

Reprinted from

ECOLOGICAL ECONOMICS

Ecological Economics 16 (1996) 217–226

Analysis

A market approach to conserving biodiversity

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Received 29 September 1994; accepted 12 September 1995



ECOLOGICAL ECONOMICS

The Journal of the International Society
for Ecological Economics

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Analysis

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Abstract

The policy now used to implement the Endangered Species Act (ESA) only prohibits actions that are harmful to listed species. While doing far too little to advance the cause of biodiversity, such prohibitions, or the prospect of them, seem to be imposing significant costs on many regional economies, and much greater impacts are feared. The article describes a market mechanism for simultaneously internalizing the social cost of eliminating especially scarce habitat, and the social benefits of protecting or producing it. For landowners with low value non-habitat land uses, the market mechanism transforms habitat from a major liability into a money-making asset. For landowners with high value non-habitat uses, the market mechanism would be a very attractive alternative to the current slow and expensive case-by-case consultation process. Environmentalists will appreciate the market process because it is less subject to politicization, or being gutted budgetarily or administratively, while assuring that agreed-upon, safe biological minimums cannot be violated.

Keywords: Biodiversity, market approach; Ecosystem protection; Habitat preservation credits

“Thousands of small businesses, landowners, and threatened species are endangered by faulty regulation.”

(Suwyn, 1993, *Wall Street Journal*)

1. Introduction

Currently, landowners (public and private) must ask the US Fish and Wildlife Service (FWS¹) for permission to do anything that might harm a threatened species, including indirectly by impacting its habitat. Even though supporters of the current policy can cite a handful of species that have been helped,

and some controversial projects the Endangered Species Act (ESA) has helped stop, the case-by-case consultation process has largely been a disaster. Indeed, on the basis of the counter-productive incentives² created by the ESA, increasingly common “shoot, shovel, and shut-up” tales, and the ESA’s impact on the public’s attitude toward environmentalism, a case could be made that the ESA has done more environmental harm³ than good. The inher-

² Landowners have an incentive to destroy potential endangered species habitat, because if they prevent its discovery, they avoid regulation and the property devaluation, even forfeiture, that goes with it.

³ Douglas Chadwick’s remark is typical: “America’s biological heritage is at risk, and one of the chief culprits is the ESA” (Mann and Plummer, 1992a). See also: Arrandale (1991), Scott et al. (1991), Noss (1991), Bean (1992), Thurm and Robinson (1992), Emerson (1991), and Egan (1991).

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¹ The National Marine Fisheries Service has a smaller role, limited more to over-harvest prevention than habitat protection.

ently costly, uncertain consultation process that underlies the ESA's dismal environmental record is also responsible for the strong opposition of rural landowners; the ESA section (10) that applies to private land is especially burdensome. The piecemeal process starts so late, and moves so slowly, that it often serves only to document extinctions (Scott et al., 1991). The ESA's consultation process greatly exaggerates the trade-offs between free enterprise, individual liberties, and the public's strong, well-grounded interest in biodiversity.

The Congress' ESA re-authorization debate (Kubasek et al., 1994) does not offer a basis for optimism about the likely nature of ESA revision. The published proposals (many are still under consideration) would not maintain biodiversity with minimum costs (dollars and freedoms). They would reduce the ESA's effectiveness, or increase landowners' burdens, or both. Unless, as some hope, the high costs abort the public effort to maintain biodiversity, the proposals would also increase the scope of government.

The proposals that would encumber the current procedures with extra due process and decision-making criteria would further reduce the ESA's environmental effectiveness without assuring landowners any relief. They would leave landowners in limbo even longer by lengthening the decision-making process. A second set of proposals, by groups who oppose changing the ESA, seek only to increase the FWS's enforcement powers and to better fund the FWS's listing and recovery efforts. Except to the extent that the permitting process might be expedited, a stronger FWS would increase landowners' burdens and thereby strengthen the perverse incentives to conceal and destroy habitat. A third set of proposals requires landowners to be compensated for excessive losses (> 20% in HR 925) they incur when they are denied activities that threaten biodiversity. That raises several issues. One is cost. Land acquisition, fee, and tax credit approaches would create large, permanent budgetary obligations. Administrative and philosophical issues might be the most troublesome. Should people be paid to refrain from socially harmful actions? ⁴ How would we determine what someone

would otherwise have done, and measure what it would have netted (appropriate compensation) them?

