribution of functional zones in the park. As it can rightfully be assumed, real recreation pressure can be considered not only within the 28% of NNP territory. Based on both local and worldwide examples, a particular share of households (especially those located close to places of attraction, e.g. Svityaz Lake) should be in some way included in the 'controlled recreation' category, as some tourists stay in the private sector during the summer period. In general, zoning corresponds with the regulations regarding the 'national park' category in both Ukrainian and IUCN classifications (3 and II accordingly).

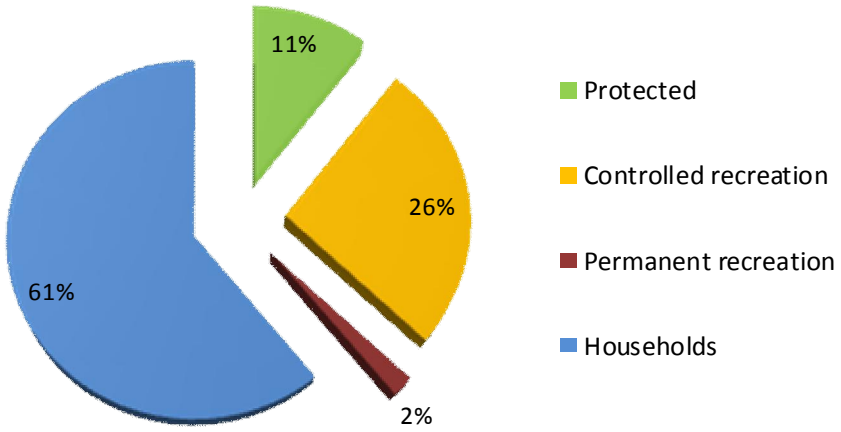

Fig. 3. Distribution of different functional zones in the NNP

Data source: Kliestov *et al.* 2005

The flora of the park is represented by 805 species of vascular pants (104 families), 110 species of bryophytes, 109 species of fungi, and 275 species of algae; however, the available literature highlights the importance of further studying of bryophytes, fungi, and algae (Mateychyk *et al.* 2011; Kotsun *et al.* 2009). According to Kotsun *et al.* (2009), 41 species of flora are listed in the Red Book of Ukraine (e.g., *Diphasiastrum camplanatum* and *Dactylorhiza majalis)*, two species are in the European Red List (*Aldrovanda vesiculosa* and *Cypripedium calceolus*), and four are protected under the Annex I of the Bern Convention (e.g. *Pulsatilla latifolia* and *Liparis loeselii*). Talking about diversity of habitats and plant formations, bogs are primarily eutrophic (with dominance of sedge) and mesotrophic; oligotrophic bogs are sparsely present in this area (Mateychyk *et al.* 2011). As mentioned by Mateychyk *et al.* (2011), the forest component of the park is dominated by pine (62%) with formations like *Pineta sylvestris fruticuloso-hylocomiosa*, *Pineta hylocomiosa*, and *Pinetum cladinosum*. For a generalized scheme of forest composition see Fig. 4.

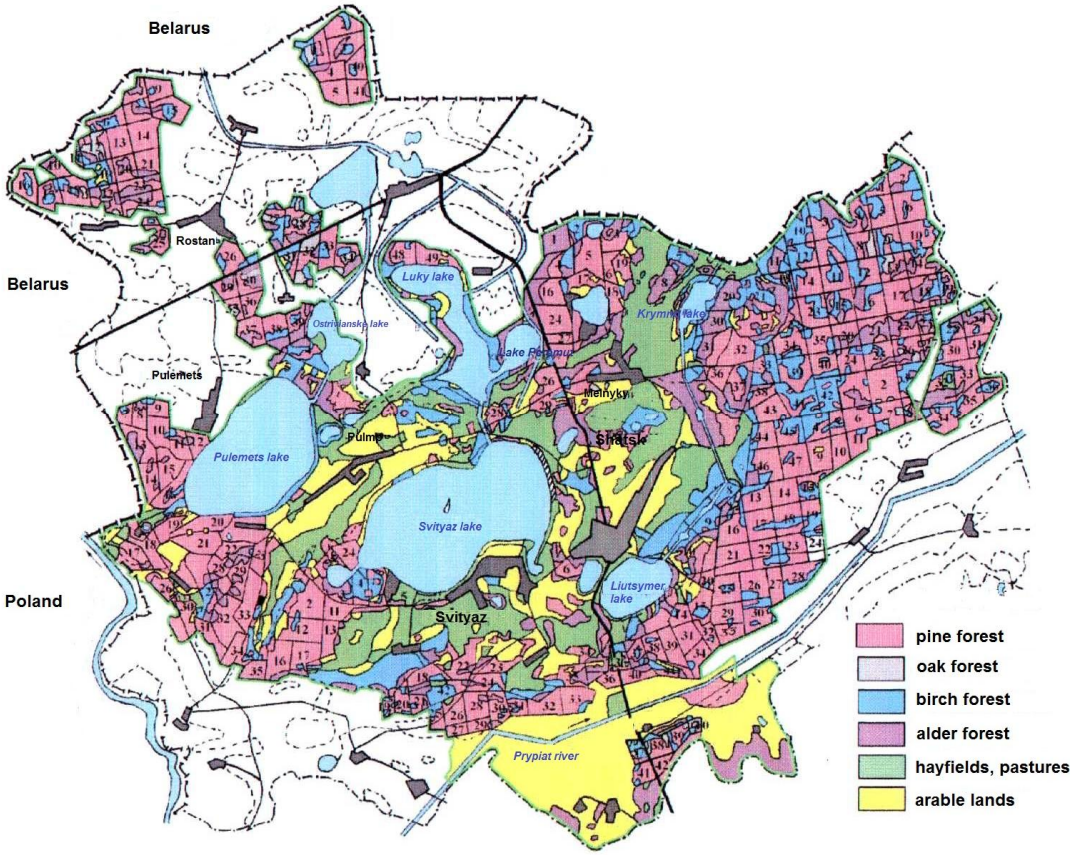

Fig. 4. Forest composition of Shatsky NNP

Source: Turych pers. comm. (with amendments)

The fauna of Shatsky NNP includes 332 species of vertebrates (55 mammal, 241 bird, 7 reptile, and 29 fish species) and 378 species of invertebrates. As the area is particularly valuable as a Ramsar site, a special attention was given to the ornithological component of NPP's biodiversity. Birds are the most representative group of vertebrates in the Western Polissya (Horun 2008). The diversity of species is in many ways conditioned by the variety of landscapes and habitats at the park. Among the main ornithological complexes are those related to forests, agricultural areas, pastures, meadows, and – the richest and the most valuable – lake complexes. They are formed not only by typical Polissya species, but also contain birds listed in the Red Book of Ukraine (42), the Bern Convention (227), the Bonn Convention (113), the Convention on International Trade in Endangered Species of Wild

Fauna and Flora (26), the European Red List (13), and the IUCN Red List (12) (Horun 2008; Mateychyk *et al.* 2011). Many of these species are protected by several documents at once, e.g., *Gavia arctica, Anser erythropus, Oxyura leucocephala, Falco cherrug, Limosa limosa, Coracias garrulus*) (Mateychyk *et al.* 2011).

The hydrological value of the park is one of the focal points, as it has 23 lakes of 6,338.9 ha in total (13% or the NNP area), 1,977 ha of bogs and peatlands, and 4,492 ha of meadows (Kliestov *et al.* 2005; Ilyin 2009; Khomik 2009). Due to the uniqueness and diversity of landscape and species, in 1999 wetlands of Shatsky NNP (32,850 ha) obtained the status of a Ramsar site (based on criteria 1, 2, 3, 5). The site plays an important role not only in the protection of bog flora and fauna, but also as a place of nesting and migration of a variety of waterfowl species (this place is located within two important migration routes: from the Baltic Sea to the Mediterranean Sea and the route across Polissya region) (Mateychyk *et al.* 2011; Marushevsky and Zharuk 2006).

Finally, talking about the administration of the park, currently it has 8 divisions: administrative, forestry, research, finance, environmental protection, household, and environmental education and awareness (Nayda 2008). According to the state program, annually the managers from the research division prepare a report called "Chronicle of Nature" on the main results of their studies with a special attention given to the conservation of endangered species.

4.2.2. Polissya Nature Reserve: Description

Polissya Nature Reserve (PNR) was created on November 12, 1968 in the Zhytomyr region of Ukraine. The total area of the reserve is 20,104 ha (88.8% of which are covered with forest) and additional 9,866 ha outside of the reserve are classified as a strict protection zone (Bumar and Tsytsiura 1998; Bumar 1993; SFCU and USPFMPA 2009). The area of Polissya NR

consists of 3 forestry (Kopyshchenske (34,4% of the area), Perganske (28,3%) and Selezivske (37,3%)) with the PA administration located in Selezivka village. As for the outside protection zone, it was created to protect the PA from the impact of agricultural activities in the adjacent territories (SFCU and USPFMPA 2009). Functional zoning of the reserves in general (analogue of IUCN category I) prohibits any activities that are not related to the aims of the PA and may threaten natural systems or scientifically or culturally significant objects (e.g., residential and road construction, recreation, timber exploitation, pasture, procurement of medicinal plants, etc.). The only exception can be made for agricultural needs of the reserve or its employees within provided norms (*ZU 'Pro PZFU'* 1992).

The flora of the reserve is characterized primarily by boreo-nemoral species and formations and accounts for 608 species of vascular plants. Vegetation is represented by 41 associations belonging to 5 main types: forest, palustral, meadow, heathland, and aquatic species. Monodominant pine forests are overriding in the vegetation cover. Also, secondary birch and mixed birch-pine forests are widely present in the reserve (SFCU and USPFMPA 2009; Bumar 1988). Among the typical palustral communities (mesotrophic and oligotrophic bogs occupy ~22% of the territory), there are *Pineto-Betuleto-Cariceto (lasiocarpae)-Sphagneta* (mesotrophic), *Pineto-Betuleto-Eriophoreto (vaginatae)-Cariceto (lasiocarpae)-Sphagneta* (oligotrophic), and *Phragmiteto-Cariceto (omskianae)* (eutrophic). Some of the rare species are on their eastern or southern borders of distribution in the reserve. Moreover, there are 3 species that are on the European Red List and Appendix I of the Bern Convention (e.g., *Rododendron luteum* and *Pulsatilla patens*), 18 Red Book species, and 15 regionally rare species in the reserve (SFCU and USPFMPA 2009; Bumar 1988). The most susceptible ecosystems of the reserve are those of sand dunes, upland oligotrophic swamps, open bog areas, and over-crowded pine plantations created in different periods before the reserve was created. The adventive component also became a typical element of the local flora (~15% of

all species) due to the fact that this territory contains or borders previously used arable lands. (Popovych and Balashov 1983; SFCU and USPFMPA 2009).

The fauna of the PNR is formed by the Central European and northern species. In total there are 280 species of vertebrates and 1381 species of invertebrates. Among the typical forest-dwelling species are *Alces alces*, *Sus scrofa*, *Capreolus capreolus*, *Canis lupus*, *Vulpes vulpes*, *Felix lynx* (3 families, which are very rare for Polissya region), *Nyctereutes procyonoides*, etc. Bog habitats are favorable for *Castor fiber*, *Lutra lutra*, and *Ondatra zibethicus*. A significant part of vertebrate fauna is also represented by 195 species of birds. Along with typical species (e.g. *Ciconia ciconia*, *Vanellus vanellus*, *Anser platirhinchos*, *Egretta alba*), there are those protected by the Bonn Convention (55), the Bern Convention (175), and one species under the European Red List (*Crex crex*) (SFCU and USPFMPA 2009; Bumar 1993).

