Master's Thesis

Does the ecosystem service discourse succeed in promoting nature conservation?

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The concept of ecosystem services (ES) has gained a foothold in, both, the scientific and political worlds. ES are the benefits people gain from nature and its diversity in all, and the concept has gained popularity especially when nature conservation is discussed. However, can such utilitarian approach conserve the biodiversity in its various forms? The aim of this study was to find out, how willing the students of the university of Jyväskylä will be to conserve or harvest a forest area, when it was described from either a utilitarian, ecological, or mixed perspective. The study was conducted as an internet survey, in which the participants answered on propositions over the management of three hypothetical forests described from a randomly selected perspective. In the end, there were not many differences in responses between the different perspectives and no clear pattern could be perceived when comparing them. The analyses suggested that such background factors as whether the participant owned forestland or felt strongly about the environmental politics of Finland might have impacted their decisions more strongly than the perspective of the arguments presented to them in the survey. The study highlights the importance of developing interdisciplinary studies to determine, what kind of argumentation should be used when promoting conservation actions. We are, after all, in a hurry to prevent the global biodiversity crisis and the optimal discourse is needed to advance in conservation efforts.

JYVÄSKYLÄN YLIOPISTO, Matemaattis-luonnontieteellinen tiedekunta
Bio- ja ympäristötieteiden laitos
Ekologia ja evoluutiobiologia

Sonia González López: Toimiiko ekosysteemipalvelukäsite luonnonsuojelun perusteluna?
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Ekosysteemipalvelut on otettu käsitteenä kiinteäksi osaksi poliittista ja tieteellistä keskustelua. Ekosysteemipalveluilla tarkoitetaan niitä hyötyjä, joita ihminen saa luonnosta ja ekosysteemeistä, ja käsite on kasvattanut suosiotaan erityisesti luonnonsuojelua koskevassa keskustelussa. On kuitenkin kyseenalaista, miten hyvin ekosysteemipalvelujen kaltainen utilitaristinen lähestymistapa onnistuu suojelemaan luonnon monimuotoisuutta. Tämän tutkimuksen tavoitteena oli selvittää, kuinka halukkaita Jyväskylän yliopiston opiskelijat olivat suojelemaan tai hyödyntämään metsäalueita, kun suojelua puoltavat argumentit esitettiin joko utilitaristisesta, ekologisesta tai näitä kahta yhdistelevästä näkökulmasta. Tutkimus toteutettiin internet-kyselyllä, jossa osallistujat vastasivat väittämiin hypoteettisten metsäalueiden suojelusta ja käytöstä, kun metsäalueet kuvailtiin heille satunnaisesti valitusta näkökulmasta. Annetut vastaukset eivät juurikaan poikenneet toisistaan käytetyn näkökulman perusteella, eikä havaituissa eroissa ollut selvää johdonmukaisuutta, Vastauksissa havaittuihin eroihin vaikuttivat ilmeisesti enemmän sellaiset taustamuuttuja kuten metsänomistus ja yleinen suhtautuminen luonnonsuojeluun. Vaikkei tutkimus kyennyt löytämään selviä eroja eri näkökulmien välillä, se toimii esimerkkinä siitä, miten monitieteellisiä lähestymistapoja voidaan soveltaa, kun halutaan löytää toimivia perusteluja luonnonsuojelun edistämiseksi. Toimivien argumenttien löytäminen on ensiarvoisen tärkeää, mikäli uhkaava biodiversiteetin heikkeneminen halutaan pysäyttää.

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TERMS AND ABBREVIATIONS

TERMS

Anthropocentrism	Philosophical viewpoint arguing that human beings are the central or most significant entities in the world.
Biocentrism	Ethical perspective holding that all life deserves moral consideration or has moral standing.
Ecosystem services	The contributions of ecosystems to human wellbeing.
Instrumental value	The value or worth of objects that provide a means to some desirable end.
Intrinsic value	Ethical value that an entity has in itself or for its own sake.
Utilitarianism	The doctrine that actions are right if they are useful or for the benefit of a majority.

ABBREVIATIONS

CBD	Convention on Biological Diversity
ES	ecosystem services
MA	Millennium Ecosystem Assessment

1 INTRODUCTION

The global loss of biodiversity, also titled as the sixth or the Holocene extinction event, is an increasing cause of concern among scientists and conservationists worldwide (e.g. Ripple et al. 2017). Such environmental problems as deforestation and loss of habitat, climate change, over-exploitation, and pollution and nutrient loading are mainly caused or induced by human activities and are the main reasons behind the loss of biodiversity (Millennium Ecosystem Assessment MA 2005a). Biological diversity or biodiversity is the variation between and within species (including taxonomic, trophic and genetic variations), and the variation of habitats and ecosystems (MA 2005a). The loss of biodiversity was famously introduced as an international issue in the United Nations Conference on Environment and Development (UNCED or Earth Summit) in Rio de Janeiro in 1992 (e.g. Cardinale et al. 2012). Over 25 years have passed after the historical summit, but the problems threatening biodiversity have not ceased to worsen (Ripple et al. 2017, Convention on Biological Diversity, CBD 2014). For instance, the global rate of deforestation is still alarming, and although it has somewhat declined (CBD, 2014), the rate of deforestation is still increasing in many tropical areas (Lambin & Meyfroidt 2011).

Although there are both local and global initiatives to conserve and restore Earth's biodiversity (e.g. Convention on Biological Diversity, CBD), the change of policies has not been fast enough for achieving the necessary goals for biodiversity (CBD, 2014). The anthropogenic loss of biodiversity has mostly been driven by the endeavour to improve human livelihoods, which has resulted in trade-offs at the expense of nature's integrity (e.g. Kareiva et al. 2007). Then again, the dependence of human wellbeing on natural ecosystems and biodiversity is also recognized and often highlighted by conservation scientists (e.g. Díaz et al. 2006). The juxtaposition of economic and ecological goals is a common trope in policies and public discussion, but there are only a few studies focusing on the question, how ecological

and economic goals are valued against each other. What are the winning arguments for promoting nature and biodiversity conservation?

This study compares two popular rhetorical ways of promoting nature conservation: ecological and utilitarian. These two types of rhetoric reflect different ethical views: the former asserts the intrinsic value of biodiversity and ecological systems and processes, while the latter emphasizes their utilitarian value to humans. The study takes a deeper look into the arguments for and the ethics behind nature conservation and the discussion around them, including the utilitarian values related to biodiversity, and how they can be used to promote nature conservation. The concept known as ecosystem services will also be examined and its role in nature conservation will be further explained. Since this study is concentrated on the Finnish boreal forest, the focus will be on the attitudes and values attached to nature in Finland.

1.1 The premises and ethics of conservation

Conservation is fundamentally a normative endeavour as its goal is to achieve the right and good for nature and for people (Van Houtan 2006). However, conservation scientists tend to focus more on the scientific and economic aspects of nature conservation and often disregard the philosophical dimensions as the ethics of conservation seem somewhat self-evident (Van Houtan 2006). Although the study of environmental ethics may feel unfamiliar to many ecologists, the knowledge of the terms and logic of environmental ethics is crucial for having constructive dialogue with those, who might not share the same morals or understanding of the issue (Van Houtan 2006). In addition, the environmental policies and guidelines are usually general, leaving the further ethical dilemmas for the practitioners to ponder (Minteer & Collins 2008), and some have expressed the need for practitioners, researchers and nature resource managers to learn to address ethical issues more proficiently (e.g. Batavia & Nelson 2016).

Mace (2014) analyses different premises that have worked as the basis and goals for conservation efforts and recognises four different phases in the history of

conservation biology: "Nature for itself" prioritizes wilderness without people, "nature despite people" focuses on threats humans cause to nature, "nature for people" focuses on management providing sustainable benefits for people, and "people and nature" recognises people as part of ecosystems and aims at developing sustainable interactions between human societies and nature. The two somewhat conflicting types of values (intrinsic and instrumental) have both been manifested within the field in turns and different premises are currently co-existing since this field of science is still relatively young (Mace 2014). Conservation biology as a science originates from the 1970s (Wiederholt et al. 2015) as does the field of environmental ethics (Minteer & Collins 2008). Therefore, it comes as no surprise that there is still an ongoing debate between the proponents of nature's instrumental value and those promoting nature's intrinsic value. This debate is quite heated, especially when we are in such dire need of solutions.

The "nature for itself" -type of premise emphasizes the protection of wild and pristine nature, which reflects and encapsulates the intrinsic value of nonhuman nature, in other words nature's own value regardless of its contribution to human welfare. Intrinsic value has a central role in ethical theory (Zimmerman 2001) and has also been a fundamental part of nature conservation. From the beginning of the field of science, the norms of conservation sciences were based strongly on the ecological characteristics of nature (e.g. biodiversity) and the notion that these characteristics had value of their own (Vucetich et al. 2014, Soulé 1985). However, intrinsic value is comprehended differently by different philosophers or – to put it more precisely - what *has* intrinsic value depends on the philosophical orientation of the thinker (e.g. Batavia & Nelson 2017). In nature conservation the two most essential schools of thought for intrinsic value are the Kantian (Immanuel Kant, 1724–1804) and the Moorean (G. E. Moore, 1873–1958) (Davidson 2013, Batavia & Nelson 2017). In a nutshell, Kantian deontology gives intrinsic value to objects or entities themselves, while Moorean consequentialism considers intrinsic value as something belonging not to any entity per se but to states of affairs, such as pleasure and overall goodness (Davidson 2013, Batavia & Nelson 2017). According to Kant, intrinsic value belongs to entities with reason (mainly human beings), but some

philosophers propose other properties such as sentience or life itself as the criterium in order extend intrinsic value outside the human realm (Davidson 2013, Batavia & Nelson 2017). In other words, an entity or object either has intrinsic value or intrinsic value is absent. In contrast, the Moorean intrinsic value is a continuum from negative to positive (neutral being in the middle and having no effect) and depends on whether a state of affairs adds to or detracts from the overall goodness in the world (Zinnerman 2001, Batavia & Nelson 2017). Consequentialism focuses on producing good and beneficial outcomes, a type of "means to an end" way of thought and is fundamentally utilitarian and perceived as anthropocentric (Davidson 2013, Batavia & Nelson 2017). Deontological (Kantian) ethics perceive bearers of intrinsic value as something with the right to be treated with respect (Davidson 2013). For example, a consequentialist would approve torturing one individual, if this saves many lives and has a smaller impact on the overall goodness, while a deontologist would argue that every individual must be treated with the same respect and is thus sacred (Davidson 2013). Environmental ethics tend to lean more towards a Kantian concept of intrinsic value, but the interpretation of ecological texts from a Moorean point of view is often also a possibility (Batavia & Nelson 2017). For example, Davidson (2013) argues that consequentialism is not inevitably anthropocentric as it can also take a biocentric perspective and consider intrinsic value belonging to nature's wellbeing.

The intrinsic value of nonhuman nature is a complex concept which is in the centre of a wide ethical discourse that goes way beyond the framework of this study (for a more comprehensive look on the matter, see e.g. Van Houtan 2006, Davidson 2013, Vucetich et al. 2014 and Batavia & Nelson 2017). The objective of the brief overview above is not to take a stand on the proper way to conceptualise intrinsic value, but to point out, how multifaceted the issue is and that there exists no current consensus within the field of conservation (e.g. Batavia & Nelson 2017). From this point on, it is enough to consider nature's intrinsic value as something that species, ecosystems and nature have as whole and that something with intrinsic value should be treated with respect (i.e. "nature for itself" type of thinking). However, there are other values that can also work as premises for conservation.

Intrinsic value is often linked to existence value. Some confuse them as meaning the same type of value (e.g. Pearson 2016), yet existence value is a utilitarian concept often used as an indicator or a proxy for intrinsic value (Balavia & Nelson 2017). Pascual et al. (2010) define existence value as "value related to the satisfaction that individuals derive from the mere knowledge that species and ecosystems continue to exist". It is a type of non-use value, the other types regarding the satisfaction that other people have access to nature's benefits now and will continue to do so in the future (Pascual et al. 2010). In contrast to intrinsic value, which an entity has regardless of its benefit to humans, existence and other non-use values are anthropocentric and utilitarian.

In the face of global environmental crisis, evidence of nature's importance to human wellbeing has been mounting from the 1990's onwards and since new conservation premises have emerged (Mace 2014). In addition to conserving nature for its own sake and protecting it from harm caused by humans the premise for conserving nature for people's sake was also recognised ("nature for people", Mace 2014). This utilitarian premise for conservation gives nature a clear instrumental value: "it is beneficial to us, thus we should protect it", and nature provably is beneficial for human wellbeing (e.g. Cardinale et al. 2012). This line of thinking generated the concept of ecosystem services, which will be discussed in more detail later in the next section.

The benefits that people gain from nature can be linked to the ecosystem functions, which in turn are expected to depend on biodiversity (Cardinale et al. 2012). Biodiversity is life on Earth, but at the same time it is the enabler of life (e.g. MA 2005a, MA 2005b). However, the complex dynamics between biodiversity and ecosystem functions are still not fully known (Cardinale et al. 2012). Yet, it has been shown that loss of biodiversity in the level of genes, species or functional groups reduces the ecosystem's effectivity in turning nutrient and energy intake into biomass (Cardinale et al. 2012). Higher species diversity has a positive effect on decomposing and recycling of litter and dead organisms, and it has been shown to stabilise resource capture and biomass production with time (Cardinale et al. 2011). The diversity of functional traits of organisms increase the productivity of an

ecosystem, while diversity loss across trophic levels can have negative effects on ecosystem functions (Cardinale et al. 2012). Thus, various aspects of biodiversity seem to be important in maintaining ecosystem functions, through which the effects of biodiversity loss resonate all the way to human wellbeing (MA 2005a, Cardinale et al. 2012). Ecosystem functions include processes that provide people with such benefits as clean air and water, pollination, erosion control and carbon intake (i.e. climate change mitigation), which are crucial for human wellbeing (e.g. MA 2005a, Cardinale et al. 2012).

The development of the different phases of conservation has been affected by the increase in scientific knowledge as well as by the political reality faced by conservation efforts. Although most conservationists still regard protecting nature for itself to be an important aspect on the field (Fisher & Brown 2014, Batavia & Nelson 2017), the proponents for the instrumental value of nature argue that the "nature for itself" approach has failed in its task to conserve biodiversity (Tallis & Lubchenco 2014). The instrumental value of nonhuman nature is considered as more practical, more appealing to a broader audience and more persuasive in policies and planning than its intrinsic value (Maguire & Justus 2008, Tallis & Lubchenco 2014, Batavia & Nelson 2017), while intrinsic value is seen as too vague and intangible (e.g. Maguire & Justus 2008). Proponents of the utilitarian premises claim that because a bearer of intrinsic value is "sacred" and untouchable, it hinders the trade-offs necessary in conservation impossible (Pearson 2016, Maguire & Justus 2008). To this Vucethic et al. (2014) argue that although something with intrinsic is considered "irreplaceable" and even though it is inappropriate to express its value with monetary means, intrinsic value is not infinite. Intrinsic value rules out basing decisions on simple cost-benefit analyses but it does not make trade-offs impossible (Vucethic et al. 2014). They note that if trade-offs are possible and sometimes even necessary with human lives, the same holds true with nonhuman nature with intrinsic value. This understanding of intrinsic value meaning total untouchability is a Kantian perception of the concept and shows incapability of acknowledging its full complexity (Vucethic et al. 2014, Balavia & Nelson 2017). Intrinsic value is a

complex and qualitative concept which is not easily quantified, but this does not make it inappropriately vague (Vucethic et al. 2014).

But why bother to promote nature's intrinsic value if it has not worked before? We are facing a biodiversity crisis, after all. In response to the human intrinsic value "not working" in promoting conservation, Balavia & Nelson (2017) comment this argument fails to appreciate the distinction between marketing and morality, as it diminishes the ethical concept to a mere rhetorical tool or a strategic campaign. As moral beings we thrive for the good and right, and because many conservationists still believe in the nonhuman intrinsic value (e.g. Cafaro & Primarck 2014, Balavia & Nelson 2017), it is something that should be kept alive in the future as well. It has also been empirically shown that the public believes that nature contains intrinsic value, too (Vucetich et al. 2014).

As demonstrated above, the ethics of nature conservation is no simple matter. Because human welfare has had a central role in conservation ethics as well (e.g. Minteer & Collins 2008), finding the right balance between social and ecological dimensions of sustainability has proven difficult. Various writers have called out for a stop to the ongoing dispute (e.g. Tallis & Lubchenco (2014), whose petition had 238 co-signatories). According to many, the debate over different viewpoints has escalated to a dispute that to some seem as delaying the conservation measures necessary for saving biodiversity, and that it is time to come up with a more inclusive way to conserve nature (Tallis & Lubchenco 2014, Pearson 2016). Mace (2014) marks the 2010's as the period of the conservation premise "nature and people", which can better recognise the dynamic relationships between people and nature.

The debate about conservation practices and discourses is epitomized by an argument surrounding a specific concept: ecosystem services. Ecosystem services is a concept that has been applied to and integrated into policies both internationally and regionally. However, what seemed as the perfect tool for promoting nature conservation at the time, is seen problematic by many.

1.2 What are ecosystem services?

Ecosystem services (ES) are defined by the Millennium Ecosystem Assessment (MA, 2005a) as "the benefits that people obtain from ecosystems". These benefits can be direct or indirect (Costanza et al. 1997) and include the species and processes that produce ecosystem goods and "sustain and fulfil human life" (Daily 1997). The ES can be produced by any types of ecosystems, regardless of their level of management or the level of human impact they have undergone (MA 2005). There are several ways to define and classify ES, but the one given by MA is perhaps the most famous one as it had a ground-breaking role in popularising the approach and establishing its role in policies (Gómez-Baggethun et al. 2010). This definition serves as ground work for the further adjustments of which there are some examples below. MA divides the ES into four categories: provisioning, regulating, cultural, and supporting services. *Provisioning services* are the products obtained from ecosystems, such as food, wood, fibres, and fuel (biological materials that can serve as sources of energy). *Regulating services* include ecosystem functions that regulate the quality of human's environment, including for example climate and water regulation (such as flood control), erosion control, water purification and waste treatment and pollination. *Cultural services* are spiritual, cognitive and recreational benefits people obtain from ecosystems, for example educational values, inspiration, aesthetic values, and recreation and ecotourism. And lastly, *supporting services*, which are the processes necessary in providing and sustaining the above services. These include soil formation, nutrient cycling, and primary production that are perhaps not directly beneficial to people themselves but are essential for the present life on Earth.

The aim of MA was to estimate how changes in ecosystems would affect human wellbeing, and to create a scientific base for conserving and utilising ecosystems sustainably (Kniivilä et al. 2011). MA's classification of ES was never meant to be stationary (Fisher et al. 2009), and the further modifications are under constant debate. There are few international attempts to create a practical tool for assessing and valuating ES. The Economics of Ecosystems and Biodiversity (TEEB) and the

Common International Classification of Ecosystem Services (CICES) are examples of such initiatives.

TEEB originates from the meeting of G8 + 5 environmental ministers in 2007 and is coordinated by the United Nation Environmental Programme (UNEP). Its aim is to "make nature visible" in the eyes of the policymakers and executives by helping to recognise the benefits provided by ecosystems and biodiversity and demonstrating their values in economic terms (TEEB, 2018). TEEB further refines the definition originally given by MA and divides the ES into provisioning, regulating, habitat or supporting, and cultural services. The categories are very alike with MA, but the supporting services are considered as habitats and genetic diversity or gene pool. There are national and regional TEEB studies, e.g. for Nordic Countries (Kettunen et al. 2012) and for Finland (Jäppinen & Heliölä 2015).

CICES works under the European Environment Agency (EEA), and provides quite a detailed, hierarchical tool for classifying ES. In CICES the ES fall into three categories (or sections): provisioning, regulating, and cultural services. In CICES the supporting services defined by MA are treated as part of the underlying structures, processes and functions that characterise ecosystems (Haines-Young & Potschin 2013). The categories are further divided into five levels from the broader "Section" (e.g. provisioning services) all the way down to the most defined "class type" (e.g. cerials). CICES has previously been used to classify the ES of the Finnish boreal forests (Saastamoinen et al. 2014). Because this study focuses on Finnish boreal forests, the ES concept of CICES and the study by Saastamoinen et al. (2014) was utilised when considering forest ES.

Ecosystem services are based on ecosystem functions: the interactions among species and with their environment. Studies have found a positive connection between biodiversity and the stability of a community and the ecosystem functions a community can maintain (Tilman et al. 2014) thus positive relationships between ecosystem services and biodiversity are also assumed. However, biodiversity and ES are both complex concepts (Mace 2012), and the understanding of their interrelations is still incomplete by some levels (Harrison et al. 2014, Duncan et al.

2015). Therefore, it is not exactly clear how, for instance, biodiversity loss will impact ES or if ecosystem management aiming to secure certain ES will also protect biodiversity.

