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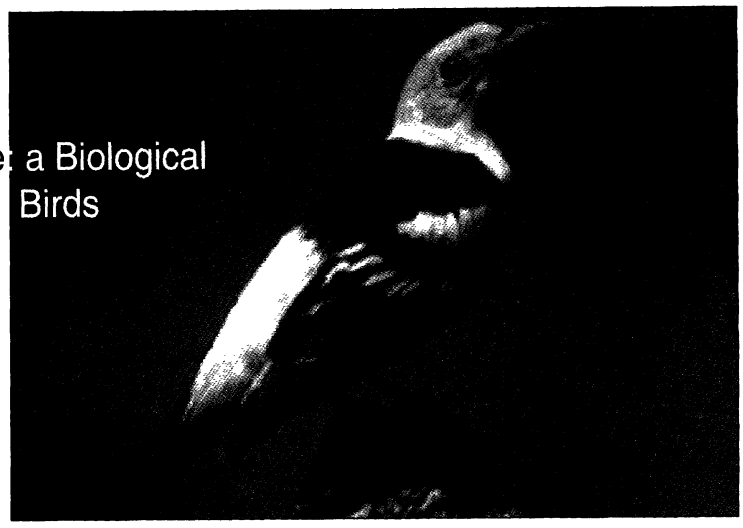

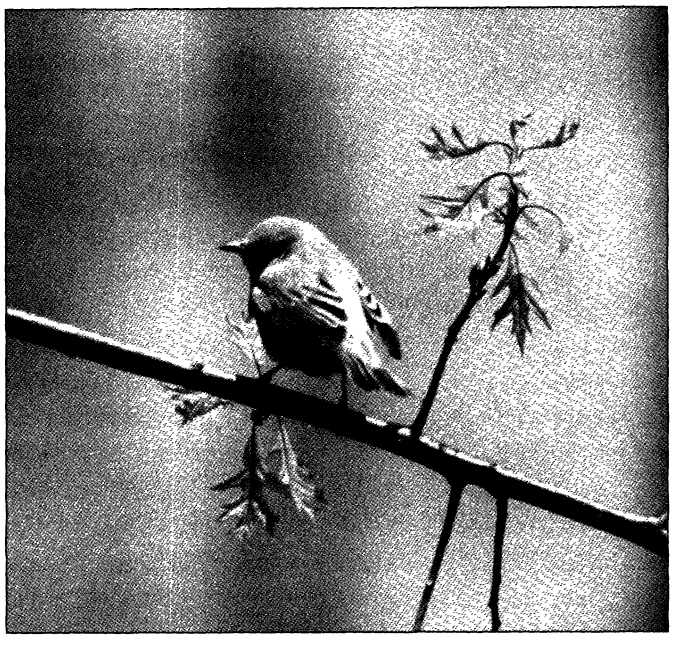

U.S. Endangered Species Management: the Influence of Politics

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Abstract

The influence of politics on the practice of conservation science and endangered species management is widely accepted, but usually reported in case studies. This approach, while helpful, prevents a comprehensive assessment of the role of politics in endangered species management. In an attempt to asses the influence of politics on the management of U.S. endangered species, this article compares the number of endangered species listings and recovery plan approvals during the last three presidential administrations. Results indicate that the Clinton administration appears to have approved significantly more endangered species listings and multispecies recovery plans that did Presidents Reagan and Bush. Once differences in U.S. Fish and Wildlife employee numbers are accounted for, however, these differences disappear. These results suggest that politics does influence endangered species management, and that this influence is manifested by different commitments of human and financial resources.

Introduction

Conservation biology is a discipline that seeks to prevent the extinction of species and the associated loss of biodiversity. When the preservation of biodiversity conflicts with economic development or other social goals, conservation issues often become deeply politicized (e.g., the case of Northern Spotted Owl and timber interests). In these cases of competing interests and goals, conservation efforts are pursued in a political process—a process that determines both who governs and in whose interests the government is run. At the national level, actions by the president, congress, and courts are all measures of a changing balance in the competition for power and advantage, and this balance of power determines what conservation policies prevail, and thus in whose interests the government is run.

While some conservation biologists advocate the involvement of scientists in this political process, even to the point of filing briefs of amici curiae in the U.S. Supreme Court (e.g., Cairns et al. 1994), others have cautioned that involvement of conservation biologists in political and legal disputes will compromise their public standing as impartial scientists (Wagner 1999). Despite this debate about whether the involvement of scientists in political disputes is beneficial, that politics definitely influences the practice of conservation is neither questioned nor debated. However, the extent to which politics influences conservation practices has proven to be difficult to quantify, and is generally reported as anecdotes. The U.S. Endangered Species Act, therefore, represents an ideal case study with which to evaluate the influence of politics on endangered species conservation using simple but easily quantifiable variables.

The U.S. Endangered Species Act (E.S.A) is the nation's strongest and most powerful conservation tool, and has served as a model for other countries (Rohlf 1991). The full mechanics of how the E.S.A. functions have been described in detail elsewhere (Bean 1983; Nicholopolos 1999). Briefly, a decision is made to list a species as threatened or endangered, either by the U.S. Fish and Wildlife Service (FWS) or the U.S. National Marine Fisheries Service (NMFS); these agencies publish their intent to list species in the U.S. Federal Register. After a period of public comment, a final decision by FWS or NMFS on whether to list a species is also published in the Federal Register. Once species have been listed, FWS and NMFS are mandated to produce recovery plans for each species, or for groups of species for so-called "ecosystem" or "multispecies" recovery plans that include suites of species. The recovery plan represents steps FWS and NMFS believe are necessary for the long term survival of the species. A species is ultimately delisted when certain objectives or recovery criteria are met that indicate that long-term survival is ensured.

There are at least three potential sources of political influence in the endangered species management process: listing, recovery plan approval, and delisting. This is because the actions of federal agencies can be just as politicized as campaigns for elected office. For example, because the agencies charged with these important conservation steps (NMFS and FWS) are federal agencies under the control of the U.S. executive

branch, the president is doubly important to their implementation. The president proposes policies, makes appointments to governmental agencies, presents budgets, lobbies for the passage of legislation, and either signs or vetoes legislation, all of which affect endangered species management. In addition, one of the most important powers of the presidency is the potential that its occupant has to persuade. Indeed, the ability to influence people both within and outside government is one of the distinguishing features of the modern presidency (Neustadt 1960). It is therefore possible that changes in the U.S. president (or the party controlling the U.S. presidency) could have indirect effects on endangered species management by altering the rate of endangered species listings, recovery plan approvals, and delistings.

Methods

To quantitatively evaluate whether changes in the U.S. president or the partisan affiliation of the presidency affects endangered species management, I considered whether the simple response variables of the number of endangered species listings or the number of recovery plans approved differs by president or political party. Since few U.S. species that have been delisted, there is inadequate sample size to quantitatively examine the delisting process.

I gathered information on endangered species listings from a compilation and reprint of 50 CFR 17.11 and 17.12. These data were current as of 31 December 1999, and are available via http:// endangered.fws.gov. For these counts, only listings for U.S. species were scored. I gathered data on endangered species recovery plan approvals from the U.S. Fish and Wildlife Reference Service (Bethesda, MD). This document was current through 1999, and is available via http:// http:// fa.r9.fws.gov/r9fwrs/. I only scored recovery plans approved from 1981 to 1999. Excluding plans approved from 1974-1980 eliminated only 7% of the plans that had been approved as December 31, 1999 from the dataset. While counting the number of plans approved by each administration, I also counted the number of multispecies plans approved by each administration. A recovery plan was scored as a multispecies plan if it was obvious from the recovery plan title if it pertained to more than one species (e.g., fishes).

I evaluated differences between presidential administrations in the number of plans and listings approved with the following statistical procedure. First, I calculated a null expectation of the number of approved listings or recovery plans. This was accomplished by dividing the total number of approved listings or recovery plans by the total number of years to give a mean rate of listings or recovery plan approval per year. The mean rate was multiplied by the number of completed years in office for each Presidential administration (8 for Reagan, 4 for Bush, and 7 for Clinton) to arrive at an expected number of listings and recovery plan approvals per administration. The observed and expected number of listings and recovery plan approvals were compared with a chi-squared test.

One potential mechanism underlying any differences between administrations detected with this procedure might be differential commitments of human and financial resources to endangered species management made by each president or each administration. If this is the case, then once these differences are accounted for, differences between the parties or presidents should disappear. To do this, I used the general linear models (GLM) procedure of SAS statistical software to compare the mean number of listings per employee and the mean number of recovery plan approvals per employee in each presidential administration (SAS Institute, 1990).

I calculated the number of FWS employees as the average number of employees for a given year employed by the U.S. Fish and Wildlife Service, from 1982-1999. Data from 1981 were not available, and were scored as missing data

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Cover: Western tanager (*Piranga ludoviciana*) and yellow warbler (*Dendroica petechia*), found in shade coffee plantations, courtesy of Seattle Audubon Society and Jim Flynn, Jr. (respectively).

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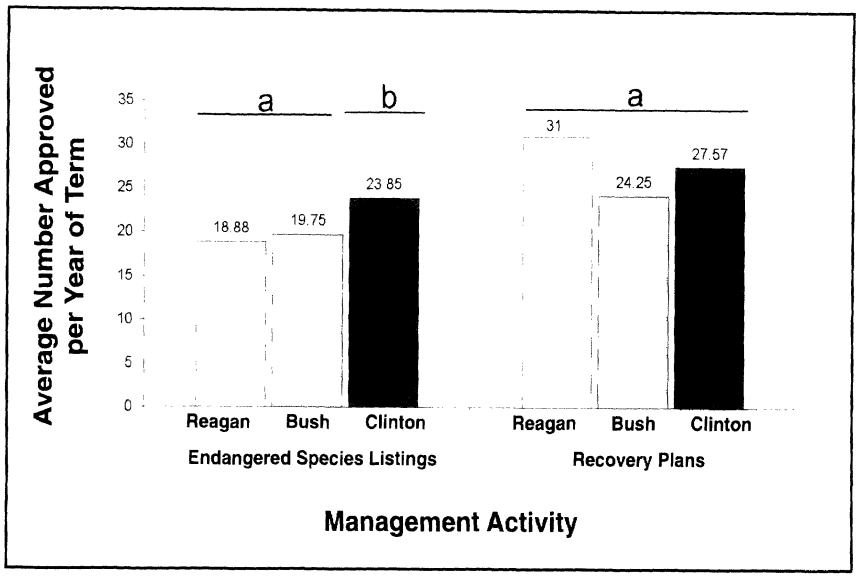

Figure 1. The presence of political influence on two endangered species management processes, the listing of species and the creation of recovery plans. The number of listings per year and the number of recovery plans approved per year are shown for the last three U.S. presidential administrations. Bars sharing the same grouping letter are not statistically significantly different from each other.

in analyses. Since not all FWS employees work on endangered species management, these data represent a maximum upper bound. Data for these analyses were provided by the U.S. Office of Personnel Management, Statistical Analysis and Services Division, Washington, D.C., U.S.A.

Results and discussion

The number of listings and the approval of endangered species recovery plans in the U.S. does not appear to be free of political influence or bias. There are marginally significant differences between the number of endangered species listings during the Reagan, Bush and Clinton administrations: the Clinton administration appears to have approved more endangered species listings than did the Reagan and Bush administrations, as compared to the null expectation that listings were approved at a fixed rate per year ($p=0.09$; Figure 1). Indeed, when these comparisons are made on the basis of the political party that controlled the presidency, rather than individual presidential administrations, Democrats approved significantly more endangered species listings than did Republicans ($p=0.031$).

Despite the apparent political bias in the number of endangered species listings, there does not appear to be any significant difference in the number of recovery plans approved-- either for comparisons of the Reagan, Bush, and Clinton administrations ($p=0.10$) or for comparisons between Democrats and Republicans ($p=0.64$).

When differences in the number of employees are accounted for, there is no significant difference between the Reagan, Bush, and Clinton administrations in the average number of listings per employee ($p=0.56$) and the number of recovery plans per employee ($p=0.11$). These patterns remain the same when considered on a party basis ($p > 0.17$ for all comparisons). These data indicate that differences between parties and presidents in endangered species listings appear to be driven by differences in the commitment of human and financial resources to endangered species management. These data also show the close connection between political, social, and economic factors and the practice of conservation science—the increased action taken on endangered species listings in the Clinton administration appears to be due to an increased commitment of human and financial resources to the U.S. Fish and Wildlife Service. If the connection between FWS employees and administrative action on endangered species management is a firm one, then it is possible that increased funding for endangered species management would expedite the bureaucratic process.

Another potential area where political influences might be permeating the endangered species recovery planning process is the approval of multispecies recovery plans. The Clinton administration approved significantly more multispecies recovery plans than did the Reagan and Bush administrations ($p=0.00002$, Figure 2). It is difficult to distinguish, however, whether this is the manifestation of a policy shift between the Republican administrations of Presidents Reagan and Bush and the Democratic administration of President Clinton (Babbitt 1995), or a reflection of conservation biology's shift from single-species to ecosystem and multispecies management strategies (e.g., Scott et al. 1993). It is unlikely, however, that all of this difference is solely a temporal trend in conservation biology, because the data for multispecies plan approvals show no clear increasing or decreasing temporal trend. If the presidency changes parties in the 2000 elections, however, within a few years it would be possible to repeat the analyses reported here with similar data without temporal factors as a confounding variable.

Limitations of the analysis

Another caveat that applies to this analysis is due to the limitations of the approach. The analyses I performed simply compared the number of listings or plan approvals during the years that a president held office with the null expectation, mainly because of the prominent role of the presidency in the American political and governance process (see above). It is possible that other factors acting during the time that a president was in office could also influence the variables measured here.

It is important to note, however, that

this procedure could be easily modified to evaluate their influence. For example, one could compare listings and approvals during election and non-election years, times of economic recession and expansion, times of military conflict versus international peace, before and after major court cases and settlements, before and after initiatives such as "Reinventing Government," or during blocks of time that different political parties controlled the House of Representatives or U.S. Senate. Despite the potential influences of these external factors, it is likely that the priorities and philosophy of a president can and do modify their relative influence on administrative actions on endangered species conservation.

Conclusions

The apparent presence of political influence on U.S. Endangered Species management gives reasons for both caution and optimism. First, identifying political influence in listing species and approving recovery plans is necessarily a coarse-scale analysis, and simply listing species and creating recovery plans is not equivalent with actually managing them to recovery. Political considerations might in fact make some of the management options necessary for a true recovery unappealing, and the extent of this type of political influence would be difficult to quantify and analyze. Even if an absence of political bias in the listing of species and the approval of recovery plans is achieved, political considerations might prevent endangered species management from being fully funded. Indeed, U.S. Endangered Species recovery efforts are often hindered by a lack of funding (National Academy Press, 1995).

