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Title: Implementing Wildlands Networks, making ecosystem planning real

Abstract

The Heart of the West Conservation Plan proposes to manage a network of core areas and linkages in deference to wildlife needs. This region which includes western Wyoming, NW Colorado, NE Utah and a sliver of Idaho links Yellowstone to the central Rockies.

Based on the science we assembled, this Conservation Plan provides a framework to guide future land use and management on a landscape scale. Our next steps are to integrate this Conservation Plan into land use decisions.

This presentation shows how the conservation community can assist land managers with this integration process. How do you set conservation priorities in such a large region? How do you measure habitat condition needed to meet conservation goals? How do you create and evaluate conservation alternatives for oil and gas development, grazing, and off-road vehicle use decisions? We have developed a number of tools that help answer these questions.

Introduction

Applied conservation biology advocates managing large regions as wildlands' networks. Core areas and linkages between them are identified in order to protect biodiversity. In the past decade, a number of presentations have been given by organizations on their work to design these wildlands networks at ESRI User Conferences. In past years, the Wild Utah Project has been one of those groups giving updates on our work. Our work focuses on the high deserts and mountains of Wyoming, Utah, and Colorado and we now have a completed wildlands network and conservation plan for this region we call Heart of the West. In addition to the Heart of the West, a number of other regions have been completed conservation plans land work is underway to change land use to be consistent with the needs of a wildlands network.

This paper focuses on the implementation of wildlands networks. The next section recounts the importance for managing ecosystems on a large scale. Following this, we briefly describe how wildlands networks are designed. This implementation draws from habitat needs for the focal species around which analysis created the wildlands network. This paper draws a number of examples from the Heart of the West Wildlands Conservation Plan.

What are wildlands networks and conservation plans

In 1995, Dave Foreman reported that "despite the protection of nearly 50 million acres of wilderness Areas and 30 million acres of National Parks in the United States outside Alaska, we see . . . biological diversity with integrity in precipitous decline" (Foreman 1995). The answer to this dilemma came from a consotrium of scientists and conservationists sought to ensure the integrity of ecosystems through the creation of wildlands networks. Reed Noss laid out four principles for this system of core areas and linkages (Noss 1992):

1. represent, in a system of protected areas, all native ecosystem types and seral stages across their natural range of variation,
2. Maintain viable populations of all native species in natural patterns of abundance and distribution,
3. Maintain ecological and evolutionary processes, such as disturbance regimes, hydrological processes, nutrient cycles, and biotic interactions, including predation and,
4. Design and manage the system to be responsive to short-term and long-term environmental change and to maintain the evolutionary potential of lineages.

Large carnivores, in particular, were identified as a critical regulating component of ecosystems and often the most imperiled component.

To apply these decades of knowledge from conservation biology, The Wildlands Project developed scientifically based process to develop wildlands networks (Trombulak, 1995, Noss 1995, Johns, 1995) This process was applied by the Wild Utah Project using a three track approach to develop the Heart of the West Wildlands Network. The framework for conservation planning for the Heart of the West lowland study area applies the core/linkage model. To determine the location and size of core areas and linkages, the Heart of the West science team integrated three basic planning approaches that scientists have adopted over the last several decades to identify areas for core areas and linkages (Noss and Cooperrider 1994, Noss et al. 1999a):

1. representation of all regional habitats, or vegetative community types, within a network of core areas,
2. identification and protection of special elements, such as rare species occurrences, biodiversity "hotspots," intact riparian zones, etc.,
3. identification and protection of key habitat of (focal) species that serve critical ecosystem roles and/or whose presence is indicative of healthy, functioning systems

For the Heart of the West Conservation Plan, fifteen focal species were selected to represent a number of ecological factors in aquatic, avian, and terrestrial habitats. In depth focal species accounts were assembled for the specific region. These focal species accounts provided habitat indicators that relate to the needs for specific focal species. These indicators are used as ecological measures in implementing the plan. Focal species habitat analysis first helped identify which lands were most important for conservation for a particular species. This analysis identified core areas and linkages. Irreplaceability and vulnerablity analysis (Pressy and Cowling 2001) was performed to measure of the relative contribution different core areas make to reaching overall conservation goals, thus helping those implementing the conservation plan to prioritize protection for various core areas in a wildlands network. Irreplaceability can be described in two ways: (1) the likelihood that a particular area is needed to achieve an explicit conservation goal, or (2) the extent to which the options for achieving an explicit conservation goal are narrowed if an area is not conserved.

