# Practical Ecosystem Management For Plants and Animals

by

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By now we should all understand that everything is connected to everything else and planet Earth is a single ecosystem. Managing the well being of the earth as a whole is extremely complex. Global considerations are just beginning to affect management decisions only because actions resulting in ozone depletion or nuclear war are such obvious threats to the system.

Human society is territorial as is evidenced by national frontiers, state and township lines, public park and forest boundaries and backyard fences. It would take a "second coming" to reform human turfism. Everyday management decisions within our various "turfs" add up to regional and global effects; but our control usually ends at the fence line.

On a broad scale, an ecosystem approach to species or biotic community conservation is simply looking beyond the fence and looking beyond the management disciplines in which we work. On a fine scale, good ecosystem management is working intelligently with the environmental variables we can manipulate while understanding the impacts of our actions.

When using an ecosystem approach for species conservation it is important to have answers to a few simple questions:

(1) Is an ecosystem approach new to species conservation?

(2) Is the approach different for plants vs. animals?

(3) Are all species equal?

(4) Is there fundamental agreement on sensible ecosystem management?

Answering questions like these may require involved thinking, yet the answers are all a simple "no." My experience in public service tells me that some of those anxious to launch into a new enlightened era of conservation will, nevertheless, subject us to a confusing array of "yes" answers to the same questions. This article looks at these questions one at a time in an attempt to focus our attention on the main pair of questions at hand:

Will future managers look at and understand more ecosystem variables before making management decisions? How will they accomplish this? Recovery efforts for the Kirtland's warbler will be used as an example of how our thinking and approaches are evolving.

## Ecosystem Approach to Species Conservation–Is it New?

Humankind has been managing ecosystems since the dawn of history. Too often it has been species mismanagement because of ignorance, short term objectives and individual greed. Sometimes it has been a creative force for species, providing vast wild grasslands or small beautiful gardens.

The two volume international symposium, *Man's Role in Changing the Face of the Earth* (Thomas 1956), presented a comprehensive historical look at change in the ecosystem of which man is a part. It has had a far reaching influence in the 37 years since its publication. Great works such as these have broadened our concern for the earth's ecosystem. Conservationists have long appealed for a more holistic approach to management of the individual fragments of that larger system.

Natural resource managers have usually worked with specific missions for specific species enhancement and addressed ecosystem factors of primary importance to accomplishing their missions. Ecosystem management for a specific species inevitably enters a game of winners and losers.

Back in the late 1970s a frustrated endangered species biologist from Wisconsin told a regional meeting, "I don't know what to do with our fish biologists. They kill off everything in the stream; then put back what they want." Waterfowl biologists have been better. They manage wetlands for ducks and proudly point to a host of other wetland species that benefit. But there are other losers. Things become intense when high profile species management missions enter the same ecosystems. In Michigan, the Deer Range Improvement and Forest Regeneration programs have been the basis for lively planning session debates and name calling over whether a particular tract would become a "mishmash of low value trees and shrubs" (good deer range) or a "biological desert" (densely stocked red pine plantation).

State and national forest plans attempt to bring species ecosystem management into peaceful equilibrium. A recent draft of Michigan's Escanaba River State Forest Comprehensive Resource Management Plan (MDNR 1990) states: "Forests are complex ecosys-

**...Management for a specific species inevitably enters a game of winners and losers**

tems composed of highly interactive biotic and abiotic components and containing resources that include plant, animal, and microbial species, air, water, soil, and deposits of rock, minerals, and petroleum. To assure proper management of the state forests for the public good, it is the declared policy of the Michigan Department of Natural Resources to manage the state forests to yield that combination of products and services which best meets the physical, psychological, and spiritual needs of all

**Karner blue butterfly *(Lycaeides melissa samuelis)* perched on an inflorescence of wild lupine *(Lupinus perennis).* Photo by Ann B. Swengel.**

people now and in the future."

That is quite an ambitious policy for ecosystem management! It also reminds us that ecosystems will be managed for those species that "people" (the public) want. No, an ecosystem approach to species conservation is not new. Yes, future managers will look at and understand more ecosystem variables when making management decisions. How will they accomplish this?

## Different Approach for Plants vs. Animals?

Some would quickly say that plants are tied to the land while animals move around, so ecosystem management would have differences for plants vs. animals. This attitude is reflected in North American game laws which claim animals as common property while plants go with the land. There are, therefore, some legal differences in how we may approach ecosystem management for plants or animals. In Michigan, only endangered or threatened plant species are claimed as common botanical resources through their protection under the state Endangered Species Act. There is also some lesser protection on public land under the "Christmas Greens" act. In time, legal protection for plants may go further depending on public desires.

