Mini-conference:

Workshop in Political Theory
and Policy Analysis

Indiana University
Bloomington,IN

May 2-4 1998

Paper:

Institutional foundations for local self governance of biodiversity

by

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The author is appreciative of the support from Norwegian Research Council, Utmarksprogrammet, Project 113411/720

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Background

This paper is mainly about institutions. What institutions are most appropriate for maintaining and governing the resilience of our life-supporting ecosystems, and how do they relate to the most crucial elements of resilience: the magnitude and ordering of biodiversity (Holling and Sanderson, 1996) ?. But in doing so, we also encounter problems which are not only connected to institutional design, efficiency and legitimacy of procedures or decisions. These are fundamental problems of how societies "think" about our relationships to Nature, about the "Social Construction of Nature" (Eder 1996). And it is even more fundamental problems related to man's contemporary relationship to the evolutionary process itself, which by same authors is seen as now "hominisized" to the extent that it is "cephalized" with humans as "heads of evolution" (de Chardin 1955).

State predators and private sheep

Endangered wild species have for 100 years been an important part of the international environmental discourse. This is now institutionalized in a number of conventions and treaties, among them the Bern-convention, the Biodiversity Convention and the Washington convention (CITES). In most of the countries that have ratified these conventions, parliaments have passed legislation that protects endangered plants and animals and have stiff sentences for the willful killing of endangered species. Almost without exception, the responsibility for protecting endangered species is placed at the national level, usually with a government agency heavily influenced by professional wildlife biologists.

But also the health and life of domesticated animals are protected by international conventions like the European Convention for the protection of Animals kept for farming Purposes (European Council), and by national legislation regulating animal health and welfare. In addition there are international conventions that protect the material basis for the culture and economic life of indigenous peoples and tribal peoples in independent countries, like ILO-convention no. 169. Many of these groups live off hunting and trapping of wild animals, some of which could be on the list of endangered or threatened species. And many of these depend on the herding of livestock that is prone to predators - also on the list of endangered species. Although the sheep and the goats as well as cattle and reindeer are private property, the responsibility for research and development of animal husbandry is vested in state institutions, usually dominated by veterinarians, geneticists and agronomists.

Taken together, these international environmental obligations places responsibility on the states that ratifies the conventions to protect both endangered wild animals and their natural habitats, to protect domesticated animals kept for farming purposes and to protect the material base for the culture of indigenous peoples. In the case of endangered species of predators, this places the modern state in a number of difficult dilemmas that, if not handled properly, can undermine the

legitimacy of both national and international environmental policies. Predators, like bears, wolves, lynx and wolverines are in their natural state opportunists who kill the most easily accessible prey. Among these are often sheep and reindeer kept by farmers in small and economically vulnerable mountain communities and by indigenous peoples who rely on pastoralism as the material base both for their economic and cultural life. It is quite obvious that it then is a serious dilemma for the modern state to protect the domesticated animals and the local and indigenous communities from the same predators as it is also protecting, in many cases from angry sheep farmers and reindeer herders who want to exterminate predators. And at first glance there seems to be no simple, rational solution to such dilemmas. The impotence of many modern states in providing workable and legitimate solutions thus have the effect of antagonizing the urban and the rural part of the environmental movement. And such unresolved dilemmas leads to the growth of anti-environmental political factions, a development, often termed "environmental backlash".

Of major relevance in an institutional analysis of governing biodiversity, is also the political reality that for the past 200 years and until the 1970s, the states themselves have been promoting the eradication of predators ("varmint") through various incentive systems and state agencies. Behind both the Norwegian state-induced bounty systems of 1730 and the more officious U.S. Division of Predator and Rodent Control in the 20th century (Dunlap 1988), there is a coherent pattern of thought that places responsibility on the state for the enhancement of nature for the benefit of humans. This enhancement meant "destruction of worthless wildlife" and promotion of "beneficial wildlife" and human cultivation and pasture for domesticated animals. This pattern of thought is definitely modern in its origin, spearheaded by the Enlightenment in the 17th. century and entrenched by the enclosure movement and the privatization of rural Europe in the 19th. century. To depict private sheep-owner's, reindeer owner's and cattle rancher's urge to kill off predators as traditional values and sentiments is therefore incorrect; it is at most a cultural survival of early modern state policies and its corresponding institutionalization.