2. Fundamentals of species or ecosystem protection

The key to improved ecological performance is a change in the incentives underlying land use. The command-and-control approach of the ESA and most other environmental laws is more costly and less effective than one that uses private property incentives (rather than opposes and erodes them) and markets. The ESA was enacted because the public saw species habitat as a valuable land use, but the implementation procedures have been too costly and largely ineffective because they have made habitat a major liability for landowners. That defect must be corrected. ⁵

This article proposes a biodiversity policy that harnesses market forces by making habitat a valuable commodity that some landowners "produce" and other landowners "consume" (destroy). The government would define habitat, indicate its scarcity, and grant habitat preservation credits (HPC) to producers (i.e., landowners) who agree to maintain habitat. The authorities would also enforce consumers' obligations to purchase HPCs to gain permission to destroy habitat. Market forces determine the monetary price of HPCs. Thus, voluntary exchange simultaneously internalizes the social benefits of habitat maintenance and the social costs of eliminating it. Details are forthcoming in Section 3.

Scarcity is significant long before species are endangered or even threatened, so species stabilization and recovery should begin earlier than under the current procedures (often too late). A careful defini-

⁴ We don't pay people to not emit pollutants on their property.

⁵ The proposed ESA revision (Sections 7 and 10 permit processes could remain available) could perhaps be implemented through administrative action. After all, the ESA does not prohibit the use of market mechanisms and incentives to conserve biodiversity. However, some existing efforts to reform the current policy (regional habitat conservation plans) are already on shaky legal grounds (Ruhl, 1991). Since property rights based on administrative changes are less certain than if based on legislation, merely changing the current policy administratively might put the proposed market mechanisms on shaky legal and economic grounds.

tion of habitat and determination of its scarcity maximizes the probability that the amount of habitat remains above a biologically relevant minimum, and it maximizes the opportunity for economic activity, flora, and fauna to coexist.

Note that the proposed market approach does not include cost-benefit analysis⁶ to determine which species should be retained. The market approach is just a more effective, less costly way to achieve the aims of the ESA. Therefore, the market approach could be implemented on the same species-by-species basis used now. However, a multi-species or ecosystem approach would be more efficient. Land use changes usually affect more than one species, and an ecosystem approach would make the ESA's lengthy, cumbersome listing process obsolete. Despite the ESA's species-by-species focus, federal agencies have already begun changing to an ecosystem approach. As Sara Vickerman and other experts have pointed out, "they'll never have enough people, or enough money to deal with species one at a time" (Arrandale, 1991).

3. Habitat as a commodity

Habitat preservation credit (HPC) markets would make habitat a valuable competing land use. Landowners could then earn income by devoting some of their land to habitat much like they do now when they allocate land to grazing or to a particular crop. A legally binding, standard promise (called a Management Agreement [MA]—like an easement) to maintain existing or new habitat formally establishes HPCs. For each acre that landowners wanted to alter so that it no longer met the definition of habitat, they would be required to buy an HPC. Environmental groups could purchase HPCs to speed up formal habitat designation. Except for them, HPC purchasers consume their HPCs. Unlike emission reduction credits that confer rights that are exercised repeatedly and then sold, HPCs confer a right that can only be exercised once. Consumed HPCs would be indirectly transferred when land is sold because

the purchase of HPCs will have reduced the amount of habitat still present there.

An appropriate MA would include a mixture of required and banned activities, ranging from minimal land use constraints to active management, and outright purchase for some extra-sensitive species. It would be wrong, either from a biodiversity or economic efficiency perspective, to mandate outright purchase in all cases. Since the ability to maintain pristine ecosystems through outright purchase is minimal (Ziegler, 1988), we have to define the terms under which humans and natural systems can coexist. The practices of groups like the Nature Conservancy have proven that deed restrictions (a type of MA) are often enough.

Since a clearly defined commodity is a key requirement of a market, a pass-fail definition of habitat should be adopted. That means that an acre that has a minimum amount⁷ of each key site and locational (like proximity to other habitat) feature would be defined as habitat. It would take an elaborate scoring system to award HPCs on the basis of qualitative differences in habitat. Such a scoring system would increase administrative expenses, rent-seeking opportunities, and market-stifling uncertainty by substantially re-introducing case-by-case consultation—a key reason for widespread⁸ dissatisfaction with the FWSs' existing procedures. A safeguard against the chance that an HPC purchase could swap high- for low-quality habitat is discussed later. For now, note that the reverse is also possible. Since a land use change that would require a HPC might leave many habitat features intact, low- for high-quality swaps are more likely.