Why ecoregional planning is important

Plans to implement wildlands networks (called conservation plans here) provide ecological standards over a large landscape. These conservation plans provide benefits beyond maintaining biodiversity. Healthy ecosystems in addition to protecting biodiversiyt also are more productive and are more resilient to episodic events such as drought. The health of the land has a direct connection to the sustainability of human communities and their economies. Damaged ecosystems jeopardize not only wildlife but also the continue existence of rural communities.

Conservation plans include a map that identifies lands where conservation should be a priority for management and other lands where intensive human activities may be more appropriate. Such a positive strategy gives those using the land more certainty where economic activities are more appropriate. Equally important, developers are put on notice that if they should chose to build within a core area or linkage, that the required conservation measures may make their proposals higher risk.

Both land management and past conservation efforts have too often been ad hoc and opportunistic. Areas have been protected not for the biodiversity they contain, but rather for natural beauty or lack of resource value (Soule and Noss 1998, Soule and Terborgh 1999). Federal land managers produce land use plans that offer comprehensive guidance for human activities and wildlife management within a planning area. In the case of Bureau of Land Management (BLM) land use plans, administrative and legal needs often dominate planning and as a result ecological management considerations are weak or absent.. One of the key purposes identified by BLM in developing resource management plans was meet National Environmental Policy Act requirements for comprehensive environmental analysis (Muhn, 1988). A resource management plan with a section titled environmental analysis would meet this legal requirement and allow, subsequent environmental analysis on a project scale to be minimal. Review of seven BLM resource management plans in Utah indicates that the environmental analysis found in the plans was administrative in nature and did not capturing key ecological health, current condition, and the causal relationship with human activities. Additional environmental analysis was to be conduced later for individual projects that are usually small in scale. For example, the BLM's Book Cliffs Resource Management Plan had limited key ecological analysis in the plan and stated, "Impacts of fish and wildlife habitat would continue to be evaluated on a case-by-case basis as a part of project level planning." (DOI 1984). Similar language was found in seven other BLM resource management plans in Utah and are likely to be representative of many other BLM land use plans. For these reasons, past land management rarely gives the needed guidance for ecosystem management on a landscape scale.

While current land use practices seem not to include ecosystem management, the concept has been endorsed. Based on national direction each BLM state office has adopted rangeland health standards and guidelines. For Utah these cite as a goal: "BLM is now giving management priority to maintaining functioning ecosystems. This simply means that the needs of the land and its living and nonliving components (soil, air, water, flora, and fauna) are to be considered first. Only when ecosystems are functioning properly can the

consumptive, economic, political and spiritual needs of man be attained in a sustainable way" (DOI 2001) Some National Forest land use plans have similar language, "Ecosystem management is different than how we've conducted our business in the past in three important ways:
1. Rather than focusing only on the small localized scale, we look at the appropriate scale depending on each resource and/or issue and we look more at those interactions with and integrating of associated resources and/or issues,
2. We focus on properly functioning ecosystems for sustainability over the long term (composition, structure, patterns, and functions) and less on maximizing production from ecosystems over the short term, and
3. Because ecosystem management requires that we look beyond administrative boundaries we must focus more on collaborating with other Federal, State and local governments in establishing goals and in creating a vision of desired future conditions (DoA 2001).