In 2004 two areas (swamp and river territories) in the reserve were given a status of the Ramsar site under the name "Polissia mires" (see Fig. 5). The site covers primarily the floodplains of Ubort and Bolotnytsya rivers with a system of bogs between them. Peat bogs, the formation of which began 8-9 thousand years ago, occupy ~65% of the site, which consists of two main parts: "Miroshi" (1600 ha) and "Zholobnytsya" (545 ha) (SFCU and USPFMPA 2009). The main criteria for choosing this territory were its hydrological and ecosystem value (a wide variety of swamps and floodplain typical for Polissya are present here) and its importance as a habitat for a number of endangered species of flora and fauna and rare plant communities of *Nymphaea candida* and *Nuphar lutea* (SFCU and USPFMPA 2009).

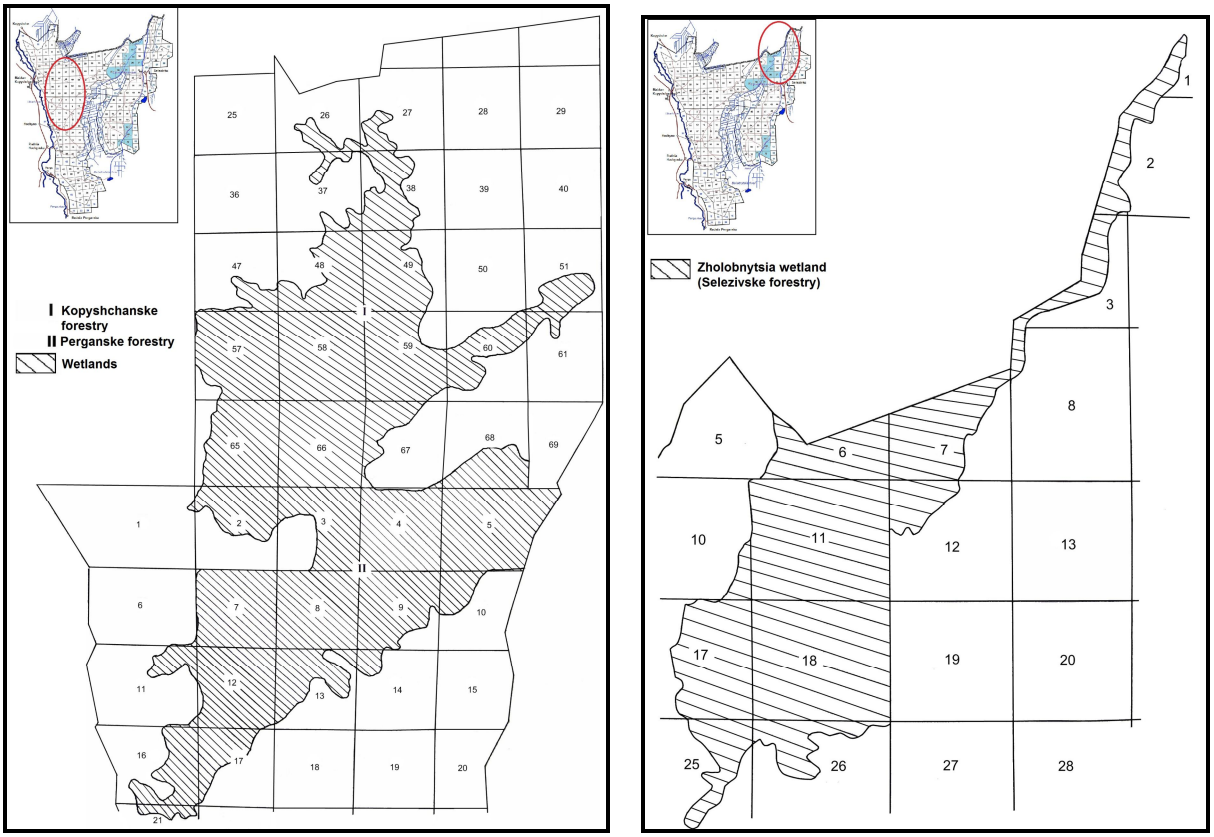

Fig. 5. Ramsar territories at Polissya Nature Reserve

Source: SFCU and USPFMPA 2009 (with amendments); Bumar pers. comm.

As for the management, during the first decade after its establishment, the reserve existed only formally and did not have any administrative center that would supervise the research work and manage routine conservation tasks (Bumar 1993). However, in 1978 the reserve became a fully-fledged legal institution. Nowadays the management is carried out by 69 people working in 3 divisions: administration (17), research (6), and forestry management (46). Despite a rather large number of employees, some specialists (e.g., manufacturing engineer and hydrologist) are still urgently needed to implement and lead the necessary research and monitoring projects (SFCU and USPFMPA 2009; Bumar pers. comm.).

4.3. TRA results and interpretation

4.3.1. Shatsky National Nature Park: TRA Results

The workshop and the follow-up communication with the management team were framed in relation to the chosen reference period of 2002-2012, and the threats were defined based on Salafsky *et al.* (2008). The choice of such time lapse was reasoned by the major changes made to the concept of management of the national park. In particular, it was stipulated by the preceding project of territory development (Horun *et al.* 1999) that the park should move toward the development of its recreational component, which was not previously included in the park management priorities. And in fact, the first practical actions in this direction began to be implemented in 2002. The results of the workshop are provided in Table 3, see Appendix A for screenshots from the workbook.

The TRA Index shows the score of -16% threat reduction over the reference period. This score was calculated based on the ranking of the 12 identified threats. Changes over time vary from 30% reduction to -60% increase of threats, and 5 out of 12 threats were identified as declining. However, no new threats appeared since 2002 – even though it was highlighted that the emergence of recreation branch of management in 2002 was chosen as a benchmark, uncontrolled tourism in this area existed for a long time before the reference point. Seven out of twelve threats are more or less directly associated with the growth of recreation pressure; therefore, their description is given accordingly.

Table 3.TRA Index for Shatsky National Nature Park (reference period: spring 2002 – spring 2012)

#	Threats	Criteria Rankings			Total Ranking	% Threat Reduced
		Area	Intensity	Urgency		
1	Tourism and recreation areas (construction)	11	11	11	33	-60
2	Camping and green tourism sites (unsustainable, high pressure on ecosystems)	12	10	8	30	-30
3	Roads (construction and exploitation)	7	8	9	24	-10
4	Housing and urban areas (construction)	8	12	10	30	-50
5	Invasive species	6	6	7	19	-10
6	Garbage and solid waste	9	4	6	19	40
7	Household sewage (absence of sewage system in most of houses)	10	9	12	31	10
8	Utility and service lines (drainage)	4	3	5	12	-5
9	Fire risk (burning of dry grass by locals)	5	7	4	16	-15
10	Other ecosystem modification (abandoned lands)	2	5	3	10	20
11	Air pollution (old stoves using low-quality fuel)	3	2	2	7	5
12	Harvesting mushrooms and berries (above limits)	1	1	1	3	30
Total		78	78	78	234	
					TRA Index = -16%	

The first two threats ("recreation areas construction" and "unsustainable camping and green tourism") are both among the top threats according to the total ranking and they both received a relatively high negative score. As described by the managers, the construction of new recreation sites primarily takes place near the Svityaz Lake and slightly less near the Pisochne Lake (Mateychyk pers. comm.; Horun pers. comm.). Initially the use of the recreational potential of natural systems was one of the main tasks of Shatsky NNP as this area has

considerable recreation resources. The season of comfortable stay lasts from mid-June until mid-August. Tourists primarily come for health purposes and stay in both controlled and permanent recreation zones. There are 65 recreation centers, the boarding house 'Shatski lakes', the resort 'Forest song', three camps for children, and six permanent establishments of universities of Lviv and Volyn regions. Simultaneously all these facilities can accept 6.2 thousand people and the additional 3 thousand stay at the household sector or camping areas. However, the development and expansion of existing health resorts and camping areas is not the only trigger for the concerned threats. Even though these two functional zones account for 28% of the area, the household sector currently undergoes a substantial development of housing area for recreational purposes (Kliestov *et al.* 2005; Nayda 2009). Observations made at Svityaz village have shown that a great share of local population tries to either repair their old houses or initiates the construction of new light or capital constructions.

Hence, the problem is that every year the number of tourists is growing, and primarily they concentrate near the 2 most popular lakes, which creates an uneven pressure on the territory and leads to exhaustion of natural complexes during the summer period. The human pressure on the ecosystems of the park can be characterized by the value of recreational digression (RD), which is a consequence of insufficient ecosystem recovery time in the offseason. The recreational performance in the areas of controlled recreation did not significantly change over the past 10 years. However, it is characterized by a slightly increased average value of RD (by 0.05 points). At the same time, the permanent recreation area demonstrated more spectacular changes in the average recreational performance. While the attractiveness of this area is growing every year, it is accompanied by the increasing anthropogenic pressure on natural complexes. Thus, the average RD over the past decade has increased by 0.37 points (Horun pers. comm.; Kliestov *et al.* 2005; Bezruchko and Rozhko 2009). The main task for the management now, as they admitted, is to find the ways of redistributing the recreational

pressure on the territory and develop alternative routes and locations for tourism with minimal construction involved (Khomik pers. comm.; Mateychyk pers. comm.; Turych pers. comm.).

The next threat – "roads" – is also in a way related with the main threat (recreation) and has received -10% reduction score, while being among the top-5 threats by total ranking. At the moment the road network is not very extensive, and this is a positive factor for the national park. There is also a network of dirt roads, which play an important role in supporting some species of vertebrates; moreover, these roads serve as natural corridors for the penetration of some endangered species of butterflies in the forest (Mateychyk pers. comm.; Kliestov *et al.* 2005). Furthermore, dirt roads are an important component of ecotourism development (walking and cycling tours, horseback riding, etc.).

Even though the development of roads is limited in the park, an overall pressure of transport is growing due to the increasing number of tourists and citizens travelling to Belarus or Poland (see Fig. 1 and 2 for the road network). To provide some statistics on the current situation, nowadays there are 83.1 km of roads of international, regional, and local importance within the NNP, among which 29.5 km of highway, 18.5 km of stone and gravel roads, and 35.1 km of dirt roads (Mateychyk *et al.* 2011). However, according to the managers, this proportion is likely to be changed as a greater share of roads will be paved due to the need of development and promotion of alternative recreation places. Current situation is as follows: while access to lakes Svityaz and Pisochne and the adjacent villages is easy and these places are well-known, other lakes and villages rarely become the destination of tourists coming to the park (Mateychyk pers. comm.; Turych pers. comm.; Kliestov *et al.* 2005). In addition, both the discussion and review of project documentation provided by the park have shown that the threat is very likely to grow, and the greatest impact is expected to come from the increasing share of private transport. As the new roads are not being constructed, nothing yet can be said about a significant increase of fragmentation of the habitats. Nonetheless,

transport poses a direct threat for amphibians and reptiles, as there are no road-crossing facilities available (e.g. tunnels), and animals are often killed while crossing the road. To reduce this threat, the planning of further infrastructure development should take the latter into consideration.

The "housing and urban construction" is among the top-3 threats in the total ranking, demonstrating a high negative score of -50%. Apart from the already mentioned construction of recreational facilities, the development of private sector is going on. There are 13 villages within the park with ~12.2 thousand inhabitants (see Fig.1). The locals are primarily employed in agriculture, forestry, education, social work, and administration. There are no enterprises or institutions that would require the construction of new buildings. However, it might become necessary for the park's purposes, especially considering the management plans regarding the recreational development. Regarding this need, the management team has created a set of requirements and regulations that should be taken into account while planning and construction, e.g.: compliance with sanitary and fire safety norms, an ultimate exclusion of pollution and unsustainable use of resources, a rational planning of different functional zones according to the future needs, the use of previously abandoned housing territories where possible. All in all, housing development has not yet caused a serious, irreversible degradation of landscape and species diversity. However, the management sees a significant risk for local biodiversity in the expansion of housing (Mateychyk pers. comm.; Turych pers. comm.; Khomik pers. comm.).

