

Kenward, R., Sharp, R., Manos, B., Arampatzis, S., Brainerd, S., Lecocq, Y., Wollscheid, K. & Reimoser F. 2009. Conservation from use of biodiversity and ecosystem services. Pp. 68-83 in Skrynnik, Y., Bendersky, E., Lecocq, Y., Melnikov, V., Petrikov, A., Sitsko, A., Fertikov, V. & Schramm, D. XXIX International Union of Game Biologists Congress. Ministry of Agriculture of the Russian Federation, Moscow, Russia.

Conservation from use of biodiversity and ecosystem services.

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Introduction

This paper describes the two main approaches to modern conservation of species and habitats. It shows how the protection of species and habitats can be complemented by conservation through use of biodiversity and ecosystem services. The latter approach has socio-economic advantages but is also more complex and requires new tools to assist its implementation. We show that appropriate tools are being developed, as concepts within international conventions and through design of an internet system for decision-support to all levels of society, from land-manager to national governments and beyond.

Conservation through protection and sustainable use

Nearly two decades after initiation of the Convention on Biological Diversity (CBD) at the Rio Earth Summit in 1992, conservation continues to embrace two main approaches. A 'protect-and-reserve' approach, the main focus for European conservation in recent decades, aims to protect species and create reserves to preserve habitats, as encapsulated in the 1979 Bern Convention on the Conservation of European Wildlife and Natural Habitats and related European Union Directives.

The second approach makes sustainable use of biodiversity a basis for conservation. The CBD defines sustainable use as "the use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations". CBD has sustainable use as its second objective and refers to it in 13 of 19 substantive Articles, e.g. to "Protect and encourage customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirements" (Article 10); and "adopt economically and socially sound measures that act as incentives for the conservation and sustainable use of components of biological diversity" (Article 11). In contrast, protection of species and habitats is mentioned in 2 of those 19 Articles.

The World Summit on Sustainable Development in 2002 stressed that human activities need to be sustainable in social and economic contexts, as well as ecologically. The Millennium Ecosystem Assessment (2005) demonstrated the importance for humanity of ecosystem services, for *regulating* climate floods and disease, for *provisioning* with food and materials, for *cultural* recreation and aesthetics and for *supporting* those three service categories with soil and clean air and water. On this basis, in 2006 the Stern Report estimated the costs to humanity of failing to address climate change. Work continues on a valuation project on The Economics of Environment and Biodiversity.

For socio-economic reasons, both protection and use of species and ecosystems have strengths and weaknesses for conservation. Protecting species has changed social attitudes to wildlife favourably but not prevented loss of biodiversity through intensive agriculture (Paine & Pienkowski 1997, Pretty 2002). Protection also creates opportunity costs, with reduction in jobs or incomes causing

conflict and local poverty (Adams *et al.* 2004). Thus, extension much past the 12% of land now protected globally may be hard to achieve (Pretty 2002).

Where land is relatively unproductive, sustainable use of wild resources can compete effectively as an alternative to intensive agriculture, as shown in southern Africa (papers in Prins *et al.* 2000). However, there is less land in Europe on which sustainable use of wild resources is more cost effective than intensive cultivation. Moreover, residual low-productivity areas tend to be refuges for rare species, which can inhibit conservation through sustainable use of wild resources, e.g. on grouse moors (Redpath *et al.* 2004).

Will land use therefore polarise into (i) large areas exploited intensively to produce food and other materials or (ii) pockets protected for science, aesthetics or to prevent extinction of species? Not necessarily. Some 17% of Europe's land area is now within the Natura 2000 network, which gives strict protection to certain species and habitats but also includes provision for use of wild resources, for example through hunting. Fear that consumptive use of biodiversity risks 'tragedy of the commons' (Hardin 1968) is countered by community-based conservation (Berks *et al.* 1989, Ostrom *et al.* 1999). A dual approach to conservation (Inamdar *et al.* 1999) envisions a "biodiversity friendly mosaic of land uses driven by the livelihoods that are derived from sustainable use of wild living resources, instead of landscapes with small islands of biodiversity in a sea of agriculture" (Hutton & Leader Williams 2003). Protected areas for core populations can render harvest more productive elsewhere (Roberts *et al.* 2002) and traditional extractive use may be needed to preserve particular habitats (Getz *et al.* 1999).

However, divergent attitudes to sustainable use as a conservation tool persist in Europe, as elsewhere. Few have problems with promoting sustainable agriculture, forestry, fisheries and tourism but more are hesitant about the consumptive use of wild animals and say "if we must have use, then we should at least ensure that it is sustainable". Others hold that use of wild resources is acceptable as long as it is sustainable or go further, considering it desirable because it offers significant conservation or livelihood benefits". To bring the human resources of these various tendencies together for conservation, agreed principles are required.