Second, the differences reported here between the three past presidents and the political parties on endangered species plan listings and multispecies plan approvals need not be bad news. Although these data indicate that endangered species management has not yet received bipartisan support despite the overwhelming support of the U.S. public (Czech and Krausman 1999), they also suggest that differences, and therefore potential choices for the U.S. voter, exist between the two major political parties when it comes to conservation.

Acknowledgements

I thank T. Mendelson, P. Kareiva, W.F. Morris, S. Pimm, D.S. Wilcove, and C. Huntley for critical comments on a previous version of this manuscript, and the Harry S. Truman Scholarship Foundation for financial assistance.

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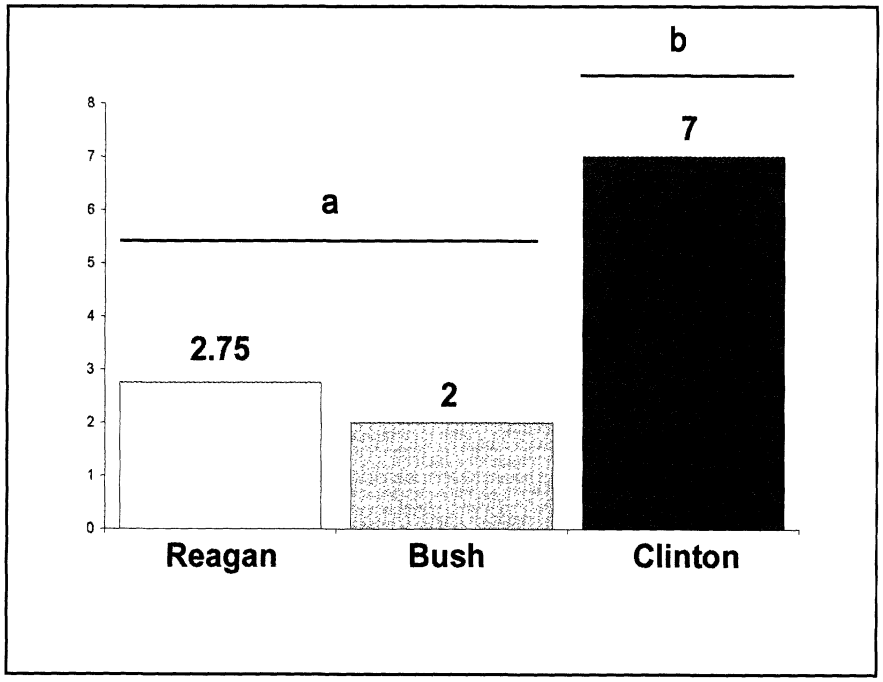

Figure 2. The number of multispecies recovery plans approved per year for the last three U.S. Presidential administrations. Bars with different grouping letters are significantly different from each other.

Report from the Field

Assessing the Conservation Value of Shade-Grown Coffee: a Biological Perspective using Neotropical Birds

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Abstract

Shade-grown coffee has been marketed as a less intensive management practice that may help improve biodiversity conservation (Perfecto et al. 1996). Studies have shown higher species richness in shade-grown coffee than sun, however, effects on bird species of conservation concern are not clear. This study uses two international conservation lists produced by the World Conservation Union (IUCN) and the Convention on International Trade in Endangered Species (CITES) to evaluate potential benefits for Neotropical birds. Sixty-six species of birds observed in coffee grown with a shade component were found on either the IUCN or CITES lists. An alternative approach may be to use range-restricted endemic birds as indicators of conservation success (ICBP 1992). Countries with high numbers of these endemics are among the highest-ranked producers of coffee. Biodiversity-friendly agriculture is only in its infancy, with coffee as an important test case. Improved assessment and monitoring of species at risk, Neotropical birds in this case, can provide an important guide for future research while improving consumer confidence in this complicated effort.

A number of studies have shown that coffee farms using less intensive management practices (shade-grown) contain a higher diversity of resident and migratory birds (Wunderle & Latta 1996, Greenburg, et al. 1997b). The initial promise of these studies has spurred a movement to market certified "shade-grown" coffees. These coffees currently focus on producing high quality taste to compete with other gourmet coffees, but are sold at higher prices (by including a price premium) to provide incentives for farmers to use less intensive growing practices. While these marketing efforts have emphasized the general benefits to tropical biodiversity and migratory birds, the direct benefits of shade-grown coffee for species identified as meriting conservation attention has received little attention. Higher numbers of species does not necessarily translate into better conservation since common species often move into human-managed landscapes artificially inflating species richness. Consequently, a better measure is needed to assess the conservation value of alternative land-use management practices like shade-grown coffee. This paper uses two well-known international lists that identify species which merit conservation attention produced by the World Conservation Union (IUCN) and the Convention on International Trade in Endangered Species (CITES) to assess how many birds species of conservation concern might benefit from shade-grown coffee in the Neotropics.

This study compared IUCN and CITES bird lists with those found in eight research publications on birds found in coffee plantations that contained some level of shade canopy as defined by the authors, excluding those found in areas defined as sun coffee. Sixty-six species of Neotropical birds listed by IUCN or CITES have been observed in shade coffee plantations (Table 1) suggesting there may be some conservation value that may enhance traditional conservation programs (i.e., park conservation). While CITES gives us a good snapshot of species that could benefit from changes in habitat management, the list is somewhat selective since species are placed on the list to impede the international wildlife trade. Several groups including birds of prey, parrots, and hummingbirds receive blanket coverage to improve enforcement efforts. However, even with these groups removed from Table 1, ten species remain based on other criteria including the Golden-cheeked Warbler (*Dendroica chrysoparia*; U.S. Endangered Species and long distance migrant), rare endemics like the Azure-rumped Tanager (*Tangara cabanisi*) and national symbols like the Resplendent Quetzal (*Pharomachrus mocinno*).

This review focused on the Neotropics where the majority of the work on birds and coffee has been conducted and does not include endangered species lists from individual countries. Another approach evaluating conservation poten-

Table 1. Neotropical bird species of international concern observed in shade coffee plantations as listed by the World Conservation Union (IUCN, where END= endangered and NT=threatened) (Collar, et al. 1992, Collar, et al. 1994) and the Convention on International Trade in Endangered Species (CITES appendix listing, see Figure 1), grouped by order and family. Data compiled by author.

Common Name	*Scientific Name*	IUCN	CITES	REFS
FALCONIFORMES				
Barred Forest-Falcon	*Micrastur ruficollis*		II	j
Sharp-shinned Hawk	*Accipeter striatus*		II	d, f
White Hawk	*Leucopternis albicollis*		II	f
Black Hawk-Eagle	*Spizaetus tyrannus*		II	f
Gray Hawk	*Buteo nitidus*		II	f
Roadside Hawk	*Buteo magnirostris*		II	b, d, f, i
Red-throated Caracara	*Daptrius americanus*		II	b, d, f, i
GALLIFORMES (Cracidae)				
Great Currasow	*Crax rubra*		III	f
Highland Guan	*Penelopina nigra*	NT	III	f
Plain Chachalaca	*Ortalis vetula*		III	a, f
PSITTACIFORMES				
Blue-and-yellow Macaw	*Ara ararauna*		II	b
Red-bellied Macaw	*Ara manilata*		II	b
Chestnut-fronted Macaw	*Ara severa*		II	b
White-fronted Parrot	*Amazona albifrons*		II	a
Red-lored Parrot	*Amazona autumnalis*		II	d
Yellow-crowned Parrot	*Amazona ochrocephala*		II	b
Hispaniolan Parrot	*Amazona ventralis*	NT	II	j
White-crowned Parrot	*Pionis senilis*		II	d
Black-headed Parrot	*Pionites melanocephala*		II	b
Blue-headed Parrot	*Pionus menstuus*		II	b
Olive-throated Parakeet	*Aratinga astec*		II	e
Orange-fronted Parakeet	*Aratinga canicularis*		II	f
Green Parakeet	*Aratinga holochlora*		II	a
Cobalt-winged Parakeet	*Brotogeris cyanoptera*		II	b
STRIGIFORMES				
Mottled Owl	*Strix virgata*		II	f
Tropical Screech-Owl	*Otus choliba*		II	b
Ferruginous Pygmy-Owl	*Glaucidium brasilianum*		II	b, f
PICIFORMES				
(Rhamphastidae)				
Red-billed Toucan	*Rhamphastos tucanus*		II	b
TROGONIFORMES				
Resplendent Quetzal	*Pharomachrus mocinno*	NT	I	h
CORACIIFORMES (Todidae)				
Narrow-billed Tody	*Todus angustirostris*	NT		j

Common Name	*Scientific Name*	IUCN	CITES	REFS
APODIFORMES (Trochilidae)				
Little Hermit	*Phaethornis longuemareus*		II	d, e
Great-billed Hermit	*Phaethornis malaris*		II	b
Reddish Hermit	*Phaethornis ruber*		II	b
Long-tailed Hermit	*Phaethornis superciliosus*		II	d, e
Emerald-chinned Hummingbird	*Abeilia abeillei*		II	c
Jamaican Mango	*Anthracothorax mango*		II	g
Berylline Hummingbird	*Amazilia beryllina*		II	f
White-bellied Emerald	*Amazilia candida*		II	f
Azure-crowned Hummingbird	*Amazilia cyanocephala*		II	d, e
Blue-tailed Hummingbird	*Amazilia cyanura*		II	c
Snowy-bellied Hummingbird	*Amazilia edward*		II	i
Cinnamon Hummingbird	*Amazilia rutila*		II	a, f
Rufous-tailed Hummingbird	*Amazilia tzacatl*		II	d, e, i
Green-fronted Hummingbird	*Amazilia viridifrons*		II	f
Antillean Mango	*Anthracothorax viridis*		II	j
Ruby-throated Hummingbird	*Archilochus colubris*		II	d, e, f
Wine-throated Hummingbird	*Atthis ellioti*		II	f
Violet Sabrewing	*Campylopterus hemileucurus*		II	d, f, i
Gray-breasted Sabrewing	*Campylopterus largipennis*		II	b
Rufous Sabrewing	*Campylopterus rufus*		II	f
Fork-tailed Emerald	*Chlorostilbon canivetii*		II	d
Hispaniolan Emerald	*Chlorostilbon swainsonii*		II	j
Magnificent Hummingbird	*Eugens fulgens*		II	d, f
Plain-capped Starthroat	*Heliomaster constantii*		II	f
Long-billed Starthroat	*Heliomaster longirostris*		II	d, f
Blue-throated Goldentail	*Hylocharis eliciae*		II	f
White-eared Hummingbird	*Hylocharis leucotis*		II	d
Amethyst-throated Hummingbird	*Lampornis amethystinus*		II	d
Blue-throated Hummingbird	*Lampornis clemenciae*		II	f
Green-throated Mountain-gem	*Lampornis viridipallens*		II	d, f
Vervain Hummingbird	*Mellisuga minima*		II	g, j
Sparkling-tailed Hummingbird	*Tilmatura dupontii*		II	f
Streamertail	*Trochilus polytmus*		II	g
PASSERIFORMES				
Parulidae				
Golden-cheeked Warbler	*Dendroica chrysoparia*	END		f
Thraupidae				
Azure-rumped Tanager	*Tangara cabanisi*	END		c
Fringillidae				
Black-capped Siskin	*Carduelis atricops*	NT		f

References

a Calvo and Blake 1998 **b** Canaday 1997 **c** Dietsch, pers. obs **d** Greenberg et al. 1997a **e** Greenberg et al. 1997b **f** Fuerrero 1999 **g** Johnson 2000 **h** Puebla et al. 1999 **i** Roberts et al. 2000 **j** Wunderle and Latta 1996

tial may be to use endemic range-restricted (less than 50,000 km^2) species as a subset of birds more likely to face conservation problems (ICBP 1992). There seems to be a strong correlation between countries with high coffee production and high numbers of range-restricted endemic birds (Table 2). In the highlands of southern Mexico, 26 of these rare bird species are found and depending on habitat requirements could benefit from the expanded use of sustainable "biodiversity-friendly" coffee growing practices (ICBP 1992). Ten of these endemic species appear on species lists from coffee plantations in southern Mexico and Guatemala (Greenberg et al. 1997a & b, Peters pers. comm., Dietsch pers. obs.). In Jamaica, Johnson (2000) found 17 of 35 endemics in shade coffee plantations.

These results suggest that conservation benefits for endemic and resident birds in the Neotropics merit more attention, especially since these birds are further constrained by breeding requirements. Of the 66 species listed here, only three are long distance migrants, a major focus of the current birds and coffee literature and marketing material. However, much more work is needed, the birds reported in Table 1 are from just a handful of studies in a fraction of the countries currently producing coffee. A number of studies are currently underway that should provide a more complete assessment for the Neotropics including Mexico, El Salvador, Nicaragua, Columbia, and Peru but more work is needed in other major coffee producing areas (i.e., Brazil and Costa Rica). While some work has been done in India, other parts of the world are conspicuously absent from the coffee-and-bird literature, most notably Africa and Southeast Asia, both major coffee producing regions (FAO 1999). Evaluating particular groups that may be at risk from management practices should improve assessments of conservation value as research continues.

Numerous challenges still remain before this approach to a conservation

CITES Appendix definitions

1. Appendix I shall include all species threatened with extinction which are or may be affected by trade. Trade in specimens of these species must be subject to particularly strict regulation in order not to endanger further their survival and must only be authorized in exceptional circumstances.

2. Appendix II shall include:
a) all species which although not necessarily now threatened with extinction may become so unless trade in specimens of such species is subject to strict regulation in order to avoid utilization incompatible with their survival; and
b) other species which must be subject to regulation in order that trade in specimens of certain species referred to in subparagraph (a) of this paragraph may be brought under effective control.

3. Appendix III shall include all species which any Party identifies as being subject to regulation within its jurisdiction for the purposes of preventing or restricting exploitation, and as needing the cooperation of other parties in the control of trade.