The fifth threat – "invasive species" (-10% reduction) – was characterized by the management as a threat which appeared both due to human influence and climatic changes. However, as for the anthropogenic component, invasive species came here in different ways. For example, *Heracleum sosnowskyi* appeared in this area, as well as in Ukraine in general, after its value as a silage plant was discovered. However, this highly invasive species quickly escaped the

boundaries of agricultural areas and began to supplant the native species. Another example is *Perccottus glenii*, which got into Ukrainian rivers with phytophage fish and became alarmingly widespread. This species eats the spawn of other fish and hence is a direct threat to biodiversity. Another potential threat may come from traders or the tourists themselves, who are accidentally bringing seeds of invasive species along with their goods (e.g., *Ambrosia artemisiifolia*). However, the mechanism of regulating this threat is not yet fully clear for the management team (Mateychyk pers. comm.; Horun pers. comm.).

The threats "garbage and solid waste" and "household sewage" (40% and 10% reduction respectively) are related to the already described development of housing (including tourism) and the growth of the recreation pressure itself. There is an urgent need to create a proper waste management infrastructure at all recreation sites, especially near the lakes, as a lot of people are polluting the area with plastic bottles, packages, and other "footprints" (Turych pers. comm.; Mateychyk pers. comm.). Talking about waste management, even though the removal of waste from health resorts and recreation centers is in a way easier to be arranged (as the territory usually has certain planning and is easily accessed by transport), there is a number of recreation centers which do not have any agreements with waste management companies, which is a violation of environmental legislation. The same problem exists in the household sector of the national park. Compared to 2002, the situation with solid waste has improved, primarily due to the construction of a landfill in Shatsk. However, now it is filled over its capacities (37 thousand m^3 of waste are landfilled instead of projected 20 thousand m^3), so the new waste is just put on the top of the existing landfill and pressed (Zubchuk 2011).

To solve this issue the local government was planning to increase the landfill size either upwards or in breadth. Another way could be a construction of a new landfill near Pulmo village to serve the needs of nearby recreation zones and villages. However, these plans still have to be assessed regarding the allowed capacities and potential impact on the territory

(Turych pers. comm.; Zubchuk 2011). Moreover, lately the local government in cooperation with the state enterprise "Ukrekoresursy" placed 26 containers for separate waste collection in one of the camping and health resorts areas, which is expected to benefit not only the environment, but also the local budget (Mateychyk pers. comm.; Dubuk 2012).

Talking about the sewage problem, it is primarily conditioned by the absence of sewage systems in the vast majority of houses (except Shatsk and the recreation zone 'Gryada'). Moreover, the existing treatment facilities quickly become overloaded during the high season, and as the sewage is not treated properly, it causes water pollution. The need of new installations has been highlighted even at the meetings of the local government. Nonetheless, for the moment there is no clear answer whether these facilities will be installed in the nearest future, as rather substantial costs are required (Zubchuk 2011; Mateychyk pers. comm.; Khomik pers. comm.).

As for the "drainage" threat, it was identified more as a potentially significant threat and defined as drainage canals for water withdrawal. The main purpose is to take away the excessive water from houses in Svityaz village. The canals were constructed recently and now water goes from the village to Svityaz Lake. However, the impact on natural ecosystems is not yet clearly defined, and the managers emphasized the necessity to use precautionary principle in this case, giving this threat -5% and a moderate total ranking score (Khomik pers. comm.; Horun pers. comm.).

The next threat – "fire risk" – received a -15% threat reduction score and was described by the managers as fires originating from the burning of dry grass by locals. Mainly, the managers cannot do anything to prevent these actions; the only way is to try to talk with locals about the damage that escaped fires can cause to the environment. As a part of fire risk management, the park's administration carries out a variety of activities, e.g.: control of forest composition (see

Fig. 4 and section 4.2.1 for the species composition), development of fire-prevention breaks and mineral belts.

Under the threat "other ecosystem modifications" the management team defined the impact of fallow lands on local biodiversity. Some major changes, for instance, the alkalization of the eroded lands, were caused by the use of synthetic fertilizers in the past and the abandonment of traditional agricultural activities. For the reference period the threat has been reduced by 20%. However, to enhance land recovery, the optimal way to solve the problem, according to the managers, is to bring back traditional agricultural practices in sustainable volume and intensity, as it will allow preserving some important and rare species of local biota (Horun pers. comm.; Mateychyk pers. comm.).

The next threat – "air pollution" – is also related to the development of the residential sector. According to the management team, as there are no factories or enterprises within the park territory or even in the closest neighborhood, air pollution primarily originates from the transport and use of wood and coal by boiler houses and local households, where often old stoves are used for heating and cooking. The choice of fuel is explained by the insufficient supply of gas in the region. However, even though the situation improved by 5% over the reference period, it still remains among mild threats, in particular to the fauna component of local biodiversity.

Finally, the last of the identified threats for the park is unsustainable "harvesting of mushrooms and berries". It has been assessed as the least serious concern compared to other identified threats and was given a 30% reduction score. Considering that recreational pressure was growing over the reference period, such management success is quite substantial. The park has certain regulations regarding the maximum allowed volume of berries and mushrooms to be collected over a particular season in a particular zone of the park. For example, it is completely

prohibited to pick berries in the protected zone, while in other zones harvesting is controlled by a set of permits issued by the government. The same limits are applied to the enterprises collecting berries from the locals. However, during the two summer months when the national park is full of tourists, it is hard to control the whole territory. The most 'popular' berry during the summer is *Vaccinium myrtillus*, while in September-October – *Oxycoccus palustris*. An uncontrolled collection of berries leads to the depletion of natural resources and is often accompanied by a mechanical trampling of berry fields, which may lead to the degradation of phytocenosis (Mateychyk *et al.* 2011). This threat can be reduced by increasing the control over the territories and raising awareness among the tourists about the possible consequences of excessive harvesting.

4.3.2. Polissya Nature Reserve: TRA Results

The management team of Polissya NR has chosen a period of 1981-2012 for the evaluation of threat reduction. This relatively long time period was claimed to be most optimal based on the fact that after the establishment of the reserve no significant changes happened to the managerial strategies. Hence, the reference point was related to the greatest working experience the managers had. The results of the workshop are presented in Table 4, see Appendix B for screenshots from the workbook.

Being guided by the standard lexicon of threats (Salafsky *et al.* 2008), the participants identified six main threats to the biodiversity. The TRA Index shows a negative, even though relatively moderate (-26%) score. No new threats have appeared for the taken time period and none were totally solved. A closer analysis demonstrates that 4 out of 6 threats need particular attention, considering that two of them are in the top-3 most significant threats according to the total ranking.

Table 4. TRA Index for Polissya Nature Reserve (reference period: summer 1981 – spring 2012)

#	Threats	Criteria Rankings			Total Ranking	% Threat Reduced
		Area	Intensity	Urgency		
1	Harvesting berries (compromising nature due to socioeconomic problems in the area)	3	1	3	7	-65
2	Drainage (created in late 1960s)	4	5	5	14	30
3	Forest fires (arsons, unintentional)	5	6	6	17	-80
4	Pine plantations (created in 1950-60s)	6	4	4	14	-20
5	Roads (exploitation)	1	3	1	5	15
6	Problematic native species (pine and green mosses)	2	2	2	6	-10
Total		21	21	21	63	
					TRA Index = -26%	

The first threat is harvesting berries by local people. The protection regime does not allow this kind of activities within the nature reserve. However, the administration of the protected area decided to allow the inhabitants of villages bordering the reserve to pick berries in limited amounts for commercial purposes. The reason for this decision was the socioeconomic problems in the area. In particular, compared to the national rate of 59.2%, only 37.5% of the local population is employed, while the main sectors of employment are agriculture and forestry. However, considering the remoteness of this area from big cities, it is also hard to find any alternative earnings (SFCU and USPFMPA 2009; SEO 2012).

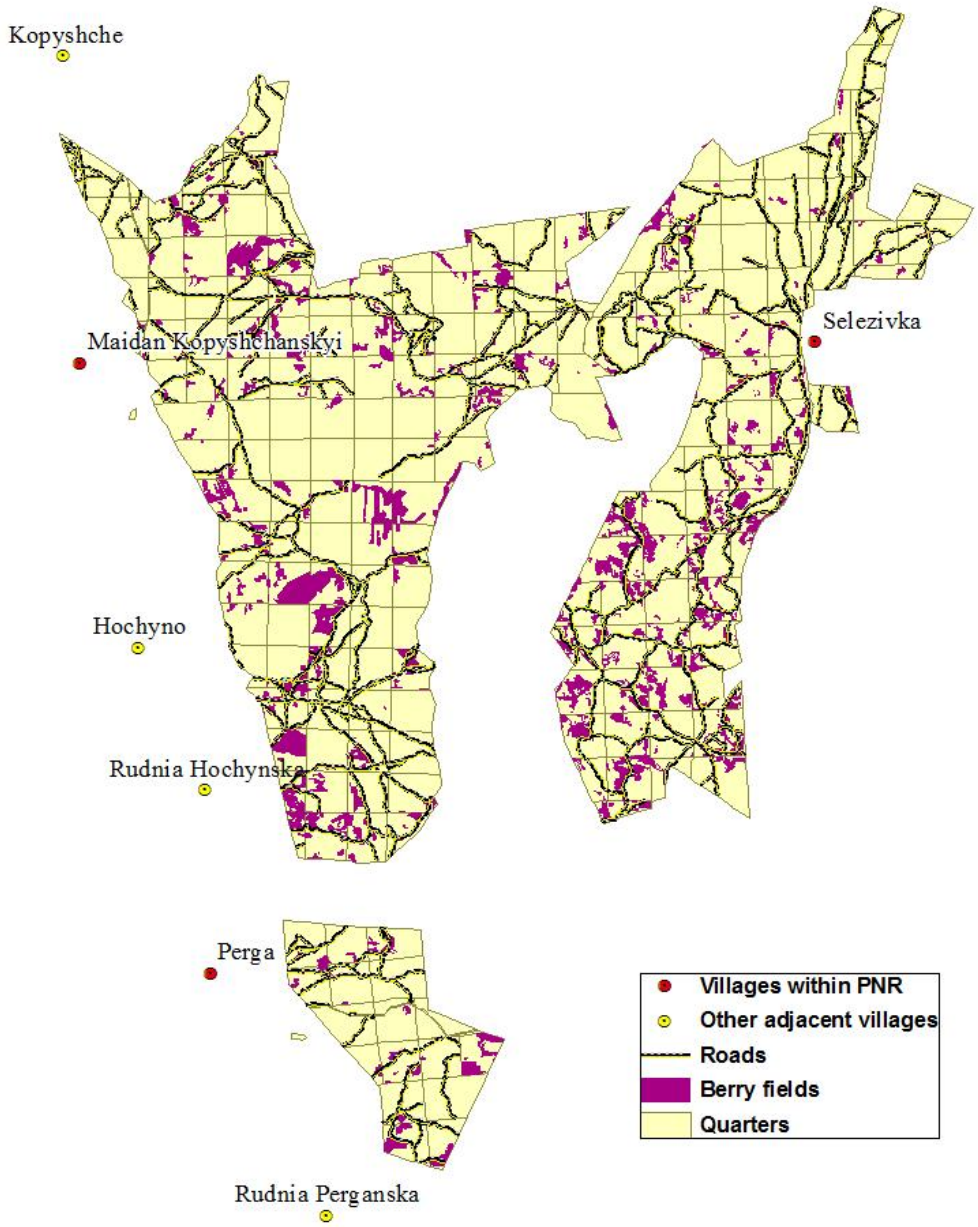

Fig. 6. Berry fields of Polissya NR and their proximity to the adjacent villages

Data source: Vasylenko pers. comm.; UNEP 2009

Despite the ~2.5 times increase of the berry fields area in after the establishment of Polissya NR, the TRA results show that an overall situation has worsened significantly (-65%). Among the main species used for commercial purposes are *Vaccinium myrtillus*, *V. uliginosum*, *Oxycoccus palustris*, and *Rhododoccum vitis-idaea*. Berry fields of the mentioned species are displayed as a single class in proximity to the adjacent villages on Fig.6 to visualize the

spatial characteristics of the threat. Usually, the berries are sold to the nearest towns (e.g., Ovruch), often being taken even further to big cities, e.g., Zhytomyr or Kyiv (Zhyla pers. comm.; Linkevych pers. comm.). However, the success in combating the issue primarily depends on proper governmental efforts directed to the elimination of poverty and unemployment in the region, while the administration of the reserve is striving to keep the balance between saving the environment and supporting local people's subsistence.