The ES approach intends to be a tool for promoting nature and biodiversity conservation, which can connect the business world and economic cost-benefit analyses to conservation. For this, some regard the MA's classification system as too vague and generic (Boyd & Banzhaf 2007), because it makes the ES difficult to measure and valuate (e.g. Kniivilä et al. 2011). Especially the cultural services are problematic as they do have socio-economic importance, but a direct market-based value is often unable to encase their complete value (Chan et al. 2012). Although the ES concept was originally used mainly as an eye-opener for the crisis of biodiversity loss, for example practical land management, the interest in economic valuation of ES for more than illustrative purposes has been increasing (Gómez-Baggethum & Ruiz-Pérez 2011).

Most decisions about land-use are made with cost-benefit analyses that are usually based on economic values, so ES may be excluded from these decisions, if they are not given comparable values (Mace 2014). Many believe that economic valuation is a way to build a bridge between the business world and nature conservation using a mutual language (Gómez-Baggethum & Ruiz-Perez 2011). An economic value for ES is often something of interest, because it provides a concrete estimate which can be used when deciding on policies, penalties and incentives, and compensations (Danley & Widmark, 2016). Many argue that economic estimation helps to raise awareness of the importance of ES and thus serves as a powerful tool of communication (e.g. Costanza et al. 2014), while some regard the economic terms as the most effective way to convey the value of ecosystems to people outside the field of conservation (Salles 2011). However, because most ES are public goods without existing markets, the trade and compensation strategies must be defined by governments, which have the responsibility of guarding the environmental quality (Boyd & Banzhaf, 2007). Furthermore, if ES are included in cost-benefit analyses based on their monetary value, their definition must be fitted to the task. For example, Boyd & Banzhaf (2007) argue that only the final products or services, such

as clean water, should be considered as ES to avoid double-counting the intermediate processes, if ES are to be encompassed in accounting (or "green accounting", which tries to include environmental assets and costs).

As pointed out previously, the identification and valuation of ES can be used for bringing forth the concrete example of the costs or benefits of environmental impacts, when making decisions over nature conservation, land use, natural resource use, or compensation measures. For example, ES can be used to demonstrate that a forest might have greater monetary value when it is conserved and left to provide water regulating services than if it would have as timber (Guo et al. 2000). However, for example de Groot et al. (2010) point out that economic valuation will be able to capture only part of the total value of an ecosystem or service. Danley & Widmark (2016) note that a more comprehensive definition, such as applied in the MA, can be more useful when expressing nature's importance to human wellbeing for the public. It has been noted that the ES approach is meant to reinforce the rationale for nature conservation (Cardinale et al. 2012), and some argue that, because the "nature for itself" -type of reasoning has failed in protecting biodiversity, the ES approach will work better in achieving a boarder support for conservation (Tallis & Lubchenco 2014, Batavia & Nelson 2017).

1.3 Criticism and concerns towards the ecosystem service approach

Since its emergence, the ecosystem services approach has been criticized from a variety of viewpoints (Schröter et al. 2014). What most critics see problematic with the ES approach is the anthropocentric and fundamentally utilitarian perspective from which it views ecosystems and biodiversity (e.g. McCauley 2006). The general idea of ES, the benefits people gain from nature and biodiversity, may be seen to imply that nature has value only when it is useful to people, which in turn disregards nature's intrinsic value (McCauley 2006). Then again, Davidson (2013) points out that the ES paradigm does not cover nature's intrinsic value, but the approach is anthropocentric only if the intrinsic value of nature is completely denied. Furthermore, intrinsic value is not completely outside of economic

valuation – a feature in the ES paradigm facing a myriad of criticism – if it is considered from the perspective of deontological (Moorean) ethics (Davidson 2013). However, the economic valuation is often tied to people's willingness-to-pay (WTP) (e.g. Boyd & Banzhaf 2007): people should be willing to pay for either having or not losing a certain part of nature, and Balavia & Nelson (2017) note that the WTP does not capture the full value of an entity, just as humanitarian welfare paid to save people in poor conditions does not capture their value and it would be perverse to think it does. Furthermore, Fairhead et al. (2012) argue that the ES paradigm may promote an exploitative human-nature relationship, which results in bending nature to do our bidding, and so called "green grabbing". As nature is seen as a commodity more often, it moves from being a public good into the ownership of the rich and powerful, and thus the economic valuation of ES may further promote the uneven distribution of wealth (Matulis 2014).

Proponents of the approach argue that ES are meant to demonstrate the value of ecosystems and biodiversity, and to reconnect human society with nature (Schröter et al. 2014), and that the concept of ES is not even meant to replace biocentric arguments, but to work beside them, giving them some more leverage (Chan et al. 2012). Because the concept captures the importance of biodiversity to human wellbeing in a more comprehensible way, it is more persuasive in promoting conservation for the public, policymakers, and businesses than the moral or ecological arguments (Costanza et al. 2017).

Furthermore, the assumption that applying the ES approach will help safeguard biodiversity remains debatable (Carrasco 2014, Morelli & Møller 2015). The ES approach is, of course, used to emphasize the importance of biodiversity to human wellbeing (MA 2005a). However, Peterson et al. (2010) argue that commodification blurs the contribution and importance of biodiversity on delivering ES in the same way as the labour of human workers is obscured in the production process. In addition, McCauley (2006) argues that the use of ES-based arguments might divert attention away from protecting biodiversity. Not all nature is benevolent or beneficial for humans, and assuming otherwise is optimistic, even naïve (McCauley 2006). For example, pests and some predators are not seen as very beneficial for

humanity, but they are still part of biodiversity. If not straight nuisances, various parts of nature are neutral to us. Some species may go extinct and some habitats get destroyed without it affecting humans' lives in any way. Morelli & Møller (2015) point out that for example agricultural ES decline in areas where ES gained from forests increases. This brings out the question: are some ES more valuable or preferable over others? If policymakers are interested in forestry, they may more likely protect ES contributing to the industry and overlook the need to protect other ES with the same effort.

Rode et al. (2015a) bring forward the concept of 'motivation crowding' which suggests that extrinsic motivators, such as monetary incentives, can undermine intrinsic motivation. They analysed eighteen studies of which thirteen presented significant or suggestive results supporting motivation crowding but note that many of the reviewed studies could not provide statistically significant results. Rode et al. (2015b) ran a survey study in which the participants were more likely to favour a presented dam project with large environmental impacts if presented arguments based on monetary valuation of ecosystem services as compared with ecological values. Additionally, use of monetary incentives reduced the intrinsic motivation on nature conservation even more when the motivation was already negligible (Rode et al. 2015a&b). However, the benefits and disadvantages of the ES approach are theoretical, and there is not much empirical evidence to support neither way.

1.4 Nature conservation, ecosystem services and Finnish boreal forests

This study focuses on Finnish boreal forests; their conservation and the ecosystem services they provide. The Finnish forests are highly valued both economically and culturally. Forests have historically been an important cornerstone of the Finnish economy. The relationship between conservation and forest industry has always been contentious, as the most productive forest land would also maintain the highest biodiversity. Although it can be shown that there is more forest growing in Finland each year than has ever been measured before (Ministry of Agriculture and

Forestry 2015), the silvicultural forests are quite monotonous. The species richness of Finnish forests has decreased in an alarming rate due to habitat degradation and fragmentation (Rassi et al. 2010). More than one third of Finnish species depend primarily on forest habitats but only 9% of forests are strictly protected (Ministry of Agriculture and Forestry 2015). Moreover, the conservation is mainly focused on Northern parts of Finland where the biodiversity – and timber yield – is lower. The conservation percentage of the diverse and vulnerable southern forest types is too low to protect the national biodiversity (Kuuluvainen 2009, Hanski 2011).

Saastamoinen et al. (2014) have assessed the ecosystem services provided by boreal forests, which Finnish people actively use. The Finnish everyman's rights (or freedom to roam) give the citizen freedom to walk in nearly any forest land regardless of the owner and collect forest fruits, such as berries and mushrooms. These rights are widely used by Finnish people, which can work as a ground for a strong relationship with nature and especially forests. The boreal forests offer various ES in addition to wood and berries, e.g. the recreational values are quite high, and this has been recognised in the governmental level as well (e.g. Ministry of Agriculture and Forestry 2015).

Finland's National Forest Strategy 2025 has a goal to further advance the quality of the forest ES and the utilisation of them, for example by promoting ecotourism. However, the various types of ES provided by forests are partly conflicting as, for example, logging a forest decreases its recreational values, and the growing boom of bioeconomy might further intensify these conflicts between different services and interests. The bioeconomy in Finland is largely based on forests, which puts even increasing pressure on the forest ecosystems. Bioeconomy is seen as eco-friendly and green as it can replace for example fossil fuels and even plastic. However, at the same time Finland is promoting its forests as carbon-sinks. It is assumed that growing forests will bind the carbon released from the use of wood but if the focus is directed more on timber production in forest management this may decrease carbon storages and biodiversity compared with more diverse forest management (Triviño et al. 2016).

Because of the vulnerability of Finnish forest biodiversity and the growing pressure to harvest forests with increasing intensity, it is ever so important to come up with effective ways to promote nature conservation and ecologically sustainable forestry. The conflict between forest exploitation and forest conservation in Finland offers a case for examining how alternative arguments in favour of conservation perform against interests in utilizing forests for economic gain. As many are eager to put the ES approach into use, it begs to ask, is it the most effective way to protect the biodiversity of our forests?

Although the debate over the different approaches is heated, only few empirical studies have focused on solving this question, Rode et al. (2015b) being one of them. This study tries to contribute to filling this knowledge gap. Will we be able to reach the same benefit from the perspective of conservation effects when utilising a utilitarian approach as we would with more traditional, ecological arguments? Will decisions made based on ES yield different outcomes? This study will seek answers to the above questions and proposes the following hypotheses:

H1: Using the two methods (ES and traditional) will have a different outcome.

H2: Making decisions based on anthropocentric/utilitarian point of view will result in poorer outcomes for nature and biodiversity.

2 DATA AND METHODS

The effectiveness of different kinds of conservation arguments was studied by a choice experiment, in which participants made decisions over conserving or harvesting hypothetical forests that were described from a randomly selected perspective: ecological values, ecosystem services, or a combination of the two. The study was executed as an internet survey of the Finnish speaking students of the University of Jyväskylä. The questionnaire was created in Webropol 3.0 and sent to all the students via e-mail lists. The students were selected as the target audience, firstly because the survey could be easily sent to all of them, and secondly because

their major subject could work as an indicator of the participants' overall interests and serve as a potential background factor. There are studies suggesting different personality types tend to orientate towards different majors (e.g. Pike 2006, Mendolia & Walker 2014). Same kind of a distinguishing factor or factors would have been more difficult to construct with a wider audience, e.g. if the survey was shared via social media. In addition, there was a raffle at the end of the questionnaire to entice the students to participate.

2.1 Constructing the survey

The questionnaire consisted of five parts. In the first part the participants were asked for basic information: gender, university faculty, and the year they began their studies. Participants of the faculty of Mathematics and Science were further asked whether they studied biological and environmental sciences as their major subject. This was done based on the presumption that students of biological and environmental sciences have more prior knowledge over the topic of the survey and may also have more favourable attitude towards nature conservation than students of other subjects.

Parts 2–4 of the questionnaire consisted of three hypothetical cases that each described a distinct forest area and presented the participant with questions about the management of the area. There were three versions of each case, describing the forest from a utilitarian (ecosystem services), ecological, and mixed perspective (a combination of the previous two). The cases are described in more detail below (sections 2.2.1–2.2.3). The three cases in one questionnaire were all described from the same perspective. The questions were the same in each questionnaire, in other words, only the descriptions of the cases varied between each version. Each participant was randomly forwarded to one of the three versions of the questionnaire. The randomization was done by sending the participants a link leading into a customized allocation tool, which randomly divided the visitors and forwarded them in one of the questionnaires.

In each of the cases the participants were given the role of a public officer in charge of the forest areas owned by the public sector. This role was chosen to direct the participants' focus to public good instead of personal gain. Each forest was described by giving brief information about its ecology, for example, what forest type it represented, how big the area was, how long it had been without management, and what was the estimated profit that could be gained if the forest was cut. Then, depending on the perspective of the questionnaire, the key species and/or ecosystem services of the forest were described as well as the consequences in terms of biodiversity and/or ecosystem services if the forest was either cut or conserved.

After reading the case description participants had to react to the given propositions regarding the use of the forest area, for example it should be harvested or protected (the propositions for each case are described below). The participants gave their answers on a Likert scale from 1 to 6, where 1 = "I disagree completely" and 6 = "I agree completely". Each option between 1 and 6 were described verbally in a similar manner.

The final part of the questionnaire contained questions regarding background information, and opinions about nature conservation and industrial forestry. Participants were asked, for example, if they or some of their family members owned forest land, and how they saw the role of industrial forestry and nature conservation in Finnish politics and as part of the country's future.

A set of literature was consulted when planning the survey, especially Vehkalahti (2008) proved to be helpful when designing the questions and the overall structure of the survey. The three decision-making cases were constructed with much care with the aim of ensuring that they were realistic but simple enough for those without much background knowledge to be able to understand all the concepts. Then again, the overall assumed attention span of a participant limited the amount of text that was considered appropriate for each case description. The descriptions had to be easy to read and not too long, but at the same time contain as much information as possible and reflect each of the given viewpoint with the same

intensity. The number of cases was selected so that each case would differentiate enough from the rest but without making the questionnaire too long and text-heavy. Three cases were considered as the optimum for this study, as they provided enough variation between the forests and propositions without making the questionnaire too long. The order of the cases was also thought through. Case 1 described quite a typical Finnish pine forest and it was considered as the best warm-up case. Although rather text-heavy, Case 1 contained only few propositions, which presented the participant with the given role for the first time. Case 2 was similar to the Case 1 but presented more options for the future of the forest. Case 3, which describes a forest area with a wetland and thus differed from the other two, was left to be the last so that the participants would stay more alert even at the end of the questionnaire.

The structure of each description was identical between versions and followed the same kind of pattern in each case. First paragraph gave an overview of the focal area, and the following paragraphs described the values linked to each feature of the area in question, including economic profit. The last paragraphs described the values that would be gained or lost, depending on the choices made. Each description aimed to emphasize the trade-off between economic profits and the benefits from protecting the area (benefits meaning ecosystem services and/or traditional conservation values, depending on the version). Only the sales revenues were given the estimate, while the ES were left without monetary value.

Finally, the survey was tested on six persons who were all students or newly graduated to see how long answering would take on average before launching. The answer times varied between 8–12 minutes.

2.2 Description of the cases

The three cases in the questionnaire were planned to realistically represent different forest areas with different kinds of benefits and pressures to fell the trees. For this, Hotanen et al. (2013) provided insight of the Finnish forest ecology and structure for constructing the cases. An online calculator provided by Metsälehti was used to

give estimations for the potential value of the forest in each case. The description of each case had similar structure, and the different versions of each case differed only on the given arguments in favour of conserving the forest. Because the forests that have not been altered by human activities are very scarce in Finland (Kuuluvainen, 2002), the forests chosen for these cases have all undergone some level of treatments at least at some point in their history but not in the recent decades. The motivation for choosing such forests also rose from the National Forest Strategy 2025 (Ministry of Agriculture and Forestry, 2015), which aims to take the Finnish forests into a more active use, for example by managing forests that have been left neglected for too long when considering the silvicultural aspects. The amount of such unattended forest areas is quite high and the pressure to utilise them is very likely to increase. Then again, the longer a forest area is unattended, the closer it gets to an old-growth state rare that is in Finland and is able to sustain a more diverse community when compared to an actively manipulated silvicultural forest. The debate whether to value economic or ecological aspects more when regarding unattended silvicultural forests will surely become even more heated in the future.

Different types of ecosystem services and habitats were included into the survey to see if they differed on the impact they had on the participants' responses. Each case introduced a different set of ES and/or ecological aspects, and each participant could act differently upon them. All categories of ES (provisioning, regulating and cultural) were included in different combinations. To make the different versions uniform with each other, the values of each forest were linked to the same aspects of the forest's ecology. For example, a wetland is important for various species of birds (ecological perspective) and is beneficial to birdwatchers (utilitarian perspective). In addition, the cases were described using somewhat different language and rhetoric, because different arguments are often described using certain tropes to make a bigger impact. For example, when the utilitarian version emphasised the recreational values (landscape, aesthetics), the ecological aspects were also presented using similarly appealing language when describing the diverse community. Although the manner of representing the arguments varied

between the cases, the language was made as consistent as possible between the different versions.

Each case is described in more detail below, and the complete case descriptions can be read in Finnish in appendix 1.

2.2.1 Case 1: An old industrial dry taiga forest

The forest in Case 1 was a minor (3 ha), dry taiga forest area that had remained undisturbed by silvicultural activities for the last 100 years. The ecologic perspective emphasized the amount of deadwood in the forest and its importance to various vulnerable species that depend on the diverse age structure of old forests. Though no species were specified in the description, the rareness of such forests and their importance to the biodiversity was highlighted. The utilitarian description emphasized the importance of deadwood as a carbon storage, which is crucial when fighting climate change. Because of the old pine trees, the forest was accessible and was popular among citizens who could enjoy the plentiful annual yield of forest berries and mushrooms. These kinds of pine dominated forests are often regarded as part of the Finnish national landscape. The mixed perspective regarded the deadwoods' importance to both, biodiversity and climate change mitigation. The diverse forest landscape and plentiful yield was also mentioned.

If the forest would be logged (regeneration felling, where all expect retention trees would be removed), there would be a profit of approx. 100 000 euros and in addition some extra profit if the stumps and other logging residue were collected for energy production. The economic profit was roughly estimated using a calculator provided by Metsälehti. After logging, the forest would be regenerated. As described from the ecological perspective, the logging would annihilate the valuable community that has been developing for a century. The removal of stumps and other logging residue would be especially harmful for the organic matter and complex networks in the soil. The vulnerable species would be lost and replaced by more common species seen in silvicultural forests. If the forest would be left as it were, it would continue its natural development, which would probably decrease its species richness but give way for rare specialist species present only in old forests. The

utilitarian description highlighted, how the logging would remove the stored carbon from the forest and how it would take at least 80 years for the renewed forest to become a carbon storage equivalent to the current level. The annual crop of berries and mushrooms would also be lost, and the recovery of both the berry and mushroom yields and the landscape values would take decades. The removal of logging residues would damage the landscape even further and might even delay its recovery. Furthermore, utilising the logging residues in energy production would discharge the carbon back into the atmosphere instead of storing it in the soil. The mixed perspective was a combination of the above.

The propositions for the Case 1 were the following:

1. The forest should be logged, and the stumps and other logging residue should be collected for energy production.
2. The forest should be logged, but the stumps and other logging residue should be left in the forest.
3. The forest should be conserved as it is.

2.2.2 Case 2: Oxalis-Myrtillus-Ledum type spruce forest

The forest in Case 2 grew in a more nutritious soil and covered an area of 20 hectares. The pressure for both, conservation and logging, would be particularly great in such a forest as the timber yield would be high, but the species richness would also be quite high or at least the forest would contain species that are somewhat uncommon in Finland. Because the area was quite large, the hypothetical loggings were planned to take place gradually, in patches of 1–2 hectares every 10 years or so. The forest area was described to already be somewhat patchy because of past loggings. In addition to gradually logging the area, some of the patches could be used to produce pulpwood by decreasing the rotation period.

In the ecological description, the emphasis was on the species richness. Some example bird and plant species, especially flora that are indicators of nutritious soil, were specified using both their Finnish and scientific names. Thus, the ecology-ethical argument for conservation was based purely on the importance the habitat

had for biodiversity. The utilitarian version in then again emphasized solely the forest's importance as a carbon storage. The aim of this approach was to lessen the personal connections one would have when considering e.g. cultural values, such as landscape and recreation possibilities, and focus on climate change mitigation. Carbon storages and climate change may often feel very abstract, but they are still often used when discussing the conservation or usage of forests. Thus, the aim for Case 2 was for it to perhaps appeal less in one's personal values and more on their rationality. Of course, the ecological-ethical aspects might be initially personal to most, and because of this its description was made as technical as possible. The mixed version was, again, a combination of the latter two.

The profit from the logging would be approx. 18000–36000 euros for each patch (which would be felled in 10-year periods). Starting logging in the area would cause loss of habitat and species in the ecological version of the description. Especially the shortened rotation period could prove to be even more harmful for the vulnerable species, which would be replaced with more common species. From the utilitarian perspective, the forest would be lost as a carbon storage – especially if the wood was used to produce such short-living material as e.g. paper, from which the carbon would probably return to the atmosphere relatively quickly. The renewed forest would function as a carbon sink, but it would take decades for it to store as much carbon as it had in its current state. The carbon cycle would be especially short, if pulpwood would be cultivated there.

The propositions for the Case 2 were following:

1. Harvesting should take place on the whole forest area.
2. Pulpwood should be cultivated in some of the areas (i.e. the rotation period should be shortened).
3. Some of the area should be harvested, but at least half of it should be conserved.
4. Some of the area should be conserved, but at least half of it should be left for harvesting.
5. The rotation period should not be shortened.