Figure 1. CITES Appendix definitions.

problem can be judged a success. Just as higher diversity does not necessarily mean better conservation, neither does the presence of an endangered species. Many of the species listed in Table 1 may have been adversely affected by the removal of original forest and native overstory trees at mid-altitudes (300 to 1,500 meters) as coffee has expanded and intensified in the Neotropics. Consequently, incentives to farmers through certification programs may help reverse this trend by encouraging the retention of native trees in the overstory, but only if gains are not offset by encouraging additional clearing of remaining forests for coffee production. Proposed certification criteria also have yet to be tested for their effectiveness in separating management practices that provide suitable habitat for birds and other taxa. While using these lists highlights the potential connections between the conservation of endangered or threatened Neotropical birds and shade-grown coffee, ultimately, the success of this effort will depend on how readily consumers respond to the idea of paying higher prices and thus contributing directly to the costs of conservation.

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Table 2. Countries with high numbers of range-restricted (R-R) birds also rank highly in coffee production (ICP 1992, FAO 1999). Endemic birds are those found only in the country listed. R-R birds are those whose geographic range is less than 50,000 km² (ICBP 1992).

Country	# of R-R Birds Occurring	# of R-R Endemic Birds	Hectares (in 1000's) of Coffee Production	Total Coffee Production (MT)	
				1998	Rank (of 59)
Indonesia	411	339	844	455	3
Peru	216	106	189	120	14(t)
Brazil	201	122	2,095	1,690	1
Columbia	189	81	1,080	732	2
Papua New Guinea	172	82	87	66	22
Ecuador	159	32	370	120	14(t)
Venezuela	120	40	150	51	28
Philippines	111	106	137	121	13
Mexico	102	59	625	288	6
Costa Rica	78	6	93	136	12
India	76	47	246	228	7

Can Shade-Grown Coffee Help Conserve Tropical Biodiversity? A Market Perspective

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Abstract
This paper studies the market for shade-grown coffee as an approach to tropical biodiversity conservation. Shade-grown coffee farms provide important habitat for a wide array of biodiversity. In particular, recent studies show that these farms serve as habitat for sixty-six species of neotropical birds that are listed as threatened or endangered by the IUCN and CITES. Initial sections of this paper provide a brief history of shade-grown coffee, describe the ecological aspects of the production process, and examine the current market for shade-grown coffee. Results are then reported from an original study of consumer behavior in the market for shade-grown coffee. The study suggests that consumers are not willing to sacrifice coffee taste for environmental concern. Income, choice of retail venue, and degree of environmental concern are influential factors when deciding to purchase shade-grown instead of conventional gourmet coffee. Finally, even in cafés where shade-grown coffee was actively marketed, the majority of consumers not purchasing the coffee were unaware of the shade-grown option.

Introduction
Tropical deforestation is a well-known cause of biodiversity loss. Traditional conservation efforts focus on the establishment of national parks and protected areas. These efforts, however, often fail to protect tropical biodiversity outside the boundaries of these areas. For example, laws that protect biodiversity and foster habitat protection typically do not govern agricultural ecosystems, yet landscapes with different agricultural practices can support substantially different levels of species diversity. The absence of government regulations in such areas has lead to the adoption of private mechanisms for protection of biodiversity. One form of a private mechanism is a market for goods and services that promotes habitat conservation and tropical biodiversity. The expanding market for shade-grown coffee provides an example.

Since the 1930s, biologists have noted similarities in the density and diversity of bird species in traditional (or shaded) coffee farms and in undisturbed rainforests. These similarities extend beyond bird species and include a wide variety of tropical biodiversity from trees and epiphytes to small mammals, reptiles, amphibians, and arthropods (Moguel and Toledo 1999). While shade-grown coffee farms support a surprisingly high level of biodiversity, more modern production practices do not. Modern production is based on direct-sun cultivation, which removes the biodiversity-rich tree canopies and increases the use of agricultural chemicals. These techniques increase coffee production, but result in a substantial decrease in habitat for biodiversity.

Efforts are underway to identify and certify coffee cultivated in shade-grown production systems. In addition to preserving tropical biodiversity, these efforts seek to provide a financial incentive to farmers who continue growing shade-grown coffee. This incentive is a price premium that consumers appear increasingly willing to pay for shade-grown coffee.

This paper explores consumer behavior and attitudes related to shade-grown coffee and the potential for shade-grown coffee to help conserve tropical biodiversity. The next sections provide a brief history of shade-grown coffee, describe biological aspects of the production process, and examine the current market for shade-grown coffee. Data collection and results of an original study of consumer behavior are then

reported. Finally, these results are discussed in concluding sections.

History of shade-grown coffee

Early production of coffee necessitated removal of only the forest understory, not the entire forest canopy. Coffee in Latin America historically thrived under the shade of forest-like tree canopies that protected coffee bushes from direct sunlight. For more than 200 years, nearly all coffee produced in Latin America grew under shade conditions.

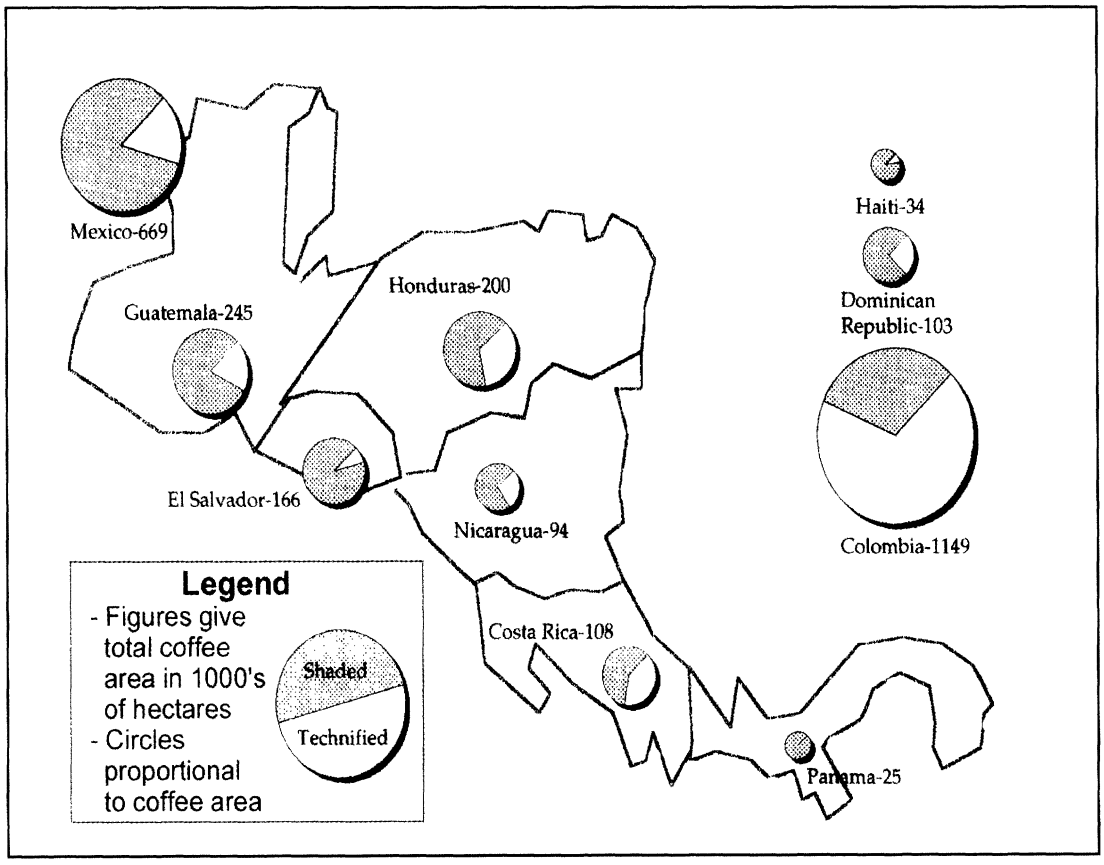

Figure 1. Technification of coffee in Central America. From Rice and Ward (1996).

In the 1970s, many Latin American governments sponsored coffee "technification" programs to boost coffee production, protect against crop loss from disease, and facilitate general economic development. Technification eliminates or reduces the tree canopy and decreases the species diversity previously supported by shade trees. Often accompanying this conversion increased reliance on chemical inputs, such as fertilizer, insecticides, herbicides, and fungicides (Rice and Ward 1996).

Through technification, shade-grown coffee plants are also replaced with smaller coffee hybrids that can tolerate direct sunlight. These new hybrids increase the density of coffee bushes from 1,000 to 2,000 plants per hectare to 3,000 to 7,000 plants per hectare. The hybrid varieties can yield up to 30% more coffee per bush when supplied with sufficient fertilizer (Rice and Ward 1996).

During the 1970s and 1980s, the U.S. Agency for International Development spent more than $80 million in Latin America promoting coffee technification (Rice and Ward 1996). Currently, 30 to 40% of all coffee from Latin America is "technified". Figure 1 shows the proportion of shaded and technified regions in Central American countries.

Ecological aspects of shade-grown coffee

As early as 1932, Ludlow Griscom of the American Museum of Natural History noted similarities in the density and diversity of bird populations found in traditional coffee farms and undisturbed rainforests (Bray 1999). More recent studies of neotropical birds show similar results. For example, the Smithsonian Migratory Bird Center documented 150 bird species in shade-grown coffee farms (Van der Voort and Greenberg 1997). Other studies demonstrate a strong link between shade-grown coffee farms and endangered neotropical birds. In Latin America alone, sixty-six threatened or endangered species of neotropical birds (as listed by the World Conservation Union (IUCN) and the Convention on International Trade in Endangered Species (CITES)) have been observed in shade-grown coffee farms (Dietsch 2000).

Shade-grown coffee farms also provide habitat for other forms of tropical biodiversity. For example, in Chiapas, Mexico shade-grown coffee farms support as much as 74% of the bat biodiversity of neighboring

rainforests (Estrada and Coates-Estrada 1993). In Costa Rica's Central Valley, a single tree in a shade-grown coffee plantation can support 30 species of ants and 126 species of beetles, a species richness and diversity rivaled only by trees in undisturbed forests. In the same study, a nearby tree contained a similar number of ant and beetle species (27 and 100, respectively), yet only 18% of the ant species and 14% of the beetle species found on this nearby tree were also found in the first tree (Perfecto et. al 1996). Other taxonomic groups, including small mammals, bats, and primates in Mexico find parallel trends (Tangley 1996). A review by Moguel and Toledo (1999) supports these broad trends by demonstrating high levels of tree, epiphyte, mammal, bird, reptile, amphibian, and arthropod diversity on traditional shade-grown coffee farms in Mexico.

In contrast, the removal of the tree canopy for sun-tolerant coffee and the increase in chemical inputs reduces the flora and fauna that previously occupied this agricultural ecosystem. In Costa Rica, ant biodiversity has exhibited a sharp decrease as agricultural practices intensify (Perfecto and Snelling 1995; Perfecto and Vandermeer 1994). In Colombia and Mexico, 94 to 97% fewer bird species are found in technified coffee farms than in shade-grown coffee farms (Van der Voort and Greenberg 1997). Studies in Panama, Mexico, Colombia, and the Caribbean show a 60 to 80% difference in bird species found in the two production systems (Petit 1998).

From a landscape perspective, shade-grown coffee farms often comprise the majority of remaining forest-like cover in highly deforested regions. For example, only 2% of El Salvador's original rainforest remains, while shade-grown coffee farms represent 60% of the country's remaining forest lands (Rice and Ward 1996). Thus, shade-grown coffee farms serve as important habitat between undisturbed islands of biodiversity.

The market for shade-grown coffee

While efforts to market shade-grown coffee are underway, little is known about existing and potential consumer demand. In general, demand for instant and ground coffee has declined for several years, while total coffee sales have remained stable. This trend is due primarily to growth in specialty coffee sales (Rice and McLean 1999) (see Table 1 for a description of the various coffee classifications). The specialty coffee market has grown dramatically in the past decade from $1 billion per year in 1990 to $3.3 billion per year in 1998 (Rice and Ward 1996, SCAA 1999). In the coming decade, specialty coffee sales are expected to continue increasing by an estimated 20 to 25% per year (Rice and McLean 1999).

Initial marketing efforts for shade-grown coffee have targeted consumers in specialty coffee markets. Exact sales of shade-grown coffee are not currently tracked by any organization. Estimates of current annual sales are between $15 to 30 million, with future sales projected around $100 million (Rice and McLean 1999, CEC 1999).

Efforts have been made to estimate the potential market for shade-grown coffee. A 1999 phone survey conducted by the NAFTA Commission for Environmental Cooperation (CEC) estimated that roughly one-in-five consumers in North America are "very interested" in purchasing shade-grown coffee from Mexico. In addition, this study found that 42% of consumers in Canada, 36% in Mexico, and 22% in the United States are willing to pay one dollar more per pound for Mexican shade-grown coffee. A 1996 study by the Smithsonian Migratory Bird Center found that 41% of respondents indicate a willingness to pay an extra dollar or two per pound to purchase "sustainable" coffee, while 23% indicate a willingness to pay "whatever it costs" to buy sustainable coffee. Only 8% of the respondents indicate that they would not be willing to pay more for a sustainable coffee (Rice and McLean 1999).

Table 1. Characteristics of different types of coffee (Rice and McLean 1999).

Characteristics of Coffee Types

Type of Coffee	Taste	Packaging	Price
Commercial ground and instant coffees	Inferior taste	Tin can and glass jar	Low
Premium coffees (mass-marketed)	Somewhat better taste	Packaged in cans (more upscale image)	Somewhat higher price
Specialty coffees (also called gourmet, made from highest quality beans)	Superior taste	Vacuum-packed bags or whole bean bins	Considerably higher price

Data collection

This research analyzes survey data collected in two cafés in the Washington, D.C. area in the spring of

1999. These cafés, Savory Café and Atomic Café, were involved in efforts to test the market for shade-grown coffee in the Washington, D.C. area. The cafés in this study vary with regard to location and clientele. Sustainable Harvest Coffee Company coordinated the market test.

The two cafés sold cups of shade-grown coffee and similar-tasting, gourmet coffee. Both caffeinated coffees came from Latin America and shared the same roaster. Consequently, this study examines consumers' choice between a higher-cost, shade-grown coffee and a lower-cost, gourmet substitute. The price premium and overall price for both coffees remained constant throughout the study period, but differed at each café (Table 2). Data collection began several months after a publicity campaign about shade-grown coffee.