The next threat – "drainage" – corresponds to the drainage network created in late 1960s in the area adjacent and partially belonging to the reserve and its protection zone (see Fig. 7). It was created as a part of the long-term Soviet Program of amelioration to extend the area of arable lands and increase agricultural production. For the reference period the situation regarding this threat improved by 30%. However, the success of the internal management of the drainage network is downgraded by the influence of drainage systems existing outside of the protected area. To be more precise, 7 km of the system (out of 120 km in total) belong to the reserve (Popovych and Balashov 1983; Bumar 1999). The threat was assessed for the whole area of the reserve; however, locally the intensity of influence differs substantially, depending on the amplitude of ground water fluctuations.

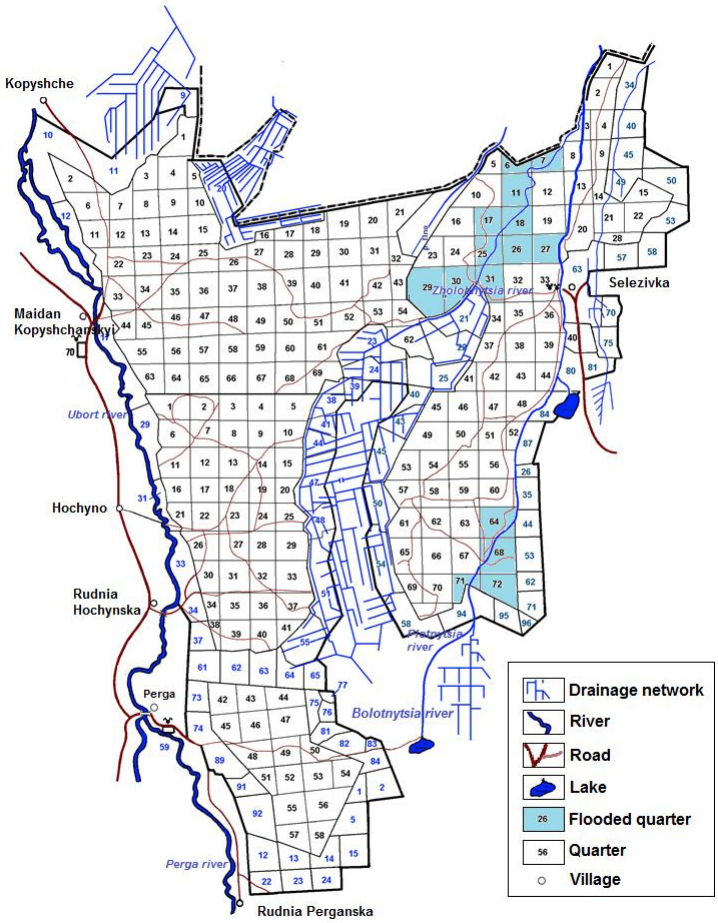

Fig. 7. Hydrological network of Polissya NR

Source: Bumar pers. comm.; SFCU and USPFMPA 2009 (with amendments)

Vegetation of the reserve is under two contradictory processes: draining and flooding. Flooding is most intensive in 350-400 m distance toward the forest and 3 km down the place of water discharge from channels to Zholobnytsya and Bolotnytsya riverbeds (see quarters painted blue at Fig. 7). More than 100 ha of forest stands have dried out or demonstrated a suppressed growth as a result of flooding (Bumar 1999; Bumar and Bumar 1998). At the same time, oligotrophic and eutrophic bogs have undergone the most drastic changes in terms of drying effect – among the most common changes are the conversion of bogs into forests and subsequent changes in flora and fauna composition. For example, one of the consequences was the increased number of animals inhabiting glades and other open spaces (Bumar and Hryb 1993).

In general, both nearby and relatively remote vegetation has encountered a significant influence of the drainage network. Successions were most active in the first years after the creation of the network, while now they have a local and well-defined nature. Nowadays the managers both monitor the mechanisms of ecosystem self-restoration (e.g., *Castor fiber* is greatly contributing to recovery of bogs by creating dams, where further transformation processes take place) and carry out a variety of actions to help the territory return to its natural state (Zhyla pers. comm.; Kobzar pers.comm.; Bumar pers. comm.). However, to complement the existing efforts, a wise solution was offered back in 1980s – to include the drained lands in the reserve, which would conserve the network while providing an opportunity for studying vegetation recovery processes (Andriyenko 1986; Bumar and Bumar 1998).

The third identified threat – "forest fires" – is the most significant one, as along with having the highest total ranking score, it also received the highest negative reduction score of -80%. During the follow-up discussion it became clear that the problem is rather complex and in the taken context it is in various ways aggravated by some of other identified threats (drainage consequences, pine plantations, problematic native species, and road network), which are described further.

Forest fires are not a rare event for Ukrainian Polissya and they are an essential part of forest and wetland natural dynamics. Fire brings both destruction of some natural systems and the restoration of, in particular, pine and heather populations. Fire damages and ruins live surface cover, undergrowth, underbrush, and tree layer, changes the structure, content, and properties of forest litter, as well as the microclimate of the habitats. Ground fires of low intensity, which often occur in Polissya NR, create a set of favorable factors that accelerate seed germination. Three main types of fire that occur in the reserve are: crown, surface, and ground fires; they can transform *inter se* (Bumar and Hermanchuk 2006; Zhyla pers. comm.).

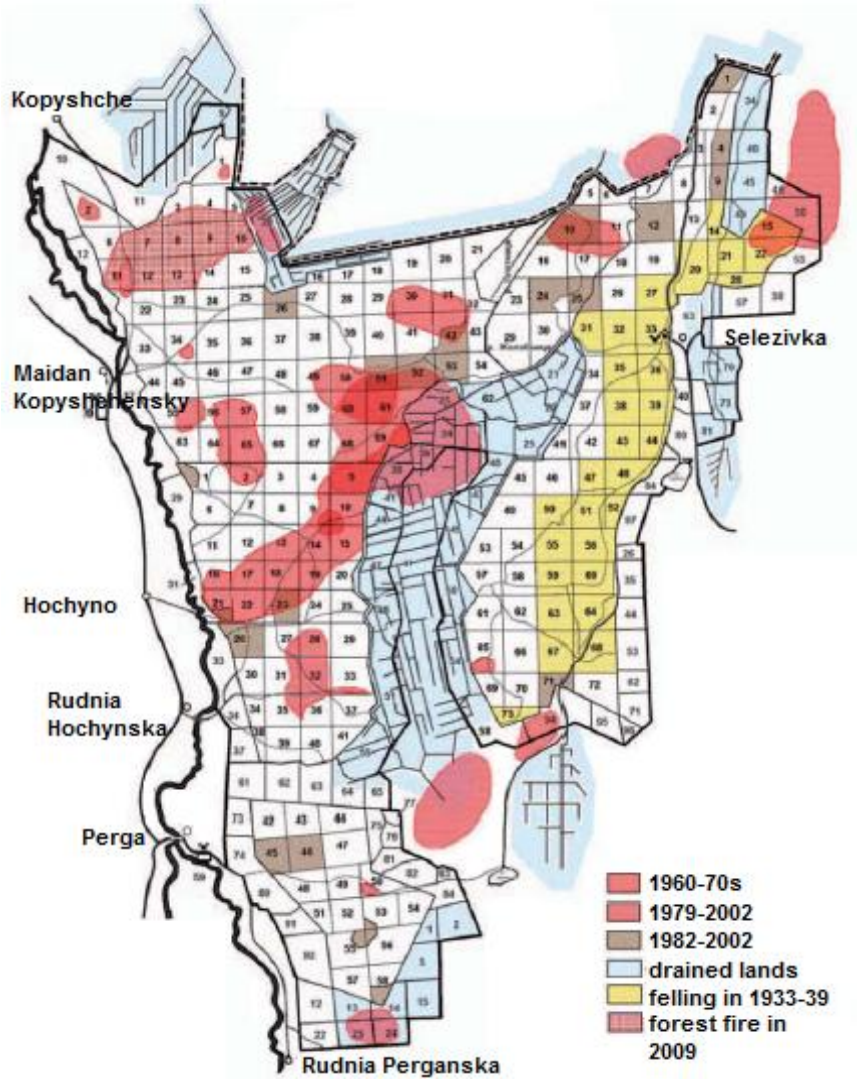

Fig. 8. Forest fires during 1950-2009

Source: Bumar 2011 (with amendments)

Before the Polissya NR was created, forest fires have also been a strong anthropogenic factor changing natural ecosystems (see Fig. 8). In the postwar years (after 1945), as a result of forest fires related to military actions, only 53% of forest cover remained in Selezivske forestry and ~69% in Kopyshchenske and Perganske forestry. Taking into account that most of the forest fires (according to Bumar and Hermanchuk (2006), ~98%) in the reserve are human-induced (usually arsons or ignitions due to careless handling of fire), to get the full picture regarding the issue, vegetation and climate peculiarities should be considered. The flammability of local forests, where an average class of fire risk is 1.9, is caused by several

factors: 1) climatic factor, in particular, moisture deficit due to climate change (Bumar 2011), 2) a typological structure of the forest (where conifers greatly prevail), and 3) area inaccessibility due to poor road network development (Vasylenko pers. comm.; Linkevych pers. comm.; Zhyla pers. comm.). However, in the case of conifers, despite the fact that their presence increases the fire risk, after the fire is gone the first outbreaks of tree species recovery are also often represented by conifers (in general, during the first 3 years). Consequently, the synergy of all the mentioned factors results in the increase of fire intensity and frequency from year to year. However, all that the management can do to reduce fire risk at the moment is to continue the sanitary felling, the creation of mineral belts, and the implementation of other widely accepted practices, as currently successful practices of combating such complex problems are missing in the field (Zhyla pers. comm.; Vasylenko pers. comm.).

The fourth threat identified by the management team is “pine plantations”, which got moderate negative reduction score (-20%) being among the top-3 issues by total ranking. By “pine plantations” the managers identified the effect of artificial plantations created in 1950-1960s for commercial purposes. However, the protection regime, which appeared after the establishment of Polissya NR, made it impossible both to cut these patches for sale and to thin them out to the extent sufficient for preserving local biodiversity.

The heart of the problem is that without a regular sanitary felling of sufficient intensity the forest stands become over-crowded, creating a dense crown cover (more than 95% of these plantations have closed canopy). Subsequently, this creates a direct threat to species diversity: undergrowth is almost absent and the composition of grass and shrub layers is changing with an increasing dominance of green mosses. Apparently, dense forest also causes the accumulation of deadwood, further increasing the risk of forest fires (this correlation is

demonstrated at Fig. 9) (Popovych and Balashov 1983; SFCU and USPFMPA 2009; Bumar 2011).