In reality, plants are no more tied to the land than animals. A seed is a complete plant. If ingested by a mammal it has legs; if by a bird, it has wings. Plants also use wind and water dispersal, clonal spread, insect pollination and numerous other effective ways to put a given genotype into a favorable habitat. The unwanted spread of exotic species painfully illustrates the subtle mobility of plants.

Animals may be more tied to particular limited habitats than their associated plants. For example, the perennial wild lupine *(Lupinus perennis)* of Midwestern native grasslands may occupy a variety of sandy, disturbed habitats. A single flower head can catapult seeds over a 100-foot diameter area. It is host to an endangered animal, the Karner blue butterfly *(Lycaeides melissa samuelis)* whose larvae feed upon it. The butterfly cannot exist without the lupine; a plant-animal relationship in which the animal has a tighter land-based requirement than the plant.

In addition to specific habitat requirements there are also many examples of territorial behavior restricting animal movement to very small land areas. Forest fragmentation is harmful for some plants and some animals while benefiting other plants and animals.

My personal view of comparing the management of plants and animals is similar to comparing men and women. There are usually some obvious differences. When it comes to employment, the job description must be the same. Plants and animals have most of the same problems making a living in their various habitats. Plants, however, often visually define biotic communities and management boundaries, so they are more easily addressed in management plans. No, ecosystem approaches are not fundamentally different for plants vs. animals. Yes, future managers will look at and understand more ecosystem variables when making management decisions. How will they accomplish this?

## Are All Species Equal?

Sometimes we forget that equal means "the same" or "identical." Species are defined by their differences. The question relates to the idea that all species might be of equal importance to the web of life; that if we fully understood ecosystem functions, their equal importance would be evident.

It certainly is true that we fail to appreciate the importance of many species. Diatoms, for example, make up a significant percentage of the earth's biomass and contribute greatly to our oxygen supply. Are there any endangered diatom species we should try to recover? The importance of individual diatom species is probably a function of time. Those adapted to a previous set of global conditions would have scientific value but be of less true importance than species that will flourish under projected global warming. If all species were of equal importance, evolution would be unnecessary.

Threats to species are unequal. Human activity causes extinctions much faster than evolutionary compensation.

We, therefore, put a higher value on species we threaten. Some species are of great current economic value. We certainly can not afford to endanger corn or rice. If these were threatened, we would have to value these crop plants over wolves or eagles. Our problem is that we do not understand the true relative importance of various species so we are afraid to assign any a low value. No, all species are not equal. Yes, future managers will look at more ecosystem variables when making management decisions. How will they accomplish this?

## Sensible Ecosystem Management

Presently the term "ecosystem management" has popular appeal among scientists and the general public. It sounds like we are finally looking beyond ecosystem parts and individual interests. We aren't all looking at the same horizon. Scientists form hypotheses about ecosystem functions according to a broad range of training, experience and professional interactions. They constantly challenge each other's ideas and conclusions. We will surely continue to receive contradictory management advice from scientists. A hotel owner adjacent to a National Forest may applaud USDA Forest Service plans for ecosystem management while mentally excluding his own property from the system. A county drain commissioner may have similar ecosystem objectives to those of the local farm bureau but different from those of a national organization such as Ducks Unlimited.

Ecosystem management will not free us from the same hard decisions we have always faced formulating management objectives. The formulation of management objectives will become increasingly difficult as we draw ecosystem lines across each other's turf.

The report "Michigan's Environment at Risk" (Rustem et al. 1992) approaches the problem of broad agreement on management objectives by examination of "relative risk." Of four risk categories, the first listed in the highest category is "Absence of land use planning that considers resources and integrity of ecosystems."

All 24 factors listed in the four categories are ecosystem risks. Solutions are suggested in the realm of public policy and research. But the advice of practical resource managers with strong scientific training is the key to selecting the right questions for mission oriented researchers to answer. Practical resource managers are the people to whom policy makers will come when they want to know what works and how much it will cost. No, there is no fundamental agreement on sensible ecosystem management. Yes, future managers will look at and understand more ecosystem variables when making management decision. How will they accomplish this?

## Kirtland's Warbler Recovery Efforts: Evolution of an Ecosystem Approach to Management

Lower Michigan's pre-settlement landscape included thousands of acres of sandy jack pine-northern pin oak *(Pinus banksiana-Quercus ellipsoidalis)* dominated forest and blueberry *(Vaccinium)* barrens. Periodic wildfires drove a cyclic pattern of plant and animals succession in which members of the biotic community were particularly adapted to exploit the dynamics of the burns. One of these species was the Kirtland's warbler *(Dendroica kirtlandii)*. Between about 6–20 years after a fire it would nest in a savanna-like setting among young jack pine and sprouts of northern pin oak.