And what make the predator policies of the 20th century state even more precarious is the long term and heavy involvement of the state in the modernization of animal husbandry. This was conditioned by a predator-free environment in which improved breeds could grow more meat faster and yield more milk and not waste energy on horns and defensive behavior. A predator-free environment also allowed more offspring per mother animal and more efficient grazing of a given pasture as strict flock behavior was no longer essential for survival. A number of these modernizing efforts in animal husbandry are so heavily institutionalized in government departments, research programs and professional associations that they tend to go on after the environment changes and predators return to the pastures. Even after the Endangered Species legislation have protected predators for over 20 years, the economic efficiency norms for yields in animal husbandry, the slaughterweight-price brackets and the farm support programs does not reflect the changing environmental conditions for range management. Also the extensification and growth in herd sizes have continued, so that for instance the number of sheep on pasture in Norway has grown from 1,7 million in 1974 to 2,5 million in 1995. Until recently, also the herd sizes and total numbers of reindeer have grown. With this simultaneous growth in rangeland livestock as well as in predator stocks, it is obvious that encounters between livestock and predators increase, thus the number of sheep in "predator prone herds" increased from 9% in 1993 to 14% in 1995. The sheep fanner and Sami reindeer owner are therefore caught in what

can be termed a "modernity trap": There is hardly any "traditional" knowledge left of predator-proof ways of pastoralism that can be turned to and the state protected predators are blocking the way for a continuation of the past 100 years of state-initiated modernization of the animal husbandry. This breeds frustration and antagonism towards both predators and state agencies.

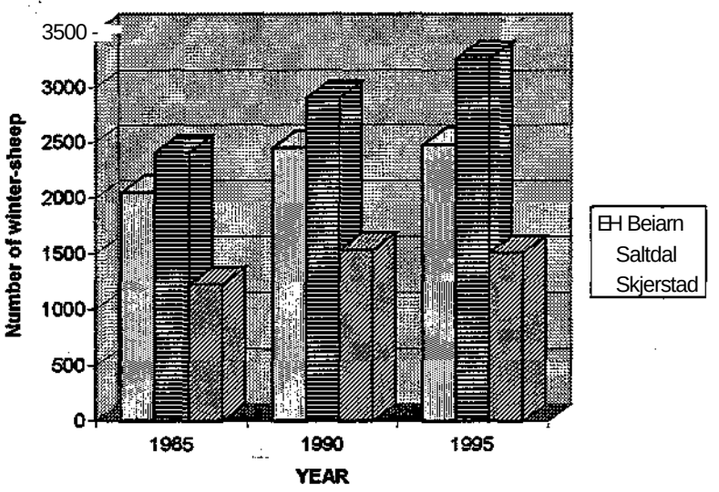
Most states acknowledge that the conflict level between environmentalists and livestock owners is too high in a number of areas where predators are returning. This is the case both in Germany, Austria and Italy where wolves are returning, in Switzerland where lynx is reintroduced and in U.S.A. where wolves are reintroduced into the greater ecosystem of national parks (Kvaalen 1997, McNamee 1997). But because the property rights related to the new concepts of ecological resilience are still largely unspecified and the rights and duties related to maintaining or increasing biodiversity are not allocated, most of these states are also unable to solve such fundamental conflicts. A fundamental question, which we shall return to later, is whether ecological resilience is best regarded as a public property and thus the prerogative of the nation state, or as a common property for a limited group of heterogeneous users, e.g. nature watchers, hikers, livestock owners, loggers and hunters, who then have to work out and enforce a way to govern this resource. So for most states, when they are unable to solve the conflicts, they employ the second best strategy, which is to "dampen the conflicts".

Norway has recently revised its official predatory policies and we shall here use Norway as an example of the inability of a modern state to solve problems that by many are seen as typical postmodernist problems as they transcend the conventional rationalization of the modern age (Bauman 1992). By others these problems are seen as typical post-environmentalist problems, as they do not easily lend themselves to conventional environmentalism in the form of a collective mobilization for a cause, but rather restructures the public discourse into "political ecology" (Eder 1996). In 1992, Norway entered a new amendment to its constitution, whereby " Everyone has the right to an Environment that secures Health and to a Nature whose Productivity and Diversity is maintained" (§11 Ob). Thus biodiversity is constitutionally guaranteed as specific right for humans (both present and future generations) to enjoy a diverse nature. But the actual governing of one crucial aspect of biodiversity - its predator resources - is much less clear cut, as it consists of a mixture of legal measures, territorial differentiations and negotiated compensatory arrangements. There is no specific Endangered Species Act, but the general wildlife law is protecting all wild animals, unless it is specifically opened for hunting or trapping in the law itself. Individual predators can thus be killed if caught "red handed" in the act of attacking someone's livestock - and then only by the owner of the livestock (§11). An individual predator can also be allowed killed if it can be demonstrated that it does repeatedly kill livestock, i.e. is a "malicious predator" (§12). These punitive measures (called "damage controls") are strictly administered and the "permit to kill" is restricted to a specific individual, to certain pastures and for a limited time period. A clever predator, although a culprit, might thus escape from its execution and become a free and protected predator again. Wolf, and in some areas also bears and wolverine, are endangered species and before damage control measures are employed to them, it is compulsory to evaluate possible preventive measures, like sedating and moving the predator, move the reindeer to another area, gather the sheep in night pens, terminate the summer pasture or to post herders or watch-dogs. These are often evaluations where biological and ecological concerns are opposed to husbandry operating concerns or private economy concerns.