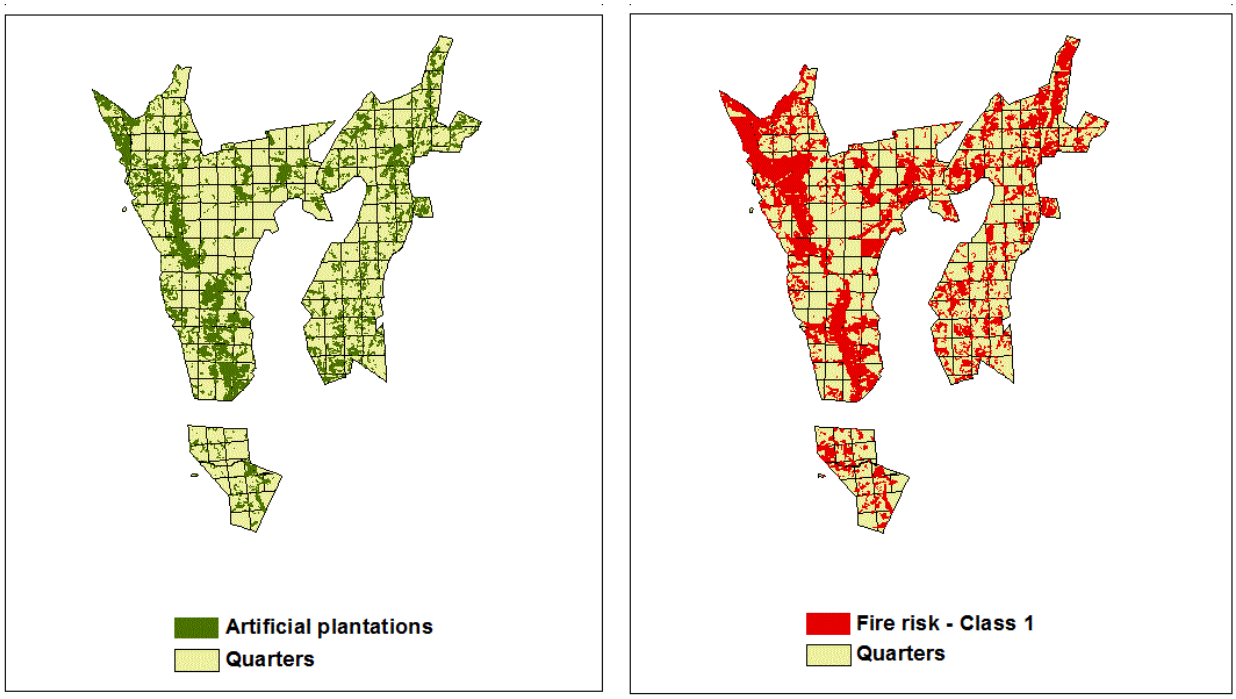

Fig. 9. Comparison of territories occupied with artificial pine plantations and areas belonging to the first class of fire risk

Data source: Vasylenko pers. comm.; UNEP 2009

It was estimated by Bumar (2011) that low-intensity felling of young pine had no influence on density in 20-30 years. And, according to the management team, the only thing they can do taking into account the protection regime is to wait until the natural processes overcome. Hence, nowadays the pine plantations remain "the main ecological problem" of the reserve (Bumar 2011, 27; Bumar pers. comm.; Kobzar pers. comm.).

The road network of the reserve was identified as the least significant threat with a 15% reduction over the reference period (some roads became overgrown). However, the contradictory nature of this threat should be examined in detail. Firstly, roads were considered as a threat to wetlands and the biodiversity of the reserve in general. In this regard, the

managers mentioned a low density of traffic and the road network itself (~20 km of paved or asphalted roads and ~310 km of dirt road), its minor influence on hydrology, and noise pollution threatening animals (SFCU and USPFMPA 2009; Linkevych pers. comm.). It was also mentioned that especially transit roads used by locals or other people often become a source of forest fire (Linkevych pers. comm.; Vasylenko pers. comm.). Therefore, any traffic of non-reserve transport on the territory of the reserve should be strictly limited.

The other side of this problem was defined as roads (meaning dirt roads used only for the reserve purposes) being an essential part of fire safety measures, and from this point of view the reduction of the network was identified as a contributing factor to increasing forest fire risks. Moreover, the project of development of Polissya NR accentuates the need of renovation of 21 km of roads (SFCU and USPFMPA 2009), while the follow-up discussion with managers also highlighted the need of the construction of new roads. It is essential for the fire control, especially in Perganske and Kopyshchenske forestry that are under a high risk of forest fires (Zhyla pers. comm.; Bumar pers. comm.; Vasylenko pers. comm.).

Finally, the threat "problematic species" with a negative reduction score -10% was defined as pressure from an outbreak of pine and green mosses, considering the limited cutting due to the protection regime. By its effect this issue is in a way similar to the artificial plantations described earlier. As 75% of forests in the reserve are represented by pine, a combination of climate, drainage, and other factors have created conditions favorable for pine growth. As a result, in recent years the share of pine in the total forest biomass has been growing. Moreover, it was noticed that green mosses follow the pine in succession, forming communities of *Pineta hylocomiosa*, where mosses are supplanting lichens and together with pine are changing local microclimatic and soil conditions (Bumar pers. comm.).

4.4. Recommendations

As one of the main research objectives was to provide the management teams with recommendations on how to improve the threats management, the results derived from the TRA workshops and the follow-up communication suggest a set of actions that can be divided in two main groups: those for the management team and for the government.

I. Recommendations for the managers of protected areas are as follows:

- *Introduce the modified TRA method as a self-monitoring procedure, while using the IUCN standard lexicon of threats as a unified tool*. Both protected areas selected for the research, as probably the most of Ukrainian PAs, are missing a permanent system of monitoring the management performance. Compared to other widely known methods, the TRA workshops are time- and cost-effective, which allows to use the method whenever needed. Moreover, based on the results of the first workshop and the materials distributed to the managers, they are able to conduct further assessments on their own.

- *Improve communication with the Ministry of Environment and Natural Resources regarding any essential needs*. Importance of communication can be demonstrated for the case of pine plantations threatening biodiversity in Polissya NR due to already mentioned restrictions posed by the protection regime. According to Parchuk (pers. comm. 2012), if the management team would try to request a permit for reconstructive felling despite the regime, while providing a proper justification, they would have a good chance to get it.

- *Develop international cooperation* (e.g., taking part in international projects and searching for grant opportunities). This would enhance the implementation of a

range of projects planned and carried out by the PA management, including those on the conservation of populations and ecosystem restoration. The project 'Integrating Climate Change into Vulnerable Ecosystems Management: natural parks in wetlands and forest areas (Ukraine)', where Polissya NR is one of the beneficiaries, can be an example of recent development of communication. Among other aims, this project is expected to improve restoration of wetland ecosystems and hayfields (Zhyla pers. comm.; Videnina pers. comm.). Moreover, cooperation with PAs across the border would potentially expedite the establishment of a biosphere reserve, which would include Polissya NR.

- For Shatsky NNP, in the case of development of new recreation sites to redistribute the recreation pressure, it is essential to *cooperate with the local government and municipal structures regarding the location of waste management and sewage treatment facilities.*

II. Recommendations for the government are listed below:

- *Revise the priorities of national conservation policies and the relevant budget structure*. The review of national policies and personal communication with representatives of government has demonstrated that currently the focus is rather on the territories belonging to Natura 2000 ecological network. This trend has to be changed to a more comprehensive strategy, in particular, to comply with the requirements of the conventions Ukraine is a part of. Regarding the regional trends of Polissya, it also would be nice to direct more funds toward supporting the fire prevention and control measures.

- *Revise and enforce already existing or elaborate upon new laws and programs on biodiversity conservation*, considering the need of introduction of continuous reporting and management monitoring scheme.

- *Create a network of protected areas, among other things, to exchange the successful practices of threat management*. Communication both between PAs and the government and in between the PAs is dramatically missing. The already mentioned problem of 'impossibility' of reconstructive felling in Polissya NR was solved in Shatsky NNP, where the felling was planned in the strict protected zone to improve the forest composition and preserve important plant species. It was achieved by preliminary consultation with the MENRU and consequent application for an official permission, while the necessary justifications were provided. Sharing such practices would substantially benefit both the protected areas and the Ministry in the long-term perspective.

4.5. Conclusion

The results of the workshops demonstrated a negative threat reduction score for both Shatsky NNP and Polissya NR. However, what helped to interpret and understand the reasons for these results were the discussions and follow-up communication with the managers (mostly, as personal or group interviews). Along with that, an overview of the background of the protected areas provided some ideas regarding the possible preconditions of some threats. As both protected areas are located in the same natural region and have rather similar natural features, some of the threats were similar (e.g., forest fires or harvesting of berries). At the same time, the specificities of each of the sites (prevalence of either lakes or bogs, proximity to residential areas, etc.) conditioned the differences. Based on the results of the workshops, relevant suggestions on how to improve threat management in protected areas were given.

The recommendations were provided for both management teams and the government, considering the importance of their communication and cooperation.

5. Conclusion

5.1. Introduction

This chapter provides a summary of the main findings in relation to the set aim and objectives and a discussion on the limitations experienced during the research. Moreover, suggestions for the future research are given and an overall conclusion regarding the research contribution is provided.

5.2. Meeting the research objectives

The aim of this research was to evaluate the existing and potential threats to wetland protected areas in the Polissya region, Ukraine and suggest ways of improving the threat management performance. Reaching this aim was crucial to answer the research question. The optimal way to illustrate the derived results is to provide a short overview on reaching each objective:

The results regarding the review of available information in the field and analysis of the main gaps on international and national level are provided in chapter 2 of the paper. Briefly, an overview of both international and national conservation policy background has shown similarities in the general goals. However, compared to the success of developed countries, the level of policy implementation and, consequently, the state of environment is much lower in Ukraine due to various reasons, among which the most significant one currently is political instability.

Talking about the application of the modified TRA tool and collection of justifications for the threat management assessment, the results are available in chapter 4. The TRA workshops demonstrated that the identified threats in both protected areas have worsened during the chosen reference period. At the same time, the follow-up communication with the stakeholders and analysis of the relevant data provided verification and support regarding the

significance of identified threats. Moreover, comparing the selected protected areas, similarities in the threats were referred to the geographical location (Polissya natural region), while the differences were assumed to be conditioned rather by the specificities of historical background of the areas.

Finally, section 4.4 presents the outcomes concerning the analysis of the results and suggestions on further management actions. It includes recommendations for the management teams of the selected protected areas and for the Ukrainian government, in particular, for the MENRU. Despite the fact that these two groups contain different suggestions, an overarching goal is to develop cooperation and communication between the PAs and the government and thus improve the threat management performance in wetland PAs in Ukraine.

5.3. Discussion on the research limitations

As any other research, the current research had its own limitations related to different factors, namely: time, distance, willingness to cooperate, materials availability, and method-related limitations.

First of all, time restrictions of the research posed one of the main limits on the scale and completeness of the research. This includes the lost possibilities both to reveal additional details on the background situation and preconditions of the threats and to communicate with a wider range of stakeholders more explicitly regarding their attitude to some of the threats and contributing factors. Nonetheless, this limitation was partially compensated by the surveying the management teams and a thorough review of literature in the field.

Another limitation was the remoteness of the chosen protected areas. Along with the time limit and agreements made with the directors, it has resulted in confining the research to 2 PAs instead of more. Apart from that, the distance factor in general puts a limit on communication of the management teams with other PAs and the government. Another

consequence of remoteness until recently was the difficulty of providing Internet connection for one of the PAs, while the telephone service has also been poor. However, several years ago the reserve got this opportunity, and gaining new means of communication is expected to improve the connections with the 'outer space'.

The next restriction was limited incentives for participating in the workshops. In fact, none of the managers were paid for their cooperation and participation in this research. Hence, potentially they could refuse to take part in it, as they would have had to spend their own time and resources for that. However, this was not the case for Shatsky NNP and Polissya NR, who readily confirmed their participation and provided all the necessary assistance for the research. Attendance and participation, which in return depended on several factors (the size of management team, their availability for the workshop, etc.), were also among the main limitations. In particular, in Shatsky NNP there were 4 participants and in Polissya NR – 5 participants. However, it is important to mention that it might become difficult to hold the discussion if there are too many people. The optimal number of participants still has to be defined empirically, but judging from the two workshops, 5-6 participants might be the best size of the focus group (the experience and the professional field of managers should be taken into account).