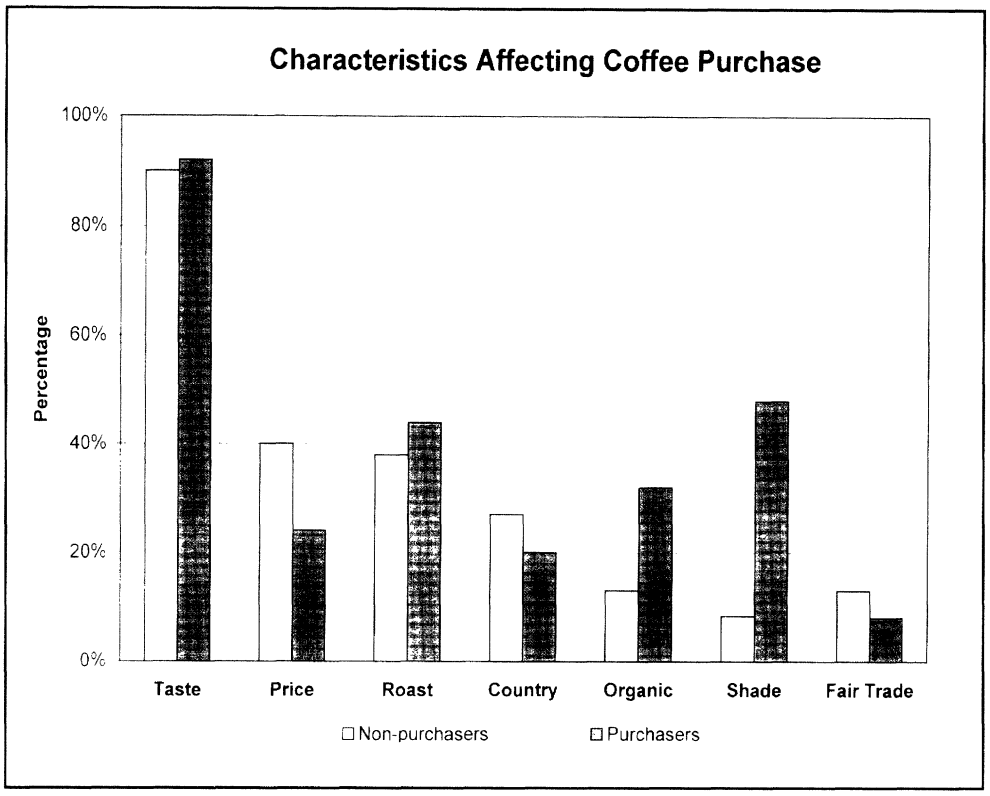

Figure 2. Characteristics affecting coffee purchase amongst sample; results report percentage of "Yes" responses.

After direct observation of a coffee purchase, an in-store, written survey was administered to both purchasers and non-purchasers of shade-grown coffee. The survey instrument asked questions about respondents' coffee consumption habits, general demographic background, and their opinions about social and environmental matters. The surveys for both purchasers and non-purchasers were identical, except that the survey for purchasers asked about their motivations for purchasing shade-grown coffee, while the survey for non-purchasers posed a hypothetical (contingent purchase) question about respondents' willingness to purchase shade-grown coffee at different price premium levels. Each survey required approximately ten minutes to complete. Data collection was done periodically over a three-month period. A total of 226 surveys were collected. The combined response rate was 67.3%.

Table 2. Coffee prices and premiums of retail vendors surveyed.

Coffee Prices and Premiums

	Savory Café		Atomic Café	
Size of Cup	*Shade Coffee*	*Sun Coffee*	*Shade Coffee*	*Sun Coffee*
Small (8 oz.)	$1.45	$1.15	$1.25	$1.05
Medium (12 oz.)	$1.95	$1.40	$1.50	$1.26
Large (16 oz.)	$2.35	$1.65	$1.70	$1.45

Results

Purchasers and non-purchasers of shade-grown coffee share many of the same preferences with regards to the characteristics that affect their coffee purchase (Figure 2). For both groups, the most important characteristic is taste. The only statistically different characteristics between the two groups are the importance of organic and shade-grown certifications. In other words, people who purchase shade-grown coffee are more likely to identify these certification programs as being important than people who do not purchase shade-grown coffee.

Purchasers of shade-grown coffee also tend to have higher aver-

age incomes, higher general environmental beliefs (as measured by the New Ecological Paradigm scale, see Dunlap et al. 1992 for further discussion), and are more likely to belong to an environmental organization (Table 3). Purchasers and non-purchasers are statistically similar in a number of different demographic categories including age, size of household, gender, marital status, and education. In addition, both purchasers and non-purchasers are statistically similar with regard to the amount of bird watching they enjoy and whether they had ever visited a tropical forest. On average, both groups "occasionally" enjoy bird watching, while 58% of purchasers and 52% of non-purchasers previously visited a tropical forest.

This study also assessed actual and hypothetical purchases of shade-grown coffee. A subset of non-purchasers was asked whether they would have purchased shade-grown coffee at a lower price premium. The survey randomly assigned lower values for the premium. As expected, responses to this hypothetical question show a decreasing willingness to purchase shade-grown coffee as price rises (Table 4). For example, at Savory Café, almost 50% of the respondents replied no to a $0.50 price premium, while 10% of the respondents replied "no" to a $0.20 price premium.

The results suggest that the market for shade-grown coffee can be broken into three segments:

Group A: Coffee consumers who currently *purchase* shade-grown coffee (current market).

Group B: Coffee consumers who currently *do not purchase* shade-grown coffee and indicate that they are *unlikely* to do so in the future even at lower prices.

Group C: Coffee consumers who currently *do not purchase* shade-grown coffee, but indicate that they *would* purchase the coffee at or below current store prices (area of potential market growth).

The number of people who currently purchase shade-grown coffee (Group A) is small relative to the total population of specialty coffee purchases. During the study period, purchases of shade-grown coffee comprised only 5.2% of the entire caffeinated coffee purchases. Excluding the consumers who were not aware that shade-grown was being sold that day (69.2% of all the non-purchasers), shade-grown purchases comprised 15.1% of the total.

The study examined the motives of purchasers. For consumers in Group A, the perception that shade-grown coffee "maintains the health of tropical ecosystems" was the primary reason why purchasers indicated that they purchased shade-grown coffee. In fact, more than 80% of this group listed this reason as the most important reason for their decision. Other reasons for purchasing shade-grown coffee included preference for the taste of shade-grown coffee, a sense of "moral satisfaction"only gained by purchasing the coffee, and the perceived benefits to birdwatchers. Each of these three reasons is significantly less important than maintaining the health of tropical ecosystems and each is statistically indistinguishable in preference from one another.

This study also examined the motivations of non-purchasers. The study queried non-purchasers who indicated that they would not purchase shade-grown coffee in the hypothetical question (Group B). These individuals were asked to select all of the reasons why they would not purchase shade-

Table 3. Statistical comparison of similarities and differences of coffee patrons.

Statistical Differences & Similarities

	Purchasers	Non-Purchasers	t-stat	Sig.
Differences				
Organic certification an important characteristic	32%	13%	-2.031	0.045
Shade-grown certification an important characteristic	45%	8.30%	-4.614	0.000
Average 1998 income	$85,000	$67,091	-1.64	0.104
Membership in service organization	56%	37%	-1.65	0.103
Membership in environmental organization	48%	20%	-2.69	0.009
Environmental concern (sum of NEP scores - out of 25)	21.04	19.42	-2.02	0.047
Similarities				
Average age (years)	38.3	38.6	0.13	0.897
Average size of household	2.17	2.13	-0.12	0.906
Gender (male)	52%	66%	1.17	0.245
Married	52%	47%	-0.41	0.684
At least BA/BS degree	92%	86%	-0.03	0.976
Beyond BA/BS degree	56%	45%	-0.71	0.482
Frequency of bird watching (occasionally or frequently)	56%	38%	-1.56	0.123
Visited a tropic forest	58%	52%	-0.48	0.63

Table 4. Percent of participants willing to pay hypothetical price premium.

Stated Willingness-to-Pay Price Premiums

Savory Café			Atomic Café		
Price Premium	Yes (%)	No (%)	Price Premium	Yes (%)	No (%)
$0.50	53.8	46.2	$0.20	50	50
0.40	66.7	33.3	0.15	66.7	33.3
0.30	64.3	35.7	0.10	73.3	26.7
0.20	90.9	9.1	0.05	70	30
0.10	100	0			

grown coffee. Of these respondents, 37.9% indicated that they needed additional information, 31.0% stated that they could not afford shade-grown coffee, 24.1% did not place importance on how coffee is grown, 13.8% preferred the other coffees at the café, and 10.3% did not like the taste of shade-grown coffee.

Non-purchasers who indicated a willingness to purchase shade-grown in the future (Group C), represent the potential market growth for shade-grown coffee. Despite the publicity efforts, 60.6% of the non-purchasers indicated that they were not aware of the concept of shade-grown coffee. In fact, despite advertising within the store (including price-board listings, sales-counter information, and table brochures), 69.2% of the non-purchasers indicated that they were unaware that shade-grown coffee was being sold that day. However, when asked whether they would have purchased shade-grown coffee if they had been aware that it was being sold that day, 67.2% indicated that they would have purchased it *with the full price premium*.

When combined with Group A, this result suggests that roughly half of the sample population would purchase shade-grown coffee with the current price premiums. This result implies that the market for shade-grown coffee has significant growth potential at current prices. At lower prices, the growth potential may even be greater. This, however, will depend on the elasticity of demand for shade-grown coffee.

Reasons for caution

While the above results appear promising for the potential market for shade-grown coffee, several areas of caution exist. For example, the statement that roughly half of the sample would purchase shade-grown coffee with a full price-premium makes three important assumptions. First, consumers must be aware of shade-grown coffee. Second, consumers must go to retail venues where shade-grown coffee is being sold. Third, consumers must remember to purchase it. To satisfy these three assumptions would likely require a large-scale marketing effort. To date, the organizations involved in marketing shade-grown coffee have not had the necessary resources to launch such an effort.

Additionally, the results suggest that the difference between stated preferences and actual behavior is significant. Whether half of the non-purchasers would actually purchase shade-grown coffee seems unlikely. As stated previously, 67.2% of non-purchasers indicated that they would have purchased shade-grown coffee with its full price premium had they been aware it was being sold that day. Yet, shade-grown coffee comprised only 5.72% of the coffee purchases observed. Given the number of repeat customers at these cafés, a substantial increase in purchases should have been observed, because, as the study progressed, an increasing number of customers became informed about the environmental benefits of shade-grown coffee. Therefore, a change of behavior should have been observed as these initial non-purchasers transformed their stated behavioral intentions to actual purchases of shade-grown coffee. During the tenure of the study, however, only a slight increase in the number of shade-grown purchases was observed, certainly nothing close to shade-grown coffee comprising one-half of all caffeinated coffee purchases.

Implications

This research has several potential implications for the future production and marketing of shade-grown coffee. First, the research clearly indicates that the concept of shade-grown coffee needs additional publicity, and retail venues that currently sell shade-grown coffee need to better inform their customers about the shade-grown option.

Second, these results support the idea that shade-grown coffee must have a high quality taste and that taste cannot be sacrificed for environmental concerns. As discussed earlier, both purchasers and non-purchasers of shade-grown coffee indicated that taste was the most important characteristic of their coffee purchases.

Third, income level, choice of retail venue, and degree of environmental concern appear to be influential factors when deciding to pur-

chase shade-grown coffee. Retail venues that serve a clientele with higher than average income levels and express a high level of environmental concern are likely to sell more shade-grown coffee.

Fourth, further investigation needs to be done on the large gap between stated preferences and actual behavior as it relates to the purchase of shade-grown coffee. This study supports industry experience that the rise of people's stated interest in shade-grown coffee has not been matched with a rise in actual sales (Griswold 1999). Caution needs to be given to stated preference results and efforts need to be undertaken to develop sales scenarios that narrow the gap between stated preferences and actual purchasing behavior. For example, in both cafés, when a customer requested a cup of coffee, the staff did not ask "Regular or shade-grown?" Instead, they automatically gave the customer a cup of the regular gourmet coffee. Thus, customers only received shade-grown cofee when they specifically requested it. Perhaps by asking the question "Regular or shade-grown?" cafés could make customers more aware of the option and increase the number of actual purchases.

While most research about shade-grown coffee has focused on its biological aspects, additional research needs to be done on the economic aspects of production and consumer demand. Currently, little is known about the level of price premium that would make shade-grown coffee sustainable on the producer side. Similarly, special attention needs to be given to how the free-rider problem affects consumer behavior related to shade-grown coffee. Economic theory suggests that individuals will not fully express their true demand for public goods, such as the environmental benefits from shade-grown coffee. Instead, consumers will avoid paying the price premium and rely upon others to provide the desired ecological benefits ("free ride"). Consequently, public goods tend to be funded below the socially desirable level.

Conclusion

It seems premature to determine whether a private market will encourage wide-scale production of certified shade-grown coffee and, thus, enable substantial conservation of biodiversity. Certainly, current levels of consumption are insufficient to achieve conservation on a broad scale. However, as marketing efforts and consumer demand continue to increase, markets for shade-grown coffee may contribute substantially to tropical biodiversity conservation.

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Book Review

Animal Underworld: Inside America's Black Market for Rare and Exotic Species.
By Alan Green. 1999, Public Affairs (Perseus Book Group), New York, NY. xxix + 286 pp. illustrated.

With support from the Center for Public Integrity and funding from the Geraldine Dodge Foundation, journalist Alan Green takes his readers on a fascinating sojourn through the market for exotic animals in the United States. He unravels egregious excesses of the pet, trophy, and medicinal markets and explores the general commercialization of wildlife. He also implicates the venerable likes of the Discover Channel, many AZA-member zoos, and research labs including some regional primate centers. Green exposes various lapses and gaps in the Endangered Species Act, the Animal Welfare Act, and state and federal health statutes, and discusses, by name, a number of unsavory breeders, auctions, and middlemen in the trails of carnage throughout. In short, no one is spared, but a plethora of timely and important issues are discussed in a well-articulated prose.

Green first informs his readers of his growing personal interest in the issue , which was peaked while he was volunteer at National Zoo's Ape House. AZA-member zoos advertise new arrivals, but this year's popular babies become future cast-offs. These well-known and well-visited institutions are themselves starting-off points supplying some markets. There is a fair amount of overlap in the twelve chapters that form the bulk of the text, but each chapter is well-documented and focused primarily on one major issue.

Particularly interesting was Chapter 4 (Paper Trails), in which Green indicates the difficulty in learning the fates of many animals due to various roadblocks he encountered in several state governments. It turns out that the Freedom of Information Act was not enough in some states (e.g. Alabama and Tennessee) to persuade employees to release animal records. Others (e.g. Michigan, Indiana, Missouri) were more forthcoming. What this of course means is that we may never know the full range of markets throughout the country, and that governments and institutions that were forthcoming (and therefore received a fair amount of criticism) may in fact be less responsible for the major excesses.