Habitat quality issues must play a key role in the selection of the minimums for each key site and location characteristic to be used in the official definition of habitat, and the minimum amount of land meeting that definition. Scientific assessments of biological requirements, while paramount, are not all-or-nothing. Setting higher minimums would (with rising marginal costs) raise the probability of sur-

⁶ Stevens et al. (1991, Stevens et al. (1993)) showed that reliable estimates of species preservation benefits might be very difficult to estimate.

⁷ Key issues were identified in the Ciriacy-Wantrup (1968), Bishop (1978), and Smith and Krutilla (1979) safe minimum standard discussion.

⁸ Environmentalists are not satisfied with species preservation results, and landowners are upset with the compliance costs.

vival, but it cannot be guaranteed. Many extinctions occur without any human culpability, and the last few percentage points of greater certainty may be extremely costly.

The definition of habitat, and the acceptable minimum amount, determines its scarcity and the potential for creating more. The additional secure habitat (ASH) needed is the difference between the minimum acreage, and the amount already protected (APH) in parks and wildlife refuges. There are two other key parameters: (1) unprotected habitat (UH); and (2) potential habitat (PH). Each is expressed in units of land area, like acres.

Note that for any region:

$$\text{Total area} = \text{PH} + \text{APH} + \text{UH} + \text{NH} \quad (1)$$

$$\text{Minimum suitable habitat} = \text{APH} + \text{ASH} \quad (2)$$

where NH = land area that is not habitat, and could not be made suitable habitat at a reasonable cost. PH is the land area that cannot support the species now, but could be made (at a reasonable cost) into habitat. $\text{PH} > 0$ in most areas with a large human population, but for cost reasons generally less than the difference between the amount of habitat that existed prior to human settlement and existing habitat (UH + APH). The values of UH and PH would be based on a land use inventory. A conservative estimate of PH would be sufficient. The objective of any species protection strategy should be to make $\text{ASH} = 0$ (APH = minimum suitable habitat).

3.1. When ecosystems, or species, are not on the brink of extinction

Where $\text{UH} > \text{ASH}$, an HPC can be manufactured by creating a new acre of habitat and protecting it with an MA (Option A), or by maintaining existing habitat with an MA (Option B). The manufacture of HPCs through Option B must reflect the difference between UH and ASH in the form of a physical price (PP) set by the authorities. PP indicates how many acres of existing habitat must be protected per HPC. PP must be set so that HPC purchases will make $\text{ASH} = 0$.

Consider a very simplistic example. Assume UH and ASH are equal to 1200 and 800 acres, respectively. Another 800 acres must be assured of remain-

ing suitable habitat to provide enough for the species to have a satisfactory chance to survive. $\text{UH} - \text{ASH}$ ($400 = 1200 - 800$) is the number of HPCs that can be created by Option B. The authorities should set $\text{PP} [= \text{ASH}/(\text{UH} - \text{ASH})]$ at two. In other words, $\text{PP} (= 2 = 800/400)$ existing acres of habitat must be protected with an MA per acre eliminated (Option B). The higher PP is, the smaller the supply of HPCs and the more Option A (create new habitat) will be substituted for Option B. If only Option B is used, UH and ASH will eventually reach zero together. If $\text{UH} = 0$, HPCs can be produced only with Option A.

Since the use of Option A will reduce ASH, but not UH, the authorities should update PP periodically. For instance, the manufacture of 50 HPCs through Option A would reduce ASH to 750. Then PP for Option B is 1.67 [$= 750/(1200 - 750)$].

3.2. When ecosystems, or species, are on the brink of extinction

The right time for the authorities to define habitat and initiate HPC markets is while $\text{UH} > \text{ASH}$ (not endangered, though perhaps threatened by the rate of decline of UH). Unfortunately, for many species $\text{ASH} > \text{UH}$ (endangered) already. If ASH is roughly equal to $\text{UH} + \text{PH}$, there is nothing for market forces to allocate. The best approach in those instances, especially as PH's share of $\text{UH} + \text{PH}$ increases, would be for the government to restore all of the PH acres, and then purchase an MA for all of the habitat.