Further, insufficient availability of literature materials online and in the libraries, except from the local ones, could become a serious restriction for describing the background situation at the PAs and providing supporting evidence for the threat assessment. However, this problem was solved with the help of the managers, who provided all the relevant literature available locally. It included both published materials and documents for internal communication.

Moreover, the research was partially limited by the availability of mapping materials. To begin with, there were no maps of anthropogenic pressure created previously. As it came up

from personal communication with the managers, the threat evaluation itself has never been carried out as a separate assessment and was not even among the priorities during the preparation of the reports on PA management. Furthermore, the mapping tool itself is still on a rather initial stage in protected areas of Ukraine. Therefore, some of the maps (apart from those available in '.shp' format) for the current research were created based on either literature or communication with the managers, who pointed out the threatened areas (e.g., flooded quarters at Fig.7), or on the relevant maps available in '.jpg' and other image formats.

Finally, limitations related to the TRA method should be mentioned. First of all, the subjectivity factor has always been an initial weakness of the method. However, the potential bias and uncertainties were relatively minimized by holding the workshops with the focus groups, where participants gave very similar answers and, when needed, corrected each other concerning the details. Moreover, as the method does not define the origin of the threats, this limitation was reduced by additional review of literature provided by the managers and by the follow-up communication. Another aspect was related to the reference period selected for evaluation. To avoid inaccuracies in the assessment results, especially for Polissya NR with its 31-year period, the relevant articles and internal documentation were analyzed.

Additional critique of the TRA method and the standard lexicon of threats (Salafsky *et al.* 2008) can be provided within several examples from the research. The first difficulty was met while trying to define the category for artificial pine plantations. According to the explanations and examples, it could belong to 3 categories: 1) silviculture, because the plantations were initially created for commercial purposes; 2) problematic native species – due to the fact that pine is a local species, and plantations exist at the reserve for already 50-60 years, consequently becoming a part of natural systems (even though the trees are generally weaker and the protection regime anticipates reconstructive cutting to improve the situation); 3) other ecosystem modifications – the category chosen for assessment due to the

fact that plantations were created before the reference point (1981) (hence, silviculture purposes do not fit as a category) and because the land management regime is not sufficient for conservation, even though it is aimed at biodiversity protection. In fact, the answer depended more on the reference point, and the decision have been made in accordance with the relevant land use and management actions. Apart from the pine plantations, some of the threats (e.g., drainage) could at the same time be either contributing factors to other threats (e.g., forest fires) or 'antagonists' of those (e.g., road network of Polissya NR – see 4.3.2.), which could create uncertainties in the evaluation. Finally, there were difficulties with defining and assessment of forest fires. Even though the method is designed for evaluation of reduction of anthropogenic threats, in the case of forest fires it might be extremely hard to classify the event as solely human-caused. As described previously, forest composition and natural species outbreaks for the Polissya region, as well as climate change, which despite of its contradictory nature is also partially driven by humans, should be considered as significant contributing factors. Saying this, it can be assumed that in some cases human factor is only one of the triggers, while the preconditions are created by natural factors.

5.4. Suggestions for the future research

Considering the original contribution within the scope of study (see chapter 1) and the limitations experienced during the research, the following suggestions for the future studies can be given:

1. It is extremely significant to learn more about the reasons of poor communication between the protected areas and the government in Ukraine. Considering the studied reasons, it would be even more important to elaborate upon the ways of connecting the stakeholders for the benefit of environment.

2. As a next step, it is essential to study the potential for creating a platform for communication between the protected areas. In particular, relevant examples of similar networks/associations in other countries shall be analyzed.

3. While carrying out the threat assessment, it is important to carefully study the preceding land use regime, as it may have a significant influence in the long-term perspective.

4. For Shatsky NNP, it is important to monitor the impact of development of Khotyslav sandpit in Belarus. Even though it was not identified as a direct threat within this study, some experts estimated that if the volume of sand and chalk extraction will exceed the projected norms, consequent redistribution of the underground water might cause a drastic fall in the water level of Shatsky lakes (Mateychyk pers. comm.; Khomik pers. comm.).

References

Andriyenko, T.L., Onyshchenko, V.A., Klyestov, M.L., Pryadko, O.I., Arap, R.Ya. 2001. *Systema kategoriy pryrodno-zapovidnoho fondu Ukrajiny ta pytannya yii optymizatsii* [The system of categories of Nature Reserve Fund of Ukraine and the question of its optimization]. Kyiv: Fitosotsiotsentr.

Andriyenko, T.L. 1986. Polesskij zapovednik [Polissya Reserve]. *Priroda* 6: 36-38.

Anthony, B. 2008. Use of modified threat reduction assessments to estimate success of conservation measures within and adjacent to Kruger National Park, South Africa. *Conservation Biology* 22 (6): 1497-1505.

Belokurov, A. and Ervin, J. 2008. Protected areas management effectiveness information module: Rapid Assessment and prioritization of Protected Area Management (RAPPAM) (methodology description). URL: http://www.wdpa.org/me/PDF/RAPPAM.pdf [consulted on 7 May 2012].

Bezruchko, L.S. and Rozhko, I.M. Otsinka prydatnosti terytorii Shatskoho natsionalnoho pryrodnoho parku dlya rekreatsiynoho pryrodokorystuvannya [Assessment of suitability of the territory of Shatsky National Nature Park for recreational purposes]. *Scientific Journal of Lesya Ukrainka Volyn National University* 1: 201-206.

Bowman, M. 2009. The Ramsar Convention on Wetlands: has it made a difference? In *Yearbook of international cooperation on environment and development 2002-03 (international environmental governance set)*, ed. Stokke, O.S. and Thommessen, O.B., 61-68. London: Earthscan Publications Ltd.

Bumar, H.I. 2011. Tendentsii shchodo zmin pryrodnykh ekosystem Poliskoho pryrodnoho zapovidnyka v rezultati dii nehatyvnykh chynnykiv [Tendencies regarding the changes

of natural ecosystems in Polissya Nature Reserve due to negative factors]. *Zbirnyk naukovykh prats Luhanskoho pryrodnoho zapovidnyka*: 25-31.

_____. 1999. Otsinka stanu bolotnykh ekosystem Poliskoho zapovidnyka [Evaluation of the state of bog ecosystems in Polissya Reserve]. Paper read at the conference 'Conservation at the turn of the millennium', October 1999, Kaniv, Ukraine.

_____. 1993. *Poliskyi pryrodny zapovidnyk* [Polissya Nature Reserve]. Zhytomyr, Ukraine: Lyonok.

_____. 1988. Okhrana redkikh vidov rastenij v Polesskom zapovednike [Protection of rare plant species in Polissya Reserve]. Paper read at the conference devoted to the 20th anniversary of the Carpathian Reserve, October 1988, Rakhiv, Ukraine.

Bumar, H.I. and Bumar, H.V. 1998. Suchasnyi stan roslynnosti v Poliskomu zapovidnyku ta yoho okhoronnii zoni [Current state of vegetation in Polissya Reserve and its protection zone]. Paper read at the conference devoted to the 100th anniversary of Askania Steppe, May 1998, Askaniya-Nova, Ukraine.

Bumar, H.I. and Hryb, I.Ya. 1993. Do 25-richchya Poliskoho zapovidnyka [On the occasion of the 25th anniversary of Polissya Reserve]. *Lisovyi zhurnal* 5: 21.

Bumar, H.I. and Hermanchuk, V.V. 2006. Lisovi pozhezhi v pryrodnykh biotsenozakh Poliskoho zapovidnyka [Forest fires in natural biocenoses of Polissya Reserve]. *Zapovidna sprava v Ukraiini* 12 (1): 74-76.

Bumar, H.I. and Tsytsiura, V.K. 1998. *Poliskyi pryrodnyi zapovidnyk: 30 rokiv* [Polissya Nature Reserve: 30 years]. Zhytomyr, Ukraine: Volyn.

Cabinet of Ministers of Ukraine (CMU). 2004a. Postanova N 769 'Pro vnesennia zmin do deiakykh postanov Kabinetu Ministriv Ukraiiny z pytan okhorony navkolyshnyoho pryrodnoho seredovyshcha' [Decree No. 769 'On introduction of changes into some of decrees of the Cabinet of Ministers of Ukraine regarding environmental protection']. URL: http://zakon3.rada.gov.ua/laws/show/769-2004-%D0%BF/ed20040616 [consulted on 15 May 2012].

_____. 2004b. Rozporyadzhennia N 675-r 'Pro skhvalennia Kontseptsii Zahalnoderzhavnoii prohramy zberezhennia bioriznomanittia na 2005-2025 roky' [Order No. 675-r 'On approval of the Concept on National conservation program for 2005-2025']. URL: http://zakon2.rada.gov.ua/laws/show/675-2004-%D1%80 [consulted on 1 June 2012].

_____. 1998. Postanova N 2068 'Pro vyznachennya poliskykh terytorii Ukraiiny' [Decree No. 2068 'On definition of Polissya territories in Ukraine']. URL: http://zakon2.rada.gov.ua/laws/show/2068-98-%D0%BF [consulted on 14 May 2012].

Carey, C., Dudley, N., and Stolton, S. 2000. *Squandering paradise? The importance and vulnerability of the world's protected areas.* Gland, Switzerland: WWF International.

Chape, S., Harrison, J., Spalding, M., and Lysenko, I. 2005. Measuring the extent and effectiveness of protected areas as an indicator for meeting global biodiversity targets. *Philosophical Transaction of Royal Society B* 360: 443–455.

Dubuk, M. 2012. Na Svityazi vyrishuiut problemu smittya [The garbage problem is being solved in Svityaz]. Official website of the Ukrainian newspaper 'Visnyk', 5 July 2012. URL: http://visnyk.lutsk.ua/2012/07/05/mynuloho-roku-reformuvaly-nashe-komunalne-pidpryjemstvo-i-teper-obovyazky-zi-skladuvannya-vidhodiv-jih-

vyvezennya-pokladeni-na-budynok-upravlinnya-urochyscha-tozh-vono-j-zajmajetsya-pytannyamy-zbor/ [consulted on 5 July 2012]

Dudley, N. (ed). 2008. *Guidelines for applying protected areas management categories*. Gland, Switzerland: IUCN.

Dudley, N. and Stolton, S. 1999. *Threats to forest protected areas: summary of a survey of 10 countries.* A research report from the World Conservation Union (IUCN) for the World Bank in association with WWF Alliance for Forest Conservation and Sustainable Use. URL: http://www.worldwildlife.org/what/globalmarkets/forests/WWFBinaryitem7370.pdf [consulted on 2 May 2012]

Ervin, J. 2003. *Rapid Assessment and Prioritization of Protected Area Management (RAPPAM) methodology*. Gland, Switzerland: WWF International.

Granderson, A.A. 2011. Enabling multi-faceted measures of success for protected area management in Trinidad and Tobago. *Evaluation and Program Planning* 34 (3): 185–195.

Hjortsø, C.N., Stræde, S., and Helles, F. 2006. Applying multi-criteria decision-making to protected areas and buffer zone management: a case study in the Royal Chitwan National Park, Nepal. *Journal of Forest Economics* 12 (2): 91–108.

Horun, A.A. (ed). 2008. Litopys Pryrody: knyha 20, 2007 rik [Chronicle of Nature: book 20, year 2007]. Prepared as internal documentation of the State Forestry Committee of Ukraine and Shatsky National Nature Park, obtained from Shatsky National Nature Park.