6. The area should be protected in its totality.

2.2.3 Case 3: Wetland

Case 3 described a silvicultural area in which a wetland had naturally evolved on the forest edge. In this case, there were plans to drain the wetland to create more land for cultivating forest. Draining the wetland would also possibly stabilize the conditions on the forest edge, improving tree growth. In Finland peatland and other semiaquatic habitats have been intensively drained in the past to produce timber.

The ecologic version described the diverse habitat a wetland provides and emphasized its importance to different species of which some were specified with, both Finnish and scientific names. The language used was intentionally somewhat colourful (e.g. onomatopoetic verbs describing the invertebrates of the wetland). The wetland's importance for some ecological processes was also described shortly. Draining the wetland would of course annihilate the current community which would be replaced by the same biota as in the surrounding forests. The utilitarian version emphasized the recreational value of the variation to the landscape that is brought by the wetland in the middle of silvicultural forests. The bird species of the area attract birdwatchers. In addition, the wetland produced cranberries and cloudberries. The wetland also provides regulating services by protecting the close-by water systems by adsorbing some of the nutrient runoffs coming from the forest cultivations. Draining the wetland would make the landscape more homogenous as well as destroy the wild berry crop and could also increase the runoffs causing problems downstream.

The propositions for the Case 3 were the following:

1. The wetland should be drained, and the area should be used for wood production.
2. The wetland should be protected.
3. The treatments on the surrounding areas should also be limited to further protect the wetland ecosystem and biodiversity.

4. The wetland should be protected but the silviculture of the surrounding areas should not be limited.
5. The whole area should be conserved so that silvicultural activities are prohibited completely.

2.3 Analyses

To see whether the responses to each proposition differed from each other between the three questionnaires, the questionnaires were compared pairwise with Student's T-test. Although the data was not normally distributed, the large sample size allowed for the usage of the T-test. It is debatable whether it is reasonable to count averages of answers given on a discrete and ordinal Likert scale, however, it is common. Because whichever of the compared groups could have greater values on average, two-way T-test was used.

To further analyse, whether individual responses differed between the three perspectives, a tree-based item response analysis (IRTree) was conducted of the responses to the most extreme propositions for conserving the forest areas: "The forest should be conserved as it is" in Case 1, "The area should be protected in its totality" in Case 2, and "The whole area should be conserved so that silvicultural activities are prohibited completely" for Case 3. The model can be used to estimate, whether there are differences in the probability that a participant agrees with the proposition to conserve the forest. The IRTree analysis does not assume normal distribution of the data and as such was useful in verifying the results as the fulfilment of the conditions for the T-test was uncertain. The IRTree model is based on general linear mixed model (GLMM) and has been developed from the Item response theory (IRT) previously used by psychologists and social scientists (López-Sepulcre et al. 2013). The method was originally developed to analyse questionnaires where responses were given as multiple-choice answers. Accordingly, the IRTree models can analyse multivariate responses by dividing the decision process into various binary responses which result in the final response (López-Sepulcre et al. 2013). In this study, the IRTree model was used to analyse the

responses given to the propositions promoting the conservation scenario in each case. To simplify the model, the extreme responses ("I agree/disagree completely") were grouped together with the second strongest option ("I mostly agree/disagree"). This was done based on the assumption that people tend to choose moderate options, even when they feel strongly about the issue in question (Vehkalahti 2008). Figure 1 shows the structure of the decision tree. Each "step" the respondent takes in the response tree is coded in binary. The first node in the tree is the proposition or question. For example, if the respondent agrees with the conservation proposition, the choice is coded as 1 as the respondent figuratively moves to the next node (Node 3 in Figure 1), where again, they either move towards deeper agreement for the conservation (1) or just a moderate agreement (0). The coding for each response is shown in Table 1. The probability for the respondent to give a specific response can be calculated from the coefficient estimates produced by the model. The model was constructed with the binary response as the dependent variable, the node and the perspective of the questionnaire as fixed independent variables, and participant as a random variable.

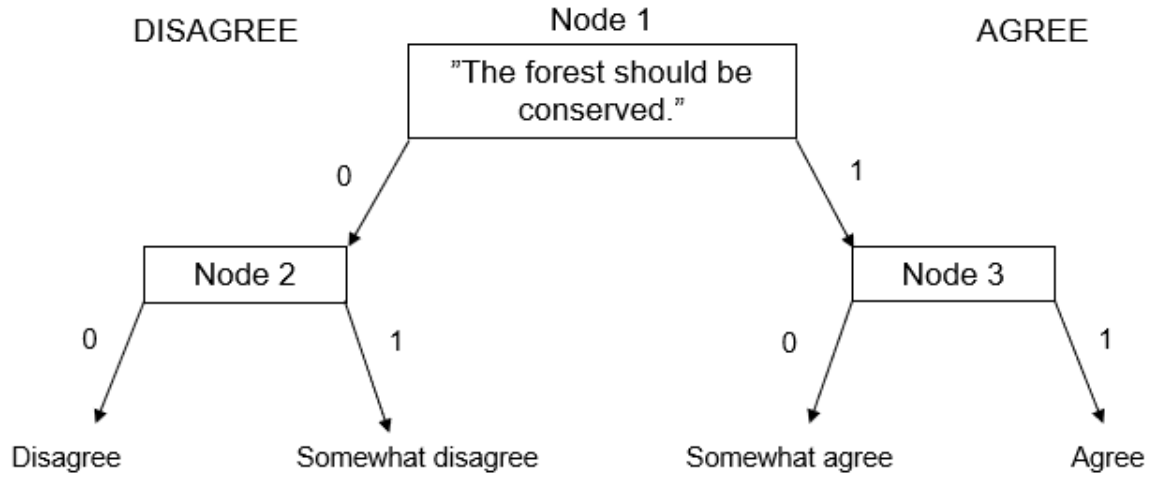


Figure 1. Item response tree (IRTree) model for a multivariate response regarding the agreement with a proposition (e.g. "The forest should be conserved"). The response is coded in binary first corresponding to agreement or disagreement and then to the strength of the opinion.

Table 1. The coding for each response in the IRTree model.

	Node 1	Node 2	Node 3
Disagree	0	0	NA
Somewhat disagree	0	1	NA
Somewhat agree	1	NA	0
Agree	1	NA	1

To examine whether the different perspectives affected the overall responses of the respondents in general, a sum variable was created. The variable represented the average "willingness to conserve" for each participant and was defined as the mean value of the responses to the most extreme propositions for the forest management scenarios. First, the responses considering propositions for harvesting the forests in each case, were reversed so that the greater the value (in range from 1–6), the more favourable it would be for the conservation of each site. Then the mean of the responses to the most extreme propositions ("The forest should be conserved" or "The forest should be harvested") was calculated. There were some propositions for intermediate actions (e.g. "Half of the area should be conserved"), which could not be reasonably scaled with the extreme propositions and were thus left out of the average willingness to conserve. If there were two propositions for either conserving or harvesting the forest which had a same kind of an impact, both of their responses were included in the calculation of the mean. Differences in the sum variable between the three versions of the questionnaire were also tested with Student's T test.

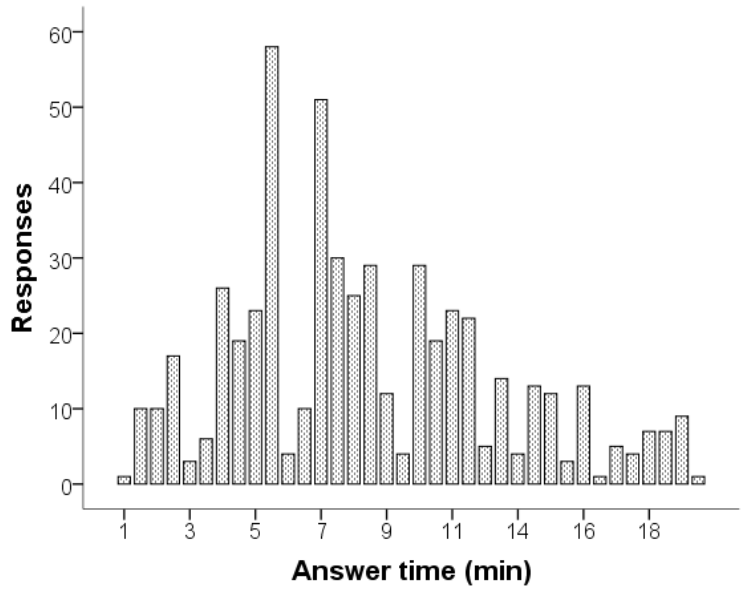
Furthermore, whether different background variables had an effect on the responses to individual propositions or the willingness to conserve was analysed using Student's T test similarly to the previous analyses. The background variables that were analysed were whether the participant a) was majoring in environmental

science, and b) owned forestland. Because over half of the participants were forest owners or had one in the family, this variable stood out as an interesting grouping factor. In addition, it is possible that forest owners would be more likely to see the forests as assets. The two groups (forest owners and non-forest owners) were similar in size, which made the comparison reasonable. The students of environmental sciences were also expected to differ from the others, so they and the other students were examined both together and separately. However, because of the smaller sample size of environmental students, the analyses between the two groups within each perspective and between the perspectives within the environmental students were done using the nonparametric Mann-Whitney's U-test instead of Student's T. The responses were first analysed between the groups regardless of the perspective and then within each perspective to see, if the differences between the groups were consistent. The possible differences between the perspectives within each group was also analysed to examine, whether some perspective had a different effect on the responses within each group. The "willingness to conserve" for was tested similarly than the responses.

The open-ended responses given at the end of each case and questionnaire were used as background material to further interpret the results of the qualitative analyses, but also to gather information on how to further develop the survey method for future studies. The responses were processed manually to find repeating themes and topics. Because the level of understanding of ecological concepts varied between the respondents, some of the concepts were referred somewhat vaguely, and only the clearest indications to, for example biodiversity and species richness, were counted to avoid false interpretations. Further discourse analysis was not relevant for the means of this study, and thus the attitudes or overtones of the responses were not analysed further.

Before testing, some cropping had to be done for the data to remove insufficient responses or responses made in too much haste. Because of the possibility to take part to a raffle at the end of the questionnaire, some participants might have filled it hastily. Such a text-heavy questionnaire could not be answered carefully in just a couple of minutes, which is why a lower limit for the plausible answer times was

necessary. Figure 1 shows the distribution of answer times (the answers made in more than 30 minutes have been left out of the graph for better visualization). According to Hahn et al. (2006) the average reading speed in Finnish is 1214 (SD 142) characters per minute. Because the questionnaires included 6887 characters on average in case descriptions, questions and propositions (not including the cover letter or options), the average answer time should have been around 5–6 minutes, without even considering the time spent thinking the answers. In the end, the average answering time was 13.91 minutes, but there were some outliers as ten participants took over an hour to give their answer, and out of these one spent 553 minutes with the survey open. Figure 2 shows the distribution of answer times without the outliers. Approximately 50 % gave their answers in less than 9 minutes, and 75 % in less than 13 minutes. It was clearly necessary to limit the minimum response time. Various limits (no time limit and limitations for ≥ 4, ≥ 5, and ≥ 6 minutes) were explored and compared with each other. In the end, 4 minutes was a reasonable lower limit for the response times. Because the mode for the answer times was 6, the lower limit of 4 minutes seemed plausible.



2. The distribution of the survey completion times; limited to maximum 20 minutes for better visualisation.

3 RESULTS

Over all, the survey gathered 596 responses, approx. 200 for each version (utilitarian, ecological and mixed), after five of the responses were deleted as they were insufficient (none or only a couple of the questions were answered). Out of the 596 responses, 47 were made in less than 4 minutes. In the end the studied sample consisted of 549 responses distributed somewhat evenly into the three viewpoints in the study. The utilitarian, ecological and mixed versions each had 186, 184 and 179 responses respectively (Figure 3).

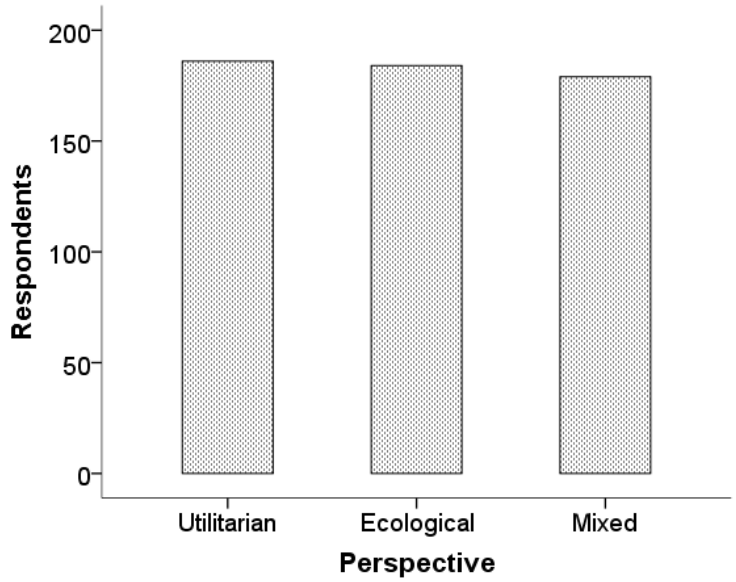


Figure 3. The number of participants for each version of the questionnaire: utilitarian, ecological and mixed, without the participants completing the survey in less than 4 minutes.

3.1 Differences between the perspectives

There were not many statistically significant differences between the responses when comparing the three perspectives with each other (Table 2). However, there were significant differences in Case 1, which were perhaps the most surprising as they were contrary to the hypothesis (H2). When compared to the utilitarian

version, the participants answering to the ecological version were a) more willing to start harvests in the forest if the stumps and other logging residue would be left on the site ($p < 0.000$, $df = 365$) (Figure 4a), and b) less eager to conserve the forest as it was ($p = 0.03$, $df = 367$) (Figures 4b). Willingness to start harvesting the area if the logging residues were left on the site was also significantly higher when comparing the ecological version to the mixed version ($p < 0.000$, $df = 358$). Although the average response to the proposed conservation of the forest in the ecological version was quite positive (4.46/6 on average, where 6 means complete agreement on the proposition to conserve the forest as a whole), it was still significantly lower than for the utilitarian version ($p = 0.030$; $df = 367$, mean value = 4.80). The responses to the Case 1 proposition where both the timber and logging residues would be harvested did not differ significantly between the perspectives, as did not the responses given to the utilitarian and mixed version of the questionnaire. However, in Case 2 the proposition to shorten the forest's rotation period for growing pulpwood on some of the plots, which was considered unfavourable for conservation, was favoured significantly more from the utilitarian than the ecological perspective ($p = 0.021$, $df = 366$). The average willingness to conserve did not differ significantly between the perspectives.

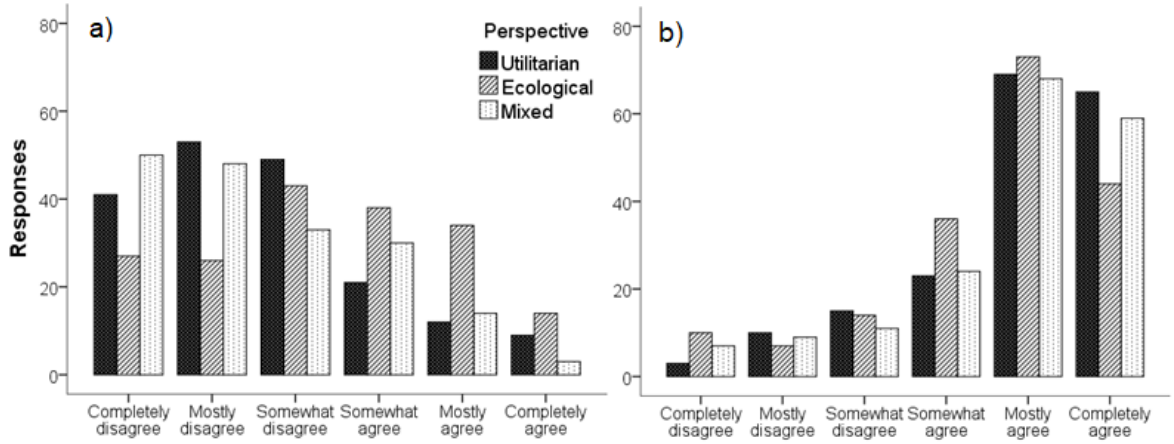


Figure 4. The responses to the propositions a) "The forest should be logged, but the stumps and other logging residue should be left in the forest", and b) "The forest should be conserved as it is" in Case 1 for each perspective: utilitarian (dark), ecological (striped), and combination of the two or mixed (dotted).

Table 2. The pairwise comparisons of responses to the propositions between different versions of the questionnaire for all the respondents (answer time ≥ 4 min.) with Student's T test.

Utilitarian and Ecological				
	Mean, Utilitarian	Mean, Ecological	p-value	df
Case 1: The forest should be logged, and the stumps and other logging residue should be collected for energy production.	2.14	2.05	0.48	366
Case 1: The forest should be logged, but the stumps and other logging residue should be left in the forest.	2.66	3.37	**< 0.001**	365
Case 1: The forest should be conserved as it is.	4.84	4.56	**0.04**	367
Case 2: Harvesting should take place on the whole forest area.	2.41	2.18	0.13	367
Case 2: Pulpwood should be cultivated in some of the areas (i.e. the rotation period should be shortened).	3.29	2.97	**0.02**	366
Case 2: Some of the area should be harvested, but at least half of it should be conserved.	3.73	3.95	0.12	367
Case 2: Some of the area should be conserved, but at least half of it should be left for harvesting.	3.25	3.41	0.22	367
Case 2: The rotation period should not be shortened.	3.98	4.10	0.39	366
Case 2: The area should be protected in its totality.	3.26	3.24	0.92	366
Case 3: The wetland should be drained, and the area should be used for wood production.	1.82	1.72	0.32	366
Case 3: The wetland should be protected.	4.78	4.83	0.70	367
Case 3: The treatments on the surrounding areas should also be limited to further protect the wetland ecosystem and biodiversity.	4.13	4.13	0.98	366
Case 3: The wetland should be protected but the silviculture of the surrounding areas should not be limited.	3.46	3.44	0.83	364
Case 3: The whole area should be conserved so that silvicultural activities are prohibited completely.	3.01	2.76	0.09	366

Willingness to conserve	4.54	4.51	0.69	368

Utilitarian and mixed

	Mean, Utilitarian	Mean, Mixed	p-value	df
Case 1: The forest should be logged, and the stumps and other logging residue should be collected for energy production.	2.14	2.02	0.36	362
Case 1: The forest should be logged, but the stumps and other logging residue should be left in the forest.	2.66	2.54	0.42	361
Case 1: The forest should be conserved as it is.	4.84	4.76	0.58	361
Case 2: Harvesting should take place on the whole forest area.	2.41	2.31	0.54	362
Case 2: Pulpwood should be cultivated in some of the areas (i.e. the rotation period should be shortened).	3.29	3.13	0.27	362
Case 2: Some of the area should be harvested, but at least half of it should be conserved.	3.73	3.84	0.43	361
Case 2: Some of the area should be conserved, but at least half of it should be left for harvesting.	3.25	3.28	0.80	361
Case 2: The rotation period should not be shortened.	3.98	3.98	0.96	360
Case 2: The area should be protected in its totality.	3.26	3.27	0.91	361
Case 3: The wetland should be drained, and the area should be used for wood production.	1.82	1.89	0.57	362
Case 3: The wetland should be protected.	4.78	4.87	0.49	363
Case 3: The treatments on the surrounding areas should also be limited to further protect the wetland ecosystem and biodiversity.	4.13	4.12	0.90	363
Case 3: The wetland should be protected but the silviculture of the surrounding areas should not be limited.	3.46	3.50	0.76	360
Case 3: The whole area should be conserved so that silvicultural activities are prohibited completely.	3.01	2.93	0.62	362
Willingness to conserve	4.54	4.57	0.79	363

Ecological and mixed

	Mean, Ecological	Mean, Mixed	p-value	df
Case 1: The forest should be logged, and the stumps and other logging residue should be collected for energy production.	2.05	2.02	0.83	358
Case 1: The forest should be logged, but the stumps and other logging residue should be left in the forest.	3.37	2.54	**< 0.001**	358
Case 1: The forest should be conserved as it is.	4.56	4.76	0.14	360
Case 2: Harvesting should take place on the whole forest area.	2.18	2.31	0.40	361
Case 2: Pulpwood should be cultivated in some of the areas (i.e. the rotation period should be shortened).	2.97	3.13	0.25	360
Case 2: Some of the area should be harvested, but at least half of it should be conserved.	3.95	3.84	0.44	360
Case 2: Some of the area should be conserved, but at least half of it should be left for harvesting.	3.41	3.28	0.33	360
Case 2: The rotation period should not be shortened.	4.10	3.98	0.39	358
Case 2: The area should be protected in its totality.	3.24	3.27	0.83	361
Case 3: The wetland should be drained, and the area should be used for wood production.	1.72	1.89	0.14	360
Case 3: The wetland should be protected.	4.83	4.87	0.79	360
Case 3: The treatments on the surrounding areas should also be limited to further protect the wetland ecosystem and biodiversity.	4.13	4.12	0.92	359
Case 3: The wetland should be protected but the silviculture of the surrounding areas should not be limited.	3.44	3.50	0.63	360
Case 3: The whole area should be conserved so that silvicultural activities are prohibited completely.	2.76	2.93	0.24	360
Willingness to conserve	4.51	4.57	0.52	361

The IRTree model further supports the above results (Table 3). The only difference between the ecological perspective and the other two was in the proposition to conserve the forest in Case 1, where the utilitarian version differed significantly from the ecological one ($p = 0.048$). The participants were more likely to "agree" with the proposition from the utilitarian than the ecological perspective (based on model estimates, probabilities to agree were 98 % and 64 % from the utilitarian and ecological perspective, respectively).