Regulatory hunting is also allowed in the law, this is done by license-hunting for wolverine and by quota-hunting for lynx ((§ 9,12 and 35). In both cases the purpose is to reduce the stock of predators in order to lower the predation pressure on livestock, especially in areas outside the primary living areas for the particular species of predator. A precondition for such hunting is that the stock of predators is generally healthy in the area and that there are reported incidents of predation in the area. A quota would specify the age and sex of the animals that can be hunted, thus adding to the modern "management of the rebuilt predator stocks" .The hunting season is generally short (2-4 months) and the quotas are seldom filled, from 1993 to 1997 only 271 out of the allowed 350 lynx (77%) and 30 out of the allowed 51 (58%) wolverines were killed. By administratively adjusting the application of the damage controls and the regulatory hunting, the wildlife department can to some extent differentiate the management of predators according to predation levels, winter pasture conditions (reindeer) - and political sentiments in the affected rural communities.

Predators cannot be confined to the limited size of National Parks, both their hunting strategies and their territory-formation instincts demands much larger areas. Thus Norway introduced in 1992 a zoning measure in the form of a new territorial category called "core areas for predators"(primary living areas) in order to be able to differentiate the management of each of the large predators. So far, "core areas" of considerable size are established for bears and wolverine, lynx have healthy stocks in most areas and are efficiently managed by quotas, while wolves are still too scarce to warrant a core area. Inside the "core areas" the predators shall enjoy a stronger protection than outside, and inside the core areas the potential for contact between livestock and predators shall be reduced also by changes in animal husbandry of sheep and reindeer (St. meld. nr. 35 (1996-97)). However, it is only the predators within these areas that can be given differential treatment by the wildlife department - with bases in the wildlife laws. The principle of different protection levels in different territories is acknowledged by the Norwegian Parliament, which is the only elected body with powers in relation to biodiversity. But the areas themselves are only administratively designated and delineated, their borders are not decided by any legislature and have no different legal status from that of other areas. Thus the pasture rights in these areas are not revoked or bought off, and the number of sheep has increased in many core areas. In 3 municipalities in «predator core-areas» in Salten, the number of winter-sheep has increased by 20-35% in the period 1985-1995, compared to an average national increase of 5%. This is shorn in Figure 1.

Fig. 1: Growth in number of winter-sheep in "predator core areas" in Salten



The private decisions that lead to increased sheep numbers are complex decisions that involve both operational convenience, investments and other sunk costs, income combination opportunities and government support programs. But at the same time "modern" animal husbandry has become increasingly more difficult in these areas with strict predator protection. These are however perceived as «collective problems» that are handled through the Farmers' Associations in negotiations with the state and through; lobbying towards parliament (Blekesaune and Straete 1997). «Modern» animal husbandry has also become more difficult outside the «predator core areas», despite their size, endangered species of predators wander outside these and have to be protected there as well, thus disrupting the whole idea of differential management model. This sums up to an institutional ambiguity that deepens the conflict and adds to the frustration of both sheep farmers and wildlife biologists. In the parliament a small majority in 1997 decided to continue the administration of predators by "core areas", while a large minority wanted to abolish them (Innst. S. nr. 301 (1996-97)).

Because the «new» ecological policy related to predators is perceived as a public policy with a detrimental effect on privately owned livestock, a policy of compensations for predator-killed livestock has been in effect since the protection of predators started. This has been a rather cautiously managed compensation program, as the criteria for documentation of predator-killing have been strict in order too weed out "background mortality from natural causes". Still, only 15 % of the compensations goes to actually documented predator-kills by clearly identifiable cadaver, the rest is to livestock deaths with a high probability of predator involvement. There has also been a tacit reluctance in the administration towards generous compensations that could act as incentives to speculative herd expansion in predator areas and carelessness in the tending of animals. Thus the compensation has been restricted to the slaughter value plus the breeding value for certain categories of animals. Still the public expenditures on predator-kill compensations have

