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Weighing the Protection of Endangered Species vs. Entire Ecosystems
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Economics of Protecting Endangered Species

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“When conservation is based on economic motives, there is a basic weakness. Most members of the land community have no economic value. It is doubtful whether more than 5 percent of the higher plants and animals native to Wisconsin can be sold, fed, eaten or otherwise put to economic use.” I begin this paper with a quote from Aldo Leopold’s, exceptional book, *Sand County Almanac* to make the following essential point: economics is not commerce, and much of the reason that conservationists think that economists do the devil’s work arises from confusion over what we do. Leopold goes on to say that some species of trees have been “read out of the party by economic foresters because they grow too slowly or have too low a sale value to pass as timber crops” (Leopold 1970, 246-249).

I hope to provide a compelling argument that economists have a good deal that is useful to say about preserving endangered species. For approximately a half century environmental economists have dwelled upon the importance of non-market values and they have devoted their professional lives to developing methods for estimating, in money terms, non-market values. More than one-fourth of our journals are and have been devoted to this subject matter. Environmental economists recognize that people get satisfaction from knowing that species exist, called existence value, and that they would be willing to make sacrifices in order to enhance species preservation. They recognize that people not only value species for themselves (the people) but they also are willing to contribute money, land, time and other scarce resources to make sure that their own kith and kin, indeed future generations, will get the opportunity to enjoy the species in existence today. This is called bequeath value.

A critical reason why one seeks to measure non-market values in money terms is that you don’t get to choose the forum where decisions to save or not are made. In many forums there are people with power who pray to the money metric. To illustrate my point, I advance the following example of an individual who thinks about habitat in terms of the dollar value of commercial animal-unit-months and also happens to be the Chair of a congressional committee that determines land use. From my perspective, the only way to this individual’s vote, if an economist wants to preserve habitat for wildlife, will be through his/her monetary frame of reference. One also must acknowledge political realities: “is” is not “ought,” because economists have a comparative advantage in portraying “is” and must leave the “ought” to ethicists.

Economists have identified ten reasons as to why economics is important for protecting endangered species. I will be selective and discuss only the most important of them.

Opportunity Cost

I begin with the idea of opportunity cost. The simple sense behind this concept is that you rarely get something for nothing, or to get something you have to give up something else. It is important that we acknowledge this point and that we are careful about just what we are giving up. To illustrate this idea, I will discuss a well-intentioned paper by a number of biologists published in *Science*. (Dobson, et al 1997) In their paper, they ask what is the minimum number of counties necessary to save a given number of species. Put this way, the good thing is species and the cost is counties. From my perspective, this is a naïve formulation because counties are not scarce.

What no one can dispute is that money for saving species is scarce. The economic way of thinking is to ask what is the least cost way of saving a given number of species or to ask what is the most species that can be preserved for a given budget. I want to pause here and point out a hidden assumption that virtually all biologists and ecologists make in public (not private) and no economists make. It is that all species—from the black rhino to small pox biota—have the same value. In their paper Dobson and his colleagues make no distinction between the value of one species from that of another. The failure to make this distinction immensely simplifies the comparative story. Shortly following their publication, some economists (Ando, et al 1998) published a reply: Suppose you want to save 453 species with the minimum number of counties. The economists demonstrated that minimizing the number of counties to save that number of species would cost \$75,000. The cost is for habitat of the endemic species in these counties. Minimizing the cost to save the same number of species would save \$23,000. Why the difference? Saving an acre of habitat in some counties is much more expensive than saving habitat in other counties and the biologists implicitly assumed an acre is an acre, i.e., that each acre in the U.S. has the same cost. Let's express the distinction another way. If you had one million dollars to preserve species, where would you spend it? Remember, we're assuming here that all species have the same value. If you spent the money on land in counties with the most unique species per county, you would save 591 species according to the economic study. If you maximized the number of species saved for one million dollars, you would save 750 species. Disregarding the economic way of thinking would have caused the extinction of 159 species. In this example, economists did nothing more than to observe that land in different counties has a different value and that the cost of saving species is the value of land in other uses: its opportunity cost.

Diminishing Returns

A given species cannot be preserved with certainty. The most sobering reason is because natural environmental shocks can occur which wipe out one or more species. Another important reason is that as we attempt to remove the impact of humans on the habitat of endangered species, we encroach on ever more important human activities and on ever less productive habitat for that species. This is the sense of what economists mean by the phenomenon of diminishing returns. The following example, which Shogren and I cite in our paper (1998), illustrates the idea of diminishing returns. One of the best ever-endangered species recovery plans was for the northern spotted owl. It was estimated by academic biologists and economists that increasing the survival odds of recovery from the status quo to 91 percent would cost \$33 billion (in 1990 dollars). If the recovery plan tried to improve the survival odds by an extra 4 percent, the cost would increase to a total of \$46 billion, a \$13 billion difference. For perspective for some of you, a representative habitat necessary to support one owl pair is about the size of a football field of Douglas fir trees,

which was valued at its timber value of \$650 million dollars. Once again, as we try to save more spotted owl, we have to use forests that are less suitable for the spotted owl habitat and increasingly more valuable as timberland. Very interestingly I think, the cost of preserving to the 95 percent level could have been reduced by one half if some of the owl's range was reduced (Montgomery, 1995), but the Act requires that endangered species be preserved throughout their spatial range.