Table 3. The results of the IRTree model predicting the responses of participants to propositions to conserve a forest area based on the version of the questionnaire (ecological, utilitarian, or mixed). The ecological version was coded as the intercept.

		Estimate	Std. Error	z value	Pr(>|z|)
CASE 1					
	Node 1	1.46	0.16	9.37	< 0.001
	Node 2	-0.32	0.24	-1.34	0,18
	Node 3	1.34	0.16	8.31	< 0.001
	Mixed	0.26	0.19	1.34	0,18
	Utilitarian	0.38	0.19	1.98	**0,05**
CASE 2					
	Node 1	-0.29	0.12	-2.31	0.02
	Node 2	-0.53	0.16	-3.40	0.001
	Node 3	0.30	0.19	1.64	0.10
	Mixed	0.01	0.15	0.08	0.94
	Utilitarian	0.02	0.15	0.15	0.88
CASE 3					
	Node 1	-0.97	0.13	-7.28	< 0.001
	Node 2	-0.71	0.14	-4.97	< 0.001
	Node 3	-0.30	0.18	-1.63	0.10
	Mixed	0.16	0.16	1.02	0.31
	Utilitarian	0.30	0.16	1.89	0.06

3.2 Background variables

Although the different perspectives did not affect the responses as expected, some other factors were associated with differences between the responses. The two grouping variables having most significant differences between the groups were the students of biological and environmental sciences ("Do you study environmental sciences as your major?") and the ownership of forest land ("Do you or someone in your family own forest land?"). There were 79 participants with environmental sciences as their major, and 301 (55 %) participants who owned forest land or had a family member with forest property.

The responses given by the environmental students were overall more favourable for nature conservation than those given by other students (App. 2, Table A1). Their willingness to conserve was significantly higher when compared to other students when examining all the responses ($p < 0.001$, $df = 547$) (Figure 6) and within each perspective ($p = 0.003$, $U = 1217$; $p = 0.008$, $U = 1492$; and $p = 0.002$, $U = 1276$ for the utilitarian, ecological and mixed perspectives respectively) (App. 2, Table A2). There were some differences within the environmental students between the perspectives (App. 2, Table A3). Just as when comparing all the respondents, the environmental students responding from the ecological perspective were significantly more willing to start logging in Case 1 if the logging residues were not collected than from a) the utilitarian ($p = 0.03$, $U = 221.5$), and b) mixed ($p = 0.03$, $U = 250$) perspectives. However, in Case 2 the environmental students responding from the utilitarian perspective were significantly more willing to shorten the rotation period to grow pulpwood than from the ecological perspective ($p = 0.03$, $U = 210.5$). The differences within the other students between the perspectives were the same as for the whole population (App. 2, Table A4). The willingness to conserve did not differ significantly between the perspectives within neither of the two groups.

The overall willingness to conserve forests was also significantly higher in non-forest owners than forest owners ($p = 0.001$, $df = 533$) (Figure 7). When examining all the responses regardless of the perspective, the two groups (forest owners and

non-forest owners) differed significantly from each other in all the propositions for Case 1 and 3, and for the proposition to conserve the whole forest area in Case 2, as the forest owners agreed more with the logging propositions and less with the conservation propositions than the non-forest owners (App. 2, Table A5). When comparing the two groups within each perspective, the willingness to conserve was higher for non-forest owners in ecological ($p = 0.046$, $df = 178$) and utilitarian ($p = 0.020$, $df = 178$) versions of the questionnaire while there was no significant difference on the mixed version. The propositions in which the two groups had responded differently varied within each perspective, but overall the forest-owners were less willing to conserve the area and more willing to increase the loggings. In the utilitarian version, the responses given to most of the propositions of Case 1 (2/3 propositions) and Case 3 (3/2 propositions) differed significantly between the forest-owners and non-forest owner, while in the ecological version only three and in the mixed version only two of the propositions differed in their responses (App. 2, Table A5).

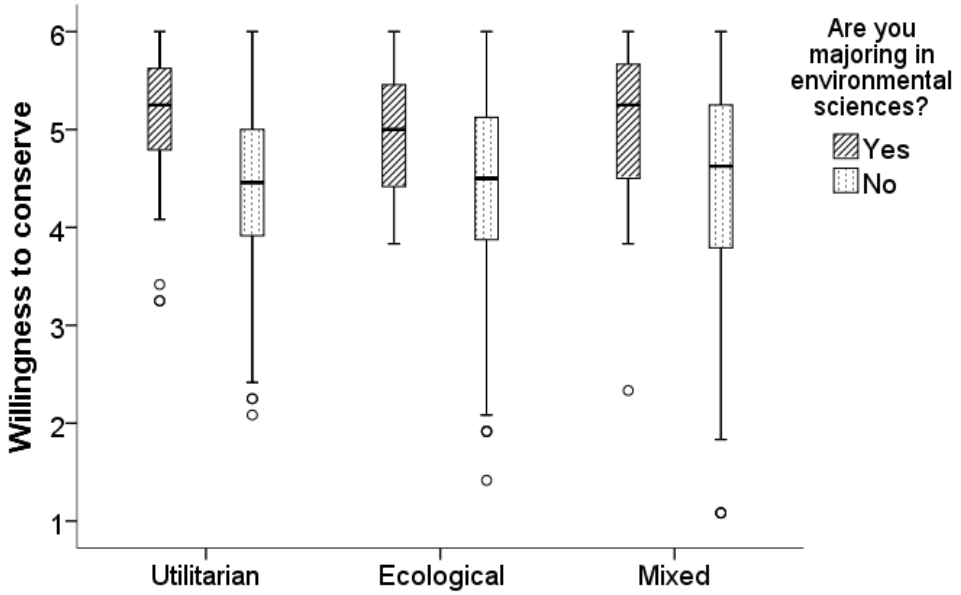


Figure 5. The willingness to conserve the hypothetical forest areas for students majoring in biological or environmental sciences (striped) compared to those majoring in some other subject (dotted) within different premises for promoting nature conservation.

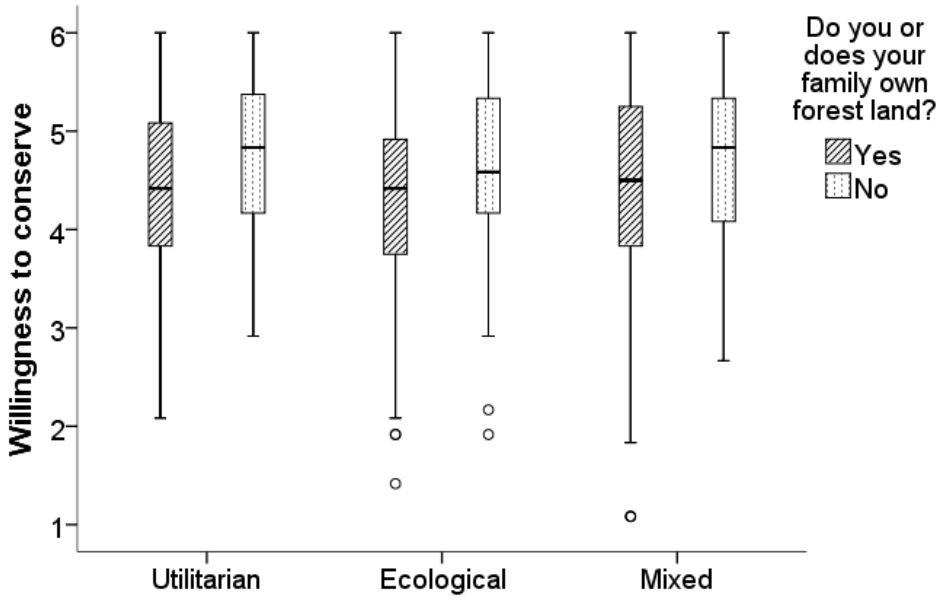


Figure 6. The average willingness to conserve certain hypothetical forest areas for forest owners (striped) and non-forest owners (dotted) within different premises for promoting nature conservation.

There were differences within the groups of forest owners and non-forest owners as well depending on the version of the questionnaire. Like all the respondents (section 3.1) only the Case 1 proposition for harvesting the forest area while leaving the logging residues on the site showed statistically significant differences between the responses within the forest owners. The forest owners responding to the ecological version were more willing to start the harvest than the forest owners in the utilitarian version ($p = 0.003$, $df = 197$) and mixed ($p < 0.001$, $df = 197$) versions (App. 2, Table A6). Within the non-forest owners in Case 1, those responding from the ecological perspective were a) more willing to start harvests in the forest if the stumps and other logging residue would be left on the site, and b) less eager to conserve the forest as it was, when compared to the utilitarian (a: $p < 0.001$, $df = 150.714$; b: $p = 0.004$, $df = 147.2$) and mixed versions (a: $p < 0.001$, $df = 147.608$; b: $p = 0.006$, $df = 146.276$) (App 2. Table A7). Furthermore, in Case 3 the non-forest owners responding on the ecological version were less willing to conserve the wetland if the use of the surrounding forest areas was also prohibited than the responses on the utilitarian version ($p = 0.030$, $df = 157$) (Figure 8). However, the non-forest owners were more eager to start harvests on the whole forest area in Case

2 from the utilitarian perspective than from the ecological perspective (p = 0.030, df = 157).

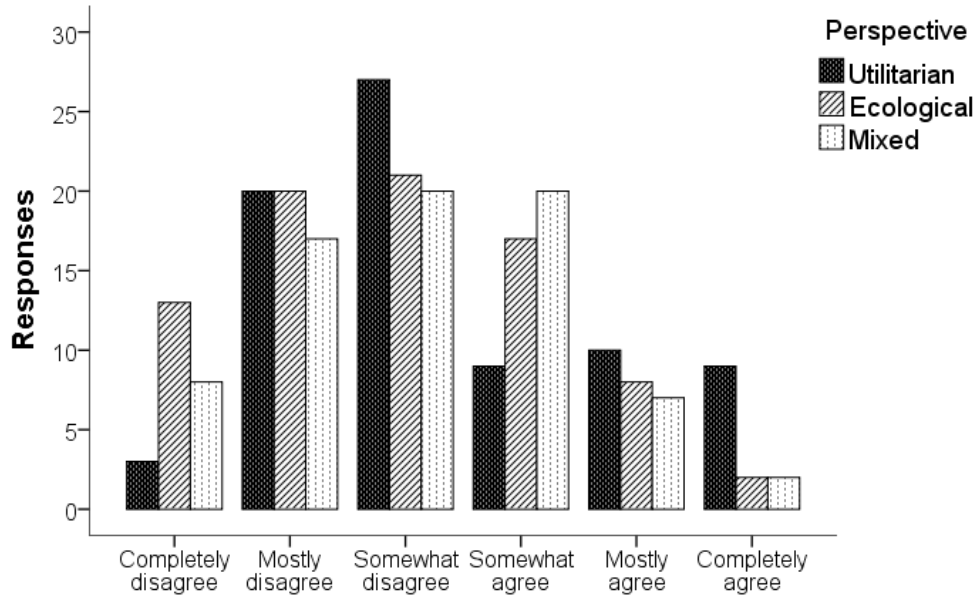


Figure 7. The responses of the participants who do not own forest land to the proposition "The whole area should be conserved so that silvicultural activities are prohibited completely" in Case 3 within each perspective.

3.2.1 Political views and attitudes

The questions which were aimed to map out some framework of the respondents' personal views and attitude towards the environment bore interesting results. Both forestry and nature conservation were regarded somewhat or extremely important (Figure 9). However, the importance of nature conservation was noticeable as 69.8% of respondents thought it was extremely important and 28.2 % that it was somewhat important (Figure 9a). Forestry was regarded extremely important for Finland's economy and development by 38.7 % and somewhat important by 53.3 % of the respondents (Figure 9b). When asked, how nature conservation was considered in Finnish policies, 17.5 % thought it is not considered enough and 56.5 % thought it could be considered more (Figure 9c). Correspondingly, forestry was not considered enough by 3.5 % and it could be considered more by 31.9 % of the respondents (Figure 9d). A notable number of respondents could not state their

opinion on how nature conservation and forestry were considered in Finnish policies as 18.4 % and 39.2 % responded "I cannot say" respectively.

Lastly, although majority of the respondents saw room for improvement in how the Finnish policies consider nature conservation, the overall opinion of the current state of nature conservation in Finland was somewhat positive or mediocre (Figure 10). Only 3.6 % of respondents considered the current state as excellent, while 36.7 % saw it as good and the majority, 43.6 %, as moderate.

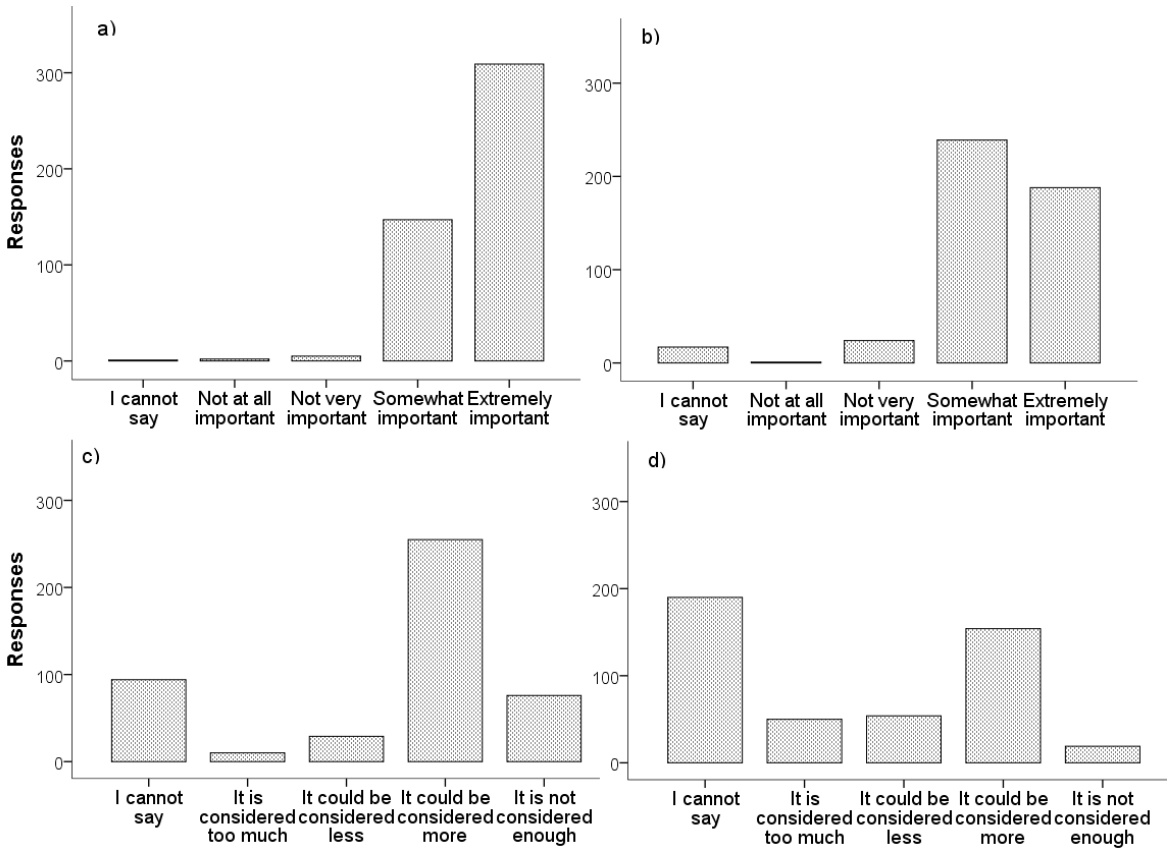


Figure 8. Distributions of responses to the questions a) "How important do you regard nature conservation and environmental protection?", b) "In your opinion, how important is forestry for the economy and development of Finland?", c) "In your opinion, how is nature conservation considered in the Finnish policies?", and d) "In your opinion, how is forestry considered in the Finnish policies?"

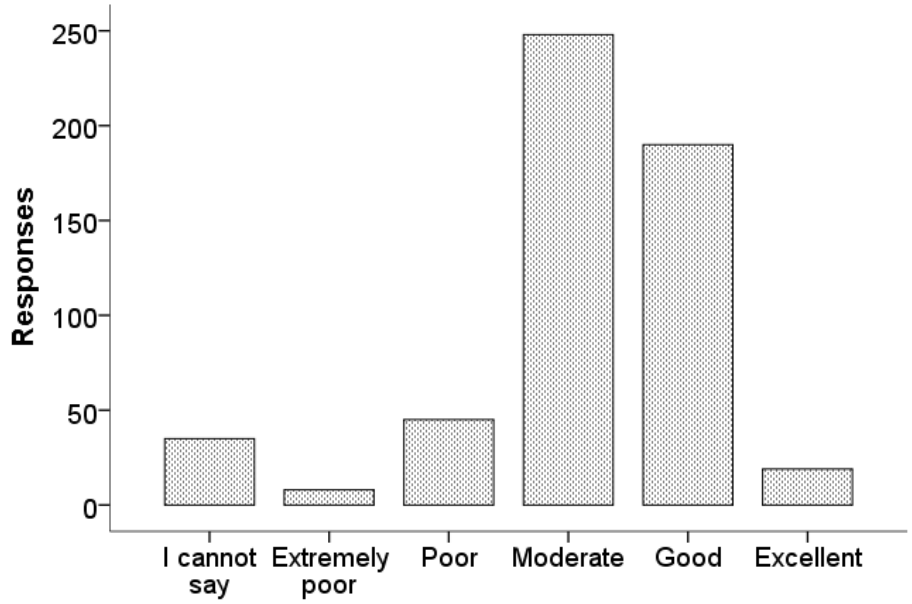


Figure 9. Responses to the question "In your opinion, what is the current state of nature conservation in Finland?".

3.3 Open-ended responses

There was an opportunity to give an open-ended response after each case and at the end of the questionnaire. The final question box regarded the whole survey and its topic. The questions received a fair amount of responses from each version of the questionnaire (107 from utilitarian, 144 from ecological, and 144 from mixed). The Cases 1–3 received 129, 74 and 74 open-ended responses respectively, and the final open-ended question was answered by 119.

Table 4 summarises the most frequent themes mentioned in the responses. The issue brought up the most was the need for a more comprehensive look into the issue at hand. This was especially highlighted by the Case 1, which was a relatively small forest area, and there was no information about the surrounding forests. The respondents noted that the cases and the overall discussion about forest management should consider the regional and/or national scale. The economic needs and the state of similar forests should be considered in the decision-making process on a larger scale. The need for more information was expanded to the respondents' own experience but also to the governmental scale. It was pointed out that an officer would need and have more information about the situation they are

deciding over, and one respondent went as far as proclaiming it completely impossible to answer the given questions.

Table 4. Summary of the themes and topics most frequent in the responses to the open-ended questions and the times they were mentioned in each perspective.

Themes and topics	Times mentioned / perspective		
	Utilitarian	Ecological	Mixed
Balance between economic values and other values	17	25	25
Biodiversity	16	22	25
Buffer zones (Case 3)	4	4	5
Carbon sinks and storages or climate change	17	5	10
Comprehensive consideration; more information or research needed	32	29	32
Concentrating harvests on more intensively managed forests	4	1	3
Confused; misunderstood or misread concept or question	5	6	3
Continuous-cover silviculture and similar approaches	5	17	18
Descriptions were leading, biased or emotional	4	13	4
Economic profit negligible, or inferior to other values	12	8	3
Focus on economics or effective forest management	6	7	5
Intrinsic value of forests or nature	2	4	4
Private forest owners should be respected/considered	1	7	4
Recreational values	31	13	12
Small area (Case 1)	7	10	8

The small size of the Case 1 forest brought up an interesting difference among the respondents. While various respondents (25 in total) mentioned the small size in their comment, some regarded this as a reason to leave it alone ("There is plenty of forest elsewhere, this is not worth the logging effort") while others saw it as a valid reason to fell the forest ("It is a small and meaningless area, so it doesn't matter if it

is logged"). The economic aspects were brought up often as something that should also be considered either by default or as a "necessary evil". However, in each version there were respondents who highlighted the efficient usage of the forest and the economic aspects so far that they seemed to have ignored all the other values they were given by the text. Some of these extreme thinkers highlighted their political stance by criticising the environmentalists or "greens". The statement "not all forest can be conserved" was brought up in three different lights: as criticism to nature conservation, as the necessary sacrifice and as a matter-of-fact. There were also those criticising capitalism and the "greediness" of the government. Distrust in the government or markets were mentioned often, either directly or between the lines. Some saw the Finnish forestry and the general environmental policies as unsustainable. However, most of the responses were moderate, and many wished for a balance between the economic and ecological interests in general or aimed for those in their responses.