Principles for Sustainable Use

The concept of keeping any use of biodiversity sustainable is not particularly new. It goes back more than a century in German forestry, and was elegantly articulated as the Land Ethic of Aldo Leopold (1948). At international level, its relevance for conservation and livelihoods was promoted by the International Union for Conservation of Nature (IUCN) in the World Conservation Strategy of 1980 (IUCN 1980). IUCN is a global organisation, founded in 1948, and in 2009 had 1,146 members, including 87 States, 120 State Agencies and 939 NGOs or affiliates, with about 1,100 staff and 10,000 expert advisors worldwide. CBD was strongly influenced by the thinking of IUCN.

The development of structured thinking about promoting conservation through use, including restoration of biodiversity, is more recent. It notes that humans value and hence conserve what is useful to them (Webb 2002): what pays, stays. In 2000 IUCN adopted a Policy Statement on Sustainable Use of Wild Living Resources, which includes the conclusion that "Use of wild living resources, if sustainable, is an important conservation tool because the social and economic benefits derived from such use provide incentives for people to conserve them". IUCN sustainable use experts then worked within CBD during three regional workshops before a global workshop in Ethiopia in 2003 produced the Addis Ababa Principles and Guidelines for the Sustainable Use of Biodiversity (AAPG). The 14 principles were adopted by the CBD at its 7th Conference of the Parties in 2004 (CBD VII/12) and linked to a complementary set of 12 principles from a workshop in Malawi, known as the Ecosystem Approach (CBD V/6, VII/11).

Two features of the AAPG (<http://www.biodiv.org/doc/publications/addis-gdl-en.pdf>) and Malawi Principles (<http://www.biodiv.org/doc/meetings/cop/cop-04/information/cop-04-inf-09-en.pdf>) are

especially important. One is that they give as much consideration to social issues and economics as they do to ecological issues. The second is that the principles are intended not to be prescriptive but advisory. In 2007, Norway worked with the European Sustainable Use Specialist Group of IUCN Species Survival Commission (ESUSG) to use the Malawi and Addis Ababa principles as the basis for a Charter on Hunting and Biodiversity for the Bern Convention. The 26 principles were condensed to 12 simple recommendations, as follows:

1. Favour multi-level governance that maximises benefit for conservation and society.
2. Ensure that regulations are understandable and respected.
3. Ensure that harvest is ecologically sustainable.
4. Maintain wild populations of indigenous species with adaptive gene pools.
5. Maintain environments that support healthy and robust populations of harvestable species.
6. Encourage use to provide economic incentives for conservation.
7. Ensure that harvest is properly utilised and wastage avoided.
8. Empower local stakeholders and hold them accountable.
9. Competence and responsibility are desirable among wild resource users.
10. Minimise avoidable suffering by animals.
11. Encourage cooperation between all stakeholders in management of harvested species, associated species and their habitats.
12. Encourage acceptance of sustainable and consumptive use as a conservation tool by the public and other conservation interests.

In the full text (<http://data.iucn.org/themes/ssc/susg/sub/europe.htm>), under each principle is advice that conservation will be enhanced if a set of guidelines are followed. The guidelines are for all aspects of hunting and draw heavily on a set of Principles and Guidelines for Sustainable Hunting developed by a Wild Species Resources Working Group of ESUSG. A charter is a document that agrees responsibility of government towards citizens, effectively conferring rights, as well as responsibility of citizens, so the Bern Charter for Hunting and Biodiversity not only has guidelines for hunters, but also for regulators so that they too can help hunters to benefit conservation of biodiversity. Moreover, although the guidelines are for hunting, the 12 Principles do not mention hunting specifically and could therefore embrace (with suitably specific guidelines) all aspects of conservation through use of wild resources.

Values of land and wildlife

Social principles are important in a dual approach to conservation, but so are economics. Supporting and regulating services of ecosystems benefit society as a whole and can therefore be considered public goods, to be sustained by public funding. The EU Common Agricultural Policy provides €55 billion annually during 2008-13, of which 44% is for agri-environment payments in a reformed 'second pillar'. Unfortunately, supporting and regulating services do not necessarily require high vertebrate biodiversity, not least because humans can fill the consumptive role of many other species; there is also pressure to reduce funding for a CAP no longer giving cheap food. Provisioning through forestry and agriculture tends to become so intensive that biodiversity suffers, while commercial or subsistence use of wild plants, fish and bush-meat can become unsustainable. However, cultural ecosystem services have a strong potential for conserving biodiversity, not simply through eco-tourism (with carbon costs of travel and pressure on local water resources), but also through local communities gathering flowers, angling or hunting, as much for recreation as for food, and making rules to keep the service sustainable.