Not All Species Can be Saved

In the real world there is scarcity. We have to make reasoned choices because there are budget constraints. Even Noah had to make a choice of what species to save because his Ark was not large enough to include all species. (See Mann and Plummer, Noah's Choice, 1995, for an entertaining description of attempts to fit all the species into the Bible's specified dimensions of the Ark. For a contribution as to how Noah could have solved his problem, see Metrick and Weitzman, 1998). The unpleasant problem is that one's ethical system is not one dimensional, so inevitably there must be trade-offs. The more we press on with preservation, the less resources we have for education, justice, equity, health and other important considerations.

The Endangered Species Act calls for saving all species. There is no explicit recognition that the benefits or costs of saving each species might diverge. Although it is a noble goal to save all species, Congress annually fails to provide sufficient funds for endangered species protection. In fact, looking at how Congress has allocated funds for mitigating endangered species over time on a per species basis, we see that it is 60% of its 1976 level. There is a level of idealism and tragedy contained in the Save All goal and the budget reality. It has to do with a deeply true fact that we ignore at our peril: People very often act in their own interest. Drawing on my paper with Jason Shogren (1998), before species are designated endangered, they must first be listed. The current budgetary constraint limits allow listing species at a rate of 100 per year, but there have been thousands of candidate species for listing. Not very long ago, 3,600 of them were expunged from the potential list, because the list of potentials caused "confusion about the conservation status of these taxa" (species) (Federal Register 7596-7597, 1996). Those who owned habitat for these species induced the excision, having complained to their congressional representatives about the economic costs of this uncertainty.

In a recent year, one-third of the species actually listed had no budget to address the threat of extinction and no recovery plans. Many of the recovery plans that do exist are irresponsible. Fifty percent of the species with recovery plans are in serious risk of extinction, even if the target populations in the recovery plans are achieved.

Metrick and Weitzman (1996, 1998) have done several statistical analyses of what has determined public expenditures for endangered species for selected periods. They found the biggest explanatory factor to be the amount of conflict between preservation and development plans. How endangered a species is also matters, as does size which Metrick and Weitzman interpret as an index of charisma. Endangered species such as reptiles have very little money spent on them, despite the claim in the Act that there should be no favorites.

People Act in Their Own Interest

What do you think a landowner would do, if his/her land was the habitat of a prospective candidate for endangered status? If listing a species as endangered prevents the landowner from gainfully using the land the owner would have an incentive to use a "shoot, shovel and shut-up" strategy to destroy habitat listing before it occurs. The print media routinely report cases of

habitat destruction triggered by anticipation of listing. For example, ten days before the golden-cheeked warbler was listed by the Fish and Wildlife Service, a firm owned by Ross Perot (a former presidential candidate) hired migrant workers to destroy hundreds of acres of oak and juniper warbler habitat (Mann and Plummer, 1995). Dobson et al. (1997), biologists no less, see this as a reason why “so many species are teetering on the very brink of extinction by the time they receive protection.”¹ Economists would never approve of the ESA as written because we, as a profession, give lots of weight to the assumption that people act in their own interest. If you don’t like the behavior that that implies, then you have to structure defensive incentives, penalties and prohibitions in legislation to ward off bad behavior.

A Controversial Policy with Serious Conservation Implications

Many years ago I was involved in an international effort to get the sale of ivory, skin and other pieces of elephant prohibited. During my research I came across a stunning bit of information about estimated elephant populations in seven different countries. I have partitioned the countries into those which show dramatic declines in population over a past decade and those countries for which population remained constant or increased. For those who value the existence of elephants, it seems pretty clear that the policies which preserve or enhance elephant populations have much to recommend them. The countries where the elephant populations are doing well are those countries such as South Africa and Zimbabwe that allow hunting and charge for hunting privileges. The funds are used for monitoring and enforcement designed to reduce poaching. Moreover, poachers are competitive with hunters so the hunters have an interest in removing poachers. For other countries such as Kenya, the World Wildlife Fund contributes to wildlife management on the condition that all hunting is prohibited. If you think hunting is bad, even hunting for culling purposes to insure that the habitat is not overgrazed, then I recommend rethinking that position. These are wretchedly poor countries. The parks mainly benefit rich tourists from outside Africa. Taxing the citizens even more to provide anti-poaching help has some worrisome equity implications.