In addition to the need for a comprehensive overlook to the situations, another issue brought up the most was the need for alternative ways for forest management. Managing the forest by removing individual trees, by thinning or by removing only some of the trees all pointed at some version of a continuous-cover method silviculture. This topic appeared regardless of the respondent's background (whether they studied environmental sciences or owned forest).

Another feature that was examined was how often the respondents mentioned the concepts associated with either perspective (utilitarian or ecological). The recreational values were mentioned the most. Even if the recreational values were not mentioned in the text (the ecological version), respondents pointed out that there were also other values associated with the forest area. One respondent of the ecological version even wrote a long comment on how it is important to bring forth nature's importance to human wellbeing and how trivial it is to list some species, when people should be encouraged to make more contact with their environment. Biodiversity was also mentioned by those responding to the utilitarian version of the questionnaire They wanted to point out that the described areas were or nature conservation in general was also important to the biodiversity and species richness.

Nature's intrinsic value was also mentioned either directly or indirectly (e.g. "The environment is important to the species, as well"). Climate change and carbon sinks or storages were also discussed in all the version, although most of the mentions came from the utilitarian version.

There were also some remarks about the survey or questions in general. The biggest issue seemed to be the bias of the descriptions as they favoured nature conservation. Some were confused or even annoyed by this feature, as they saw the descriptions as "prejudiced", "one-sided", "leading" or "emotional". Some especially pointed out that they were expecting a more balanced case and did not understand the point for the bias or were confused by it. Some felt that they were "forced" to think more positively about nature conservation. These types of comments were given to all the versions, but most came from the ecological questionnaire.

There were also some misunderstandings with the texts or the questions. Some of the propositions were regarded as conflicting with each other. Especially the final questions regarding the policies for nature conservation and silviculture in Finland were especially problematic as there was no middle option for those, who saw the current situation as good enough. One respondent pointed out that there is a lot of discussion of Finnish forestry, but the problem is not in the amount of discussion but its quality.

Furthermore, there were also some who had not read the text carefully or had understood something wrong. For example, there were many defending the rights of private forest-owners, even though the role of a public officer was highlighted various times. One respondent, however, had not understood, what public ownership meant. Because two respondents pointed out that they would probably had answered differently, if they had given the role of a private forest-owner, this kind of misconceptions might have caused errors in some of the responses. In addition, there were some terminology that was troublesome. The most remarkable of such misunderstandings is the confusion between carbon sinks and carbon storages. The use of these two terms varied widely between the respondents. While some proposed increasing the production of long-lasting wood-based products to

help with climate mitigation, others were confused by the difference between carbon storages and carbon sinks. Other terms that some mentioned as needing for clarification were regeneration felling ("päätehakkuu"), silviculture or forestry ("metsätalous"), and conservation or protection ("suojelu").

4 DISCUSSION

This study could not find any clear pattern between the different perspectives in promoting nature conservation. Whether the two argumentation methods – utilitarian and ecological – would bear significantly different outcomes for conservation could not be confirmed (H1 is repealed). Although Case 1 showed statistically significant differences in responses to some of the propositions and the mean willingness to conserve, the results cannot conclusively prove the issue one way or another. The results do not support the view that the utilitarian perspective bears poorer outcomes than the ecologic perspective when promoting conservation (H2 is repealed). The variation between the responses seemed to be explained more by the background factors, such as whether the respondent or their family owned any forest land, and on the respondent's stance towards nature conservation and forest industry, than the perspectives. Overall, the students were very conservation-friendly which was also reflected in their responses.

The results are somewhat contrary to the results of a broadly similar study conducted by Rode et al. (2015a) where providing only economic rationale for nature conservation resulted in a poorer outcome for conservation than non-economic, moral-based rationale and a combination of these two. However, perhaps unlike Rode et al. (2015a), the utilitarian arguments emphasizing the ecosystem services in this study were partly based on recreational values which might have provoked a stronger emotional response from the participants than the ecological arguments, which might explain the higher willingness to conserve the forest in Case 1 in the utilitarian version of the questionnaire. Rode et al. (2015b) provided

their respondents with more analytical and technical arguments to be used in a cost-benefit-analyses, which resulted in a higher support for a hypothetical dam project with high environmental impacts, than the ecological and moral arguments.

In the end, the audience for the survey proved to be very homogenous in their attitude towards nature conservation, which might explain the lack of differences between the versions of the questionnaire and between participants. This was partly anticipated, which is why the faculties were expected to serve as a background factor for telling personalities apart. Although the major a person chooses could work as an indicator for the personal traits of some, in this study all the faculties were not equally represented, and thus all the faculties could not be examined separately. However, spreading the survey to a wider audience is an important step in mapping the attitudes and reactions of different personalities and groups. The issues concerning nature conservation are never black and white, and people view the world differently depending on their past experiences, temporal situation, political stance, and personal beliefs and morals. Furthermore, the respondents' inherent attitude and interest towards nature and forestry may be what made them take part to the survey in the first place, which may further explain the homogenous responses. When the participation is voluntary, those already interested on the subject might be overrepresented inevitably.

Differences between the three perspectives were inconsistent and it is debatable whether any assumptions can be made without further studies. The only difference that was consistent even within the groups that were examined separately was in Case 1, but no further consistence was found. The fact that Case 1 was the only one showing differences between the three versions of the questionnaire consistently might be because of the different ways people interpret scenarios and make connections. Firstly, Case 1 was the simplest of the scenarios and consisted of a relatively small forest, which might have been considered as insignificant. Secondly, and more importantly, there were two different harvesting scenarios for the forest, one more extreme than the other. It is possible that once the respondents disagreed with the logging and the recollection of the stumps and logging residues, they

considered the more intermediate proposition to be the "lesser evil" and did not disagree as strongly. The recreational values would be lost regardless of the logging method, but the ecological processes and species would not be as badly affected if the residues were not removed. Most of the carbon stored in the forest would also have been lost regardless of the harvesting method. Thus, the logging scenario perhaps was not seen as devastating from the ecological perspective than the other two. However, a similar kind of difference between the utilitarian and ecological versions was seen within the non-forest owners in Case 3, where those answering from the utilitarian perspective were slightly more willing to prohibit treatments on the forests surrounding the wetland. It is possible that the recreational values of the surrounding forests connected better with the respondents than the biodiversity the forests would help to maintain as this was not specified more deeply in the text. This could indicate that the utilitarian arguments were somewhat more convincing, yet the mixed version comes very close to the ecological version in Case 3, which is again contrary to the findings of Rode et al. (2015b). In their study the combination of the two perspectives (economic and non-economic) bore the results most favourable for conservation. Yet, when the students of environmental sciences were examined separately, in Case 2 those answering from the utilitarian perspective were more willing to shorten the rotation period to cultivate pulpwood than from the ecological perspective.

It is possible that such aspects as the recreational values in the utilitarian and mixed versions influenced the participants' decisions more than purely ecological arguments, perhaps because of a deeper emotional connection, but that is mere speculation based on the responses to the propositions and the open-ended questions. The better suitability of one line of argument cannot be assumed based on one case only. Most importantly, the background variables seem to have had a greater role as forest-owners and environmental students differed so significantly from others. However, it is also possible that the variable behind the differences is connected to the participants' attitude towards nature conservation or personality traits or other background factors that could not be sufficiently analysed in this study.

When planning the cases for this study, the clarity, truthfulness and simplicity of the texts was a focal point. Partly because of this, the scenarios did not turn out to be very ambitious or high-flown, and thus not very controversial, unlike the dam case in Rode et al. (2015b). Large forest cuts are quite unusual in Finland, which is why the forest areas were planned to be relatively small. The open-ended responses verified that more comprehensible scenarios should be used and that the areas should be wide enough to consider the situation on regional or national scale. However, balancing between the necessary amount of information and the attention span of the respondents is not an easy task. Furthermore, as some of the open-ended responses showed, people may pay attention to the same things but make different conclusions of them. This was the case with, for example, the small forest in Case 1. The fact that the forest area was relatively small was enough reason to fell the forest for some and to conserve it for others. These differences in the worldview were also reflected in how the respondent thought about the surroundings of the forest in question, whether it was surrounded by industrial forest or not. Some argued that it should be conserved especially if it was the only one of its kind in the area, while others saw there no point in conserving such a deviation These examples illuminate on the necessity to further map out the respondents' worldview or, alternatively, to aim at finding the pieces of information needed to widen their perspective, if they are to be persuaded to make more balanced and ecologically sustainable decisions in forestry and land-use.

The open-ended questions revealed how biased the respondents saw the descriptions as. The conservation-friendly perspective was deliberate as the aim of the study was to find out, which of the perspectives would be more efficient in convincing the recipient to conserve. It is debatable whether this was the most efficient approach or not. The limitation to the amount of text also limited the complexity of the possible scenarios, which resulted on simplified and biased descriptions that aimed at being on the point. However, this kind of direct approach ("Here are the reasons to conserve.") might be off-putting to some, especially if the reasons are purely ecological. The issue was mentioned various times in the open-ended questions and it should not be ignored. It is true, that the topic is a lot more

complex than the cases in this study, as all the four dimensions of sustainable development should always be kept in mind when making such decisions. However, these comments also reflect on the fact that the conservation around forestry and nature conservation in Finland is currently quite heated and polarised. In politics around Finland's forests have emphasized their utilisation as the aim is to further enhance the management of neglected forest areas while there is currently a citizen initiative calling for the management of government-owned with continuous-cover silvicultural methods. With two polarised extremes, it can be argued that expressing one's opinion strongly is often squinted at. This attitude seems to be especially evident when a scientist speaks out in a way that can be regarded as one-sided, regardless of their statement basing on peer-reviewed research. Some see the statements made by environmental scientist as having some secret agenda, or even as unnecessary fuss.

Furthermore, the questionnaires each represented only one perspective, which could affect the respondent's way to answer the questions, as they might get tired or even annoyed with the same types of arguments. There were some respondents who expressed such irritation in the open-ended responses. It would have been possible to randomly give each respondent some of the three versions of each case, but because the expectations for the number of the respondents was far lower, this approach was discarded as it could have resulted in uneven or insufficient sample sizes for each perspective. In addition, the single-perspective approach was simpler and less confusing, as the former case and the perspective in its description might affect the way a respondent views the next case. To rule out these sorts of cognitive connections between the cases and the order of perspectives that might linger from one case to another the sample size should be quite large or there should be other questions or methods for analysing or removing such connections.

Even though this study could not show differences between the two ways of argumentation, it demonstrates the usefulness of social and qualitative methods in finding the best way to argument for promoting conservation. Social methods should be further deployed in nature conservation studies as well, since they offer the only way to map out people's attitudes and opinions. This is crucial if the

practicing conservationists are to achieve such a balance between nature and human society that the two can continue to co-exist, and if the further loss of biodiversity and possible loss of ecosystem services were to be prevented.

Many studies have linked biodiversity with ecosystem functions (e.g. Cardinale 2011, Tilman 2014), and although the relations are not unambiguous (e.g. Harrison et al. 2014), the positive relationship between biodiversity and ecosystem services are also assumed. Because of this connection, many see the ES approach as a promising tool for promoting nature conservation. However, the ES approach is not without risk, as its link to biodiversity is not definite nor straightforward (Morelli & Møller 2015, Carrasco 2014). Arguably, not all nature is benevolent to people, as some aspects are neutral or even harmful, so called disservices. At its worst, the concept might be utilised to further exploit nature (McCauley 2006) instead of protecting it. However, these risks might be necessary to take if we want to improve the current state of nature and to stop global biodiversity loss. Although giving "price tags" to something outside of market-based pricing feels perverse to some (e.g. McCauley 2006), monetary estimations for ES can be useful when linking nature conservation to the cost-benefit analyses that are a necessary part of policies and decision-making, and nature should not be left out of these decisions (Pearson 2016). Furthermore, the concept can be helpful when demonstrating the nature's importance to human wellbeing and when connecting individuals to the environment with which many have lost touch.

Trade-offs between nature conservation and other economic or social interests cannot be avoided as they are necessary in environmental management since all human activities cannot be halted (Pearson 2016). However, safeguarding nature's intrinsic value does not hinder further human development impossible, since intrinsic value is not a synonym to untouchability (Vucethis et al. 2014). In contrary, those completely disregarding the importance of nature's intrinsic value are also disregarding the fact that the ecosystem service approach was designed to work beside the ethical arguments and not to replace it. The intrinsic value of nonhuman nature must not be diminished to only existence value, either (Batavia & Nelson

2017). Correspondingly, those regarding the ethical and biocentric grounds as the only base for nature conservation also lack the wider understanding of the ES approach. The diverse usage of neither of these concepts, the ES and the nonhuman intrinsic value, should not be disregarded if they are used correctly. As Pearson (2016) points out, different arguments can be used in different spatial levels and situations as global and regional issues may have different solutions. As such, arguments based on intrinsic value can work better than utilitarian values in protecting an endangered species, while utilitarian values can be more suitable in habitat conservation. Tallis & Lubchenco (2014) add that the toolbox for promoting nature conservation should be diverse and welcoming to every reason to stop the loss of biodiversity. To do so, we must act fast.

In addition to the need of conservationists to find a common language with business and policy-makers, they must find one among themselves as well. One reason behind the ongoing debate between the promoters of nature's instrumental value and those of nature's intrinsic value may be the lack of familiarity with ethics among conservation biologists (Van Houtan 2006, Batavia & Nelson 2017). The intrinsic value of nature is one of the most central concepts in nature conservation and the debate around ES, yet its definition is far from straightforward (Davidson 2013, Batavia & Nelson 2016). Thus, it is no wonder that it might be easy to see the intrinsic value as too vague and intangible of a concept. However, statements like these are one of the reasons why some environmental ethicists are pointing out the lack of understanding of environmental ethics and concepts like intrinsic value among the conservationists (e.g. Van Houtan 2006, Batavia & Nelson 2017). Some even argue that there is a lack of clarity and consistency with regards to ethics within conservation and sustainability movements that in fact hurts their effectiveness (e.g. Batavia and Nelson 2016). Moreover, to introduce these fundamental ethics of nature conservation to a wider audience, a deeper understanding of the terms and logic of environmental ethics is needed for this dialogue to be fruitful (Van houtan 2006).

4.1 In the future studies

Firstly, this study works as a good example, how survey studies are worthwhile even in environmental studies to bring clarity to widely debated issues that require anthropologic analysis. However, it also highlights the importance of cross-scientific cooperation in designing and conducting surveys that can best answer the chosen research question. For example, combining ecological knowledge with expertise on social studies and linguistics would provide studies like this with effective tools for improving the arguments to promote conservation. These special fields are needed to further develop the survey methodology and to polish the tone of each text. Knowledge on social science and even psychology could be used to find out the background variables and attitude towards nature and forests in general. This is especially important if there are no other uniting factors within the study group (such as students). If these types of studies are to be executed on a wider audience, there must be effective ways to analyse the personality traits of each person in addition to their political beliefs. Furthermore, it must be either ensured that all the participants share the same basic knowledge on terminology (e.g. carbon sink vs. carbon storage) or tested how well each participant understands certain aspects of ecology and environmental sciences.

Furthermore, it would be advisable to create more distinct and controversial scenarios which would be more likely to divide opinions, if one would like to intend to see if there are differences between the groups. Instead of small forest areas, the loggings should take place on a larger scale. The scenarios could even include nation-wide policies instead of just small local issues. The alternative management options should be more diverse and complex and could include for example continuous-cover methods. However, when planning such complex cases, one must pay a lot of attention in providing the participants with enough information without being too overwhelming. It is also crucial to keep the participant interested and invested in the survey.

Secondly, it may be useful to build the survey based on a decision tree, so that the structure of the data would better correspond to the assumptions of the IRTree

models. With a decision tree type of a questionnaire, the respondent can be given more information or additional questions in stages depending on how they have responded to the previous questions. Combining the two methods, the decision tree and IRTree models, could reveal if different interest groups – such as policy makers, businesspersons or land owners - had different response patterns and whether further information or options affected them differently. This information would be used when presenting propositions for nature conservation to the groups above. However, this may require a relatively high number of participants.

In addition, there are other ways to execute this type of a study. If one is satisfied with a smaller sample size, interviews or similar face-to-face methods would be a very interesting approach and would enable a wide arrange of different study settings. In addition to traditional interviews, the study could take a form of a decision-making game or even a digital simulation, to give a few examples. A separate personality test could also be easier to add to such studies. Whichever kind of setting the future studies come up with, the survey should be made compelling to those, who are usually not very interested in nature conservation or forest management. Furthermore, there are also various ways for analysing survey data in addition to the ones described above. Another example would be factor analysis, which aims at finding underlying variables explaining the variation in the responses (or observed variables). This would require a decent amount of background questions mapping the same traits, such as "environmentalism", "practicalism" or "sentimentalism". This information could be further utilised to compare groups of individuals with similar traits or ways of thought instead of just individuals.

Lastly, to find out whether monetary incentives cause motivation crowding, or the diminishing of motivation based on other arguments, monetary values of ecosystem services could be further estimated and utilised in the study. Rode et al. (2015b) presented the participants with an economic cost-benefit-analysis calculating social and environmental costs, which made the participants more agreeable about the land-use project than nature conservation. However, their results did not unambiguously support motivation crowding as the economic arguments did not deteriorate the non-economic arguments, as the combination of the two was the

most successful in promoting conservation. Thus, it would be interesting to further adapt monetary estimations to studies focusing on examining the discourse over nature conservation. Because of each case in this study was on a relatively small scale, it proved to be somewhat insensible to estimate values to any other ecosystem component than the yield of wood. The monetary estimations would be easier to give to larger entities. The monetary values are not necessarily limited to material extractions: one example for the future scenarios could be to test the conflict between ecotourism and industrial forestry, since both are currently promoted at the same time. Other land use scenarios, such as replacing the forest with a residential district or industrial area, should also be considered. The loss of forest ecosystems could be compared to for example the gain of labour hours and the costs needed to compensate the lost ecosystem services or biodiversity.

5 CONCLUSIONS

Although this study was unable to bring clarity to the ongoing debate over the most appropriate way to promote nature conservation, it gave some insight into the possibilities, benefits and pitfalls of such surveys. There were some differences between the three questionnaires, as in one of the three example cases the utilitarian arguments resulted in slightly better outcomes for the conservation than the ecological. However, it is difficult to say, whether the reason behind these differences lays in the arguments or the cases themselves. Interestingly, the open-ended responses highlighted how forest management is not a black-and-white issue, as people can understand topics very differently and, of course, share different values. More similar empirical studies are needed to clarify, whether one approach is truly better than the other or whether it all depends on the recipient.

What the open-ended responses of this study showed is that, even though people are able and willing to consider issues from different perspectives, many lack the basic information needed to understand the complex structures of ecosystems and

climate. Of course, we need the correct tools to capture the attention of those that see things one-sidedly and to widen their viewpoint, but first we need to make sure everyone stands on the same line when it comes to basic knowledge. As scientists, we must educate others, but we must also educate ourselves and widen our perspectives as well. Conservationists and other environmental scientists are experts when it comes to things nonhuman, but this scope of expertise should be widened to include human beings as well. To finally end the search for the optimal approach for promoting nature conservation, empirical studies are needed to move beyond theoretical disputes. This requires cross-scientific cooperation. Psychology, anthropology and social sciences are needed to effectively tackle the question, how to promote nature conservation among those who have other interests and are unable to see the value in nature, while more empirical evidence is needed on how biodiversity affects ecosystem functions and the ES and how the ES encase biodiversity.

The biodiversity is declining globally and locally. In Finland the pressure on forest ecosystems is increasing rapidly as the threats of climate change grow closer. Although there is a need for urgent actions to save the life on the planet as we know it, conservation efforts are often faced with disregard and underrating. It is time to stop disputing among the field of science and to start finding ways to change the current direction the humankind is heading. The public discourse must be changed radically, but we must find the correct ways to change it. As Tallis & Lubchenco (2014) manifested, the conservation efforts "must be underpinned by a stronger focus on synthesizing and expanding the evidence base that can identify what works and what fails in conservation so that we can move from philosophical debates to rigorous assessments of the effectiveness of actions".

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APPENDIX 1: THE CONTENT OF THE QUESTIONNAIRIES (FINNISH)

Tervetuloa vastaamaan kyselyyn, joka on osa Pro Gradu -tutkimustani. Tämä kysely on lähetetty kaikille Jyväskylän yliopiston opiskelijoille.

Kyselyssä on 5 osiota ja vastaamiseen kuluu aikaa 10–15 minuuttia.