With $(\text{PH} + \text{UH}) > \text{ASH}$, there is something to allocate ($\text{PH} + \text{UH} - \text{ASH}$ acres), and markets do that better than bureaus. A more complicated version of the Option B described above should be used. To illustrate, let $\text{UH} = 800$, $\text{ASH} = 1000$, and $\text{PH} = 400$ acres. Then non-habitat uses can occur on another 200 ($\text{PH} + \text{UH} - \text{ASH}$) acres⁹ without threatening the species. PP_B is the correct physical price when a species is on the brink (B) of extinction.

$$(\text{PH} + \text{UH} - \text{ASH}) \times \text{PP}_B = \text{ASH} \quad (3)$$

$\text{PP}_B = 5 = \text{ASH}/(\text{PH} + \text{UH} - \text{ASH})$. Since it may be difficult to get a precise measure of PH, a conser-

⁹Timing is important. The restoration of new habitat must be complete before existing habitat is eliminated.

vative estimate of PH should be used in Eq. (3). The ratio $PH/(PH + UH)$ ($= 1/3$) defines the share of PP_B that must be restored habitat. The remainder, $UH/(PH + UH)$ ($= 2/3$), of the acres to be covered by MAs can be existing habitat. If PH is large enough so that $PP_B \times [PH/(PH + UH)] < 1$, HPC transactions would produce a net habitat loss. To avoid that, the ratio of restored habitat to eliminated habitat must be no less than ASH/UH ($= 1.25$). In other words, since the amount of actual habitat is already too small, habitat elimination must be more than offset by restoration. Again, the eventual outcome of HPC purchases would be $ASH = 0$. Since habitat elimination is more than offset by restoration, the policy would be analogous to the Environmental Protection Agency's Offsets Policy for air-quality non-attainment areas wherein new polluters must more than offset their impact on air quality.

Since the species is already endangered, a gradual decrease in the difference between the amount of secure habitat and the safe minimum amount may be an unaffordable luxury. There are at least three ways to speed up the process. One way would be for the government to pay to quickly restore enough habitat to make up the initial difference between UH and ASH. Then, with $UH = ASH$, the subsequent demands for habitat elimination could be accommodated with Option A described previously.

A second way for the government to speed up the restoration and MA set-up process is by offering habitat producers an incentive bonus. This method is analogous to the proposal by Bean (1992) to "jumpstart" a proposed incentive program to protect and restore red-cockaded woodpecker habitat. The bonus would be set high enough to restore the additional desired habitat faster than HPC markets would have done the job. It should cost less than directly paying for restoration, because on top of their incentive bonuses the habitat producers would receive a partial HPC (missing the MA for the existing habitat share of PP_B) which they could sell per ASH/UH or $(PP_B \times PH/(PH + UH))$ acres restored. Subsequent habitat eliminators could acquire a full HPC by purchasing a partial HPC, plus an MA for $PP_B \times UH/(UH + PH)$ acres from UH.

A third possibility would be to set the restoration component of PP_B above ASH/UH or $(PP_B \times PH/(PH + UH))$. That would decrease ASH more

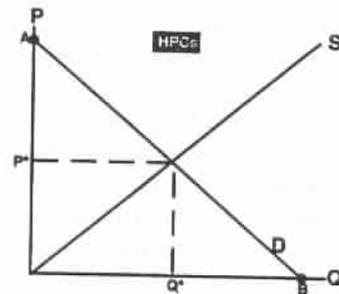


Fig. 1. Determining the dollar price of HPCs.

quickly if habitat eliminators' demand is strong and price inelastic. That is likely to be the case when PH is very large. If their demand is very price-sensitive (elastic), such a price increase would slow the decrease in ASH.

3.3. The HPC market

Market forces will decide the money price (see Fig. 1) of an HPC. The downward-sloping demand (D) line reflects the relative profitability of land use changes that eliminate habitat. For example, if a region's population began growing more rapidly, urban land uses would increase in value. That would raise the demand for HPCs, thereby shifting D to the right, and increasing the dollar price (P^*) of an HPC and annual sales (Q^*). Point A indicates each year's highest return to such land use changes. Point B indicates how many acres of habitat would be eliminated in a year if there was no policy. The upward-sloping supply (S) reflects PP , expected losses from foregoing land uses prohibited by the MA, and the costs of management practices that MAs impose on landowners. A more demanding definition of habitat would increase each. That would increase HPC prices and reduce annual sales by shifting S to the left. The smaller the average size of Q^* , the longer it will take ASH to reach zero.