Chapter 9 (Time Bombs) is also particularly informative. In it, Green discusses many of the health issues associated with the growing pet markets. Macaques, until the mid-1990s, were mostly held and bred by zoos and biomedical research enterprises in the United States, but are now a mainstay of the pet trade. All species also carry the deadly (to humans) herpes b virus, and an estimated 80 to 90% of adult animals test positive. Other health threats, such as the fact that prairie dogs now sold in some pet shops are major carriers of bubonic plague, are also brought to light.

Woven throughout are other stories of our modern fascination with wildlife. Canned-hunt facilities (generally denounced by the NRA and Safari Club International) regularly acquire surplus from zoos and some allow patrons to shoot caged or penned animals. Some breeders of large cats and bears regularly supply the exotic meat and medicinal markets. Wisconsin state officials have issued warnings of the potential for the spread of brucellosis and tuberculosis to domestic livestock by large exotic ungulates brought in regularly, and Michigan's deer herds (where canned hunts are common) already carry the latter. Green discusses several individuals who kept large numbers of exotics in squalid conditions: sufferers of 'collector's syndrome.' Some heroes are also discussed, including a wealthy Kentucky couple who have set up a well-run sanctuary for unwanted monkeys and apes. Some people advocate more and tougher laws, while in some states, the animals traders and canned-hunt operators are politically well-connected and able to thwart these attempts (e.g. Texas).

The stories go on and on, but Green comes to some potential answers in the end, especially for AZA-member zoos to ponder. Honest, open policies that could be considered, such as mandating sterilization for all surplus, using surplus ungulates as feed for large carnivores, euthanasia, and overtly using surplus animals for canned hunts or medicinal markets, are discussed. Many of these are now done by middle men so that the large zoos can absolve themselves of the thorny issues. Green suggests that AZA-members may in fact be the biggest obstacles to change, as any criticism is generally considered (and publicized) to be emanating from the animal rights fringe. If the public knew of the large numbers of surplus and potential markets for them, perhaps a more complete dialogue could be achieved.

This book should be read by all zoo professions and animal breeders and wholesalers. I am sure many will find fault where I could not. In my mind, much more appalling than canned hunts or euthanasia, for example, is the gross proliferation of exotic animals as household pets (few of which come from zoos). My own city (Miami) is indicted repeatedly by Green for being a major source, legally and illegally, through both breeding and importation. Many exotics are dumped regularly in and around Miami (as elsewhere) by irresponsible pet owners who want the latest designer animals for, apparently, prestige. Thus the carnage continues.

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Marine Matters

Sustainable Salmon: Marine Stewardship Council's Eco-Labeling Program

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Abstract

The world is at risk of losing many of its commercial fisheries, and these losses could have major impacts on societies' economic, cultural, environmental and biological well being. The Marine Stewardship Council (MSC) has developed a new program which uses market-based incentives to encourage improved fisheries management around the world. The MSC's program is an independent third party certification program that is designed to assess individual fisheries against an internationally developed standard for sustainable fisheries. Fisheries that meet the MSC's Standard are awarded the MSC certificate for sustainable and well-managed fisheries. Any products from that fishery can then use the MSC Label once traceability of the product is determined through a Chain of Custody assessment. The MSC Label will identify seafood products as the best environmental choice in seafood and allow consumers to play a role in the conservation of those resources. Under the Marine Stewardship Council program three fisheries were certified in 2000 as meeting the MSC's sustainable fisheries standard. This paper briefly explains the MSC program and the results of those certifications.

Background

The world's fishery resources are not inexhaustible. The United Nation's Food and Agriculture Organization (FAO 1998) report on the State of World Fisheries and Aquaculture, and Alverson and Dunlop (1998) both provide considerable data and analysis about the status of the world's fisheries. The authors noted:

- Of the 569 marine fish stocks examined in 1994, only 296 are clearly classified in regards to their status (52%). These stocks made up 65% of the reported marine catch in 1994.
- About 30% of the world fish stocks classified to date are categorized as being overexploited, depleted or similar. These classified stocks yield 46% of the landings of marine capture fisheries.
- Data supporting overfishing is pervasive; ineffective management is probably present in both developed and developing countries in many areas of the world.
- The actual status of marine fish resources may be worse due to lack of data-especially for smaller inshore fish populations, and uncertainty about existing data.

While the statistics are ever-changing, what remains constant is the knowledge that our fishery resources are limited, while the demand for fish as a protein source is stronger than ever before. The National Fisheries Institute reports that Americans consume an average of 14.9 pounds of seafood a year—up from 12.5 pounds in 1980. The NFI statistics also indicate that Americans are spending nearly $50 billion on seafood products annually (NFI 2000). At the same time, some of the most popular seafoods are overfished or in serious need of improved management. *Our Living Oceans* (NMFS 1999) reports cod, haddock, and yellowtail flounder found on Georges Bank off New England are currently the United States' most depleted stocks.

Improved fishery management may be able to provide increased fish production. FAO suggested worldwide fishery production could increase by 10 to 20 million metric tons with improved management (FAO 1997).

In addition to concerns about fisheries management, there is growing concern about the impacts of fishing practices on marine ecosystems including: incidental catch (bi-catch)

of non-target fish species; incidental catch of non-target non-fish species such as marine mammals, turtles, and seabirds; and damage to the environment caused by certain fishing methods such as bottom trawls, dredges, poisons, and explosives.

The MSC Standard

The MSC has developed an environmental standard for sustainable fishing, *The Principles & Criteria for Sustainable Fishing* (MSC 2000). The Standard was developed after international consultation with leaders from academia, industry, government, and non-governmental organizations over a 2 year process. The starting point was the FAO's *Code of Conduct for Responsible Fisheries*, and the result was a standard that has three main principles (Figure 1).

The Marine Stewardship Council

The MSC's voluntary fishery certification program was designed to provide a mechanism to bring consumer pressure to bear in moving fisheries towards "best management practices." Being awarded MSC certification entitles products from the fishery to bear the MSC eco-label. It tells consumers they are making an environmentally conscious seafood selection by choosing a product from a well-managed and sustainable source.

Research has shown that consumers have an interest in purchasing eco-labeled seafood if they understand the issue and the label has credibility (Wessels et al. 1999). The MSC label allows consumers to express their interest in marine conservation through their purchasing power, and it has the potential to provide retailers with a marketing edge over their competitors. The label will also be appealing to the seafood industry that will see a continuous supply of products as a result of sustainability-focused fishery management.

The MSC Eco-label program

The MSC program consists of several key components. First, the MSC has developed and maintains an international standard for sustainable fisheries. Second, fisheries can apply to be certified against the MSC Standard. Third, if a fishery is certified as meeting the MSC Standard, the individual companies that sell those fishery products must obtain a chain of custody certificate. Fourth, companies that want to use the MSC Label must enter into a Logo Licensing Agreement with the MSC.

MSC certification

Fisheries around the world can apply to be assessed against the MSC Standard. The certification process is an extensive and thorough review. The process begins with initial discussions between the certifier and client regarding the readiness of the fishery for certification. The client can be any group, organization, or company that has an interest in the fishery for which they are seeking certification. The certifier is a professional certification company that has met the extensive and professional requirements to become accredited by the MSC.

The pre-assessment, or scoping project, gathers background information on all aspects of the fishery, including: fishing methods used, fisheries management, geographical area of the fishery, identification of stakeholders, government and political stability, domestic consumption and export information, and other external factors influencing the fishery. This part of the process is confidential between the client and certifier. A report is then issued on the outcome of the pre-assessment, and a bid is provided for a complete certification. Based on the results from the pre-assessment, the client can chose whether to move forward.

If the client chooses to have a complete assessment done, they contract with the certifier for this work. The certifier must then pull together a team that has professional expertise in the areas of fishery stock assessment, ecosystem analysis, and fisheries management. The certification team works with the certifier to apply and score that particular fishery against the MSC Standard. The team develops performance criteria for each principle which translate the MSC's generic statements of sustainability into specific perfor-

Marine Stewardship Council Labeling Principles

Principle 1
A fishery must be conducted in a manner that does not lead to overfishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery.

Principle 2
Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends.

Principle 3
The fishery is subject to an effective management system that respects local, national and international laws and standards and incorporates institutional and operational frameworks that require use of the resources to be responsible and sustainable.

Figure 1. The MSC labeling program is based on three fundamental principles of sustainability.

mance statements which can be evaluated. Then using a decision support process, Analytical Hierarchical Process (AHP), the team can prioritize, weigh, and score sets of performance indicators within each individual principle. Each principle is evaluated independently and must obtain an evaluation score consistent with meeting compliance in order for the fishery to be certified.

The MSC website details examples of how the certification teams have applied the MSC Standard to the Alaska Salmon Fishery (MSC 2000) and the Western Australia Rock Lobster Fishery (MSC 2000). The certification team collects available data, holds extensive stakeholder discussions, and meets with fishers and fisheries managers in order to understand the fishery and the issues that are relevant to that fishery.

Once the certification team has completed its initial report, a peer review is undertaken by an independent panel of experts to ensure that the assessment process has been carried out in line with the certifier's own procedures and the MSC certification methodology. Finally, if the fishery meets the MSC Standard, certification is awarded to the fishery. At the conclusion of the certification, a summary of the certifier's report is made public. Each certified fishery is subject to annual monitoring by the certifier to ensure ongoing compliance with the MSC Principles and Criteria. Certification covers a five-year period after which, the fishery must apply for re-certification.

MSC chain of custody and logo licensing

Once a fishery meets the MSC standard, products from the fishery qualify to bear the MSC sustainability label. Individual companies wishing to use the MSC label must undergo a "Chain of Custody" certification which guarantees traceability of MSC-labeled seafood. This insures that if a product has the MSC Label then it came from an MSC certified fishery. The MSC chain of custody certification looks only at product ownership and requires that companies have a system and maintain records showing that the fish products with the MSC Label actually came from the MSC certified fishery.

Once a company obtains a valid chain of custody certificate they then must enter into a logo licensing agreement with the MSC which enables them to use the MSC Label on their products. The label must be accompanied by the MSC claim: *This product comes from a fishery which meets the Marine Stewardship Council's environmental standard for a well-managed and sustainable fishery.*

The MSC has logo licensing requirements for both on and off product uses of the MSC Logo. These requirements are necessary to allow the MSC to build consumer recognition of and confidence in the MSC Logo. The MSC regulates off product logo uses such as advertising or point of sale materials to ensure the consistency of logo presentation. A logo licensing fee is charged by the MSC of 0.05% ($500 per $1.0 million) in sales value for on product use, and it is assessed at the point where the logo is affixed to the product.

Marketing the MSC Label

Essential to the Marine Stewardship Council's success is the consumer acceptance and understanding of the eco-label which identifies certified products. With that in mind, the MSC launched a major public awareness campaign in the U.S. in September 2000, designed to educate the consumer, retail community and the seafood industry about the eco-label which guides consumers to the best environmental choices in seafood. The campaign's kick-off coincided with the public announcement of the Alaska salmon certification on September 5, 2000. With its marketability and international distribution, salmon was the perfect conduit for the MSC's message. A recognizable product in the U.S., the certification highlighted the MSC and is expected to build consumer confidence in its label which will begin appearing on Alaska salmon products before the end of the year. The certification is having a positive effect on processors and retailers who recognize the marketing advantage provided by the label and are assured of its ability to handle fisheries which may be as large and complex as Alaska salmon.

An international public relations firm has been brought on board to facilitate consumer outreach that began in September 2000 with news stories placed in the trade, culinary and general media. That has been followed by MSC's participation in a number of events across the country promoting marine conservation and sustainable cuisine. Additional media coverage and events are in the planning stages in the U.S. and abroad for 2001. The MSC hopes that with education and exposure, U.S. consumers will follow the lead of their European counterparts who are currently more responsive to environmental and conservation issues. The MSC believes the consumer, by simply shopping the label, can pressure additional fisheries into responsible management and in turn have a positive effect on marine conservation.

Alaska Salmon Fishery

The Alaska Salmon Fishery met the MSC's Standard in September 2000, and companies that sell salmon harvested from the Alaska Salmon Fishery can now qualify to use the MSC label on their products if they so choose.

When Alaska became a state in 1959, its salmon fishery was in trouble. Since 1940, overfishing had contributed to severe declines in salmon stocks. The situation was so critical in fact, that President Eisenhower declared Alaska a federal disaster area in 1953. In

1959, statewide harvests totaled 25 million fish (ADF&G, 2000). Since then, the state has focused on rebuilding its five salmon species—chinook (*Oncorhynchus tshawytscha*), coho (*Oncorhynchus kisutch*), pink (*Oncorhynchus gorbuscha*), sockeye (*Oncorhynchus nerka*) and chum (*Oncorhynchus keta*).

The Alaskan State Constitution requires that the salmon habitat be conserved and protected. Key to its conservation plan is improved management techniques and salmon research implemented over the years. In Alaska, the focus of salmon management is on escapement, allowing enough salmon to make it upstream to spawn. Harvest is only permitted if escapement goals are being met. Alaska Department of Fish and Game (ADF&G) pre-season estimates are adjusted with real time data that are collected during the salmon migration. Immediate harvesting adjustments are made in-season as necessary to ensure that adequate escapement is achieved. Those methods have resulted in a healthy and sustainable salmon stock today. The record high commercial catch of 217,000,000 fish in 1995 was 17% higher than the year before. This may have been the result of improved management, pristine habitats, ocean conditions allowing high survival of juveniles and a bycatch reduction (NMFS 1999) ADF&G reports statewide harvests are ranging from 100 to 200 million salmon a year for the past 15 years. Alaska salmon accounts for more than 95% of the entire U.S. salmon harvest today (ADF&G 2000).

The assessment team found that Alaska's commercial Salmon fisheries met all three MSC Principles and Criteria independently. The certification team wrote, "Alaska's management of its commercial salmon fisheries provides an excellent example of a strict effort controlled fishery with day to day adaptive management" (Chaffee 2000). The team noted several specific examples of strength in the Alaska system including:

- Statutes and regulations codify the authority and decisions of the management system;
- The Emergency Order system allows rapid, on-site response to changed or unexpected fishery conditions;
- The Management system has a very high success rate in achieving target escapements, and conducting orderly harvests of surplus stocks;
- An adopted Sustainable Fisheries Policy.

Chaffee (2000) details many more examples in the summary document.

The team also found some areas for improvement, most significantly in bycatch monitoring and some aspects of the stock assessments and setting of escapement targets. A summary of the specific requirements for continued certification are:

Target reference points

- Determine the number of spawning stocks, the basis on which they are managed, and categorize each spawning stock according to relevant characteristics.