Ensimmäisessä osiossa kysytään vastaajan esitietoja. Osioissa 2–4 tulet asettumaan viranomaisen rooliin, jossa päätät julkisessa omistuksessa olevien metsien hoidosta. Saat kussakin osiossa luettavaksesi lyhyen tekstikatkelman, joka kuvailee metsäkohdetta, jonka hoidosta sinun on päätettävä. Luethan tekstin ja kysymykset huolella ja vastaathan rehellisesti. Kysymyksiin vastaaminen ei vaadi ennakkotietoja.

Kyselyn lopuksi voit halutessasi osallistua arvontaan, jossa voit voittaa Finnkinon leffaliput itsellesi ja kaverillesi. Arvontaa varten annettuja yhteystietoja ei voida yhdistää muihin vastauksiin, jotka käsitellään täysin anonyymisti. Kaikki tiedot käsitellään luottamuksellisesti eikä mitään kerätyistä tiedoista luovuteta kolmansille tahoille.

Vastauksia ei voi tallentaa, joten vastaathan kaikkiin kysymyksiin kerralla.

Sukupuoli

- ◯ Nainen
- ◯ Mies
- ◯ Muu

Tiedekunta

- ◯ Humanistis-yhteiskuntatieteellinen
- ◯ Informaatioteknologia
- ◯ Kauppakorkeakoulu
- ◯ Kasvatustieteet ja psykologia
- ◯ Liikuntatieteellinen
- ◯ Matemaattis-luonnontieteellinen

Opiskeletko pääaineenasi bio- ja ympäristötieteitä?

- ◯ Kyllä
- ◯ En

Opintojen alkamisvuosi

- ◯ Aiemmin kuin 2010
- ◯ 2010
- ◯ 2011
- ◯ 2012
- ◯ 2013
- ◯ 2014
- ◯ 2015
- ◯ 2016
- ◯ 2017

CASE 1

Hyötynäkökulma

Suomen kansallisessa metsästrategiassa halutaan lisätä metsien tehokkaampaa käyttöä muun muassa ottamalla käyttöön unohtuneita talousmetsiä. Kohteena oleva 3 hehtaarin kokoinen kangasmetsä on kasvanut ilman ihmisen aiheuttamia häiriöitä yli 100 vuotta. Metsässä on elävän puuston lisäksi paljon lahopuuta ja puustoon on sitoutunut runsaasti hiiltä. Tällaiset hiilivarastot ovat elintärkeitä ilmastonmuutoksen torjunnassa. Metsä on myös marjastajien ja sienestäjien suosiossa ja sieltä kerätäänkin vuosittain sievoinen marjasato. Varttunut männikkö on helppokulkuinen ja siksi mieluisaa ulkoilualuetta. Tällaiset mäntykankaat ovat suomalaista kansallismaisemaa.

Mikäli metsässä suoritettaisiin päätehakkuu, jossa vanha puusto poistettaisiin kokonaan, tukkipuuta kertyisi n. 100 000 euron edestä. Tukkipuun lisäksi metsästä voidaan kerätä talteen runsaasti kuitupuuta ja hakkuujätettä. Kannot ja muu hakkuujäte voidaan hyödyntää esimerkiksi energiantuotannossa. Päätehakkuun jälkeen metsä uudistetaan ja jätetään kasvamaan tuleviksi vuosikymmeniksi.

Metsän päätehakkuu tuottaa suuren määrän puuta ja merkittävää taloudellista hyötyä. Toisaalta päätehakkuussa metsään sitoutunut hiili vapautuu ja virkistysarvot menetetään täysin. Hakkuiden jälkeen metsä uudistetaan, mutta kestää kymmeniä vuosia ennen kuin ruokasieniä ja marjoja on jälleen mahdollista kerätä alueella, ja ennen kuin maisema on palautunut nykyisen kaltaiseksi. Kantojen ja muun hakkuujätteen kerääminen muuttaisi maisemaa rajummin ja saattaisi hidastaa metsän palautumista. Hakkuujätteen polttaminen energiaksi vapauttaa siihen sitoutuneen hiilen sen sijaan, että se sitoutuisi maaperään.

Seuraavaan päätehakkuuseen kuluisi lähemmäs 80 vuotta, jolloin metsä olisi varastoinut itseensä suunnilleen saman määrän hiiltä kuin nyt. Jos metsä säästetään hakkuilta ja suojellaan, se säilyy hiilivarastona ja marjoja ja sieniä on kerättävissä lähitulevaisuudessakin.

Ekologinen näkökulma

Suomen kansallisessa metsästrategiassa halutaan ajaa metsien tehokkaampaa käyttöä muun muassa ottamalla käyttöön unohtuneita talousmetsiä. Kohteena oleva 3 hehtaarin kokoinen kangasmetsä on saanut kasvaa luontaisesti yli 100 vuotta. Metsässä on elävien puiden lisäksi paljon kuollutta puuainesta.

Metsän kuollut puuaines ylläpitää runsasta kolopesijöiden, selkärangattomien ja sienten lajikirjoa. Suuri osa maamme uhanalaisista lajeista on riippuvaisia tällaisista yli satavuotiaisista, puustoltaan eri-ikäisistä metsistä, jotka ovat kuitenkin hyvin harvinaisia. Vanhojen metsien, kookkaiden puiden ja lahopuun väheneminen ovat merkittävimmät syyt metsälajien uhanalaisuudelle.

Mikäli metsässä suoritettaisiin päätehakkuu, jossa vanha puusto poistettaisiin kokonaan, tukkipuuta kertyisi n. 100 000 euron edestä. Tukkipuun lisäksi metsästä voidaan kerätä talteen runsaasti kuitupuuta ja hakkuujätettä. Kannot ja muu hakkuujäte voidaan hyödyntää esimerkiksi energiantuotannossa.

Päätehakkuun jälkeen metsä uudistetaan ja jätetään kasvamaan tuleviksi vuosikymmeniksi.

Metsän päätehakkuu tuottaa suuren määrän puuta ja merkittävää taloudellista hyötyä. Toisaalta samalla menetetään pitkälle kehittynyt metsä ja sen arvokas lajisto. Erityisen haitallista olisi, jos myös kannot ja muu hakkuujäte korjattaisiin talteen. Tämä tarkoittaisi kuolleen puuaineksen menettämistä sekä maaperän ja sen monimutkaisten verkostojen tuhoutumista. Metsän lajisto korvautuisi ensin heinikolla ja sitten talousmetsälle tyypillisillä lajeilla, kun metsä uudistetaan istuttamalla ja sitä hoidetaan perinteisen metsätalouden keinoin.

Jos metsä säästetään hakkuilta ja suojellaan, sen luontainen kehitys johtaa yhä vanhempaan metsään.

Metsän vanhetessa, sen lajimonimuotoisuus - siis lajien lukumäärä - vähenee, mutta siellä viihtyviä lajeja ei tavata muualla kuin vanhoissa metsissä.

Yhdistelmä

Suomen kansallisessa metsästrategiassa halutaan ajaa metsien tehokkaampaa käyttöä muun muassa ottamalla käyttöön unohtuneita talousmetsiä. Kohteena oleva 3 hehtaarin kokoinen kangasmetsä on saanut kasvaa luontaisesti yli 100 vuotta. Metsässä on tukkipuun lisäksi paljon lahopuuta ja erilaisia lajeja.

Vanhat metsät ovat Suomessa harvinaisia ja yhtä harvinaisia ovat vanhojen metsien lajit, jotka ovat riippuvaisia eri-ikäisestä puustosta ja kuolleesta puuaineksesta. Vanha metsä tarjoaa retkeilijälle ja luonnonystävälle aivan toisenlaista ihailtavaa kuin tavallinen talousmetsä. Kuollut puuaines ei ainoastaan tarjoa kotia kolopesijöille ja selkärangattomille, vaan myös sitoo hiiltä itseensä ja maaperään. Kyseinen metsä on suosittu tarjoamansa marja- ja sienisadon ansiosta.

Mikäli metsässä suoritettaisiin päätehakkuu, jossa vanha puusto poistettaisiin kokonaan, tukkipuuta kertyisi n. 100 000 euron edestä. Tukkipuun lisäksi metsästä voidaan kerätä talteen runsaasti kuitupuuta ja hakkuujätettä. Kannot ja muu hakkuujäte voidaan hyödyntää esimerkiksi energiantuotannossa.

Päätehakkuun jälkeen metsä uudistetaan ja jätetään kasvamaan tuleviksi vuosikymmeniksi.

Metsän päätehakkuu tuottaa suuren määrän puuta ja merkittävää taloudellista hyötyä. Tällöin metsä lajistoineen kuitenkin tuhoutuisi täysin ja kaikki virkistysarvot menetettäisiin samalla. Myös hiilivarasto menetettäisiin. Kantojen ja hakkuujätteen kerääminen palauttaisi niihin sitoutuneen hiilen nopeasti ilmakehään. Lisäksi maaperän eliöstö häiriintyisi, ja metsän uusiutuminen voisi tulevaisuudessa hidastua. Hakkuiden jälkeen metsä uudistettaisiin, mutta kestäisi kymmeniä vuosia marja- ja sienisadon palautumiseksi normaaliksi ja vähintään 80 vuotta ennen kuin metsä olisi sitonut itseensä saman määrän hiiltä. Tällöin metsä hakattaisiin uudestaan.

Jos metsä säästetään hakkuilta ja suojellaan, se jatkaa luontaista kehitystään, joka johtaa ennen pitkään lajiston muutokseen. Lajien lukumäärä ja puolukan määrä vähenevät, mutta tilalle tulee vain vanhoissa metsissä tavattavia lajeja.

Toimit viranomaisena, joka päättää julkisessa omistuksessa olevien metsien hoidosta. Kuinka ylläolevassa esimerkissä kuvattua metsäaluetta tulisi mielestäsi käyttää?

	Täysin eri mieltä	Enimmäkseen eri mieltä	Jokseenkin eri mieltä	Jokseenkin samaa mieltä	Enimmäkseen samaa mieltä	Täysin samaa mieltä
Metsä tulisi päätehakata, ja kannot ja hakkuutähteet kerätä energiaksi.	○	○	○	○	○	○
Metsä tulisi hakata, mutta kannot ja hakkuutähteet jättää metsään.	○	○	○	○	○	○
Metsä tulisi suojella nykyisellään	○	○	○	○	○	○

Muita kommentteja?

CASE 2

Hyötynäkökulma

Kuusivaltainen lehtomainen kangasmetsä on ollut vuosikymmenet ilman metsänhoidollisia toimenpiteitä. Alue kattaa 20 hehtaaria metsää, josta on kaadettu puuta viimeksi 1960-luvulla. Aikaisempien hakkuiden synnyttämät eri-ikäisen puuston muodostamat metsäkuviot ovat paikoin selkeästi erotettavissa. Iso osa puustosta on jo korjuukypsää eli saavuttanut kasvuhuippunsa, ja siksi hakkuupaine alueella on kova. Uudistushakkuut suunnitellaan toteutettavaksi porrastetusti niin, että metsää kaadettaisiin hehtaari tai kaksi kerrallaan n. 10 vuoden välein. Osalla metsäkuvioista olisi mahdollista kasvattaa kuitupuuta, jota voidaan korjata lyhyellä hakkuuvälillä.

Kustakin hakkuusta saataisiin arviolta 18 000 – 36 000 euroa tuloja. Kokonaistulot hakkuista olisivat lopulta arviolta 360 000 euroa. Hakattu alue uudistetaan istuttamalla uusia taimia, minkä jälkeen siellä toteutetaan säännöllisesti tilanteen kulloinkin vaatimia hoitotoimenpiteitä.

Kyseisen kaltainen rehevä havumetsä varastoi tehokkaasti hiiltä puuhun ja karikkeeseen, joka muodostaa metsänpohjalle paksun kerroksen. Varttuneeseen

metsään on jo varastoitunut paljon hiiltä, mikä auttaa ilmastonmuutoksen hillinnässä. Ilmastonmuutos tulee lisäämään taloudellista epävakautta maailmanlaajuisesti, minkä vuoksi sen hillitseminen riittävällä nopeudella on ensiarvoisen tärkeää. Tämä vaatii muun muassa hiilinielujen ja -varastojen lisäämistä lyhyellä aikavälillä. Hakkuista saataisiin merkittävät taloudelliset tulot, mutta metsän hakkaaminen tarkoittaisi hiilivaraston häviämistä. Kasvaessaan hakatun tilalle uusi metsä sitoisi edelleen hiiltä, mutta nykyisenkaltaisen hiilivarastoin kertyminen veisi vuosikymmeniä. Iso osa kaadettavaan puuhun varastoituneesta hiilestä olisi todennäköisesti vapautunut ilmakehään kymmenessä vuodessa. Kuitupuuhun sitoutuneen hiilen kiertoaika on erityisen lyhyt.

Ekologis-eettinen näkökulma

Kuusivaltainen lehtomainen kangasmetsä on ollut vuosikymmenet ilman metsänhoidollisia toimenpiteitä. Alue kattaa 20 hehtaaria metsää, josta on kaadettu puuta viimeksi 1960-luvulla. Aikaisempien hakkuiden synnyttämät eri-ikäisen puuston muodostamat metsäkuviot ovat paikoin selkeästi erotettavissa. Iso osa puustosta on jo korjuukypsää eli saavuttanut kasvuhuippunsa, ja siksi hakkuupaine alueella on kova. Uudistushakkuut suunnitellaan toteutettavaksi porrastetusti niin, että metsää kaadettaisiin hehtaari tai kaksi kerrallaan n. 10 vuoden välein. Osalla metsäkuvioista olisi mahdollista kasvattaa kuitupuuta, jota voidaan korjata lyhyellä hakkuuvälillä.

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Metsä on rehevä ja lajistoltaan monipuolinen, ja sisältää paikoin runsaasti lahopuuta. Valtapuun, kuusen, lisäksi metsässä viihtyvät paikoitellen kataja (*Juniperus communis*) ja näsiä (*Daphne mezereum*). Kenttäkerroksessa mm. vanamo (*Linnaea borealis*), metsäkurjenpolvi (*Geranium sylvaticum*) ja talvikit kertovat osaltaan kasvupaikan rehevyydestä. Tällaiset lehtomaiset kangasmetsät ovat puuntuottokyvyltään erinomaisia ja ovat siksi olleet erittäin haluttuja

metsätalouden näkökulmasta. Rehevä kuusikko on myös monien lintujen, kuten hippiäisen (*Regulus regulus*) ja puukiipijän (*Certhia familiaris*), mieleen, kuten myös lukuisten selkärangattomien ja sienten. Erityisesti lahopuusta riippuvaisille lajeille tällainen metsä olisi luonnontilaisena elintärkeä. Hakkuista saataisiin merkittävät taloudelliset tulot. Lajisto kuitenkin köyhtyisi hakkuiden myötä ja vanhassa kuusikossa viihtyvät lajit katoaisivat. Lupaavasti alkanut luontainen kehitys pysähtyisi ja nykyinen lajisto korvautuisi talousmetsille tyypillisillä lajeilla. Erityisesti selkärangattomat ja sienet sekä lahopuusta riippuvaiset, usein uhanalaiset lajit, kärsisivät. Mikäli osa metsästä otetaan kuitupuun tuotantoon, eli hakkuiden väliin jäävää aikaa lyhennettäisiin, lajit joutuisivat entistäkin ahtaammalle. Kuitupuumetsät kaadetaan nuorina ja nuori metsä tarjoaa elinympäristön jo ennestään melko yleisille lajeille.

Yhdistelmä

Kuusivaltainen lehtomainen kangasmetsä on ollut vuosikymmenet ilman metsänhoidollisia toimenpiteitä. Alue kattaa 20 hehtaaria metsää, josta on kaadettu puuta viimeksi 1960-luvulla. Aikaisempien hakkuiden synnyttämät eri-ikäisen puuston muodostamat metsäkuviot ovat paikoin selkeästi erotettavissa. Iso osa puustosta on jo korjuukypsää eli saavuttanut kasvuhuippunsa, ja siksi hakkuupaine alueella on kova. Uudistushakkuut suunnitellaan toteutettavaksi porrastetusti niin, että metsää kaadettaisiin hehtaari tai kaksi kerrallaan n. 10 vuoden välein. Osalla metsäkuvioista olisi mahdollista kasvattaa kuitupuuta, jota voidaan korjata lyhyellä hakkuuvälillä.

Kustakin hakkuusta saataisiin arviolta 18 000 – 36 000 euroa tuloja. Kokonaistulot hakkuista olisivat lopulta arviolta 360 000 euroa. Hakattu alue uudistetaan istuttamalla uusia taimia, minkä jälkeen siellä toteutetaan säännöllisesti tilanteen kulloinkin vaatimia hoitotoimenpiteitä.

Tällaiset lehtomaiset kangasmetsät ovat puuntuottokyvyltään erinomaisia, minkä vuoksi niiden suojelun tila on verrattain heikko. Sen lisäksi, että metsä ylläpitää monipuolista selkärankaisten ja selkärangattomien lajien kirjoa, se toimii myös hiilivarastona. Elävään ja kuolleeseen puuhun sekä paksuun karikekerrokseen on

sitoutuneena runsaasti hiiltä. Vaikka metsä uusiutuukin hakkuiden jälkeen eikä koko aluetta kaadeta kerralla, alueen nykyinen, vanhalle kuusikolle tyypillinen lajisto katoaisi täysin.

Hakkuista saataisiin merkittävät taloudelliset tulot, mutta metsän ottaminen takaisin metsätalouskäyttöön merkitsisi vanhan metsän lajiston häviämistä ja hiilivaraston menettämistä. Metsän kiertoajan – siis hakkuutiheyden – lyheneminen merkitsisi myös hiilen kierron lyhenemistä ja sitä, että nykyinen lajisto korvautuisi nuorelle metsälle tyypillisillä, melko yleisillä lajeilla.

Toimit viranomaisena, joka päättää julkisessa omistuksessa olevien metsien hoidosta. Kuinka ylläolevassa esimerkissä kuvattua metsäaluetta tulisi mielestäsi käyttää?

	Täysin eri mieltä	Enimmäkseen eri mieltä	Jokseenkin eri mieltä	Jokseenkin samaa mieltä	Enimmäkseen samaa mieltä	Täysin samaa mieltä
Koko metsäalueella tulisi aloittaa puunkorjuu.	○	○	○	○	○	○
Osalla metsäkuvioista tulee kasvattaa kuitupuuta (eli lyhentää hakkuuväliä).	○	○	○	○	○	○
Alueella tulee aloittaa puunkorjuu, mutta vähintään puolet alueesta on suojeltava.	○	○	○	○	○	○
Alueesta osa tulisi suojella, mutta vähintään puolet on jätettävä puunkorjuulle.	○	○	○	○	○	○
Hakkuuväliä ei tule lyhentää.	○	○	○	○	○	○
Alue tulee suojella kokonaan.	○	○	○	○	○	○

Muita kommentteja?

CASE 3

Hyötynäkökulma

Metsätalouskäytössä olevalla alueella sijaitsee metsänreunaan luonnollisesti syntynyt kosteikko. Koska puun kysyntä on jatkuvassa kasvussa, kosteikko halutaan kuivattaa ja ottaa metsätalouskäyttöön. Kuivatus lisäisi puuta tuottavan metsän pinta-alaa 3–4 hehtaarilla, minkä lisäksi metsän kasvu paranisi kosteikon ja

metsän rajapinnassa kasvuolosuhteiden vakiinnuttua. Tämä tarkoittaisi 750–1000 kuution lisäystä tukkipuun tuotantoon eli arviolta 40 000 – 55 000 euron lisätuloja päätehakkuusta. Kosteikon ja metsän reuna-alueella päätehakkuu voitaisiin suorittaa jo 20 vuoden kuluttua. Kuivatetulla kosteikolla kasvatettu metsä olisi valmis päätehakattavaksi noin 60 vuoden kuluttua.

Metsätalouden lisäksi alue on aktiivisessa virkistyskäytössä. Metsässä risteilee paljon polkuja, joilla näkee paikallisia ulkoilemassa lähes päivittäin. Kosteikko on erityisen suosittu alue, sillä se tuo virkistävää vaihtelua muuten yksipuoliseen metsämaisemaan. Lintuharrastajat vierailevat kosteikolla tiuhaan tarkkailemassa sen lajistoa. Paikallisia houkuttelee alueelle myös kosteikon tarjoama lakka- ja karpalosato. Marjasadon ja virkistyskäytön lisäksi kosteikko suojaa läheisiä mökkirantoja pidättämällä tehokkaasti hakkuualueilta tulevia ravinne- ja kiintoainesvalumia sekä ehkäisemällä näiden valumista lähivesistöihin.

Kosteikon kuivatuksella olisi paljon taloudellisia hyötyjä. Saatavaa puuta voitaisiin hyödyntää rakentamisen lisäksi esimerkiksi energiantuotannossa. Kosteikon häviäminen heikentäisi alueen muita käyttömahdollisuuksia maiseman muuttuessa yksipuolisemmaksi ja marjasatojen hävitessä. Myös ravinnevalumien määrä lähivesistöihin voi lisääntyä, mikä voi osaltaan haitata mökkeilyä.