Valuing Non-Market Goods

I alluded to all the intellectual effort that economists spend valuing non-market goods. Now is an appropriate time to provide an illustration. It has to do with global warming or global climate change. Here is the background. The research arm of the electric utility industry in the U.S., the Electric Policy Research Institute, naturally is concerned about global climate change (GCC). Economists have looked at the future costs of climate change in the U.S. and there does not appear to be lots of expected damage in the agricultural or industry or municipal sectors. Some regions will experience a loss of agricultural production but these losses will be partially offset by gains elsewhere. Similarly this is expected to hold true for the forestry sector. It is hard to envision lots of loss to the dot com industry or Boeing, for example, because of global warming. You may think these views are flawed, but the point is that key people in the utility industry think it’s true. So, “Where’s the beef?” as some say. Well, maybe there will be a significant loss in ecosystems. To answer this question, my colleague, David Layton and I designed a case study to estimate the value of ecosystem loss. GCC is expected to move the margin of forest land up to higher elevations and be replaced by grass on the Front Range in Colorado, including the land area in back of Boulder. What would people be willing to pay not to experience this change in their ecosystem? That’s the crux question we asked.

Here is the sense of how we did it. Imagine that the last time you went to a restaurant, you thought you would like to buy the scallops but they were too expensive. Suppose the waiter says that you got the wrong menu and gives you a new one with all prices just the same except now the scallops are priced a few dollars lower, say at \$12. By now choosing the scallops, you reveal that they are worth at least \$12 but not more than, say the \$14 earlier price.

After many focus groups, we paid hundreds of people around the Denver area to make choices when presented with different menus. The respondent can choose to do nothing and bear no money cost or he/she can opt for a program that reduces the hit of GCC but at increasing monthly cost. The estimation technique shows that people are willing to pay increased amounts of money to avoid increasing loss of forest in terms of how far the creep up the mountain goes. Moreover, early losses hurt more than subsequent losses—the diminishing returns phenomenon, discussed earlier. As an example, our data show that if the forest margin would creep up 1200 feet within 60 years, a representative person would be willing to pay about \$60 per month to avoid that. Two comments close this paper. First, this was an extremely expensive study to do because the stakes were big and enormous care went into its design. Second, there is a lot of suspicion within the economics profession about these studies. Our study was one of the very rare ones to be published in a top ten general-interest economics journal.

Notes

1. Using data from 1000 forest plots, Lueck and Michael (2003) show that the closer a timber lot was to known Red Cockaded Woodpecker habitat the more likely that Southern Pine timber was harvested and at a lower age than timber harvested further away. Lueck and Michael cite very many studies documenting preemptive habitat destruction. They have a choice quote from the National Homebuilders Association stating that managing property so that the Endangered Species Act won't be put into effect is called the "scorched earth" technique.

Bibliography

- Andow, A., J. Camm, S. Polasky and A. Solow, "Species Distributions, Land Values, and Efficient Conservation," *Science*, **279**, 27 (1998).
- Brown, G. M. and J. F. Shogren, "Economics of the Endangered Species Act," *Journal of Economic Perspectives*, **12**, 3, 3-20 (Summer 1998).
- Dobson, A. P., J.P. Rodriguez, W. M. Roberts and D. S. Wilcove, "Geographic Distribution of Endangered Species in the United States," *Science* **275**, 550 (1997).
- Layton, D. and G. M. Brown, "Heterogeneous Preferences Regarding Global Climate Change," *Review of Economics and Statistics*, **82**, 616-624 (2000).
- Leopold, A., *Sand County Almanac* (Oxford, 1970).
- Lueck, D. and J. Michael, "Preemptive Habitat Destruction under the ESA," *Journal of Law and Economics*, **46**, 27-60 (2003).
- Mann, C. and M. Plummer, *Noah's Choice* (New York, 1995).
- Metrick, A. and M. Weitzman, "Patterns of Behavior in Endangered Species Preservation," *Land Economics*, **72**, 1-16 (1996).
- Metrick, A. and M. Weitzman, "Conflicts and Choices in Biodiversity Preservation," *Journal of Economic Perspectives*, **12**, 3, 21-32 (Summer 1998).
- Montgomery, C. H. 1995. "Economic Analysis of the Spatial Dimensions of Species: The Distribution of the Northern Spotted Owl Habitat," *Forest Science*, **41** (1), 67-83
- Shogren, J. F. and John Tschirhart, *Protecting Endangered Species in the United States, Biological Needs, Political Realities, Economic Choices* (Cambridge, U.K., 2001).