These cultural services also have high value. The latest 5-year survey of US spending on wildlife-associated recreation (USDI, FWS & USDC 2007) estimates that 88 million US adults (38% of adults) watched (71m), fished (30m) and hunted (13m) wildlife in 2006, spending \$122 billion. That represents \$155 for each of the 774 million hectares of the USA. In Europe, an FP6 project on Governance and Ecosystem Management for the Conservation of Biodiversity (www.gemconbio.eu) estimated that 23 million anglers, 7 million hunters and 6 million bird-watchers spent at least €40

billion on these activities in 2006 (Kenward *et al.* 2009). This is equivalent to at least €121 for each of the 331 million hectares of the EU. In the UK alone, estimated income from a wide range of wild resources (including collected plant products and fungi but excluding released game) was €7.2 billion in 2002, 30-50% the value of UK agricultural production and providing some 58,000 jobs (IUCN-UK & ESUSG 2004, see also Sharp & Wollscheid 2009).

Could some of this spending do more to help restore biodiversity? All 5 main factors associated with decline of 30 farmland bird species (Newton 2004), including (i) weed control, (ii) early ploughing, (iii) grassland management, (iv) intensified stocking, (v) hedgerow loss & predation, can be addressed in ways that produce fractional reductions in crops yields, such as when headland-edges are left unsprayed to increase abundance of game birds and other wild fauna and flora (Boatman & Sotherton 1988). Kenward & Visi Garcia (2005) noted that if land gives annual income per hectare of I from intensive production, reduced income from constrained use C may be acceptable if compensated by income U per hectare from use of wild resources ($C + U \geq I$) especially where U is leveraged with stewardship subsidies S (i.e. $C+S+U \geq I$). In forestry, $C+U \geq I$ occurs without subsidies when the cost of adding some deciduous woodland to a conifer crop is offset by gain in value of deer and reduced bark-stripping damage (Reimoser & Reimoser 1997).

The challenges of handling complexity and changing attitudes

The science of restoring biodiversity through de-intensification and re-introduction is well advanced. However, there is a challenge in bringing together all the necessary socio-economic and ecological information and another in gaining support for conservation through use of biodiversity and ecosystem services. These challenges are being addressed by designing an internet-based Transactional Environment Support System (TESS), with European Commission 7thFP funding (www.tess-project.eu). The aim is not only to help access the rich but disparate environmental research findings from across Europe, but also to integrate the economics of sustainable use and state incentives for cost-effective environmental decisions at all levels.

The TESS project is testing the idea that although planners can now anticipate and constrain or alleviate environmental problems from corporate sources, it is the myriad of individual decisions, on what and when to plant or remove, what to consume or discard or how to travel, which summate to change the biosphere and its diversity of life. Central governments cannot regulate all these decisions without harming the diversity of human interests and land uses that can sustain a diversity of fauna and flora. Instead, as foreseen in CBD, local communities need to be enlightened, empowered, motivated and guided to manage the environment. Thus:

- central planners can collate complex knowledge and incentives to assist local decisions;
- they need local information to monitor and adapt their knowledge and incentives policy;
- local managers must also gather local information to make and monitor their decisions;
- they can exchange local information for the complex knowledge that benefits livelihoods;
- the huge volume of local-centre exchanges will need an automated support system.

However, such a system will work only if it meets social requirements, by being not merely user-friendly and user-attractive but also socially integrated. Social integration is being promoted in communities across Europe, for mapping habitats and species and for planning local projects that benefit biodiversity and livelihoods, mediated locally by committees of volunteers who wish to aid their environment because they make use of it. For instance, land-management skills of farmers and foresters will be complemented by species management of hunters and anglers, aided by interests of wildlife watching and countryside access, working with national and international NGOs to provide encouragement for the cooperation involved.

Social integration can be helped at national and international level by cooperation of government and non-government organisations to implement such a 'citizen science' system. There is already such cooperation between Birdlife International and the Federation of Associations for Hunting and

Conservation of the EU within the Sustainable Hunting Initiative of the European Commission. It is in the interests of those who use wild resources in any way to improve the cost-effectiveness of conservation funding, whether public or private, and to encourage livelihood benefits from biodiversity. It behoves those who harvest wild resources to build awareness of their many activities that benefit the environment (Table 1). The conservation world might then ask ‘how to encourage more of these useful people?’

Table 1. Activities that can affect public attitudes to recreational use of wild resources.

	<u>Public Perception of Users</u>	
	<u>Tolerable</u>	<u>Useful or Indispensable</u>
Ecology	(no harm)	(monitoring, restoring)
Social	(humane)	(educating, organising)
Economy	(no cost)	(contributing, motivating)

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