Horun, A.A., Mateychyk, V.I., Pryadko, O.I., Pidopryhora, L.M., Khomik, N.V., Tsvyd, M.V., Yurchuk, P.V., Zakharko, V.V., Tsvyd, V.I., Sakovets, V.V., Turych, V.V.,

Prasyuk, M.M., Denisovets, L.T., Andriievska, O.L., and Kliestov, L.S. 1999. Proekt orhanizatsii terytorii, okhorony, vidtvorennia ta rekreatsiinoho vykorystannia pryrodnykh kompleksiv i obiektiv Shatskoho natsionalnoho pryrodnoho parku [Project of territory organization and protection, restoration, and recreational use of natural complexes and objects of Shatsky National Nature Park]. Prepared as internal documentation of the Ministry of Environmental Protection and Nuclear Safety of Ukraine, Research center on conservation issues, and Shatsky National Nature Park, obtained from Shatsky National Nature Park.

Information and reference website 'Ukraine' (IRWU). [2010?]. Prime ministers of Ukraine. URL: http://proukraine.net.ua/history/Primier-minister_of_the_Ukraine.htm [consulted on 15 May 2012].

International Union for the Conservation of Nature (IUCN). 1994. *Guidelines for protected area management categories*. Gland, Switzerland: IUCN.

Kapos, V., Balmford, A., Aveling, R., Bubb, P., Carey, P., Entwistle, A., Hopkins, J., Mulliken, T., Safford, R., Stattersfield, A., Walpole, M., and Manica, A. 2008. Calibrating conservation: new tools for measuring success. *Conservation Letters* 1: 155–164.

Khomik, N.V. 2009. The foundations of the integrated water management on the territory of Shatsk National Nature Park. *Scientific Journal of Lesya Ukrainka Volyn National University* 1: 42-46.

Kliestov, M.L., Osypova, M.O., Chumak, S.Yu., Horun, A.A., Yurchuk, P.V., Shevchenko, P.H., Sydoruk, P.P., Matviyishyn, M.Ya., Holinchuk, M.M., Fukarevych, A.V., Horban, I.M., Mateychyk, V.I., Andriievska, O.L. 2005. Proekt orhanizatsii terytorii, okhorony, vidtvorennia ta rekreatsiinoho vykorystannia pryrodnykh kompleksiv i

obiektiv Shatskoho natsionalnoho pryrodnoho parku [Project of territory organization and protection, restoration, and recreational use of natural complexes and objects of Shatsky National Nature Park]. Prepared as internal documentation of the Ministry of Ecology and Natural Resources of Ukraine and Shatsky National Nature Park, obtained from Shatsky National Nature Park.

Kothari, A. 2004. Protected areas and people: participatory conservation. In *Biodiversity issues for consideration in the planning, establishment and management of protected area sites and networks*. Montreal, Canada: Secretariat of the Convention on Biological Diversity (SCBD).

Kotsun, L.O., Kuzmishyna, I.I., Voityuk, V.P., Romaniuk, N.Z., Mateychyk, V.I., and Bezsmertna, O.O. 2009. Conservation status of rare and endangered species of plants of Shatsky National Nature Park. *Scientific Journal of Lesya Ukrainka Volyn National University* 2: 27-31.

Kupper, P. 2009. National parks in European history. *Protected Areas In-Sight: The Journal of the EUROPARC Federation*. Issued on the occasion of 100 years of National Parks in Europe.

Lisovy kodeks Ukrainy [Forest Code of Ukraine]. 1994. *Vidomosti Verkhovnoi Rady* 17.

MacKay, H., Finlayson, C.M., Fernández-Prieto, D., Davidson, N., Pritcharde, D., and Rebelo, L.M. 2009. The role of Earth Observation (EO) technologies in supporting implementation of the Ramsar Convention on Wetlands. *Journal of Environmental Management* 90 (7): 2234–2242.

Malysheva, N.R. and Dupont, C. 2009. *Current state and perspectives of legal regulation for wetlands of national and local importance in Ukraine*. Kyiv: ECBSea.

Manaran, M. 2012. Participatory management and monitoring of protected areas in the Philippines. UNEP: Environment for Development official website. URL: http://www.unep.org/dec/onlinemanual/Enforcement/InstitutionalFrameworks/DesignationofResponsibilities/Resource/tabid/809/Default.aspx [consulted on 7 May 2012].

Margoluis, R. and Salafsky, N. 2001. *Is our project succeeding? A guide to threat reduction assessment for conservation*. Washington, D.C.: Biodiversity Support Program.

Margules, C.R. and Pressey, R.L. 2000. Systematic conservation planning. *Nature* 405: 243-253.

Marushevsky, G.B. and Zharuk, I.S. [eds.]. 2006. *Vodno-bolotni uhiddya Ukraiiny. Dovidnyk* [Directory of Ukraine's Wetlands]. Kyiv: Wetlands International Black Sea Programme.

Matar, D. 2009. *New insights into monitoring protected area management in Lebanon*. Master of Science thesis, Central European University, Budapest.

Matar, D.A. and Anthony, B.P. 2010. Application of Modified Threat Reduction Assessments in Lebanon. *Conservation Biology* 24 (5): 1174–1181.

Mateychyk, V.I., Horun, A.A., Khomik, N.V., Turych, V.V., Turych, Ya.V., Sinchuk, M.A., Zakharko, A.V., and Mykhailevsky, B.I. 2011. Litopys Pryrody: knyha 23, 2010 rik [Chronicle of Nature: book 23, year 2010]. Prepared as internal documentation of the State Forestry Committee of Ukraine and Shatsky National Nature Park, obtained from Shatsky National Nature Park.

Ministry of Environment and Natural Resources of Ukraine (MENRU). 1999. Nature conservation in Ukraine. Internal report T-PVS (99) 43, prepared for Convention on the Conservation of European Wildlife and Natural Habitats. Available from Ministry of Environment and Natural Resources of Ukraine, Kyiv.

National Ecological Centre of Ukraine (NECU). 2007. Biodiversity in Ukraine. URL: http://necu.org.ua/bioriznomanittya/ [consulted on 1 June 2012].

Nayda, V.S. 2009. Aspekty okhorony pryrody biosfernoho rezervatu "Shatsky" [Aspects of Nature Protection in Shatsky Biosphere Reserve]. *Scientific Journal of Lesya Ukrainka Volyn National University* 1: 15-20.

_____. 2008. Priorytetni aspekty pryrodookhoronnoii diialnosti Shatskoho natsionalnoho pryrodnoho parku [Priority aspects of environmental protection at Shatsky National Nature Park]. Paper presented at scientific conference 'State and biodiversity of ecosystems of Shatsky National Nature Park', September 2008. Lviv: Spolom. URL: http://bioweb.lnu.edu.ua/biologh/conf2008-2.pdf [consulted on 1 June 2012].

Popovych, S.Yu. and Balashov, L.S. 1983. Pryrodni ta antropohenni zminy roslynnoho pokryvu bolit Poliskoho derzhavnoho zapovidnyka [Natural and anthropogenic changes in bog vegetation of Polissya State Reserve]. *Ukrainsky botanichny zhurnal* 11 (3): 86-92.

Prots, B., Ivanenko, I., Yamelynets, T., and Stanciu, E. 2010. *Ekspres-otsinka stanu terytorii pryrodno-zapovidnoho fondu Ukrainy ta vyznachennia pryoritetiv shchodo upravlinnia nymy* [Rapid Assessment and Prioritization of Protected Area Management (RAPPAM) for Ukraine]. Lviv: Gryf Fond.

Ramsar Secretariat. 2012. Contracting Parties to the Ramsar Convention on Wetlands. Official website of the Ramsar Convention on Wetlands. URL: http://www.ramsar.org/cda/en/ramsar-about-parties-parties/main/ramsar/1-36-123%5E23808_4000_0__ [consulted on 5 May 2012].

_____. 2008. Strategic framework and guidelines for the future development of the List of Wetlands of International Importance of the Convention on Wetlands (Ramsar, Iran, 1971). 3rd ed., as adopted by Resolution VII.11 (COP7, 1999) and amended by Resolutions VII.13 (1999), VIII.11 and VIII.33 (COP8, 2002), IX.1 Annexes A and B (COP9, 2005), and X.20 (COP10, 2008). URL: http://www.ramsar.org/pdf/key_guide_list2009_e.pdf [consulted on 5 May 2012].

Salafsky, N., Margoluis, R., Redford, K.H., and Robinson, J.B. 2002. Improving the practice of conservation: a conceptual framework and research agenda for conservation science. *Conservation Biology* 16: 1469-1479.

Salafsky, N., Salzer, D., Stattersfield, A.J., Hilton-Taylor, C., Neugarten, R., Butchart, S.H.M., Collen, B., Cox, N., Master, L.L., O'Connor, S., and Wilkie, D. 2008. A standard lexicon for biodiversity conservation: unified classifications of threats and actions. *Conservation Biology* 22 (4): 897–911.

Salafsky, N. and Wollenberg, E. 2000. Linking livelihoods and conservation: a conceptual framework and scale for assessing the integration of human needs and biodiversity. *World Development* 28 (8): 1421–1438.

Secretariat of the Convention on Biological Diversity (SCBD). 2012. About the Convention on Biological Diversity. Secretariat of the Convention on Biological Diversity official web-site. URL: http://www.cbd.int/convention/ [consulted on 6 May 2012].

State Employment Office (SEO). 2012. V Ukraini tretii rik pospil skorochuietsia bezrobittia, – natsionalna dopovid v OON [Ukraine witnesses third consecutive year of declining unemployment, – National Report to the UN]. Press-center official news, July 4, 2012. URL: http://www.dcz.gov.ua/control/uk/publish/article?art_id=244347&cat_id=364661 [consulted on 4 July 2012]

State Forestry Committee of Ukraine and Ukrainian State Project Forest Management Production Association (SFCU and USPFMPA). 2009. Proekt organizatsii terytorii ta okhorony pryrodnykh kompleksiv Polis'koho pryrodnoho zapovidnyka Zhytomyrs'koho oblasnoho upravlinnya lisovoho ta myslyvs'koho hospodarstva [Project of territory organization and protection of natural complexes of Polissya Nature Reserve of Zhytomyr regional forestry and hunting administration]. Prepared as internal documentation of the SFCU, USPFMPA, and Polissya Nature Reserve, obtained from Polissya Nature Reserve.

Swedish Environmental Protection Agency (SEPA) and Ministry of Environment and Natural Resources of Ukraine (MENRU). 2011-2012. Metodychni rekomendatsii shchodo vkliuchennia polozhen Zakonu Ukrainy 'Pro ocnovni zasady (stratehiiu) derzhavnoi ekolohichnoi polityky na period do 2020 roku' ta Natsionalnoho planu dii z okhorony navkolyshniioho pryrodnoho seredovyshcha na 2011-2015 roky do prohram rozvytku haluzei (sektoriv) ekonomiky ta rehioniv [Methodological recommendations on inclusion of statements from the Law of Ukraine on basic principles (strategy) of national environmental policy for the period until 2020" and National action plan on environmental protection for 2011-2015 into programs of development of economy sectors and regions]. URL: http://www.menr.gov.ua/media/files/Methodological recom.doc [consulted on 12 May 2012].

Thomas, L. and Middleton, J. 2003. *Guidelines for management planning of protected areas*. Gland, Switzerland: IUCN.

Thompson, R. and Starzomski, B.M. 2007. What does biodiversity actually do? A review for managers and policy makers. *Biodiversity and Conservation* 16: 1359–1378.

Tucker, G., Bubb, P., de Heer, M., Miles L., Lawrence, A., Bajracharaya, S.B., Nepal, R.C., Sherchan, R., and Chapagain, N.R. 2005. *Guidelines for biodiversity assessment and monitoring for protected areas*. Kathmandu, Nepal: KMTNC.