The means by which transactions are facilitated would probably vary according to the market's probable competitiveness and volume. In some cases, HPCs would be brokered by the same commodity exchanges that market pollution reduction credits. In some cases, the authorities might broker transactions. In low-volume cases (most HPC markets initially), landowners interested in buying HPCs would have to solicit individual potential HPC producers.

Allowing HPC rentals might help overcome problems in low volume markets. A temporary commitment to an MA would create an HPC for rent. Since habitat destruction is often permanent, HPC consumers would eventually have to buy one, but a rental could be used to buy time until a seller can be found. The addition of a rental market would broaden the incentive to reveal and protect habitat, and reduce some landowners' incentive to conceal or destroy species or their habitat. It would also make it less likely that renters follow through with their development plans.

3.4. Discussion

Even apart from the benefits of competitive markets¹⁰ and greater personal liberty, HPC markets would have six advantages over the process in use now, and most published reform proposals (Hudson, 1993; Kubasek et al., 1994). First of all, HPC markets pursue the common interest in biodiversity with a much smaller infringement on individual liberties. Second, the HPC market assures that agreed-upon biological minimums are not violated; each of the n purchases achieves $1/n$ th¹¹ of the desired habitat maintenance outcome.

Third, with the implementation process used now, the listing of a species lowers the value of all property that the public believes the FWS might designate as habitat. With the HPC market, the listing would raise property values where the non-habitat use values are lowest, thereby spreading the economic benefits of development pressures. Then a large fraction of landowners would cheer an imminent listing and eagerly reveal the presence of endan-

gered species and the habitat or potential habitat on their land. Fourth, though the value of property with high non-habitat use values could still be reduced in value by a listing, the drop would be smaller than it would have been under the current policy. The incentive to "shoot, shovel, and shut-up" would also be weakened by peer pressure. Clandestine habitat destruction by some landowners would reduce the incomes of the landowners that were HPC producers. The HPC's observable price assures the right to proceed expeditiously with non-habitat uses, so delay-related costs are eliminated. HPC purchases could be subsidized to the extent that the political process determined that the public should share the cost of habitat protection and restoration.

Fifth, the HPC market approach would compel the FWS, for each species or ecosystem, to make public, and support with scientific documentation, its definition of habitat and its determination of ASH. That would make it easier for Congress and the public to monitor the FWS's performance, while making it more difficult for anyone to selectively enforce the law for political gain.¹² Politics would be confined to the broad issues where it belongs and where the political process can work reasonably well, and kept out of the details, where it can only generate mischief and undercut public trust.

Sixth, most of the landowners who accepted the standard MA to produce HPCs would retain title to the affected acreage, but the assessable value and property tax load of that property would be reduced. That would be especially beneficial to landowners who desire to remain on their homesteads despite development pressures.

Cost estimates in proposed regional habitat conservation plans (RHCP) like the Balcones Canyonlands Conservation Plan (Ruhl, 1991; Gau and Jarrett, 1992) for central Texas support the assertion that the HPC approach would be much less costly to developers. The Balcones RHCP allows habitat eliminators to help pay for refuge land in lieu of individually complying with Section 10 of the ESA. Gau

¹⁰ The structure of HPC markets would very widely depending on the extent and distribution of habitat, land ownership patterns, and development pressures. A competitive structure would produce the best results, but the current policy's inferiority to either a competitive or imperfectly competitive HPC market would not have to be accepted on faith. The existing ESA Section 7 and 10 procedures could be left as alternatives to an HPC purchase with minimal administrative expense.

¹¹ This feature may help the proposed ESA revision satisfy the US Supreme Court's new "rough proportionality" test for whether restrictions imposed on developers demand compensation. (Tigard decision - June 24, 1994 [Associated Press, 6/25/94]).