soared in later years and parliament has had great difficulties in budgeting the "predation damage" correctly. The number of compensations for killed sheep rose from 10.938 in 1992 to 23.650 in 1996, the number of reindeer compensations rose from 2.185 to 8.335 in the same period (St.meld. nr. 35 (1996-97)). Altogether 40 mill. NOK ($5,5 mill.) is paid in predator compensations annually, this covers about 60% of the applications from livestock owners. An additional problem is the bureaucratic problem where the compensation decisions have to be a subjective evaluation under difficult conditions, where applicant and administrator often have sharply opposed views, both on what actually might have occurred in the pasture and on crucial issues in ecological policy. The wildlife administration therefore wants more specific, «objective» and detailed rules which can protect the individual officer against charges of arbitrariness (St.meld. nr. 35 (1996-97)). Livestock owners have complained that compensation was "too little and too late" and that all the extra paper work connected to documentation of predator-kills and applications for compensation, was not fully compensated. And livestock owners claim that their goal is not to make a living from compensations, they are fundamentally against raising sheep in order to feed bears, wolverines and lynx, even if they are paid for it. Therefore, their solution, to kill predators, will be much cheaper for the taxpayer. And the Parliament, impotent in addressing the underlying constitutional dilemma between rights and duties related to maintaining biodiversity, is only able to decide on increases in the compensations to cover all costs, including consequences for breedstock, loss of weight from predator disturbance and additional labor spent on guarding, herding and search for preyed livestock. In addition, Parliament also has decided that wildlife legislation shall include the right to full compensation for livestock damage done by protected predators, and from all secondary consequences thereof (Innst. S. nr. 301 - 1996-97). Thus we find that 250 years of state initiated predator eradication programs and 60 years of state supported modernization of sheep and reindeer ranching in a predator free-environment results in large public expenditures to cover all private costs of «return to the natural state». With a continued unmanaged growth in numbers of private sheep in «predator core areas» and an unchecked additional growth in state predators due to rural depopulation, reforestation and a dramatic growth in wild herbivores, such a rights based compensation system can become a very expensive way to maintain biodiversity, although an easy way out for legislatures. In fact, a postmodern opportunity of raising sheep and reindeer in order to feed expanding predator stocks that can re-enchant the mountains and forests for the expanding European adventure tourist industry, might become an attractive way of making a rural living. But as we shall see, that is far from the fundamental objective of maintaining biodiversity in order to increase ecological resilience.

Aware of the inherent dangers from the «wrong» incentives of generous compensation scheme, the wildlife department has made great efforts to make compensations for predator-kills conditional. In the «predator core areas» the government (the wildlife department and the agricultural department together), proposed that compensations should be made more dependent on the willingness of livestock owners to employ preventive measures and to transform their operations into a less predator-prone animal husbandry. This was considered crucial, as Norway had the poorest performance, i.e. the highest loss of livestock per living lynx, bear and wolf in its territory in a comparison of 11 European countries. The main reason for this was the development of the most «modern» sheep ranching in Europe, where unflocking sheep are allowed to graze unherded and untended in forested areas. For reindeer herding, which utilizes all-year pastures,

there is widespread agreement on these preventive measures. They are to keep the reindeer in the best possible physical shape through ecologically sound stocking and herding strategies relative to the carrying capacity of the most crucial pastures. Strong reindeer in an efficiently structured herd in open mountainous landscape is not particularly prone to predators. Only in some areas with a high proportion of mountain forest cover, will it be necessary with an intensification of reindeer husbandry; with smaller herds, lower degree of mechanization, higher degree of domestication and more efficient and directional herding (St.meld. nr. 35 (1996-97)). For sheep, however, the situation is much more difficult, as the «modernity trap» makes the sheep farmers unable, or unwilling, to transform their extensive ranching system into more intensively herded operations. The government proposed a large number of measures to make sheep farming in «predator core areas» less predator prone. They were all based on a continuation of the zoning management model, outside the core areas, extensive sheep ranching could continue as before (St.meld. nr. 35 (1996-97)). Among the proposed means were:

- reduction in number of sheep on pastures in «predator core areas»
- intensive and directional herding of sheep, with both herders and herding dogs in «predator core areas»
- managed pastures use with fencing and special night folds in «predator core areas»
- standard criteria for the intensity of monitoring of sheep as a condition for compensation for predator-kills in «predator core areas»
- transfer to other, more predator-resistant breeds of sheep, goats or milk sheep in «predator core areas»
- transfer to other productions than sheep husbandry, e.g. milk cows, in «predator core areas»
- transfer to predator-free pastures for parts of the grazing season, or earlier gathering of sheep from summer pastures (especially in wolverine prone pastures)
- changes in production cycle, i.e. early lamming and early slaughter to avoid heavy autumn predation of bear and wolverine in «predator core areas»
- technical protection like nylon necklaces, predator repellents etc. (especially in lynx prone pastures)
- eradication of predators in animal husbandry areas outside the «predator core areas»
- strict regulation of predator stocks in «buffer zones between «predator core areas» and non-predator areas.

Taken together, these proposals amount to a full restructuring of animal husbandry in «predator core areas», with a fundamental intensification and domestication as a guiding principle. A crucial question is whether this is regarded as a return to more traditional and labor intensive husbandry practices, or whether it can be regarded as a further «modernization» of agriculture - towards an ecologically adapted animal husbandry. For sheep-farmers and their associations, most of these proposals are perceived as only costly images of a return to more primitive forms of animal husbandry. For them the modern solution is still to eradicate predators and the last 250 years of modernization of animal husbandry is perceived as an irreversible process. But despite their importance for the long term solution to the predator/livestock dilemmas, and their importance for constituting fundamental institutions for governing human relations to nature, the Norwegian Parliament did not manage to make policies on this issue. The only reference they have to the extensive section on this in the government proposal is the following:

«The majority of the committee, all except for the members of the Labor Party, is opposed to the financing of preventive measures through the yearly negotiated agricultural support agreements between the state and the agriculture/reindeer associations. It is not correct that the livestock industries shall be burdened with the costs of the predator-policy that is decided by the state. The majority therefore asks that all expenses for preventive measures that are consequences of the current predator policy, is to be financed over the budget of the Ministry of Environment (Wildlife Department))).