In conclusion, landscape ecosystem management is endorsed in principle but rarely seen in practice. As mentioned earlier, federal land managers make decisions at a scale that does not address ecosystem needs. Federal land use plans provide general guidance that too often lack ecological standard with a map showing where they should be applied. The actual decision on what is allowed on the land too often addresses only short issues associated with a small area. The ecological impact analysis, for example, for oil and gas drilling focuses too often on the impacts of one well pad, its access road, and a narrow buffer for, example, nesting raptors. Larger scale issues on habitat fragmentation and animal movement are seldom addressed. Grazing decisions most often are based on an individual allotment by allotment basis emphasizing livestock forage production and game animal forage needs. Riparian areas within allotments too often are neglected. Likewise, off-road vehicle (ORV) routes are rarely designated with consideration to regional habitat fragmentation.

Wildlands Network Implementation Process, **Heart of the West Conservation Plan**

Drawing from specific land management practices and protective designations commonly used today, this conservation plan applies a step-by-step decision procedure for guiding land use for the Heart of the West.

Our implementation model employs several fundamental principles:

- *Managing for healthy populations of focal species*. While focal species habitat modeling was key in designing the wildlands network, the focal species concept continues to be critical in the implementation stage as well. For example, many of the Heart of the West focal species were chosen because they can serve as indicators of habitat health. The decline of these indicator species may be a signal that the health of the land has also diminished. Part of implementation involves putting in place management prescriptions that will ensure healthy and viable populations of focal species and functional focal species habitat.
- *Adaptive management*. Biologically based adaptive management allows for adjustments based on ecological indicators. The appropriate use of adaptive management involves testing management changes for the desired result, making

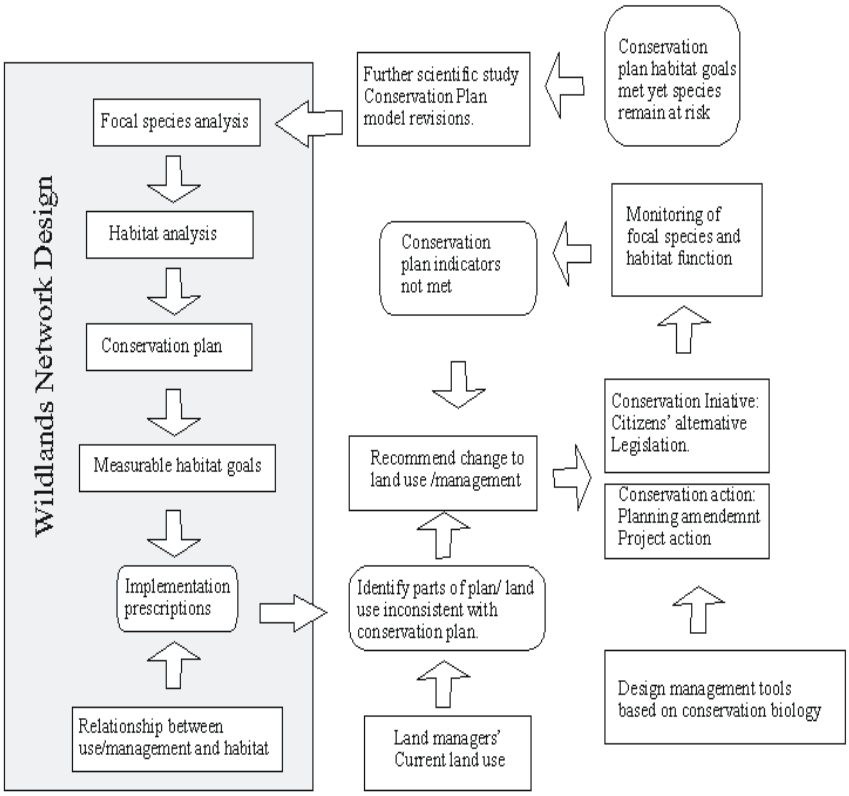
changes based on monitoring of key ecological indicators, and independent peer review.