Limit reference points

- ADF&G must explain to the certification body how the Alaska Salmon fisheries will be managed sustainably in the event that ocean survival rates decrease.
- ADF&G must provide evidence to the certification body that the joint stock status report for northern coho required by the Pacific Salmon Treaty (PST) is being undertaken in a timely and cooperative manner.
- ADF&G must present to the certification body an explanation of why ADF&G believes the stocks being co-managed under the PST are considered sustainable based on the current management paradigm.

Bycatch and discards

- ADF&G must implement a sampling program to identify major non-salmon fish species, birds and marine mammals taken in the salmon net fisheries of the State and must provide evidence and a summary regarding its findings to the certification body.
- ADF&G must present information to the certification body on the number of permits determined to be consistent with the limited entry law.
- ADF&G must identify research needed to assess the magnitude of the interaction of hatchery programs on the wild stock gene pool and the effect on the reproductive fitness of those stocks (Chaffee 2000).

While Alaska celebrates successfully being certified, it still has concerns about its salmon fisheries. The Alaska Seafood Marketing Institute (ASMI 2000) research revealed that American consumers largely do not differentiate between Alaska salmon and the threatened and endangered salmon stocks of the Pacific Northwest, particularly those in Washington and Oregon. ASMI is working to make it clear that Alaska salmon is sustainable and should not be avoided by consumers who are concerned about endangered or threatened seafood.

Other MSC certifications

Two other fisheries have attained MSC certification since the program's inception, and others under consideration.

Western Australia Rock Lobster fishery

The Western Australia Rock Lobster (*Panulirus cygnus*) fishery was the first to achieve MSC certification in March 2000. The fishery consists of eight species, but *Panulirus cygnus* is the most common. Western Australia Rock Lobster (WARL) is exported live, frozen,

whole cooked or as raw lobster to Taiwan, Japan, Hong Kong and China or processed into frozen lobster tail for the U.S. market. They are commonly referred to as "crayfish" or "spiny lobsters." Western Australia Rock Lobster is the most valuable single-species fishery in Australia and usually represents about 20% of the total value of Australia's fisheries.

The MSC certification has impacted fisheries management for WARL. In order to maintain the ongoing MSC certification, the WARL fishery will implement the following:

- Complete an ecological risk assessment;
- Prepare an environmental management strategy;
- Increase involvement of the environmental community in decision making (MSC 2000).

From a marketing perspective, the WARL fishery participants appear to be fairly satisfied. The sellers of WARL were interested in obtaining certification in order to diversify their markets into Europe and North America. Early indications are that the MSC certification has helped in this market diversification.

Thames Herring Driftnet Fishery

Also in March, the Thames Herring (*Clupea harengus*) Driftnet Fishery was awarded MSC certification. The relatively small fishery for spring spawning herring, located in the Greater Thames Estuary in the United Kingdom, had a 1999 to 2000 total allowable catch of 121 tons. The fishery sought certification in an effort to win a competitive advantage over other herring fisheries and because a large proportion of the fishery is within a marine Special Area of Conservation (SAC).

This certification has also impacted the fisheries management for Thames Herring. In order to maintain the ongoing MSC certification, the Thames Herring fishery will implement the following:

- Improve data collection on catch and fishing effort, by-catch, and discards;
- Detail available spawning stock biomass calculation;
- Prepare a fishery management plan;
- Implement a comprehensive consultation process (MSC 2000).

Fisheries under consideration

There are two fisheries currently undergoing full certification through the MSC process: New Zealand Hoki (*Macruronus novaezelandiae*) and Burry Inlet Cockles (*Cerastoderma edule*). The certifications for these two fisheries should be completed by January 1, 2001. Reports will be posted on the MSC website upon completion (www.msc.org).

In addition, there are approximately 15 to 25 fisheries throughout the world that are in the pre-assessment phase of the MSC process. Pre-assessment is a confidential process, and as such, these fisheries cannot be identified.

Summary

The MSC Fishery Certification Program has grown from an idea in 1996 to having three certified fisheries that are providing MSC labeled products throughout the world. In addition, other major fisheries are seeking to obtain MSC certification. The initial indications are that MSC certification process has credibility and is positively moving fisheries management towards "best management practices." At the same time, interest from companies that want to use the label and from fisheries that are seeking certification indicates that the program should experience rapid growth in the near future.

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Note from the Editors

Approximately three and a half years ago, we published a special issue of the *Endangered Species UPDATE* (ESU) on Habitat Conservation Planning (July/August 1997). This comprehensive issue covered many angles of the debate surrounding habitat conservation plans (HCPs), including the advantages and disadvantage of HCPs and the challenges to implementing them. Since this landmark issue, the editors of ESU have been committed to staying abreast of new developments in habitat conservation planning to provide our readers with the latest information in this sphere. In this current issue, we are pleased to introduce kick off a three part series, titled "Where Property Rights and Biodiversity Conmverge," prepared by Gregory A. Thomas, President of the Natural Heritage Institute.

The ESU editors have envisioned this series to be useful for people just beginning to learn about HCPs as well as for those who work with this process. Because this series is a follow-up to our special issue on HCPs, we thought that it would be helpful to give a brief background on the history, process, key issues, and evolution of HCPs. According to Michael A. O'Connell, Director of the Natural Community Conservation Planning for The California Nature Conservancy, HCPs must confront some of the major and most complicated issues in environmental policy today. In the HCP debate many questions are raised, including: What is the role of private landholders in conservation? How may biodiversity be more effectively preserved? Who must be held accountable for species conservation?

HCPs may be seen as a promising new conservation tool that combines biology and economics, facilitating both species conservation and planned development. They grew out of Sections 9 and 10(a) of the ESA. Section 9, stipulating that it is illegal to "take" (i.e. kill or damage) a listed species on either private or public lands, has proved particularly troublesome for private landowners who wish to develop their land. These landowners could face criminal or civil charges if they harm or destroy a listed species in the process of development. Section 10(a) helps to mitigate this prohibition through the issuance of an incidental take permit—a permit that allows for unintentional harm to listed species during development—to non-federal landowners upon the preparation of a HCP for this listed species.

The habitat conservation planning process is made up of three stages: development, approval, and implementation. This process is usually complex, requiring the participation of outside consultants and the district-level U.S. Fish and Wildlife Service or National Marine Fisheries Service to applicants during development. One advantage of this process is the framework it provides to promote cooperation and compromise between public and private sectors and state, municipal, and federal agencies in the conservation of listed species and habitat. Also, it allows for the conservation of overall biodiversity, i.e. for species not listed under the ESA.

The HCP process, however, can last many years and can incur high costs, leading to dissatisfaction in the private sector. This process has also come under fire by the environmental community that views HCPs as a compromise to the ESA's strict protection for endangered species. Moreover, HCPs have been criticized for their fragmented approach to the protection of listed species: the overwhelming majority of HCPs are prepared by individual landowners for a single species and encompass a comparatively small area. Finally, some critics argue that HCPs are usually not implemented early enough to overcome species extinction.

Nonetheless, the HCP program has expanded very rapidly in recent years. Both the size and scope of HCPs have increased dramatically from the first one developed in 1983 for several butterfly species in the San Francisco area. This trend attests to the new role of some HCPs in addressing the conservation of endangered species and ecological communities on a regional scale as is highlighted in the first article in our HCP series, "Where Property Rights and Biodiversity Converge: Lessons from Experience in Habitat Conservation Planning." This piece recounts the lessons learned from habitat conservation planning and promotes the integration of HCPs into bioregional conservation strategies. This new vision of HCPs is poised to benefit both endangered species and private landholders. The second article in this series will elaborate on the need to focus more sharply on species recovery in the HCP process, and on the need to involve independent scientists and the public in this process. Finally, the last article will be dedicated to the integration of two interrelated tools—adaptive management and the precautionary principle—in designing flexible HCPs that can adjust to the varying responses of ecosystems to human intervention.

We hope that you find this series worthwhile and welcome your feedback at *esupdate@umich.edu*!

Compiled by Stephanie Hitztaler, UPDATE Editorial Assistant, from: Aengst, P., J. Anderson, J. Chamberlin, C. Grunewald, S. Loucks, E. Wheatley, and S. Yaffee, "Introduction to Habitat Conservation Planning."; Dohner, C. and E. Smith, "Habitat Conservation Plans and the Incidental Take Permit Planning Process: The U.S. Fish and Wildlife Perspective."; Corn, L. 1997. "HCPs: The Light of Yesterday?"; O'Connell, M. 1997. "Improving Habitat Conservation Planning Through a Regional Ecosystem-Based Approach." All articles appeared in Endangered Species UPDATE 14(7&8) July/August 1997.

Special Series: Habitat Conservation Planning

Where Property Rights and Biodiversity Converge Part I: Conservation Planning at the Regional Scale

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Abstract

In the tension between property rights and the public interest in protecting remnant habitats resides the most daunting challenges that our national program to protect biodiversity will face in the next era. Habitat Conservation Plans (HCPs) provide a mechanism to address these conflicts. The number of HCPs has increased dramatically in recent years leading to considerable scrutiny of this tool by conservation biologists and environmental organizations. This paper distills the many critical reviews and recommendations for reform of this process. It reveals that HCPs that approach conservation at a bioregional scale can better address the needs of both imperiled species and property owners than can single species, single landowner plans. Bioregional conservation planning can potentially lead to several benefits, including: more equitable apportionment of the costs of conservation, fostering species recovery, facilitating adaptive management, strengthening public participation, and capturing economies of scale for high-caliber science. Multi-species plans undertaken by county or state governments can be a step in this direction. Recovery plans and programmatic conservation standards could be upgraded to also serve as vehicles for establishing bioregional conservation goals as a template for individual HCPs. All of these strategies will require a more proactive involvement of federal agencies to assist in conservation science and planning and in managing public lands to foster recovery of imperiled species.

Biodiversity protection versus private property rights

Harvard professor Edward O. Wilson predicts that at current extinction rates, our world could irretrievably lose a fifth or more of its plant and animal species by the year 2020. This is 1,000 to 10,000 times the natural extinction rate (Wilson 1992). In the United States, 16% of mammals, 14% of birds, and an alarming 37% of freshwater fish species *are either extinct, imperiled, or vulnerable* (The Nature Conservancy 1997). Each of these species is a unique, one-time adaptive experiment, and an embodiment of wonder and learning never to be repeated while this planet endures. We are, in effect, throwing away the science books before they can be written. The overwhelming cause is loss of habitat.

The potential conflict between private property rights and the public interest in preserving biodiversity is among the daunting challenges that conservationists will face in the next era of biodiversity protection. And, this conflict is poised to become increasingly contentious. According to the U.S. Fish and Wildlife Service, half of all federally listed species are not found on federal lands, and more than half of listed species have at least 80% of their habitat on nonfederal land (Defenders of Wildlife 1998). The only hope for preserving species over time is by maintaining or restoring viable populations of species that are adequately distributed in healthy ecosystems (Cheever 1996). Yet, for those species whose habitat is mainly or exclusively on private lands, intact ecosystems are becoming increasingly rare.

Habitat conservation plans: a solution?

When it was enacted in 1973, the Endangered Species Act (ESA) simply prohibited any "take" of endangered species, and that prohibition has since been extended by the U.S. Supreme Court to include destruction of a species' habitat (*Babbitt v. Sweet Home Chapter of Communities*, 115 S.Ct. 2407 1995). An absolute ban on the development of endangered species habitat, however, proved unworkable. Instead, Congress proposed Habitat Conservation Plans (HCPs) as an alterna-

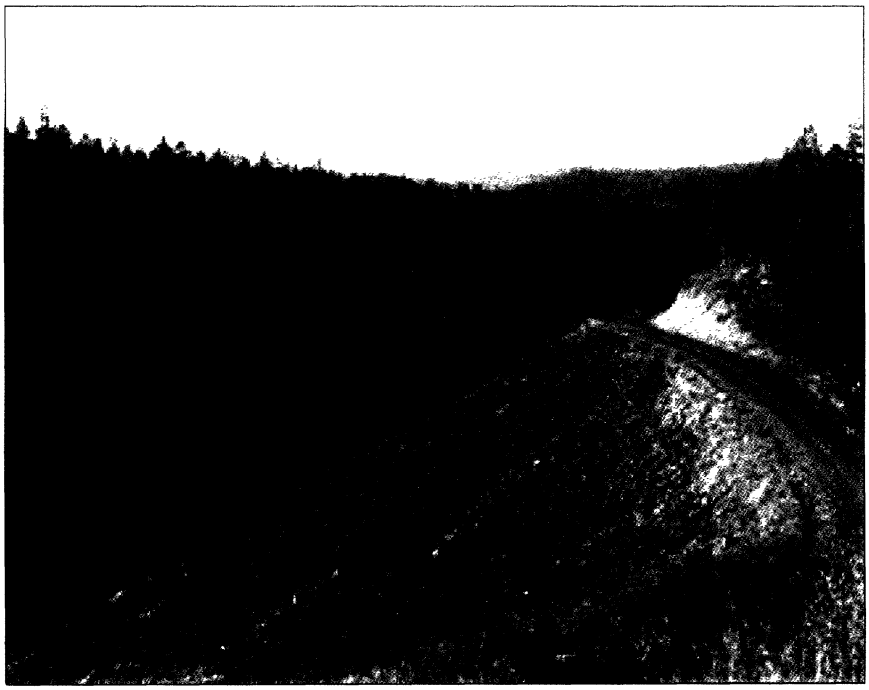

Figure 1. Northern spotted owl (*Strix Occidentalis caurina*) habitat in Oregon. The spotted owl depends on old growth forest for habitat needs. Old growth forest is also a lucrative source of timber for houses. Nine HCPs have been approved for industrial landowners in the Pacific Northwest since 1992, allowing incidental take of the owl. Photo courtesy of U.S. Fish and Wildlife Service/Steve Hillebrand.

tive to such a ban. The ESA was amended in 1982 to authorize the U.S. Fish and Wildlife Service and the National Marine Fisheries Service (collectively, the Services) to permit take incidental to development when approved as part of a habitat conservation plan prepared by the land or water rights holder.

These HCPs are essentially settlements of regulatory liabilities that are voluntarily negotiated between the federal government and private landholders or state and local governments and other stakeholders (in some cases). They are designed to foster economic development free of the risks associated with the occurrence of endangered species on private lands. HCPs must include species conservation and mitigation measures sufficient for the Services to find that the take will not appreciably reduce the likelihood of survival or recovery of the species. The landowner then receives an assurance—called the "no surprises" guarantee—that the Services will not increase the conservation measures or other requirements without the landowner's consent, no matter how successful or unsuccessful these may ultimately prove to be. The no surprises arrangement has ignited a veritable explosion in HCPs. As of this writing, some 400 such plans are in various stages of development, approval, or implementation nationwide.