Since 1992, the budget for «preventive measures against predator damage» has increased from 7 mill. NOK to 20 Mill NOK, with a more and more even distribution between the Wildlife Department and the Agriculture Department (10+10 mill in 1998). This ensured the cooperation with the agricultural extension services in the restructuring of animal husbandry in "predator core areas". In the absence of all other policy directions on preventive measures to limit predation of livestock and thereby limit compensations, this signal from parliament now makes it the responsibility of the Wildlife Department alone to obtain budgets and carry out the restructuring of the livestock industry in the «predator core areas». Without the direct access to the agricultural extension services, and all the supporting institutions surrounding agriculture and livestock, the Wildlife department will not be as efficient in its restructuring efforts as the continued joint undertaking would have been. With the fundamental skepticism among sheep-farmers to both the Wildlife department and to any idea of "returning to old fashioned herding", this policy change will run the risk of slowing down the necessary structural and institutional changes and maintain the high compensation expenditures for a long time.

A recent analysis of the Norwegian «Predator Discourse)) (Blekesaune and Straete, 1997), sees the struggles over Norwegian predator policies as a battle between 4 different «management ideologies:

Two «expert-oriented» ideologies:

- an agrotechnocratic industrial ideology based on private enterprise, and
- a field ecologists' management ideology based on public management responsibility

Two «egalitarian» ideologies:

- a liberalistic, free enterprise ideology based on private property and the management rights of livestock owners to areas where they have pasture rights, and
- an ecophilosphical ideology based on a common management responsibility for our common genetic resources.

The logic of the discourse is that proponents of these ideologies argue against each other in order to catch as much public attention as possible, and that this decides the outcome of the discourse. Thus the «expert» ideologies have the ear of the administration, while the «egalitarian» ideologies have the ear of the Parliament and local government in the rural areas. The Department of Agriculture, which used to be dominated by the agrotecnical industrial ideology has joined the field ecologists' management ideology, while large part of the extension services and the decentralized agricultural administration are still proponents of agrotecnocratic solutions to most problems (Blekesaune and Straete, 1997).

The analysis is interesting, but it misses some crucial points about the dynamic character of the interplay between ecological processes and public opinion processes. Crucial among these are the trust and the reputation of the agents that shall implement the structural changes among private livestock owners that their principals wants. As traditional knowledge of livestock herding strategies in predator prone pastures have died out as a consequence of the lengthy modernization process, the livestock owner must be convinced that the experts' preventive measures give the expected effect. Government subsidies are not sufficient, maybe not even necessary, in modernized agriculture it is the quality of the agrotechnical knowledge itself that decides success and failure, not the degree of public attention of its accompanying ideology. Increased local management of both predator stocks and livestock pastures will also demand technological and institutional solutions that has the confidence of private livestock owners. And despite the prominent place of preventive measures in government documents, few of them are proven in similar ecological settings and few of them has had any significant acceptance and success. Apart from the transfer to dairy cattle and the removal of sheep from pasture in early autumn, most proposed operational changes cannot yet demonstrate significant effect and profitability. More scientific and experimental work, involving sheep farmers themselves, need to be done in order to demonstrate convincingly effective herding systems, technical protective measures and predator-resistant breeds of sheep to reluctant livestock owners. In addition it is necessary to develop supporting institutions for advice and profitable marketing of «predator friendly» products, which would otherwise loose in the competition against the more meaty lambs marketed from areas outside the "predator core areas". Thus modernization of agriculture seems to be irreversible, with no traditional past to turn to, an unless massive agrotechnical effort is supplied by the state, the modern solution to the predator problem will more probably be an increasing separation of predators and livestock. This might again affect basic ecological dynamic processes, in the form of rural depopulation, reforestation of cultural landscapes, growth in certain species of wild herbivores and subsequent growth in stock of predators and further expansion of these outside the «predator core areas». This would support a postmodern view of nature: that even with strict state control of predators, a relaxation of human control over nature in the form of less physical settlements, less cultivation, less grazing and less varmint hunting, causes nature to take back its own control over nature. This is what is often called the re-enchantment of nature (Bauman 1992).

Towards local self governance of biodiversity?

Can these experiences from the Norwegian Predator policy debate be of some help in a general discussion of the institutional foundations for governing biodiversity and aid us in understanding the institutional consequences of recent advances in evolutionary biology and ecosystems research? We have shown the difficult dilemmas a state encounters when it takes on the obligation to the international community of maintaining biodiversity in its territory. And we have shown how many local communities in the modern world are not able to apply traditional ecological knowledge and eco-practices evolved over centuries - as the case still is in many developing countries (Berkes, Folke and Gadgil 1995). With the help of both science and the state, 250 years of modernization have involved them in practices of agriculture, animal husbandry, fishing and aquaculture that reduces biodiversity and weakens resilience. This means that most modernization

results seems irreversible to local community members and they easily find themselves in a "modernity trap" when a continuation of this development is constrained by modern national or international environmental policies.