- *The precautionary principle*. The urgency for increased habitat protection requires us to make scientifically informed decisions in the face of imperfect knowledge. In these instances we must apply the precautionary principle. The precautionary principle prescribes erring on the side of caution in the face of uncertainty. It suggests that the better the monitoring is, the more certain a manager can be that management practices do not put ecological health at risk. The less adequate monitoring is, the greater the uncertainty and the greater the risk. For example, if we are to ensure viable populations of sage grouse, we cannot afford to allow further loss of function of sagebrush steppe. The burden of proof in cases of doubt necessarily falls on the proponents of a particular land use to show that it will not impair the land, not on the proponents of conservation to show that it will. This change of emphasis to follow the precautionary principle is the cornerstone of sound conservation. (Jones et al, 2003)

This implementation flow chart describes a stepwise approach that translates the plan's prescriptions into actions on the land. The Heart of the West Wildlands Network features core areas, linkages, and compatible use areas. The network components each come with implementation prescriptions that describe the types of human activities compatible with those protective designations, as well as the habitat indicators for measuring the compatibility of these activities with biological goals. Prescriptions described in this conservation plan are lead to standards for managing human activities in a manner that is consistent with habitat needs. These prescriptions are developed from information in the focal species accounts, past management practices, and other scientific analyses.

The Heart of the West Conservation Plan recommends that implementation occur in the steps

Wildlands Network Implementaton Chart.



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1 Implementation flow chart

of the flow path shown in Figure 1 These steps aid land users, managers, and conservationists (referred to in this plan as "reviewers") as they use this conservation plan as a basis for land use decisions. Below we develop the concepts represented by each box in the flow chart in Figure 1 Actions that are proposed are compared with ecological standards in the Conservation Plan.

Once the reviewer has identified those land uses that are inconsistent with the conservation plan, the next step is to design a remedy. Based on the biological prescriptions in the conservation plan, the reviewer designs the type of remedy needed to meet the plan's goals, including the kind and intensity of human use acceptable in specific places, and necessary monitoring.

This remedy is then applied and its results monitored using habitat indicators relating to needs of focal species. If the remedy was successful, then the habitat condition will meet focal species needs. If those standards are not met, then remedy is again adjusted and new actions taken to meet the ecological goal.

Figure 2 Adaptive Management

This cycle of adaptive management describe here is based on ecological standards. Figure 2 illustrates the elements of an adaptive management cycle. Conservation plan goals are expressed in terms of measurable objectives. Monitoring collects data related to objective measures. Ecological standards are then used to determine if monitored data meet the standards. Activities such as livestock grazing or recreation are then adjusted should the standard not be met. Once these activities are changed, monitoring again measures whether the standards are met or not and the process continues in a cycle.

Each of these steps applies adaptive management in a cycle that requires a relationship, preferable numeric, between each adaptive management cycle step. Goals specified as objectives provide a monitoring measure of habitat condition that meets focal species needs.

For example, the percent of bare ground offers one indirect measure of ecosystem health. Properly functioning habitat normally has very little bare ground while impacted habitat can have major amounts of bare ground. Common range monitoring methods are available that capture the amount of bare ground. Bare ground in any plant community varies according to weather conditions, soil community type, elevation, and other factors. However even with this variation, standards can be used. It is possible to describe expected bare ground in terms of ecological conditions absent of human intervention. Ecological reference areas and ecological site descriptions are created that serve as references (Pellant, 2000). Such a measure forms a standard that is unique to a habitat type in a certain local. In the adaptive management cycle, the current monitoring of the amount of bare ground is then compared against this reference standard Once the analysis determines if the standard is met current land use is validated and not, then changes are made to land uses. This cycle of measuring bare ground will continue. It can take decades to improve ground cover and only a few years to degrade an area. While bare ground is easy to measure, determining the precise amount and timing of grazing needed to meet this ecological standard is not so clearly known. As a result, trial and error through repeated cycles are needed to reach the desired habitat goal.