¹² According to Mann and Plummer (1992b), FWS decisionmaking has become highly politicized: "The agency, formerly a haven for guys who liked to work outdoors, is now a hot spot of sophisticated partisan arm-twisting."

and Jarrett (1992) found that the proposed per-acre development fee could be set at a fraction of the per-acre cost to each landowner of complying with Section 10 (even without the RHCP's big government and environmental group subsidies), and still generate enough funds for outright purchase of the targeted amount of refuge lands. That means that in areas already actively subject to the FWS's current policy, the HPC market alternative would produce area-wide property value increases.

Those pluses come from combining elements of several recent policy innovations, including parts of the current policy. For example, the ESA's Section 10a permit requires a conservation plan, including mitigation measures such as land acquisition and rehabilitation (Carter, 1991). The HPC market process also includes property right transfers and habitat restoration, but stops short of outright purchase whenever possible by as much as possible. An even more important difference is that Section 10a mitigation measures are determined through consultation on a case-by-case basis. With the HPC process, the ratio of habitat acres eliminated to acres kept as habitat (perhaps after restoration) through MAs is known in advance and, at any given time, is the same for everyone.

HPCs resemble tradable development rights and air pollution offsets, but there are big differences. Tradable emission rights (such as those created by the Clean Air Act amendments of 1977 and 1990) are exercised repeatedly (i.e., every year) and may be resold, so expectations of future prices are important. HPC buyers can't resell the HPC after having exercised the rights it confers, though the land that it is used on can be sold. Also, since HPC ownership confers a right that is exercised only once, future MAs need not have exactly the same terms as past MAs. MAs can be updated to incorporate new knowledge. HPCs differ from development rights because of HPCs' physical price, and to the extent that the MAs accepted by HPC producers mandate action.

The use of market mechanisms to conserve biodiversity need not be limited to land plants and animals. Where air or water pollution threatens vulnerable species, effluent fees or tradable discharge permits can be used to pay for mitigation or provide a safe level of minimum habitat. Where surface water

diversions or groundwater withdrawals during low flow periods threaten habitat, water users should share the cost of sustaining sufficient flows in the habitat areas, or providing artificial habitat until normal flows resume. Such a situation currently exists in South Central Texas. Springflows from the Edwards Aquifer sustain several endangered species. Unless pumping is reduced during droughts, or artificial habitat is available, a severe drought would eliminate several species by temporarily destroying their habitat.

HPC markets would probably be more effective for government land as well as private land. Though agency directors may not react to market pressures like landowners, habitat-eliminating practices through the HPC purchase requirement would still cause ASH to move closer to zero. Officials may frequently prefer it to the ESA Section 7 process that virtually all government projects have access to. Isolated examples such as the Army buying red-cockaded woodpecker habitat to minimize the restrictions on their use of Fort Bragg (Bean, 1992) hint that implementation of the proposed ESA revision could help government officials perform their tasks more efficiently.

HPC markets can be implemented while the existing Section 7 and 10 permitting procedures are retained as options. If the ESA is amended to give HPC markets a firm legal foundation, private landowners will avoid the old Section 10 process, and many government agencies may prefer the HPC market to Section 7.

Since no two acres are identical, the eliminated acre may be *better or worse* habitat than the area that will be protected to produce the HPC. To prevent a species from being harmed by the HPC market, an agency should be empowered to review, and perhaps modify or stop, HPC uses challenged on ecological grounds (major quality differences, fragmentation, etc.). Such a process is like a watermaster's power to modify or stop proposed water rights transfers challenged by another water user. Since administrative procedures can be slow, costly, and vulnerable to being biased by political pressures, review and modification powers should be statutorily limited to cases with clear, compelling scientific merit. The possible harm caused by not reviewing marginal cases can be expected to be offset by HPC

transactions that have an above average species protection benefit.

3.5. Should landowners have to pay to alter their own land?

Landowners have taken the position that they should be paid to refrain from actions that convert habitat on their land to other uses. They see restrictions imposed by the current policy as takings for public purposes requiring just compensation. Holders of that view see the habitat values of private land as a costless byproduct of land use practices that have left them intact, not as an unused right having been placed in the public domain (Barzel, 1989), and that the public should pay for the benefits once there is an opportunity cost.