But before proceeding further, it is important to understand that the crucial idea of biodiversity is not that predators shall kill sheep. Although there are some theoretical foundation for an ecosystem function for predators in preventing any single specie of herbivores to become too dominating, this can hardly be extended to sheep, who without the help of humans would not have survived the northern winter at all. The role of predators, especially top predators like wolves and bear, is to keep a constant check on the wild herbivores, not only on their absolute numbers in relation to available pastures (regulatory role), but also on their demographic composition (selective predation role) and their adaptive behavior in the ecosystem. This the predator does by constantly weeding out weak individuals so that the total herd optimizes its health and its reproductive and defensive properties. And by the continuos presence in the pasture, it maintains a pressure on both individual and flock behavior of the herbivores that is identical to that of the natural selection mechanisms through the evolutionary history. Thus it conditions and disciplines also the behavior of the herbivores (Holling 1994). In this way modern ecology provides a modern rationality for predators; it is well equipped to do part of the operational work in the management of wild herbivores and the wild vegetation that is their pasture, keeping both the grasseaters and the grazing areas in good shape for us humans. This job the predators will do more efficiently than any human organization, and in most cases at much lower costs, the predator works hard for its food. Provided the human predation on herbivores through managed hunting is not in contradiction with the selection strategies of the predators, the presence of predators have a beneficial effect on wildlife and they can therefore act as efficient co-managers together with humans in modern systems of scientifically based wildlife management.

In the Norwegian predator debate, the biodiversity argument has been used by pro-predator camps in order to establish legitimacy for extensive «predator core areas». However, this failed, largely because maintenance of biodiversity was presented as something of common interests to the whole society, an abstract construction which few could identify with (Blekesaune and Straete 1997). The biodiversity argument used in the debate over the re-introduction of wolves to Yellowstone National Park was concentrated on the beneficial effects of the wolves to the Greater Yellowstone Ecosystem, which was plagued by overgrazing from the unchecked expansion of elk, moose and bison (McNamee 1997). This proved to be a much more efficient argument than reference to biodiversity as a general concept, and the politically difficult return of the wolves to an area where it has been extinct for 60 years has been a success. One reason why it is difficult to appeal to the concept of biodiversity directly in the public debate is that the biodiversity/resilience paradigm is challenging some fundamental patterns of thought characteristic of a number of institutions of the modern age. As soon as the debate goes beyond the simplistic notion that diversity is a good thing, it is therefore widespread opposition fro affected groups of organized interest to most implications of the biodiversity/resilience paradigm.

Studies of how biodiversity is introduced and opposed in public debates on the governing of renewable biological resources therefore forms a fertile ground for deconstruction of some present institutional rationales and investigations into some possible new alternatives of

organizing societal relations to nature. There is only room for a short exercise here, but it can serve as an illustration of the analytical potential of these concepts in social science:
In the western world is we find that social organizations that are based on either early modern or late modern ideas of human/nature relations have coexisted for a long periods and that the continued modernization has not left old patterns of organization behind - they and their accompanying doctrines are all part of the contemporary institutional web:

Thus we still find among many resource users, 17th century ideas of nature as raw and brutish with a need for human management and enhancement, and for a "rationalization" of nature that includes efficient landscaping, vermin control, pest control and the eradication of all competing predators. A number of arguments in the Norwegian predator debate are based on this kind of ideas, notably from farmers, livestock owners and local communities. They claim that the last 250 years of forefathers' clearing of forests and fields, of settlements on the edge of wilderness, of pasture enhancement and varmint-control, all this will be wasted if predators are again allowed to roam the forests. From the response in media and in Parliament, such patterns of thought are quite widespread in a western population towards the end of the 20th century.

Thus we still find among many conservationists and urban environmentalists, 20th century ideas of the superiority of an original and untouched nature in ecological balance through succession towards a sustained climax assemblage - based on a notion of a single equilibrium. These arguments have also been frequently used in the Norwegian predator debate, in form of an argument for the intrinsic value of every single species. All species are of equal value in the complex web of life and it is impossible to distinguish between worthless and beneficial wildlife. It is therefore a need for larger National parks where predators can be protected and live in their natural state and we humans can study how the ecological balances are maintained without the interference of humans.