Drawbacks of HCPs

Several features of HCPs have stirred controversy. First, HCPs allow the Services to permit development activities that will have some measure of adverse impact on species and habitats that are already severely depleted and degraded as long as these activities do not *appreciably* reduce the prospects for the survival and recovery of the species. What these species need, however, is a net improvement in their survival prospects. They need a recovery strategy. Indications of this mismatch between statutory and conservation requirements can be seen on the ground: 62% of listed species covered by an HCP are declining and 4% of these species are declining so rapidly that extinction is possible within the next 20 years (Karieva et al. 1999). As long as HCPs are seen as instruments to "nickel-and-dime" species toward extinction, the HCP process will never be satisfactory to conservation interests, just as it will never be satisfactory to private rights holders as long as habitat conservation represents a permanent cloud over the exercise of development rights.

Second, the "no surprises" regulatory assurance provides landowners with important incentives to participate in the development and implementation of HCPs. But, it does so by making vulnerable species bear the risks incident to incomplete and ambiguous understanding of how abundance levels will respond to particular conservation strategies. Neither investments in private development nor the survival of species are secure under this arrangement. The regulatory exemption is a gamble because HCPs tend to freight more on the current state of conservation science than it can deliver. Three respected experts have stated, "Biological systems are not only more complex than we know; they are inherently more complex than we can know" (Noss et al 1997). Thus, often there is no certain answer to the key questions that are posed in a HCP.

For many years the dominant scientific paradigm held that ecosystems were stable, closed, internally regulated, and behaved in a deterministic manner. Today, however, ecosystems are seen as being in a constant state of flux, usually without long-term stability. Moreover, they are affected by a series of human and other stochastic factors, many of which originate outside the ecosystems (Williams, 1997). Biologists worry that the "no surprises" guarantee does not take into account this new understanding of ecosystems.

In a statement to the U.S. Congress, 150 prominent conservation scientists contended that assurances to landowners guaranteeing the immutability of their conservation obligations in HCPs "does not reflect ecological reality and rejects the best scientific judgment of our era. Moreover, it proposes a world of certainty that does not, has not, and will never exist" (Meffe 1996). The rigidity of the "no surprises" guarantee could foil the Services' ability to take action to the point of extirpation for a listed species. The political firestorm ensuing such an occurrence could render the entire "no surprises" guarantee null and void. Also, conservation interests and local communities are often excluded from the balancing of biodiversity protection and local economic development that occurs in HCP negotiations. Consequently, the process often does not integrate the support of these interests or generate confidence in the scientific base of the resulting conservation program.

Clearly, some vehicle is needed to conserve habitats affected by development rights on lands and waters beyond the federal domain. In order to be effective, this vehicle must provide incentives for private rights holders to work with regulatory agencies. The challenge is to set up a conservation arrangement that truly advances the survival and ultimate recovery of species and concurrently limits the financial burdens and biological risks imposed on private enterprises.

Fitting HCPs within bioregional conservation strategies

Although biodiversity conservation requires ecosystem protection, the ESA's regulatory mechanisms are species-specific and are only activated by the listing of individual species (Thornton 1991). Conservation biologists argue that the single species focus of the ESA has not been very successful in protecting functioning ecosystems since it does not take into consideration the interdependence of species with one another and the broader landscape (Noss et al. 1997, Carrol et al. 1996). Because the needs of species are "specific", single species plans for the same area could potentially be pitted against one another if not closely coordinated.

Conservation biologists and commentators are beginning to reach a consensus that the optimal planning unit for habitat conservation should not be the individual land holding or water diversion, and that the main conservation focus should not be the individual listed species. Instead, planning should be conducted on a landscape level in which habitat conservation strategies are developed for a "bioregion" covering entire ecosystems and communities of species that live within them (Defenders of Wildlife 1998; Noss et al. 1997). This scale of planning would benefit both ecosystems and property rights holders. Furthermore, there is some evidence that plans devel-

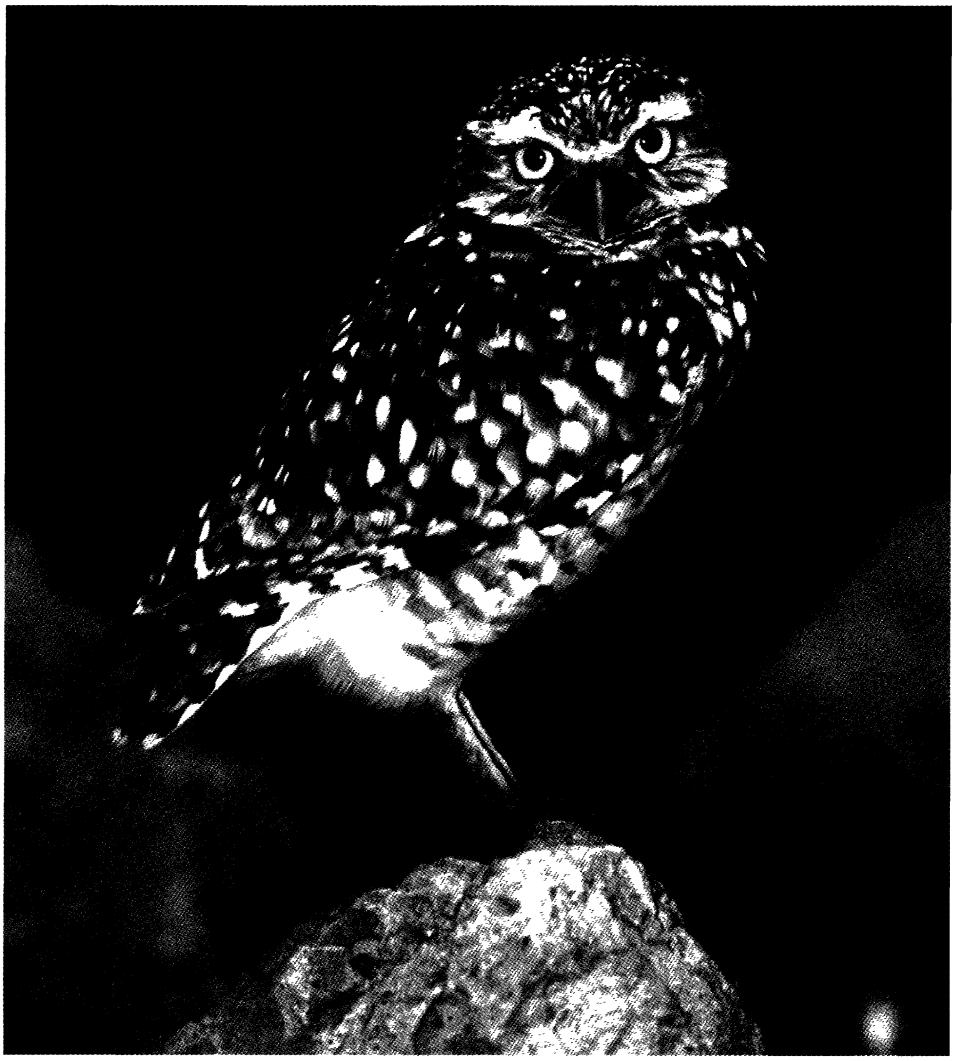

Figure 2. Along with listed species, burrowing owls (*Speotyto cunicularia hypugaea*), a Federal and California State Species of Concern, benefit from the management of the Western Riverside County Multiple Species HCP. Photo courtesy of Don Des Jardin.

oped for ecological communities have been scientifically superior to single-species plans, especially with respect to mitigation and monitoring (Kareiva et al. 1999).

Clearly, the extent to which HCPs take into account multiple species and the ecosystem as a whole is important to their ultimate success (Noss et al. 1997). Historically, however, individual property owners have prepared HCPs to cover activities within their parcel that will affect one or more listed species found thereon. Although most HCPs have been relatively small, neither the ESA nor its regulations limit HCP size. In fact, the range of HCP size is extremely broad, spanning six orders of magnitude. The smallest approved plan to date was prepared for the Florida scrub jay on just 0.4 acres of habitat; the largest plan covers over 1.6 million acres of forest managed by the Washington State Department of Natural Resources.

Several of the largest HCPs, such as those developed in Southern California, have considered multiple properties and species and have attempted to address planning for endangered species and ecological communities on a regional scale. Local government units generally direct these plans, covering a community of both currently listed and potentially listable species. Multi-species, multi-parcel conservation planning is a promising step forward. Moreover, rescaling conservation planning and permit issuing can address many of the perceived problems with HCPs for both species and property owners. Potential advantages of landscape-scale, multi-party HCPs include the following:

Providing a biological basis for allocating responsibility among rights holders: Landscape scale planning can specify the overall conservation effort that is needed to protect communities of species, thereby providing a basis for determining what share of the burden an individual property owner should bear in an HCP. Currently, the ESA affords no mechanism for allocating the conservation burden between multiple private landowners or between private rights holders and public lands. Instead, the burden is allocated in a piecemeal fashion through the approval of individual HCPs, federal actions related to endangered species and their habitat (Section 7 of the ESA), and public land management decisions. As a result, those who get their approvals earliest get the best deal, with larger burdens reserved for latecomers.

Fostering species recovery: At the landscape scale, it is possible to calibrate habitat conservation planning toward recovery of listed species and protection of other vulnerable species. The only biologically defensible aim for habitat conservation planning is a net improvement in the survival prospects for listed species and the prevention of further declines in unlisted species. This objective is harder to advance at the level of landholding-specific HCPs, which tend to aim for mitigation or, at best, avoidance of impacts on listed species.

Creating economies of scale for science: Good science is expensive and the tasks of gathering and interpreting the necessary data can be onerous for individual landowners. Rescaling shifts an appreciable degree of this burden from individual property owners applying for incidental take permits to the public agencies and the broader constellation of rights holders that have interests and responsibilities in the eco-region.

Facilitating adaptive management: Because adaptive management requires that some part of the development plan covered by an HCP remain contingent, it is more feasible to engage in adaptive management at the landscape scale. Although this management style is more effective on a larger planning scale, it is feasible for smaller plans as well.

Strengthening public participation: The degree and quality of public participation is generally higher within a broader planning scale that includes multiple parties. This correlation is especially evident if a local government unit mediates the HCP process by applying for the federal permit and then issuing sub-permits to individual landholders. Such local agencies routinely include the public in similar land use planning processes. In contrast, case studies show that public participation has not been higher in cases where a single landowner prepares a large, landscape-scale HCP, as is exemplified by the many HCPs developed by timber companies.

The idea that landholding-specific or water right-specific conservation requirements should be determined in the context of broader conservation objectives is hardly radical. It is rather analogous to the way permits are issued for new, major pollution-emitting facilities within airsheds that are already in violation of national ambient air quality standards. Similarly, discharger-specific effluent allowances regulating water pollution are determined in reference to basin-wide water quality criteria. Likewise, new incursions on habitat for biodiversity should be subject to conditions that contribute toward a landscape-scale objective of recov-

ery for imperiled species.

Vehicles to achieve a bioregional conservation strategy

Individual HCPs should be designed to contribute to a bioregional conservation strategy that aims for long-term, sustainable conservation. Reaching this goal may entail more rigorous activities than simply avoiding or minimizing impacts on the subject landholding. In some cases, off-site mitigation may be required to reduce the threat to the species. This type of mitigation may be best fulfilled by requiring that contributions be made to a mitigation fund as a condition of permit issuance.

Natural communities conservation plans

The land-use planning functions of state and local governments can be harnessed to undertake bioregional conservation planning. Since state and local governments already play the predominant role in local land-use planning, economies of scale and consistency of conservation objectives can be achieved by directly involving them in HCP development. In the currently emerging model, state and local government units prepare regional conservation plans, submit them to the Services for approval as master HCPs, and distribute sub-permits to individual property owners that specify take allowances in a manner consistent with the master HCP and master Incidental Take Permit.

The California Natural Communities Conservation Program (NCCP) represents such a bioregional planning program (Silver 1997). The NCCP is a regional, ecosystem-wide, and multi-species program. A typical plan might cover a mix of listed and unlisted, but declining, species and their shared habitats. Concomitantly, this plan would accommodate development outside the areas set aside as preserves. Potentially, NCCPs can address the conservation requirements of unlisted species before they decline to a level requiring ESA protection. Preventative strategies will invariably provide more options for habitat protection than reactive measures that become necessary when species decline reaches a crisis level (Bosselman 1997).

The Services encourage NCCP-type plans for several reasons. They circumvent backlogs created through case-by-case decisions and help in avoiding economic "train wrecks" by involving landowners in long-term planning instead of last-ditch preservation efforts. Also, they allow for greater flexibility, promote coordinated planning, and reduce the regulatory burdens of ESA compliance for all affected participants (USFWS and NMFS 1996; Welner 1995; Silver 1997).

These advantages help explain why the NCCP process was, in general, favorably received in southern California. For conservationists, comprehensive state planning based upon federal ESA standards has appeared to have the greatest potential in protecting the best remaining patches of coastal sage ecosystems. Developers valued the regulatory assurances stating that they would not be responsible for additional mitigation in the event a species covered by the plan subsequently becomes listed or declines. Local governments were pleased to retain autonomy over land use decisions in the face of federal listings and maintain the prerogative to strike the appropriate balance between development and open space in their communities. The state and federal wildlife agencies saw the NCCP process as a means to transcend the limitations of project-by-project mitigation. Although each stakeholder perceived the benefits of participating in the NCCP process differently, enough mutual benefits

Figure 2. California gnatcatcher (*Polioptila californica californica*). Its listing was a key element in the development of the NCCP. Photograph courtesy John Menge/University of California, Riverside.

and common ground were found to advance a politically difficult process (Silver 1997).

Lessons from California's early experimentation with NCCP can lead to an improved nationwide model (Silver 1997). First, the NCCP experiment revealed that the listing of endangered species played an essential role in bringing landowners to the negotiating table. Second, the direct involvement of local governments proved very valuable. Local land use laws can sometimes accomplish what state and federal agencies alone cannot achieve. Involvement in the NCCP process led to a "spill-over" of better planning in general as these efforts encouraged local governments to focus on the many benefits of natural open space preserves for their communities. Third, because local governments were directly involved and acted as the applicant in the NCCP process, it was much more accessible to the public than traditional HCPs for single property owners. Lastly, regulatory assurances were necessary to encourage involvement of landowners in the NCCP process.