Ekologis-eettinen näkökulma

Metsätalouskäytössä olevalla alueella sijaitsee metsänreunaan luonnollisesti syntynyt kosteikko. Koska puun kysyntä on jatkuvassa kasvussa, kosteikko halutaan kuivattaa ja ottaa metsätalouskäyttöön. Kuivatus lisäisi puuta tuottavan metsän pinta-alaa 3–4 hehtaarilla, minkä lisäksi metsän kasvu paranisi kosteikon ja metsän rajapinnassa kasvuolosuhteiden vakiinnuttua. Tämä tarkoittaisi 750–1000 kuution lisäystä tukkipuun tuotantoon eli arviolta 40 000 – 55 000 euron lisätuloja päätehakkuusta. Kosteikon ja metsän reuna-alueella päätehakkuu voitaisiin suorittaa jo 20 vuoden kuluttua. Kuivatetulla kosteikolla kasvatettu metsä olisi valmis päätehakattavaksi noin 60 vuoden kuluttua.

Kosteikko tuo erittäin merkittävän lisän paikalliseen monimuotoisuuteen, sillä alueen metsät poikkeavat lajistoltaan hyvin vähän. Se tarjoaa ympäröivistä metsistä

täysin poikkeavan elinympäristön lajeille, joita lähialueilla ei juuri muuten tavata. Vedessä ja vedenrajassa viihtyy monenlaisia kasveja, kuten suo-orvokki (*Viola palustris*), keltakurjenmiekka (*Iris pseudacorus*) ja ruohokanukka (*Cornus suecica*). Monipuolisen kasvillisuuden lisäksi kosteikko ylläpitää runsaasti erilaisia selkärangattomia, kuten vedessä sukkuloivia sukeltajia, vedenpinnalla pyöriviä hopeaseppiä ja ilmassa päristeleviä sudenkorentoja. Selkärangattomat tarjoavat runsaasti ravintoa linnuille sekä sammakoille ja vesiliskoille. Linnustoon kuuluvat erityisesti kahlaajalinnut, kuten liro (*Tringa glareola*), metsäviklo (*Tringa ochropus*) ja taivaanvuohi (*Gallinago gallinago*).

Kosteikon kuivatuksella olisi paljon taloudellisia hyötyjä. Siitä saatavaa puuta voitaisiin hyödyntää rakentamisen lisäksi esimerkiksi energiantuotannossa. Kosteikko on kuitenkin ekologisesti erittäin merkittävä, sillä se osaltaan ylläpitää alueen monimuotoisuutta ja tarjoaa talousmetsästä poikkeavan elinympäristön lajeille, joita alueella ei muuten tavattaisi ollenkaan. Lisäksi kosteikolla on tärkeä rooli paikallisissa ekologisissa prosesseissa kuten ravinteiden ja veden kierrossa. Mikäli kuivatushanke toteutettaisiin, tämä ainutlaatuinen elinympäristö tuhoutuisi täysin. Kuivatuksen myötä kosteikkolajit korvautuisivat ympäröivien metsien lajistolla.

Yhdistelmä

Metsätalouskäytössä olevalla alueella sijaitsee metsänreunaan luonnollisesti syntynyt kosteikko. Koska puun kysyntä on jatkuvassa kasvussa, kosteikko halutaan kuivattaa ja ottaa metsätalouskäyttöön. Kuivatus lisäisi puuta tuottavan metsän pinta-alaa 3–4 hehtaarilla, minkä lisäksi metsän kasvu paranisi kosteikon ja metsän rajapinnassa kasvuolosuhteiden vakiinnuttua. Tämä tarkoittaisi 750–1000 kuution lisäystä tukkipuun tuotantoon eli arviolta 40 000 – 55 000 euron lisätuloja päätehakkuusta. Kosteikon ja metsän reuna-alueella päätehakkuu voitaisiin suorittaa jo 20 vuoden kuluttua. Kuivatetulla kosteikolla kasvatettu metsä olisi valmis päätehakattavaksi noin 60 vuoden kuluttua.

Kosteikko tarjoaa monipuolisen ympäristön esimerkiksi kahlaajalinnuille, kuten metsäviklolle (*Tringa ochropus*) ja taivaanvuohelle (*Gallinago gallinago*), joita

lintuharrastajat tulevat ihailemaan. Kosteikko tuo kaivattua vaihtelua muuten metsävaltaiseen maisemaan ja paikka onkin paikallisten suosiossa. Monipuoliseen kasvilajistoon kuuluvat muiden muassa suo-orvokki (*Viola palustris*) sekä satoisat luonnonmarjat isokarpalo (*Vaccinium oxycoccos*) ja lakka (*Rubus chamaemorus*). Kaiken kaikkiaan kosteikon ympäröivästä metsästä huomattavasti poikkeava lajisto tarjoaa ulkoilijoille paljon ihailtavaa tai poimittavaa.

Kosteikon kuivatuksella olisi paljon taloudellisia hyötyjä. Siitä saatavaa puuta voitaisiin hyödyntää rakentamisen lisäksi esimerkiksi energiantuotannossa. Tämä kuitenkin merkitsisi alueellisesti ainutlaatuisen elinympäristön ja sen tuomien käyttöarvojen menetystä.

Toimit viranomaisena, joka päättää julkisessa omistuksessa olevien metsien hoidosta. Kuinka ylläolevassa esimerkissä kuvattua metsäaluetta tulisi mielestäsi käyttää?

	Täysin eri mieltä	Enimmäkseen eri mieltä	Jokseenkin eri mieltä	Jokseenkin samaa mieltä	Enimmäkseen samaa mieltä	Täysin samaa mieltä
Kosteikko tulisi kuivattaa ja alue valjastaa puuntuotantoon.	○	○	○	○	○	○
Kosteikko tulisi suojella.	○	○	○	○	○	○
Myös kosteikkoa ympäröivien alueiden käsittelyjä tulisi rajoittaa kosteikon suojelemiseksi.	○	○	○	○	○	○
Kosteikko tulisi suojella, mutta alueen muuta metsätaloutta ei pidä rajoittaa.	○	○	○	○	○	○
Koko alue tulisi suojella niin, että metsätalouden harjoittaminen alueella estetään.	○	○	○	○	○	○

Muita kommentteja?

Omistatko tai omistaako perheesi metsää?

- ◯ Kyllä
- ◯ Ei
- ◯ En tiedä

Liikutko vapaa-aikanasi paljon luonnossa?

- ◯ Päivittäin
- ◯ 1–2 kertaa viikossa
- ◯ 1–3 kertaa kuukaudessa
- ◯ Harvemmin kuin kerran kuukaudessa
- ◯ En lainkaan

Kuinka tärkeää metsätalous on mielestäsi Suomen taloudelle ja kehitykselle?

- ◯ Elintärkeää
- ◯ Jokseenkin tärkeää
- ◯ Ei kovin tärkeää
- ◯ Ei lainkaan tärkeää
- ◯ En osaa sanoa

Millä tavalla metsätalous huomioidaan mielestäsi suomalaisessa poliittisessa päätöksenteossa?

- ◯ Siihen keskitytään liikaa
- ◯ Voitaisiin huomioida vähemmän
- ◯ Voitaisiin huomioida enemmän
- ◯ Ei huomioida lainkaan tarpeeksi
- ◯ En osaa sanoa

Miten tärkeänä pidät luonnon- ja ympäristönsuojelua?

- ◯ Elintärkeänä
- ◯ Jokseenkin tärkeänä
- ◯ En kovin tärkeänä
- ◯ En lainkaan tärkeänä
- ◯ En osaa sanoa

Mikä on mielestäsi luonnonsuojelun nykytila Suomessa?

- ◯ Erinomainen
- ◯ Hyvä
- ◯ Kohtalainen
- ◯ Heikko
- ◯ Erittäin heikko
- ◯ En osaa sanoa

Millä tavalla luonnonsuojelu otetaan mielestäsi huomioon suomalaisessa päätöksenteossa?

- ◯ Siihen keskitytään liikaa
- ◯ Voitaisiin huomioida vähemmän
- ◯ Voitaisiin huomioida enemmän
- ◯ Ei huomioida lainkaan tarpeeksi
- ◯ En osaa sanoa

Muita kommentteja koskien kyselyä tai metsien käyttöä ja suojelua?

APPENDIX 2: PAIRWISE COMPARISONS OF THE QUESTIONNAIRES

Table A1. The pairwise comparisons of responses to the propositions between students of environmental sciences and students with some other major for all the responses (answer time ≥ 4 min.) with Student's T test.

	Mean, Environmental students	Mean, others	p-value	df
Case 1: The forest should be logged, and the stumps and other logging residue should be collected for energy production.	1.63	2.15	< **0.001**	544
Case 1: The forest should be logged, but the stumps and other logging residue should be left in the forest.	2.59	2.91	0.08	543
Case 1: The forest should be conserved as it is.	5.06	4.66	**0.003**	123.96
Case 2: Harvesting should take place on the whole forest area.	1.81	2.38	< **0.001**	124.19
Case 2: Pulpwood should be cultivated in some of the areas (i.e. the rotation period should be shortened).	2.73	3.20	**0.004**	545
Case 2: Some of the area should be harvested, but at least half of it should be conserved.	4.05	3.80	0.12	545
Case 2: Some of the area should be conserved, but at least half of it should be left for harvesting.	2.90	3.38	< **0.001**	119.98
Case 2: The rotation period should not be shortened.	4.29	3.98	0.06	543
Case 2: The area should be protected in its totality.	3.82	3.16	< **0.001**	545
Case 3: The wetland should be drained, and the area should be used for wood production.	1.33	1.89	< **0.001**	168.88
Case 3: The wetland should be protected.	5.39	4.73	< **0.001**	150.44

Case 3: The treatments on the surrounding areas should also be limited to further protect the wetland ecosystem and biodiversity.	4.85	4.01	< **0.001**	545
Case 3: The wetland should be protected but the silviculture of the surrounding areas should not be limited.	3.08	3.53	**0.002**	543
Case 3: The whole area should be conserved so that silvicultural activities are prohibited completely.	3.13	2.86	0.12	545
Willingness to conserve	5.01	4.46	< **0.001**	122.77

Table A2. The pairwise comparisons of responses to the propositions between students of environmental sciences and students with some other major within the perspectives (answer time ≥ 4 min.) with Mann-Whitney *U* test.

Utilitarian perspective

	Mean, Environmental students	Mean, others	p-value	*U*
Case 1: The forest should be logged, and the stumps and other logging residue should be collected for energy production.	1.83	2.19	0.12	1577.5
Case 1: The forest should be logged, but the stumps and other logging residue should be left in the forest.	2.29	2.71	0.19	1618.5
Case 1: The forest should be conserved as it is.	5.13	4.80	0.11	1562.0
Case 2: Harvesting should take place on the whole forest area.	2.04	2.46	0.19	1560.5
Case 2: Pulpwood should be cultivated in some of the areas (i.e. the rotation period should be shortened).	3.17	3.30	0.69	1771.5
Case 2: Some of the area should be harvested, but at least half of it should be conserved.	4.04	3.68	0.28	1673.0
Case 2: Some of the area should be conserved, but at least half of it should be left for harvesting.	3.22	3.25	0.90	1833.0
Case 2: The rotation period should not be shortened.	4.33	3.93	0.14	1579.0

Case 2: The area should be protected in its totality.	3.70	3.19	0.11	1474.0
Case 3: The wetland should be drained, and the area should be used for wood production.	1.22	1.91	**0.001**	1134.0
Case 3: The wetland should be protected.	5.50	4.67	**0.001**	1158.0
Case 3: The treatments on the surrounding areas should also be limited to further protect the wetland ecosystem and biodiversity.	4.75	4.04	**0.01**	1344.0
Case 3: The wetland should be protected but the silviculture of the surrounding areas should not be limited.	3.13	3.51	0.08	1438.0
Case 3: The whole area should be conserved so that silvicultural activities are prohibited completely.	3.17	2.98	0.34	1639.0
Willingness to conserve	5.02	4.47	**0.003**	1217.0

Ecological perspective

	Mean, Environmental students	Mean, others	p-value	*U*
Case 1: The forest should be logged, and the stumps and other logging residue should be collected for energy production.	1.61	2.13	**0.026**	1616.0
Case 1: The forest should be logged, but the stumps and other logging residue should be left in the forest.	3.14	3.42	0.36	1927.0
Case 1: The forest should be conserved as it is.	5.04	4.47	0.08	1742.0
Case 2: Harvesting should take place on the whole forest area.	1.79	2.26	0.09	1771.0
Case 2: Pulpwood should be cultivated in some of the areas (i.e. the rotation period should be shortened).	2.43	3.07	**0.02**	1589.5
Case 2: Some of the area should be harvested, but at least half of it should be conserved.	4.14	3.91	0.56	2036.0
Case 2: Some of the area should be conserved, but at least half of it should be left for harvesting.	2.93	3.50	**0.02**	1593.0
Case 2: The rotation period should not be shortened.	4.39	4.05	0.20	1844.5
Case 2: The area should be protected in its totality.	3.79	3.14	**0.04**	1667.0
Case 3: The wetland should be drained, and the area should be used for wood production.	1.32	1.79	**0.03**	1667.5

Case 3: The wetland should be protected.	5.32	4.74	**0.03**	1636.5
Case 3: The treatments on the surrounding areas should also be limited to further protect the wetland ecosystem and biodiversity.	4.78	4.02	**0.003**	1356.5
Case 3: The wetland should be protected but the silviculture of the surrounding areas should not be limited.	3.04	3.51	**0.04**	1642.0
Case 3: The whole area should be conserved so that silvicultural activities are prohibited completely.	3.07	2.70	0.20	1843.5
Willingness to conserve	4.94	4.43	**0.008**	1492.0

Mixed perspective

	Mean, Environmental students	Mean, others	p-value	*U*
Case 1: The forest should be logged, and the stumps and other logging residue should be collected for energy production.	1.48	2.12	**0.006**	1405.5
Case 1: The forest should be logged, but the stumps and other logging residue should be left in the forest.	2.30	2.59	0.18	1715.0
Case 1: The forest should be conserved as it is.	5.04	4.72	0.25	1769.0
Case 2: Harvesting should take place on the whole forest area.	1.63	2.43	**0.01**	1440.0
Case 2: Pulpwood should be cultivated in some of the areas (i.e. the rotation period should be shortened).	2.67	3.22	0.07	1612.5
Case 2: Some of the area should be harvested, but at least half of it should be conserved.	3.96	3.81	0.38	1826.5
Case 2: Some of the area should be conserved, but at least half of it should be left for harvesting.	2.59	3.40	**0.003**	1314.5
Case 2: The rotation period should not be shortened.	4.15	3.95	0.53	1875.0
Case 2: The area should be protected in its totality.	3.96	3.15	**0.02**	1463.5
Case 3: The wetland should be drained, and the area should be used for wood production.	1.44	1.97	**0.02**	1511.5
Case 3: The wetland should be protected.	5.37	4.78	**0.01**	1442.5
Case 3: The treatments on the surrounding areas should also be limited to further protect the wetland ecosystem and biodiversity.	5.00	3.96	**< 0.001**	1153.0

Case 3: The wetland should be protected but the silviculture of the surrounding areas should not be limited.	3.07	3.58	0.11	1663.5
Case 3: The whole area should be conserved so that silvicultural activities are prohibited completely.	3.15	2.89	0.40	1849.0
Willingness to conserve	5.07	4.48	**0.002**	1276.0

Table A3. The pairwise comparisons of responses to the propositions between different versions of the questionnaire for the students of environmental sciences (answer time ≥ 4 min.) with Mann-Whitney *U*.

Utilitarian and Ecological				
	Mean, Utilitarian	Mean, Ecological	p-value	*U*
Case 1: The forest should be logged, and the stumps and other logging residue should be collected for energy production.	1.83	1.61	0.57	308.5
Case 1: The forest should be logged, but the stumps and other logging residue should be left in the forest.	2.29	3.14	**0.03**	221.5
Case 1: The forest should be conserved as it is.	5.13	5.04	0.28	281.5
Case 2: Harvesting should take place on the whole forest area.	2.04	1.79	0.36	277.5
Case 2: Pulpwood should be cultivated in some of the areas (i.e. the rotation period should be shortened).	3.17	2.43	**0.03**	210.5
Case 2: Some of the area should be harvested, but at least half of it should be conserved.	4.04	4.14	0.65	312.0
Case 2: Some of the area should be conserved, but at least half of it should be left for harvesting.	3.22	2.93	0.26	266.0
Case 2: The rotation period should not be shortened.	4.33	4.39	0.74	318.5
Case 2: The area should be protected in its totality.	3.70	3.79	0.99	321.5
Case 3: The wetland should be drained, and the area should be used for wood production.	1.22	1.32	0.54	297.5
Case 3: The wetland should be protected.	5.50	5.32	0.55	307.0
Case 3: The treatments on the surrounding areas should also be limited	4.75	4.78	0.68	303.0

to further protect the wetland ecosystem and biodiversity.				
Case 3: The wetland should be protected but the silviculture of the surrounding areas should not be limited.	3.13	3.04	0.58	294.0
Case 3: The whole area should be conserved so that silvicultural activities are prohibited completely.	3.17	3.07	0.83	311.0
Willingness to conserve	5.02	4.94	0.40	290.5

Utilitarian and mixed

	Mean, Utilitarian	Mean, Mixed	p-value	MWU
Case 1: The forest should be logged, and the stumps and other logging residue should be collected for energy production.	1.83	1.48	0.29	275.0
Case 1: The forest should be logged, but the stumps and other logging residue should be left in the forest.	2.29	2.30	0.46	286.5
Case 1: The forest should be conserved as it is.	5.13	5.04	0.63	300.0
Case 2: Harvesting should take place on the whole forest area.	2.04	1.63	0.15	243.0
Case 2: Pulpwood should be cultivated in some of the areas (i.e. the rotation period should be shortened).	3.17	2.67	0.15	240.0
Case 2: Some of the area should be harvested, but at least half of it should be conserved.	4.04	3.96	0.86	315.0
Case 2: Some of the area should be conserved, but at least half of it should be left for harvesting.	3.22	2.59	0.05	214.5
Case 2: The rotation period should not be shortened.	4.33	4.15	0.50	289.5
Case 2: The area should be protected in its totality.	3.70	3.96	0.52	278.5
Case 3: The wetland should be drained, and the area should be used for wood production.	1.22	1.44	0.55	287.5
Case 3: The wetland should be protected.	5.50	5.37	0.80	312.0
Case 3: The treatments on the surrounding areas should also be limited to further protect the wetland ecosystem and biodiversity.	4.75	5.00	0.25	266.0
Case 3: The wetland should be protected but the silviculture of the surrounding areas should not be limited.	3.13	3.07	0.99	310.0

Case 3: The whole area should be conserved so that silvicultural activities are prohibited completely.	3.17	3.15	0.93	306.0
Willingness to conserve	5.02	5.07	0.64	299.0

Ecological and mixed

	Mean, Ecological	Mean, Mixed	p-value	MWU
Case 1: The forest should be logged, and the stumps and other logging residue should be collected for energy production.	1.61	1.48	0.59	350.5
Case 1: The forest should be logged, but the stumps and other logging residue should be left in the forest.	3.14	2.30	**0.03**	250.0
Case 1: The forest should be conserved as it is.	5.04	5.04	0.66	353.0
Case 2: Harvesting should take place on the whole forest area.	1.79	1.63	0.60	350.5
Case 2: Pulpwood should be cultivated in some of the areas (i.e. the rotation period should be shortened).	2.43	2.67	0.52	341.0
Case 2: Some of the area should be harvested, but at least half of it should be conserved.	4.14	3.96	0.90	370.5
Case 2: Some of the area should be conserved, but at least half of it should be left for harvesting.	2.93	2.59	0.25	312.0
Case 2: The rotation period should not be shortened.	4.39	4.15	0.31	319.5
Case 2: The area should be protected in its totality.	3.79	3.96	0.56	344.0
Case 3: The wetland should be drained, and the area should be used for wood production.	1.32	1.44	0.95	375.0
Case 3: The wetland should be protected.	5.32	5.37	0.76	361.5
Case 3: The treatments on the surrounding areas should also be limited to further protect the wetland ecosystem and biodiversity.	4.78	5.00	0.41	319.0
Case 3: The wetland should be protected but the silviculture of the surrounding areas should not be limited.	3.04	3.07	0.72	357.0
Case 3: The whole area should be conserved so that silvicultural activities are prohibited completely.	3.07	3.15	0.90	370.5
Willingness to conserve	4.94	5.07	0.28	314.5

Table A4. The pairwise comparisons of responses to the propositions between different versions of the questionnaire for the students majoring in some other subject than environmental sciences (answer time ≥ 4 min.) with Student's T test.