Ecologically based monitoring and analysis

Land managers have a number of existing monitoring methods that, coupled with land use plans and management practices, offers ways within an existing institutional structure. However, much is often needed to ensure that the relationships just described under adaptive management are in place. Today in most National Forest plans, key elements needed for ecosystem management are there in part. And because part is missing, the continued viability of focal species such as the Canada lynx remain in jeopardy. "single factor threatening the contiguous U.S. Distinct Population Segment of lynx is the inadequacy of existing regulatory mechanisms, specifically the guidance for conservation of lynx in National Forest Land and Resource Plans" (Federal Register,2000).

As a reviewer of a proposed action, we can supply the analysis that may not be fully presented by the land manager as they prepare public review of a land use decision. The update of an ORV vehicle travel plan in part of the Heart of the West offers a good example of how a reviewer's analysis can aid a land manager in following the ecological standards found in the Heart of the West Conservation Plan. The example area, the Ogden Ranger District in the Wasatch-Cache National Forest, lies in the Bear River Range in northeastern Utah. Growing vehicle use has pioneered trails in habitat important to the Canada lynx. The area in this example is a core area in the wildlands network and is also identified by the Forest Service as a major terrestrial mammal corridor.

In the Forest Plan for this area, the Forest Service requires that any new routes added for ORVs consider the density of routes in the decision process (USDA, 2003). The draft travel plan for the Ogden Ranger District did not address the issue of route density. With a number

of local users and conservationists, the Wild Utah Project researched standards for road density and using GIS, performed route density analysis.

We drew from conservation biologists, standards of road density that describe measures that can apply to making ORV travel plan decisions. Carlos Carrol, considered to be one of the premier habitat modelers for lynx and other forest carnivore species, has produced numerous year-round lynx habitat suitability models that use a threshold of 0.6 km of road/km^2 to delineate effective lynx habitat in western U.S. forests (Carrol et al. 2000)

Using this route density standard for route densities, we prepared a density map that shows which new routes fall in areas where the density would exceed this standard. A number of new routes in high value lynx habitat exceeded this standard. We recommended to the Forest Service that they not add new routes and go even further to reduce route density in core areas. The final decision is pending.

This example does not describe all that a reviewer will need to consider in implementing the Heart of the West Conservation Plan for ORV decisions. Other factors must also be considered for the Canada lynx. Furthermore, other habitat factors for other wildlife species must also be taken into consideration.

Land management agencies current management methods may not include the kind of monitoring or analytic methods required for ecosystem management. Wild Utah Project has design several tools to fill some of these situations.

One example of where need ecological management tools are needed concerns range management. Grazing management, as has been traditionally practiced, relies on range productivity analysis methods that does include ecological factors in making key management issues. Livestock rates are based on models that manage to maximize forage productivity for livestock and large game animals. Ecological needs in terms of plant community structure, composition, and function were not a part of this earlier range capacity analysis model. Even today, the Forest Service and BLM uses this older preecosystem management analysis model that today is ill suited.

Recognizing the need to an ecologically based model to assess livestock levels of grazing, Wild Utah Project with a number of scientists developed a GIS based tool. Described in a paper you can get on line http://rangenet.org/directory/jonesa/sulrprec/appendixb.html, this tool allows land managers to make range management decisions that ensures that habitat in wildlands network cores and linkages function properly (Catlin et al, 2003).

Earlier presentations at ESRI User Conferences have explained the key elements of this ecologically based forage capacity analysis. This is one example of a number of needed ecological monitoring and analysis tools that are required in the implementation of a wildlands network. Scientists in the conservation community can provide methods that agencies use where such methods are lacking.

Wildlands Network Design, critical review and revision
New knowledge critical to our understanding ecosystems is being created and needs to be considered as we manage ecosystems. The implementation model that we suggest includes a path were this new information has a way either to validate earlier work or to guide change of the wildlands network. As new information comes in, maps of core areas and linkages may change and so may the management prescriptions that guides land use.

Conclusion
Ecoregional planning following the principles described earlier nearly twenty years ago now have lead to the design of a number of wildlands networks. With these in place a new effort is underway to match land use and land use planning in this larger ecological context. In this paper we offer some examples of how ecological measures can be used to assess habitat condition relating to ecological health.

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