That point has been (Kubasek et al., 1994), and remains, a very contentious part of the debate on proposed ESA amendments. Many people see uncompensated restrictions on habitat elimination as analagous to the widely accepted polluter-pays principle. If landowners are responsible for their share of impact on shared air and water, they should be responsible for their share¹³ of impact on biodiversity. According to that view, regulation would not require compensation because it would only represent a public claim of rights that landowners have left in the public domain. The polluter-pays analogy is rejected by some who assert that habitat elimination does not produce the kind of observable physical impairment of third parties' property rights that air and water pollutants do. If the Congress agrees, the HPC market price can be used to estimate the correct amount of compensation.

The current analysis does not pretend to settle that issue, but it accepts the polluter-pays analogy on its merits, and because it's consistent with the current law. Still, the proposed HPC market approach is somewhat of a compromise. Landowners who de-

stroy habitat incur the social cost, but landowners are paid for committing to an MA. The current policy imposes the passive components of an MA without compensation.

4. Implementation issues

The government, through agencies like the FWS, would have to define an appropriate MA, estimate the parameters UH and ASH, rule on contested HPC transactions, and enforce HPC purchase requirements and the terms of MAs. The FWS already does, or at least is required to do, the equivalent of defining and enforcing MAs (recovery plans), and through the National Biological Service (*Wall Street Journal* editorial "Go Fish", 11/8/93), the FWS should soon be able to define ASH and UH. A rough estimate of PH would suffice. That would require physical data and a restoration cost judgment. Since the FWS and landowners would be relieved of the cost and uncertainty of case-by-case rulemaking, the proposed market approach would not place greater demands on taxpayers. With a tax on HPC transactions, the market approach might be self-funding. On the other hand, a subsidy could be justified by a desire to share the cost of habitat protection more widely, or to relieve traditional land uses of increased costs. An ecosystems approach would eliminate the costly, lengthy, and politically sensitive listing process for thousands of potentially threatened or endangered species.

5. Summary and conclusions

The current policy does too little to protect species, and it threatens an unnecessarily high toll on landowners (especially small landowners) and some regional economies. The HPC market approach creates incentives to maintain and restore habitat and avoid habitat elimination, and it does so in a way that biological minimums cannot be violated. Landowners could benefit by selling HPCs, or by avoiding the ESA's costly, lengthy, uncertain Section 10a permitting process. However, since habitat eliminators may (when they can't produce HPCs for

¹³ On June 24, 1994, the US Supreme Court (Tigard) ruled by a 5–4 vote that restrictions on developers were an unconstitutional taking unless the government can show a "rough proportionality" between the restriction and the impact of the development (Associated Press, 6/25/94). The closeness of the vote and the nature of the decision will further enliven this debate.

themselves) have to pay for some uses of their own property, some property rights advocates will object. Even if one agrees that landowners should not have to pay to use their land, even in socially harmful ways, the HPC market is still the best approach. Then the public would have to subsidize HPC purchases.

The proposed ESA revision could help avoid another unpleasant potential outcome of species protection efforts. Many natural scientists have concluded that "land use and human settlement patterns must be regulated, much more so than today" (Noss, 1991). Measured in dollars or freedoms lost, that is a more costly approach than just specifying overall results (ASH = 0 in time), and achieving them through economic incentives.

The biggest foe of reform is inertia. Transition issues are always thorny, and people have proven willing to pay a high price to avoid the uncertainty that comes with change. A successful defense of the current policy against market-based reform, or replacing it with another command-and-control approach, would be a great economic and environmental tragedy.

6. Acronym definitions

- ESA = The Endangered Species Act of 1973 as amended.
- FWS = US Fish and Wildlife Service.
- HPC = Habitat preservation credit. An HPC entitles its owner to eliminate one land area unit (acre) of habitat.
- PP = Newly protected units of habitat per eliminated unit of habitat.
- PP_B = PP for species on the brink of extinction.
- UH = Unprotected habitat in land area units.
- ASH = Safe minimum additional secure habitat in units of land area.
- PH = Potential habitat in units of land area.
- MA = Management Agreement. An MA would combine some mix of deed restrictions, mandated owner activities, and permission for other people to perform certain activities.
- APH = Already protected habitat, including park and wildlife refuge acreage.
- NH = Land area that is not habitat, and could not be made suitable habitat at a reasonable cost.

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USA POSTMASTERS: Send address changes to *Ecological Economics*, Publications Expediting, Inc., 200 Meacham Avenue, Elmont, NY 11003. Airfreight and mailing in the USA by Publication Expediting.

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