Tvedten, I. and Hersoug, B. (eds). 1992. *Fishing for development: small-scale fisheries in Africa*. Motala, Sweden: Motala Grafiska AB.

Ukrainian Scientific Center of Marine Ecology (USCME). 2005. National program on biodiversity conservation in Ukraine for 2007-2025 (project). URL: http://www.sea.gov.ua/GIS/BSR/UA/documents/legislation/Prog_bio.htm [consulted on 14 May 2012].

United Nations Environment Programme (UNEP). 2009. Protected areas international - all international sites (polygons). Created by the UNEP Environmental Data Explorer based on data from World Conservation Monitoring Center - World Database on Protected Areas Consortium. URL: http://geodata.grid.unep.ch/options.php?selectedID=1758 [consulted on 5 May 2012].

_____. 1992. Convention on biological diversity. Adopted during the Earth Summit in Rio de Janeiro, Brazil on 5 June 1992. URL: http://www.cbd.int/doc/legal/cbd-en.pdf [consulted on 6 May 2012].

United Nations Environment Programme - World Conservation Monitoring Centre (UNEP-WCMC). 2007. *Millennium Development Goals, Indicator 26: Protected Areas report*. Cambridge, United Kingdom: UNEP-WCMC.

United Nations Educational, Scientific and Cultural Organization (UNESCO). 1971. Convention on Wetlands of International Importance especially as Waterfowl Habitat. Adopted in Ramsar, Iran on 2 February 1971. URL:

http://www.ramsar.org/cda/en/ramsar-documents-texts-convention-on/main/ramsar/1-31-38%5E20671_4000_0__ [consulted on 6 May 2012].

Vodny kodeks Ukrainy [Water Code of Ukraine]. 1995. *Vidomosti Verkhovnoi Rady* 24.

Voznesensky, N. 1948. *Voyennaya ekonomika SSSR v period Otechestvennoj vojny* [The USSR military economics in the period of Great Patriotic War]. Moscow: Gospolitizdat.

Zakon Ukrainy 'Pro Pryrodno-Zapovidny Fond Ukrainy' (ZU 'Pro PZFU') [Law of Ukraine on Nature Reserve Fund]. 1992. *Vidomosti Verkhovnoji Rady* 34.

Zakon Ukrajiny 'Pro okhoronu navkolyshnyoho pryrodnoho seredovyshcha' (ZU 'Pro ONPS') [The Law of Ukraine on Environmental Protection']. 1991. *Vidomosti Verkhovnoji Rady* 41.

Zemelny kodeks Ukrainy [Land Code of Ukraine]. 2002. *Vidomosti Verkhovnoi Rady* 3-4.

Zubchuk, K. 2011. Yak polegshyty dolyu Svityazya [How to make Svityaz destiny easier]. Official website of the independent community newspaper "Volyn", 19 May 2011. URL: http://www.volyn.com.ua/?rub=32&article=0&arch=1234 [consulted on 5 July 2012]

Personal communication:

Bumar, G.I. Research fellow at Polissya Nature Reserve. Formal interview. Selezivka, 8 June 2012.

Horun, A.A. Leading researcher at Shatsky National Nature Park. Formal interview. Svityaz, 15 May 2012.

Khomik, N.V. Senior researcher at Shatsky National Nature Park. Formal interview. Svityaz, 15 May 2012.

Kobzar, L.I. Research fellow at Polissya Nature Reserve. Formal interview. Selezivka, 8 June 2012.

Linkevych, P.P. Forest engineer at Polissya Nature Reserve. Formal interview. Selezivka, 8 June 2012.

Mateychyk, V.I. Deputy Director for Science at Shatsky National Nature Park. Formal interview. Svityaz, 16 May 2012.

Parchuk, H. Head of Development Division of the Nature Reserve Fund of the Department of Reserve Management. Informal meeting. Kyiv, 8 June 2012.

_____. Head of Development Division of the Nature Reserve Fund of the Department of Reserve Management. Informal meeting. Kyiv, 25 December 2011.

Turych, V. Research fellow at Shatsky National Nature Park. Formal interview. Svityaz', 15 May 2012.

Vasylenko, V.P. Head of the forest fire service. Formal interview; during the interview a set of base maps of Polissya NR in .shp format was obtained. Selezivka, 8 June 2012.

Videnina, Yu. Head of the project 'Integrating Climate Change into Vulnerable Ecosystems Management: natural parks in wetlands and forest areas (Ukraine)'. Informal communication. Svalovychi, 17 May 2012.

Zhyla, S.M. 2012. Director of Polissya Nature Reserve. Formal interview. Selezivka, 8 June 2012.

Appendices

Appendix A: TRA Workshop - Shatsky National Nature Park

Threat Reduction Assessment (TRA) - INDEX

TRA Project Information

Site name:	Shatsky National Nature Park
Site description:	Terrestrial and aquatic complexes of the park (forest, meadow, wetland, and other ecosystems)
Assessment period:	Spring 2002 – spring 2012
Completed on:	15 May 2012
Completed by:	Olena Kovalenko

Cell types

Input	
Calculation	
Product	

TRA Index Sheet

#	Threats	Criteria Rankings			Total Ranking	% Threat Reduced	Raw Score
		Area	Intensity	Urgency			
1	Residential and commercial development (housing and urban areas)	8	12	10	30	-50	(15.00)
2	Residential and commercial development (tourism and recreation areas)	11	11	11	33	-60	(19.80)
3	Transportation and service corridors (roads and railroads)	7	8	9	24	-10	(2.40)
4	Transportation and service corridors (utility and service lines)	4	3	5	12	-5	(0.60)
5	Biological resource use (gathering terrestrial plants)	1	1	1	3	30	0.90
6	Human intrusions and disturbance (recreational activities)	12	10	8	30	-30	(9.00)
7	Natural system modifications (fire and fire suppression)	5	7	4	16	-15	(2.40)
8	Natural system modifications (other ecosystem modifications)	2	5	3	10	20	2.00
9	Invasive and other problematic species and genes (invasive alien species	6	6	7	19	-10	(1.90)
10	Pollution (garbage and solid waste)	9	4	6	19	40	7.60
11	Pollution (air-borne pollutants)	3	2	2	7	5	0.35
12	Pollution (household sewage and urban waste water)	10	9	12	31	10	3.10
Total		78	78	78	234		(37.15)

TRA Index Formula

	TRA Index
Result	-16%

Threat Reduction Assessment (TRA) - INDEX

TRA Project Information

Site name:	Shatsky National Nature Park
Site description:	Terrestrial and aquatic complexes of the park (forest, meadow, wetland, and other ecosystems)
Assessment period:	Spring 2002 – spring 2012
Completed on:	15 May 2012
Completed by:	Olena Kovalenko

Input

Explanation of Theats

#	Threats	Threats definition	Explanation of 100% reduction
1	Residential and commercial development (housing and urban areas)	Expansion of residential area boundaries	The boundaries of residential areas are not expanding; constructions are carried out only when necessary and keeping the PA conservation among the priorities
2	Residential and commercial development (tourism and recreation areas)	Primarily, construction of new recreation centers	New recreation centers are not being constructed, recreation areas development is done through renovation and modernization of existing facilities
3	Transportation and service corridors (roads and railroads)	Threat for amphibians, reptiles, and birds from motor vehicles; new roads are not constructed, but the existing dirt roads are paved	No new roads are constructed and the dirt roads are paved only when necessay; during the conversion of road category biocorridors for amphibians and reptiles should be placed where appropriate
4	Transportation and service corridors (utility and service lines)	Construction of drainage canals to withdraw water from residential areas; water flows from Svityaz village to Lake Svityaz. The impact is not yet clearly defined, so the precautionary principle is to be used	Infrastructure created for drainage is sustainably used
5	Biological resource use (gathering terrestrial plants)	Collection of mushrooms and berries above the limits	Harvesting of biological resources within the limits
6	Human intrusions and disturbance (recreational activities)	Camping, boating, trecking, rural tourism, etc. (over the period of 2 months, mid-June to mid-August)	Recreational pressure within the projected norms, restructuring the existing recreation network to avoid extensive pressure near lakes Svityaz and Pisochne
7	Natural system modifications (fire)	Burning of grass by local people	Prohibition and strict control of grass burning
8	Natural system modifications (other ecosystem modifications)	Alkalization of the eroded lands, abandonment of traditional agricultural activities	Introduction of traditional agricultural activities within the sustainable resource use vision
9	Invasive and other problematic species	Some species of birds, fish, and plants	Non-admission and control of invasive species, raising awareness regarding the issue
#	Pollution (garbage and solid waste)	Garbage left by tourists and locals, pollution of lakes and a threat for animals	Creation of optimal waste management infrastructure
#	Pollution (air-borne pollutants)	Heating and cooking using coal and wood in old stoves leads to aerosol pollution of the area; additional pollution is caused by motor vehicles	Development and use of alternative sources of energy
#	Pollution (household sewage and urban waste water)	There is no common sewage system at the park area, apart from Shatsk and "Gryada" recreation zone	Creation of centralized sewage infrastructure and treatment facilities sufficient for the existing needs

Threat Reduction Assessment (TRA)

Event: Workshop at Shatsky NNP
Date: 15 May 2012

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Appendix B: TRA Workshop - Polissya Nature Reserve

Threat Reduction Assessment (TRA) - INDEX

TRA Project Information

Site name:	Polissya NR
Site description:	Species, ecosystem and landscape complex of biodiversity
Assessment period:	Spring 1981 - spring 2012
Completed on:	8 June
Completed by:	Olena Kovalenko

Cell types

Input	
Calculation	
Product	

TRA Index Sheet

#	Threats	Criteria Rankings			Total Ranking	% Threat Reduced	Raw Score
		Area	Intensity	Urgency			
1	Biological resource use (gathering terrestrial plants)	3	1	3	7	-65	(4.55)
2	Natural system modifications (artificial plantations)	6	4	4	14	-20	(2.80)
3	Natural system modifications (fire and fire suppressio	5	6	6	17	-80	(13.60)
4	Natural system modifications (drainage)	4	5	5	14	30	4.20
5	Transportation and service corridors (roads and railro	1	3	1	5	15	0.75
6	Invasive and other problematic species (problematic n	2	2	2	6	-10	(0.60)
Total		21	21	21	63		(16.60)

TRA Index Formula

	TRA Index
Result	-26%

Threat Reduction Assessment (TRA) - INDEX

TRA Project Information

Site name:	Polissya NR
Site description:	Species, ecosystem and landscape complex of biodiversity
Assessment period:	Spring 1981 - spring 2012
Completed on:	8 June
Completed by:	Olena Kovalenko

Input

Explanation of Theats

#	Threats	Threats definition	Explanation of 100% reduction
1	Biological resource use (gathering terrestr	Harvesting berries as a compromise due to socioeconomic problems in the region	Biosphere reserve status (zoning), help from the government to develop the region and fight poverty and
2	Natural system modifications (artificial plan	Plantations of pine created in 1950-60s are currently contributing to increase of fire risk and threat to	Full reduction with the current protection regime is not possible; some reduction can be done through
3	Natural system modifications (fire and fire	This threat is complex; however, in the context of Polissya NR it means increasing frequency and	No one can fight this issue so far; reduction of fire risk would be possible through conduction of a set of fire
4	Natural system modifications (drainage)	Drainage network constructed in 1960s in the adjacent areas; from the beginning and until now it has a strong	Restoration of hydrological regime similar to the original one.
5	Transportation and service corridors (road	System of roads existing in the reserve consists of paved and dirt roads; it is not just a minor threat to	Reduction of the threat is possible, but dangerous, as the roads are essential for combating another threat -
6	Invasive and other problematic species (pr	Increasing share of pine and green mosses	Full reduction is not possible, however the reconstructive felling would reduce the impact of this

Threat Reduction Assessment (TRA) - INDEX

Event: Workshop at Polissya NR
Date: 8 June 2012

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