The Kirtland's warbler was first discovered on its wintering grounds in the Bahamas in 1879. Its Michigan nesting grounds were discovered in a young jack pine stand in Oscoda County in 1903. Nesting pairs have never been observed outside the Lower Michigan jack pine ecosystem.

Early statewide conservation efforts for the area emphasized reforestation with fire control to bring trees to merchantable size as timber. By the late 1950s it was clear to some that these practices had greatly reduced nesting habitats for the Kirtland's warbler. Four special management units were set up to

**Kirtland's warbler *(Dendroica kirtlandii)* perched on jack pine *(Pinus banksiana)*. Photo by Lou George, USFWS.**

try to simulate pre-settlement habitat. By the time the effectiveness of the special management was demonstrated, the majority of other habitat had passed the successional stage usable by the species. By 1974 the warbler population dropped to its all time low of 167 singing males; about half on the management units.

With passage of the federal Endangered Species Act, the fate of the Kirtland's warbler took on a status warranting a review of habitat management in the entire jack pine region. A large percentage of potential Kirtland's warbler habitat was under state and federal forest management; the poor economic productivity of the lands having discouraged private ownership. It was determined that the species could be recovered entirely on public lands by a harvest of jack pine every 50 years (i.e., 50-year commercial rotation).

In the late 1970s, 134,000 acres of jack pine and Kirtland's warbler habitat in 24 management areas were designated for joint management: birds and timber. Between 36,000–40,000 acres of productive nesting habitat supporting 1,000 singing males would be available at all times. An annual supply of 50-year old jack pine timber would be available on 3,600–4,000 acres. The endangered species program paid for tree planting; other funds paid for forest management.

Management units were considered multiple use land areas under a "Key Value" system. The first key value was assigned to Kirtland's warbler and the second to timber. Other management objectives included public recreation uses, particularly hunting of white-tail deer and snowshoe hare. If a lesser objective was compatible with a higher key value, it was allowed. Snowmobiles were compatible. Trail bikes were not. Active nesting habitat carried more restrictions than management areas currently in other stages of the rotation. Existing conflicting land uses of oil and gas extraction and military training were successfully addressed but only because of the power of the federal Endangered Species Act.

Like many new operations, things did not go according to schedule. At first only about half the planned habitat was regenerated. In 1980, a 23,000-acre wildfire, the Mack Lake Burn, made up the difference for awhile by naturally regenerating the jack pine, as fire maximizes the release of seeds from the cones and prepares the seed bed. This fire did much more than bail out a struggling recovery program. It provided an opportunity for ecosystem analysis of a broad, burned over landscape.

Initially there was no planned integrated effort. Several independently conceived study projects came together within the forum of the Kirtland's Warbler Recovery Team's semiannual open meetings. With only six years from burn to Kirtland's warbler occupation, managers and forest ecologists mapped soils and jack pine stocking and classified ecosystem units. Their work overlapped with ornithologists who studied establishment, occupation and territorial use by the warbler. Communication among scientists and semiannual reports to the recovery team greatly broadened everyone's understanding of the system. These understandings continue to help formulate improved management techniques.

In 1990, another wildfire in Crawford County swept through a large red and jack pine plantation within a Kirtland's warbler unit. The killed trees were only five years from rotation and still quite valuable for timber harvest. Wildlife biologists wanted to leave the dead snags, claiming they would help create ideal habitat. Foresters wanted to salvage the value of the logs, claiming soil scarification by logging operations would help create ideal habitat. In order to evaluate outcomes, part was left; part was harvested. A recovery team-appointed salvage committee developed scientifically testable guidelines for similar side by side comparisons for any future wildfires. This initiative asks a powerful ecosystem question. Can we maintain the integrity of the system while extracting resources?

The Kirtland's warbler shares its ecosystem with other species in need of the same special management for early successional stages including four plant species listed as "threatened" or "special concern" on the Michigan endangered species list. These now receive more attention within the management plan.

Public support of present management varies. Recently, the Michigan Chapter of Trout Unlimited dedicated a tract of its land adjacent to AuSable River frontage to Kirtland's warbler management. Many neighbors dislike the large clear-cuts which set back succession. After being raised with a reforestation ethic and respect for ancient forests, few view new plantations or young savannas as ideal settings for vacation or retirement. Off road vehicle operators doubt so many restrictions are necessary. On the other hand, people come from all over the world to view the Kirtland's warbler. The Grayling Holiday Inn has joined the ecotourism business by becoming headquarters for tours conducted by the U.S. Fish and Wildlife Service. As time goes by, tour guides have more and more to say about the total ecosystem.

## Conclusion

The endangerment of species, like the Kirtland's warbler, has helped us look more closely at the systems we affect. Yes, future managers will look at and understand more ecosystem variables when making management decisions. How will they accomplish this? By combining their training with everyday practical knowledge and experience and applying these to a broader set of conservation values.

### Literature Cited


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