Utilitarian and ecological				
	Mean, Utilitarian	Mean, Ecological	p-value	df
Case 1: The forest should be logged, and the stumps and other logging residue should be collected for energy production.	2.19	2.13	0.69	314
Case 1: The forest should be logged, but the stumps and other logging residue should be left in the forest.	2.71	3.42	**< 0.001**	313
Case 1: The forest should be conserved as it is.	4.80	4.47	0.03	315
Case 2: Harvesting should take place on the whole forest area.	2.46	2.26	0.21	316
Case 2: Pulpwood should be cultivated in some of the areas (i.e. the rotation period should be shortened).	3.30	3.07	0.12	315
Case 2: Some of the area should be harvested, but at least half of it should be conserved.	3.68	3.91	0.14	315
Case 2: Some of the area should be conserved, but at least half of it should be left for harvesting.	3.25	3.50	0.09	316
Case 2: The rotation period should not be shortened.	3.93	4.05	0.43	314
Case 2: The area should be protected in its totality.	3.19	3.14	0.77	315
Case 3: The wetland should be drained, and the area should be used for wood production.	1.91	1.79	0.31	315
Case 3: The wetland should be protected.	4.67	4.74	0.63	315
Case 3: The treatments on the surrounding areas should also be limited to further protect the wetland ecosystem and biodiversity.	4.04	4.02	0.87	315
Case 3: The wetland should be protected but the silviculture of the surrounding areas should not be limited.	3.51	3.51	0.98	313
Case 3: The whole area should be conserved so that silvicultural activities are prohibited completely.	2.98	2.70	0.08	315
Willingness to conserve	4.47	4.43	0.65	316

Utilitarian and mixed

	Mean, Utilitarian	Mean, Mixed	p-value	df
Case 1: The forest should be logged, and the stumps and other logging residue should be collected for energy production.	2.19	2.12	0.64	311
Case 1: The forest should be logged, but the stumps and other logging residue should be left in the forest.	2.71	2.59	0.42	310
Case 1: The forest should be conserved as it is.	4.80	4.72	0.59	310
Case 2: Harvesting should take place on the whole forest area.	2.46	2.43	0.89	312
Case 2: Pulpwood should be cultivated in some of the areas (i.e. the rotation period should be shortened).	3.30	3.22	0.57	312
Case 2: Some of the area should be harvested, but at least half of it should be conserved.	3.68	3.81	0.37	310
Case 2: Some of the area should be conserved, but at least half of it should be left for harvesting.	3.25	3.40	0.28	311
Case 2: The rotation period should not be shortened.	3.93	3.95	0.92	309
Case 2: The area should be protected in its totality.	3.19	3.15	0.81	311
Case 3: The wetland should be drained, and the area should be used for wood production.	1.91	1.97	0.65	312
Case 3: The wetland should be protected.	4.67	4.78	0.45	312
Case 3: The treatments on the surrounding areas should also be limited to further protect the wetland ecosystem and biodiversity.	4.04	3.96	0.58	312
Case 3: The wetland should be protected but the silviculture of the surrounding areas should not be limited.	3.51	3.58	0.63	310
Case 3: The whole area should be conserved so that silvicultural activities are prohibited completely.	2.98	2.89	0.58	312
Willingness to conserve	4.47	4.48	0.93	312

Ecological and mixed

	Mean, Ecological	Mean, Mixed	p-value	df

Case 1: The forest should be logged, and the stumps and other logging residue should be collected for energy production.	2.13	2.12	0.94	303
Case 1: The forest should be logged, but the stumps and other logging residue should be left in the forest.	3.42	2.59	**< 0.001**	303
Case 1: The forest should be conserved as it is.	4.47	4.72	0.12	305
Case 2: Harvesting should take place on the whole forest area.	2.26	2.43	0.30	306
Case 2: Pulpwood should be cultivated in some of the areas (i.e. the rotation period should be shortened).	3.07	3.22	0.34	305
Case 2: Some of the area should be harvested, but at least half of it should be conserved.	3.91	3.81	0.53	305
Case 2: Some of the area should be conserved, but at least half of it should be left for harvesting.	3.50	3.40	0.52	305
Case 2: The rotation period should not be shortened.	4.05	3.95	0.52	303
Case 2: The area should be protected in its totality.	3.14	3.15	0.95	306
Case 3: The wetland should be drained, and the area should be used for wood production.	1.79	1.97	0.17	305
Case 3: The wetland should be protected.	4.74	4.78	0.81	305
Case 3: The treatments on the surrounding areas should also be limited to further protect the wetland ecosystem and biodiversity.	4.02	3.96	0.70	305
Case 3: The wetland should be protected but the silviculture of the surrounding areas should not be limited.	3.51	3.58	0.63	305
Case 3: The whole area should be conserved so that silvicultural activities are prohibited completely.	2.70	2.89	0.23	305
Willingness to conserve	4.43	4.48	0.61	306

Table A5. The pairwise comparisons of responses to the propositions between forest owners and non-forest owners (answer time ≥ 4 min.) with Student's T test, first for all the responses and then within each version of the questionnaire.

All the responses				
	Mean, Forest-owners	Mean, Non-forest owners	p-value	df
Case 1: The forest should be logged, and the stumps and other logging residue should be collected for energy production.	2.22	1.88	**0.001**	529.84
Case 1: The forest should be logged, but the stumps and other logging residue should be left in the forest.	3.01	2.65	**0.005**	529
Case 1: The forest should be conserved as it is.	4.57	4.91	**0.002**	530.89
Case 2: Harvesting should take place on the whole forest area.	2.37	2.22	0.22	532
Case 2: Pulpwood should be cultivated in some of the areas (i.e. the rotation period should be shortened).	3.18	3.05	0.28	532
Case 2: Some of the area should be harvested, but at least half of it should be conserved.	3.75	3.94	0.10	531
Case 2: Some of the area should be conserved, but at least half of it should be left for harvesting.	3.37	3.26	0.31	531
Case 2: The rotation period should not be shortened.	4.01	4.07	0.58	529
Case 2: The area should be protected in its totality.	3.11	3.41	**0.03**	531
Case 3: The wetland should be drained, and the area should be used for wood production.	1.90	1.70	**0.03**	532
Case 3: The wetland should be protected.	4.68	5.00	**0.002**	532.80
Case 3: The treatments on the surrounding areas should also be limited to further protect the wetland ecosystem and biodiversity.	4.02	4.24	**0.05**	532

Case 3: The wetland should be protected but the silviculture of the surrounding areas should not be limited.	3.60	3.32	**0.01**	530
Case 3: The whole area should be conserved so that silvicultural activities are prohibited completely.	2.69	3.13	**< 0.001**	532
Willingness to conserve	4.41	4.70	**< 0.001**	530.23

Utilitarian perspective

	Mean, Forest-owners	Mean, Non-forest owners	p-value	df
Case 1: The forest should be logged, and the stumps and other logging residue should be collected for energy production.	2.27	1.99	0.122	177.989
Case 1: The forest should be logged, but the stumps and other logging residue should be left in the forest.	2.85	2.35	**0.015**	177
Case 1: The forest should be conserved as it is.	4.63	5.10	**0.009**	174.242
Case 2: Harvesting should take place on the whole forest area.	2.38	2.42	0.823	177
Case 2: Pulpwood should be cultivated in some of the areas (i.e. the rotation period should be shortened).	3.32	3.15	0.393	177
Case 2: Some of the area should be harvested, but at least half of it should be conserved.	3.66	3.78	0.528	177
Case 2: Some of the area should be conserved, but at least half of it should be left for harvesting.	3.36	3.08	0.127	177
Case 2: The rotation period should not be shortened.	4.00	4.01	0.948	177
Case 2: The area should be protected in its totality.	3.10	3.49	0.095	176
Case 3: The wetland should be drained, and the area should be used for wood production.	1.92	1.71	0.171	177
Case 3: The wetland should be protected.	4.60	4.99	**0.030**	177.909
Case 3: The treatments on the surrounding areas should also be limited	3.95	4.37	**0.028**	178

to further protect the wetland ecosystem and biodiversity.				
Case 3: The wetland should be protected but the silviculture of the surrounding areas should not be limited.	3.58	3.35	0.186	175
Case 3: The whole area should be conserved so that silvicultural activities are prohibited completely.	2.70	3.38	**0.001**	177
Willingness to conserve	4.41	4.73	**0.020**	178

Ecological perspective

	Mean, Forest-owners	Mean, Non-forest owners	p-value	df
Case 1: The forest should be logged, and the stumps and other logging residue should be collected for energy production.	2.28	1.77	**0.004**	173.139
Case 1: The forest should be logged, but the stumps and other logging residue should be left in the forest.	3.47	3.27	0.358	176
Case 1: The forest should be conserved as it is.	4.53	4.57	0.832	178
Case 2: Harvesting should take place on the whole forest area.	2.39	1.96	**0.041**	178
Case 2: Pulpwood should be cultivated in some of the areas (i.e. the rotation period should be shortened).	3.10	2.86	0.231	178
Case 2: Some of the area should be harvested, but at least half of it should be conserved.	3.85	4.11	0.201	178
Case 2: Some of the area should be conserved, but at least half of it should be left for harvesting.	3.49	3.40	0.619	178
Case 2: The rotation period should not be shortened.	3.99	4.26	0.196	177
Case 2: The area should be protected in its totality.	3.09	3.32	0.319	178
Case 3: The wetland should be drained, and the area should be used for wood production.	1.85	1.56	0.051	178
Case 3: The wetland should be protected.	4.70	4.98	0.153	178

Case 3: The treatments on the surrounding areas should also be limited to further protect the wetland ecosystem and biodiversity.	4.11	4.12	0.954	177
Case 3: The wetland should be protected but the silviculture of the surrounding areas should not be limited.	3.60	3.26	0.079	178.000
Case 3: The whole area should be conserved so that silvicultural activities are prohibited completely.	2.61	2.91	0.145	178
Willingness to conserve	4.37	4.64	**0.046**	178

Mixed perspective

	Mean, Forest-owners	Mean, Non-forest owners	p-value	df
Case 1: The forest should be logged, and the stumps and other logging residue should be collected for energy production.	2.12	1.86	0.158	172
Case 1: The forest should be logged, but the stumps and other logging residue should be left in the forest.	2.71	2.31	0.049	169.514
Case 1: The forest should be conserved as it is.	4.54	5.08	**0.004**	169.046
Case 2: Harvesting should take place on the whole forest area.	2.35	2.28	0.787	173
Case 2: Pulpwood should be cultivated in some of the areas (i.e. the rotation period should be shortened).	3.11	3.15	0.849	173
Case 2: Some of the area should be harvested, but at least half of it should be conserved.	3.73	3.92	0.352	172
Case 2: Some of the area should be conserved, but at least half of it should be left for harvesting.	3.27	3.30	0.861	172
Case 2: The rotation period should not be shortened.	4.03	3.93	0.649	171
Case 2: The area should be protected in its totality.	3.15	3.42	0.255	173
Case 3: The wetland should be drained, and the area should be used for wood production.	1.93	1.84	0.616	173

Case 3: The wetland should be protected.	4.74	5.03	0.099	172.968
Case 3: The treatments on the surrounding areas should also be limited to further protect the wetland ecosystem and biodiversity.	3.99	4.24	0.233	173
Case 3: The wetland should be protected but the silviculture of the surrounding areas should not be limited.	3.62	3.35	0.168	173
Case 3: The whole area should be conserved so that silvicultural activities are prohibited completely.	2.76	3.09	0.109	173
Willingness to conserve	4.46	4.72	0.091	173

Table A6. The pairwise comparisons of responses to the propositions between different versions of the questionnaire for the forest owners (answer time ≥ 4 min.) with Student's T test.

Utilitarian and ecological				
	Mean, Utilitarian	Mean, Ecological	p-value	df
Case 1: The forest should be logged, and the stumps and other logging residue should be collected for energy production.	2.27	2.28	0.94	198
Case 1: The forest should be logged, but the stumps and other logging residue should be left in the forest.	2.85	3.47	0.003	197
Case 1: The forest should be conserved as it is.	4.63	4.53	0.59	197
Case 2: Harvesting should take place on the whole forest area.	2.38	2.39	0.93	198
Case 2: Pulpwood should be cultivated in some of the areas (i.e. the rotation period should be shortened).	3.32	3.10	0.23	198
Case 2: Some of the area should be harvested, but at least half of it should be conserved.	3.66	3.85	0.31	197
Case 2: Some of the area should be conserved, but at least half of it should be left for harvesting.	3.36	3.49	0.44	198
Case 2: The rotation period should not be shortened.	4.00	3.99	0.96	197
Case 2: The area should be protected in its totality.	3.10	3.09	0.97	198

Case 3: The wetland should be drained, and the area should be used for wood production.	1.92	1.85	0.64	198
Case 3: The wetland should be protected.	4.60	4.70	0.63	198
Case 3: The treatments on the surrounding areas should also be limited to further protect the wetland ecosystem and biodiversity.	3.95	4.11	0.39	197
Case 3: The wetland should be protected but the silviculture of the surrounding areas should not be limited.	3.58	3.60	0.91	187.97
Case 3: The whole area should be conserved so that silvicultural activities are prohibited completely.	2.70	2.61	0.62	198
Willingness to conserve	4.41	4.37	0.76	198

Utilitarian and mixed

	Mean, Utilitarian	Mean, Mixed	p-value	df
Case 1: The forest should be logged, and the stumps and other logging residue should be collected for energy production.	2.27	2.12	0.43	199
Case 1: The forest should be logged, but the stumps and other logging residue should be left in the forest.	2.85	2.71	0.49	198
Case 1: The forest should be conserved as it is.	4.63	4.54	0.66	198
Case 2: Harvesting should take place on the whole forest area.	2.38	2.35	0.89	200
Case 2: Pulpwood should be cultivated in some of the areas (i.e. the rotation period should be shortened).	3.32	3.11	0.27	200
Case 2: Some of the area should be harvested, but at least half of it should be conserved.	3.66	3.73	0.70	198
Case 2: Some of the area should be conserved, but at least half of it should be left for harvesting.	3.36	3.27	0.61	200
Case 2: The rotation period should not be shortened.	4.00	4.03	0.88	199
Case 2: The area should be protected in its totality.	3.10	3.15	0.82	200
Case 3: The wetland should be drained, and the area should be used for wood production.	1.92	1.93	0.95	200
Case 3: The wetland should be protected.	4.60	4.74	0.46	200
Case 3: The treatments on the surrounding areas should also be limited to further	3.95	3.99	0.84	200

protect the wetland ecosystem and biodiversity.				
Case 3: The wetland should be protected but the silviculture of the surrounding areas should not be limited.	3.58	3.62	0.78	193.00
Case 3: The whole area should be conserved so that silvicultural activities are prohibited completely.	2.70	2.76	0.76	200
Willingness to conserve	4.41	4.46	0.72	200

Ecological and mixed

	Mean, Ecological	Mean, Mixed	p-value	df
Case 1: The forest should be logged, and the stumps and other logging residue should be collected for energy production.	2.28	2.12	0.38	197
Case 1: The forest should be logged, but the stumps and other logging residue should be left in the forest.	3.47	2.71	**< 0.001**	197
Case 1: The forest should be conserved as it is.	4.53	4.54	0.94	197
Case 2: Harvesting should take place on the whole forest area.	2.39	2.35	0.83	198
Case 2: Pulpwood should be cultivated in some of the areas (i.e. the rotation period should be shortened).	3.10	3.11	0.97	198
Case 2: Some of the area should be harvested, but at least half of it should be conserved.	3.85	3.73	0.55	197
Case 2: Some of the area should be conserved, but at least half of it should be left for harvesting.	3.49	3.27	0.22	198
Case 2: The rotation period should not be shortened.	3.99	4.03	0.84	196
Case 2: The area should be protected in its totality.	3.09	3.15	0.79	198
Case 3: The wetland should be drained, and the area should be used for wood production.	1.85	1.93	0.63	198
Case 3: The wetland should be protected.	4.70	4.74	0.81	198
Case 3: The treatments on the surrounding areas should also be limited to further protect the wetland ecosystem and biodiversity.	4.11	3.99	0.54	197
Case 3: The wetland should be protected but the silviculture of the surrounding areas should not be limited.	3.60	3.62	0.89	198

Case 3: The whole area should be conserved so that silvicultural activities are prohibited completely.	2.61	2.76	0.44	198
Willingness to conserve	4.37	4.46	0.52	199

Table A7. The pairwise comparisons of responses to the propositions between different versions of the questionnaire for the non-forest owners (answer time ≥ 4 min.) with Student's T test.

Utilitarian and ecological				
	Mean, Utilitarian	Mean, Ecological	p-value	df
Case 1: The forest should be logged, and the stumps and other logging residue should be collected for energy production.	1.99	1.77	0.18	156
Case 1: The forest should be logged, but the stumps and other logging residue should be left in the forest.	2.35	3.27	**< 0.001**	150.71
Case 1: The forest should be conserved as it is.	5.10	4.57	**0.004**	147.20
Case 2: Harvesting should take place on the whole forest area.	2.42	1.96	**0.03**	157
Case 2: Pulpwood should be cultivated in some of the areas (i.e. the rotation period should be shortened).	3.15	2.86	0.17	157
Case 2: Some of the area should be harvested, but at least half of it should be conserved.	3.78	4.11	0.13	158
Case 2: Some of the area should be conserved, but at least half of it should be left for harvesting.	3.08	3.40	0.12	157
Case 2: The rotation period should not be shortened.	4.01	4.26	0.23	157
Case 2: The area should be protected in its totality.	3.49	3.32	0.49	156
Case 3: The wetland should be drained, and the area should be used for wood production.	1.71	1.56	0.30	157
Case 3: The wetland should be protected.	4.99	4.98	0.95	158
Case 3: The treatments on the surrounding areas should also be limited to further protect the wetland ecosystem and biodiversity.	4.37	4.12	0.21	158

Case 3: The wetland should be protected but the silviculture of the surrounding areas should not be limited.	3.35	3.26	0.63	157
Case 3: The whole area should be conserved so that silvicultural activities are prohibited completely.	3.38	2.91	**0.03**	157
Willingness to conserve	4.73	4.64	0.53	158

Utilitarian and mixed

	Mean, Utilitarian	Mean, Mixed	p-value	df
Case 1: The forest should be logged, and the stumps and other logging residue should be collected for energy production.	1.99	1.86	0.47	151
Case 1: The forest should be logged, but the stumps and other logging residue should be left in the forest.	2.35	2.31	0.83	151
Case 1: The forest should be conserved as it is.	5.10	5.08	0.90	151
Case 2: Harvesting should take place on the whole forest area.	2.42	2.28	0.52	150
Case 2: Pulpwood should be cultivated in some of the areas (i.e. the rotation period should be shortened).	3.15	3.15	0.98	150
Case 2: Some of the area should be harvested, but at least half of it should be conserved.	3.78	3.92	0.53	149.41
Case 2: Some of the area should be conserved, but at least half of it should be left for harvesting.	3.08	3.30	0.26	149
Case 2: The rotation period should not be shortened.	4.01	3.93	0.70	149
Case 2: The area should be protected in its totality.	3.49	3.42	0.77	149
Case 3: The wetland should be drained, and the area should be used for wood production.	1.71	1.84	0.41	150
Case 3: The wetland should be protected.	4.99	5.03	0.81	151
Case 3: The treatments on the surrounding areas should also be limited to further protect the wetland ecosystem and biodiversity.	4.37	4.24	0.52	151
Case 3: The wetland should be protected but the silviculture of the surrounding areas should not be limited.	3.35	3.35	0.98	150
Case 3: The whole area should be conserved so that silvicultural activities are prohibited completely.	3.38	3.09	0.18	150
Willingness to conserve	4.73	4.72	0.96	151

Ecological and mixed				
	Mean, Ecological	Mean, Mixed	p-value	df
Case 1: The forest should be logged, and the stumps and other logging residue should be collected for energy production.	1.77	1.86	0.56	151
Case 1: The forest should be logged, but the stumps and other logging residue should be left in the forest.	3.27	2.31	**< 0.001**	147.61
Case 1: The forest should be conserved as it is.	4.57	5.08	**0.006**	146.28
Case 2: Harvesting should take place on the whole forest area.	1.96	2.28	0.14	153
Case 2: Pulpwood should be cultivated in some of the areas (i.e. the rotation period should be shortened).	2.86	3.15	0.18	153
Case 2: Some of the area should be harvested, but at least half of it should be conserved.	4.11	3.92	0.34	153
Case 2: Some of the area should be conserved, but at least half of it should be left for harvesting.	3.40	3.30	0.65	152
Case 2: The rotation period should not be shortened.	4.26	3.93	0.13	152
Case 2: The area should be protected in its totality.	3.32	3.42	0.69	153
Case 3: The wetland should be drained, and the area should be used for wood production.	1.56	1.84	0.07	153
Case 3: The wetland should be protected.	4.98	5.03	0.77	153
Case 3: The treatments on the surrounding areas should also be limited to further protect the wetland ecosystem and biodiversity.	4.12	4.24	0.55	153
Case 3: The wetland should be protected but the silviculture of the surrounding areas should not be limited.	3.26	3.35	0.62	153
Case 3: The whole area should be conserved so that silvicultural activities are prohibited completely.	2.91	3.09	0.38	153
Willingness to conserve	4.64	4.72	0.58	153