And thus we also find new ideas originating in the last two decades, which claim that the conservationist's notion of a unique optimal path to a sustained optimal climax is static and unrealistic and that there are multiple stable states and many alternative paths to the different states. Humans, as adaptive and opportunistic actors, will not have homogeneous responses to disturbances, and have thus set the path for widely different environmental evolutions towards an open future. According to such ideas, environmental change is not continuos and gradual, but both "patchy" and episodic and with destabilizing forces that maintain diversity, resilience and opportunity, and stabilizing forces that maintain productivity and biogeochemical cycles. This necessary interdependency between destabilization and stabilization has been visualized as a general renewal cycle that consist of four ecosystem functions: exploitation and conservation as well as release and reorganization (Holling 1996). These kind of ideas are also reflected in modern findings that forest fires can be beneficial, that "patchy" cultural landscapes holds a higher biological diversity than uniform "natural" forest and that "refuges" of "wilderness" in a farmed landscape give better disease- and insect resistance than large and uniform farmed fields. Such thoughts, that humans can enhance and utilize biodiversity for their own benefit, e.g. to scientifically fight plant diseases without pesticides, to fight insect attacks on crops with predator insects etc., are also the thoughts at the scientific front in evolutionary ecology. But in the public debate on large predators, these kinds of thought patterns have no attached associations or state

bureaucracy to voice their input. And the sciences of associations - the sociology and the political science - have barely started work on the institutional consequences of the new concepts of biodiversity and resilience as human artifacts.

Both early and late modern ideas of man/nature relationships have been institutionalized in various legal structures and government departments and associations. They are «heavy structures)) that are clearly visible both in practical operations and in constitutional debates like part of the Norwegian Predator debate. With a rich historical and legal «luggage» their institutional foundations can be analyzed:

- In brief, the rural development programs of the last century, which has continued until today in the form of cultivation extension programs, animal improvement programs and forest cultivation programs, are part of a widespread institutionalization of the human urge to enhance nature. Also the institutions of central negotiations between the state and the associations in agriculture and reindeer husbandry have for years been important for shaping the relationships between the rural population and the very nature they are depending on. These early modern ideas of enhancement has, however, been embedded in specialized organizations that has learnt to enhance by simplification of ecological relationships and reduction of biodiversity.

- In brief, the institutions supporting the creation of national parks, conservation measures and habitat protection, and all auxiliary institutions connected to the creation of these, are part of an institutionalization of the idea of an untouched nature which strives towards ecological balance. The major environmental organizations and a part of the biological research community are also part of this institutional family. The creation of larger than national parks - "predator core areas" as management units for intensified protection of predators and reduce contact between predators and livestock are also a logical extension of this institutionalization process. However, this attempt at top-down institutionalization of the sovereignty of nature in large territorial units with people living inside them naturally feeds counteractions from both these people and from the heavy structures of institutionalized early modern ideas. It is possible that the controversies could have been avoided by negotiated enlargements of bufferzones around existing national parks - in the form of "bio-reserves" (UNESCO 1994), but in many cases the endangered species of predators were not exactly where the existing national parks were.

- In brief, the resilience/biodiversity paradigm is not yet institutionalized in any part of the western world, and there is widespread uncertainty as to what exactly this would imply. Basically an increased resilience against shocks and disturbances, and the long term survival of the ecosystems which humans are depending on, should be the prime objective for the human governing of resources. This would imply that ecological change is not continuos and predictable, it moves in leaps and bounds and institutions must be able to accommodate fundamental ecological uncertainty. It also means that resources cannot be managed uniformly by fixed carrying capacities for livestock or wild game or by fixed sustainable yields of fish or lumber, this will over time lead to ecosystems that lack resilience and are prone to break-down from disturbances that could otherwise have been absorbed. And it means that human

intervention based on scientific knowledge and technology, can strengthen the resilience of the ecosystems by adding diversity to it in the form of plant and tree intercropping, predator insects and birds, rodent and herbivore controlling predators etc. Thus the cyclical fluctuations between the ecosystem functions of "exploitation, conservation, release and reorganization" are multiplied to such an extent that it gives the appearance of "ecological balance" (Holling 1996). Institutionalizing these ideas would also mean human enhancement of nature, but in contrast to the early modern ideas of enhancement, now by complexifying the ecological relationships and increasing the biological diversity.

One fundamental problem remains before we can discuss the potential for design or evolvement of institutions for governing biodiversity. That is the question of the role of humans in ecosystem functions and in the process of evolution itself. There are two main positions here, which have been touched on through this paper.
One is that nature is itself best suited to take care of its own affairs, once we humans leave it alone and protect it from ourselves, it will resume its resilience and evolve towards a state of ecological balance. We have termed this "re-enchantment" of nature a postmodern position (Bauman 1992).
Another is the position that with 6 billion humans on the planet, we are already the most dominating specie ever to have existed. This means that human activities influence the rest of the biosphere to the extent that the biological environment has become totally dominated by humans. And because we depend on the continuation of the biosphere, we have a responsibility to use all the scientific knowledge we have and all the technology we master to maintain or increase its resilience. This position therefore puts humans as the heads of evolution, which has thus become "cephalized" and it is up to the total web of living thought - the human sphere of mind *(noosphere)* whether they lead this evolution in the direction of simplification or in the direction of complexification of ecological relationships (de Chardin 1959). This is what can be termed a continuation of the modern position, where rationalization continues, but where the dominating ideas of what is rational keep changing. This position seems at present the one within which appropriate institutions for governing biodiversity can most effectively be discussed.