The NCCP experiment also failed in ways that can be corrected in adapting this vehicle for use elsewhere (Silver 1997). Given the program's extraordinary complexity and its susceptibility to political and economic pressure, its scientific bases must be beyond debate. Yet, in the NCCP experiment, the initial scientific panel disbanded after a set of conservation guidelines were prepared, and the NCCP statute at that time made no provision for independent scientific consultation or review. Moreover, the failure to explicitly establish recovery as the standard to be achieved was a substantial deficiency. Also, zoning constraints or project authorizations issued by local government need to be reconciled with the conservation objectives and strategies pursued by the NCCP program. Finally, a secure source of funding for land acquisition and management is necessary to ensure the long-term success of these plans. Under normal circumstances, it is necessary to seek new funding sources, such as loan funds, funds from the Land and Water Conservation Fund, or mitigation banks. Because the value of real estate may increase as a result of open space protections, a portion of the local property tax that corresponds to the marginal rise in adjacent real estate values could also serve as a funding source (NRDC 1997).

Species recovery plans

Another potential vehicle for landscape scale planning could be the recovery plans that the Services are required to develop for listed species. Recovery plans can provide much needed scientific background on species and ecosystems that a landholding-specific HCP can utilize, such as information on species' habitat needs and effective restoration techniques. (Kareiva et al. 1999; USFWS and NMFS 1996).

There are several problems, however, with using recovery plans as a basis for HCP development. Recovery plans currently lag years behind the listing of a species. The Services have completed recovery plans for only 40% of listed species (Sher and Weiner 1997), and they are not authorized to disapprove a proposed HCP on the grounds of a missing recovery plan. The scientific quality of recovery plans has been criticized. For instance a study by the National Center for Ecological Analysis and Synthesis (NCAES) (Kareiva et al. 1999) found that the availability of a recovery plan for a given species did not necessarily improve the scientific quality of HCPs for that species.

Recovery plans are not intended to be binding on or enforceable against the non-federal lands that are encompassed in a species' range. Efforts to make these plans binding or enforceable would be viewed in the political sphere as tantamount to expanding the scope of recovery plans to include land-use planning, which is historically a state and local prerogative. Recovery plans have often inappropriately subordinated the biological objective to economic considerations. Economic analysis is important in distributing the conservation burdens among the public and private landowners, but it must not be allowed to dictate the biological requisites of the recovery plan. Finally, because recovery is a species-based concept, recovery plans do not necessarily address the health, processes, or functions of the ecosystem as a whole. There is no obvious reason, though, why recovery plans could not also be written as bioregional, multi-species conservation strategies. Indeed, such an approach would further the ESA's goals to preserve the ecosystems that support threatened and endangered species.

Programmatic conservation standards

A third potential vehicle for landscape-scale conservation planning is the promulgation of programmatic standards or guidelines for multi-species conservation by federal land and water managers. For example, the recent adoption by the National Marine Fisheries Service (NMFS) of programmatic guidelines for logging on anadromous fish-bearing streams in the Pacific Northwest may be a useful model in other situations. Such guidelines can apply standards for riparian buffers and acceptable sedimentation levels throughout watersheds Similarly, the President's Forest Plan provides a multi-layered approach intended for ecosystem-wide forest management.

Bioregional conservation planning demands a larger governmental role

Whatever the vehicle, it is clear that landscape scale habitat conservation planning will require either the Services, or state and local government units in the case of NCCP plans, to play a more proactive role in collecting the necessary biological information and developing conservation strategies that cover multiple parcels, both private and public. This new demand will entail a sharp departure from the Services' traditional roles and will require a substantial increase in both financial and professional resources.

The Services' role in HCP development has not been clearly defined. Congress, however, apparently expected them to do more than just exercise regulatory oversight by also providing technical assistance to applicants (USFWS and NMFS 1996). The HCP Handbook recommends active involvement from the Services during HCP development. Besides assisting in general HCP development, they are expected to direct mitigation measures; monitor protocols and reserve designs; provide a timely review of draft documents; and help find solutions to contentious issues (USFWS and NMFS 1996).

Notwithstanding these expectations, the Services simply do not have the resources to provide the degree of scientific and technical guidance that Congress intended (Kareiva et al. 1999). This lack of guidance often results in HCP applicants simply following precedents established in earlier HCPs. Consequently, HCPs that were developed before conservation biology principles were properly applied have nonetheless set a *de facto* standard of quality. (The issue of biologically defensible performance standards for HCPs will be addressed in a subsequent article in this series.)

Figure 4. Fragmentation and conversion of coastal sage scrub habitat by housing development was a major impetus for the expanded use of habitat conservation planning. Photo courtesy U.S. Fish and Wildlife Service/Claire Dobert.

Finally, the Federal government can play a more proactive role in landscape-scale planning by setting a higher conservation standard in land and water management. Following a landscape-scale approach to conservation, federal agencies that manage public lands and waters (and their commodity users) may shoulder a larger share of the conservation burden and may be held to a higher standard for protected species recovery. If private lands are managed according to the ESA's current or "jeopardy" standard, no margin of safety is left for vulnerable species. It is especially critical that federal natural resource managers undertake a "fair share" of the conservation burden in areas within a matrix of federal and private lands, such as the checkerboard pattern of private and federal land found in many western states.

Conclusion

HCPs have provided a mechanism to resolve conflicts between endangered species and economic activities on non-federal land. In response to the growing number of plans, commentators have identified numerous shortcomings in HCP policy and have made recommendations for improving the process. Scaling HCPs to fit within bioregional conservation strategies can reap many benefits for imperiled species as well as property holders. Planning can be conducted in a more comprehensive manner to address questions of equity and, simultaneously, allow for more ambitious conservation objectives.

Bioregional planning will promote economies of scale for pooling scientific resources; facilitate greater involvement by independent scientists and the interested public; and demand a larger role for local, state, and federal governments. The expanded planning scale allows bioregional plans to address realistically objectives of species recovery, meaningful adaptive management, and the conservation of ecological communities. Finally, bioregional planning can facilitate a more equitable distribution of responsibility for conservation among property owners, levels of government, and the general public.

Acknowledgements

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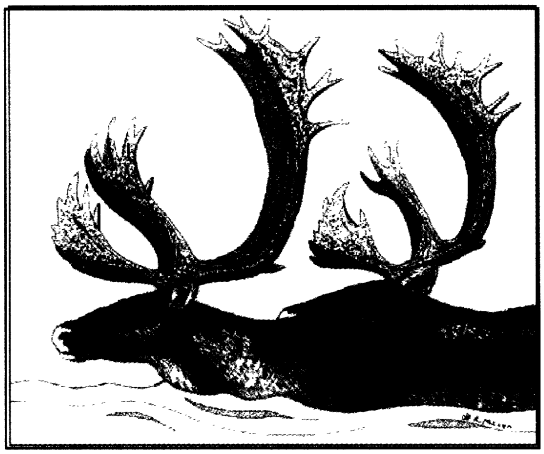
FOCUS ON NATURE ™ *by Rochelle Mason*



The WOODLAND CARIBOU *(Rangifer tarandus caribou)* bull weighs 275-600 pounds. The cow is much smaller and has shorter and spindlier antlers. Air-filled hollow hairs of the outer coat provide great buoyancy when swimming. The hooves are large and soft in the summer and hard and shrunken in the winter for better traction in varied terrains. Diet consists mainly of tree lichens, especially in the winter. Grasses and other available plants are consumed within the mature coniferous forests of the Selkirk Mountains (northeast Washington, northern Idaho, and Canada). As habitat is being lost and fragmented, you can help save this endangered species by donating time or money to a nature conservation organization.

News from Zoos

Conservation Grant Aids Snow Leopard

Woodland Park Zoo held a press conference on 24 August to announce a conservation grant that its Zoological Society is awarding to the International Snow Leopard Trust (ISLT). The $65,000 grant will bolster conservation efforts throughout 12 countries in Asia, where wild populations may be as low as 4,000 due to black market demands and human encroachment.

The grant will not only help stabilize the ISLT, but also generate community-based projects and snow leopard field research. In addition, the zoo has created a conservation station at their snow leopard exhibit, highlighting the history and fieldwork for the ISLT, and their collaboration with the zoo on conservation programs and initiatives. The station will also provide visitors an opportunity to contribute to the snow leopard's preservation.

Monterey Bay Aquarium Allies with Whole Foods, Bon Appetit to Promote Sustainable Seafood

The Monterey Bay Aquarium has allied with two major commercial partners in time for October's National Seafood Month, aiming to raise consumer awareness about a critical conservation issue: the seafood buying decisions we make as individuals have a profound effect on the health of ocean wildlife.

Beginning October 20, all 16 Whole Foods markets in Northern California and Washington will distribute the aquarium's "Seafood Watch" consumer buying guides at their seafood departments. The stores will also highlight "Seafood Watch Best Choices" with signs inside seafood display cases to alert consumers that selected species are rated by the aquarium as coming from well-managed sources.

In a second partnership, Bon Appetit Management Co., which operates corporate and educational food services at 150 locations nationwide, has adopted "Seafood Watch" guidelines for all of its menus. In addition to the aquarium, Bon Appetit's blue-chip client list includes Cisco Sytems, Hewlett-Packard, Oracle, Netscape, Exxon USA headquarters, Dayton Hudson corporate headquarters, The Getty Center in Los Angeles, Stanford University, Georgetown University Law School, Loyola University of Chicago and the University of Pennsylvania.

The aquarium launched "Seafood Watch" in October 1999 in response to its growing concern that rising consumer demand for seafood was seriously damaging the health of ocean ecosystems and ocean wildlife populations.

"Fisheries conservation is among the most important marine conservation issues today," said aquarium Executive Director Julie Packard. "It's an environmental problem whose solution is in people's hands every time they buy seafood. Through 'Seafood Watch,' we want to give people the information they need to make wise choices when they shop."

Increased consumer demand for seafood and the growth of destructive fishing practices have had a disastrous effect on the health of the oceans. Today, 11 of the world's 15 most important fishing areas - and nearly 70% of the world's fisheries - are either fully fished or overfished. Perhaps 30 million tons of fish, sharks and seabirds die each year as "wasted catch" - animals caught accidentally and discarded, dead or dying.

Fish-farming, or aquaculture, has its own set of problems, including pollution, spread of disease to wild populations and the destructive conversion of coastal wetlands into commercial fish farms.

"At Bon Appetit, we believe it's possible to have healthy oceans and to keep seafood in our diet," said company co-founder and CEO Fedele Bauccio. "That's why we're proud to partner with the Monterey Bay Aquarium's Seafood Watch program."

Brevard Zoo Works to Conserve Rare Parrot

The Brevard Zoo and the Rare Species Conservatory Foundation (RSCF) joined forces to help renovate the only psittacine avairy on the Caribbean island of Dominica, home to one of the Imperial Amazon (*Amazona imperialis*).

The Imperial Amazon (known locally as the Sisserou) is Dominica's national bird, and the aviary houses the only captive pair in the world. The bird is the focus of an intense conservation program managed by Dominica's Forestry and Wildlife Division and that works in partnership with the U.S.-based Rare Species Conservatory Foundation.

Brevard Zoo's Curator of Exhibits David Mannes, and his son Eric, accompanied RSCF staff to the island, spending 10 days stripping, painting, re-wiring and landscaping the aviary, located in the capital city of Roseau. The aviary is part of Dominica's Parrot Conservation and Research Centre (PCRC). Brevard Zoo has also supplied interpretive signs for the PCRC, which is available by limited access to the public.

It is estimated that less than 250 Imperial Amazons remain in the forest of Dominica and only two active nest sites have been discovered in the past 10 years. The Morne Diablotin mountain range is the only known nesting area and site monitoring and population assessment are extremely difficult due to the rugged terrain. Imperials prefer to nest in cavities formed in old-growth rainforest trees, some of which reach over 250 feet in height.

News and Events

2001 Society for Conservation Biology Meeting

The Society for Conservation Biology will hold its 15th Annual Meetin at the University of Hawaii in Hilo, Hawaii, 29 July through 1 August 2001. The Scientific program will consist of a plenary address by Sir Robert May, seven symposia, approximately 300 contributed oral presentations, two evening poster sessions, and a variety of workshops and discussions. The conference theme is Ecological Lessons from Islands, and includes such figurative islands as isolated framents of habitat within altered landscapes. The island of Hawaii, with its active volcanoes and diversity of ecosystems will provide a dramatic setting for the 2001 meeting. The meeting is co-hoted by the Pacific Island Ecosystems Research Center of U.S.G.S. Biological Resources, the University of Hawaii, and Hawaii's Secretariat for Conservation Biology.

The local organizing committee inties abstracts for oral papers nad poster presentations. The deadline for submission of abstracts is 31 January 2001. For complete information on how to submit an abstract, as well as detailed travel and registration information, visit the conference website at http;//www.uhh.hawaii.edu/~scb/. For questions regarding local arrangements contact Kristi Trousdale (808/967-7396 x232); scientific program questions contact Bethany Woodworth (x237).

Native Inland Fish Symposium

Practical approaches for conserving native inland fishes of the west, a symposium hosted by the Montana Chapter and Western Division of the American Fisheries Society (AFS), will be held 6-8 June 2001 in Missoula, Montana. The symposium will emphasize implementation and evaluation of field techniques. Session topics include watershed and habitat restoration for salmonids, non-native fishes, genetic issues in fish conservation, captive broods, pesticides, conservation agreements with the U.S. Fish and Wildlife Service, and statewide and regional conservation planning. For more information contact the University of Montana, http://www.umt.edu/afs; the Montana Chapter of AFS, http://www.fisheries.org/AFSmontana/; or Symposium Chair Brad Shepard, bshepard@montana.edu.

2001 North American Forest Ecology Workshop

The 3rd North American Forest Ecology Workshop, entitled "Issues of Scale in Forest ecology--Theory to Practice," will be held 24-27 June 2001 in Duluth, Minnesota. The workshop will bring together forest managers and researchers from Canada, Mexico, and the U.S. to discuss issues of scale and how they relate to forest management. Events will include plenary, technical, and poster sessions, as well as field trips. Topics will include scale linkages--from trees to landscapes, forest health, interactions between spatial patterns and wildlife, non-timber forest products, forest and surface water interactions, and spatial assessment and decision tools. For details contact Mary Ann Hellman (616/24-7222) or visit http://www.cnr.umn.edu/cfc/outreach/NAFEW/nafew.html.

Announcements for the Bulletin Board are welcomed. Some items have been provided by the Smithsonian Institution's Biological Conservation Newsletter.

Endangered Species UPDATE

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