In broad terms, there are two institutional scenarios related to the governance of nature in the modern, hominisized world. One is the simplified nature that has evolved out of the human ideas of enhancement of production by eradication of worthless species from the early modern period. The other is a complexified nature that evolves from human ideas of enhancement of resilience by increasing biodiversity from the late modern period.

In the concepts of contemporary ecosystem theory, a simplified ecosystem will experience aggravated fluctuations as it moves through the phases of exploitation, conservation, release and reorganization. At some stages large harvests can be made from single resources cropland, fish, timber, mountain pastures, wildlife etc. At other stages resources "crash" through disease, attacks by exploiting rodents or insects or they are overexploited and goes completely out of use until they again are ready for a new release. In terms of institutionalization, numerous attempts at management of sustainable yields for single resources have been tried, most of them by central government departments. Most of these have failed, either because sustainable yields are

ecologically impossible for the resource in question, or because the ecological dynamics requires a degree of flexibility and detailed governance which a government bureaucracy cannot gain mastery in. Another form of institutionalization is the entrepreneurial model of resource governance, which logically resembles the fundamental model of ecosystem renewal (Holling 1996). This "institution" is well known to opportunist humans through centuries and has been the basis for various "bio-rushes" and resource-mining operations of the past: on the American bison, on the walrus, on the whales etc. A scientific model for such a social renewal cycle was advocated already by Schumpeter, who saw all collapse as an opportunity for renewal-strategists to reorganize and innovate. Inevitably the epigones will follow the entrepreneurs, institutions will be established to reduce uncertainty and bureaucratic hierarchies will establish themselves and fight for organizational survival, thereby becoming rigid and less responsive to resource dynamics and to the public. The consequence of this is loss of ecosystem resilience and a greater vulnerability to surprise and crisis, the social organization thus carries inside it the same logic of embryonic collapse as the modern ecosystem model does. This kind of governance is thus not long-enduring, it is basically cyclic in its rise and fall, in the same way as monarchies, aristocracies and democracies once were believed to be cyclic occurrences due to the effects of their internal dysfunctions (Machiavelli, 1525).

Still within the concepts of contemporary ecosystem theory, a complexified ecosystem will still tend to follow the basic ecosystem phases of exploitation, conservation, release and reorganization. But by human enhancement through increased diversity in the ecosystem, the number of such interconnected renewal cycles multiplies. Thereby they represent "check and balances" on each other and are not allowed to fluctuate so vigorously as they would do in a more simplified ecosystem. This means that the probability for the one time bumper harvest or big catch is gone, but so is the probability for the total crash or disappearance. Thus this ecological facts can, if properly managed, represent both necessary and sufficient conditions for long-enduring institutions. However, the governing for complexification of an ecosystem, and for running it as "heads of evolution", places great demands on the institutional design. For most practical purposes, institutional development for governing resilience/biodiversity would have to be both flexible, adaptive and experimental and take place at scales compatible with the scales of critical ecosystem functions. This means that the level of the state is not a feasible level, neither is the level of the individual farm property. Institutions for complex ecosystem governance would have to be worked out at the intermediate levels of municipality and province, depending on the extension of crucial ecosystem functions. But they would need the extensive help from the state, both from their scientists and from their seed banks and genebanks, where much of the biodiversity is presently stored. And it would need the support of the state, as a democratic application of the biodiversity principle would provoke reactions from conservationists and their institutions.

The genetic biodiversity resources are basically common property resources, that work best for humans when they are put to work in natural settings. The world wide lessons for governing common property resources can therefore also be used when carving out institutions for complexifying and managing biodiversity. Thus there is a convergence in human relations with nature - and our social construction of nature: from the early modern attempts to enhance nature --to the late modern attempts to enhance nature, it is still all about rationalization.

Epilogue.

The Norwegian mountain valley is quiet now. The big predator debate 20 years ago ended up in a total defeat for the state. The state predators are now taken over by the community and managed as a common property resource. Especially the community wolves are appreciated for doing a good job of keeping the valley's large stocks of moose, deer and roe-deer in good shape and preventing them from destroying the forest resources. The plentiful game attract a large number of hunters every year. The well organized pack of wolves defend their territory against stray predators and the formerly numerous lynx is now reduced considerably. All the wolves and bears are equipped with radio collars and are continuously monitored by the community themselves. This is a substantial improvement from before, when then state biologists kept the predators' position secret for the herders. The livestock industry is flourishing with a large variety of breeds of cattle, goats and sheep in ongoing experiments to find the most appropriate animals for the different pasture conditions in the valley. The sheep-herders and reindeer herders are always updated on their positions on the GPS-system and can now herd the sheep accordingly and chose secure night-folds. But after only 3 generations of wolves, they seemed to have learned to stay away from sheep, reindeer and the humans herding them, an information line on their respective rights and duties is formed. The Intermunicipal Commons Committee has worked hard to reestablish optimism in this partly depopulated valley and is now braving itself to have established a modern rural community based on the intelligent governing of biodiversity.

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