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# *Human Ecology Review*




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***From the Editor***

***Linda Kalof***
***George Mason University***

This is the third issue of *Human Ecology Review* that has been produced at George Mason University, and we are very proud of our accomplishments thus far. Our proposal to renew **Jenny Growney's** position as Graduate Research Assistant assigned to the journal was funded by **Dean Daniele Struppa** of the College of Arts and Sciences. We appreciate his support for the 1999-2000 academic year.

The editorial processing of submitted manuscripts has been successfully streamlined over the last year. We are usually able to get a decision back to authors within 2 months of the initial submission. We have had the opportunity to employ the services of a professional editor for some of the accepted manuscripts that need editorial work. (Thanks again to Dean Struppa for providing the funds needed to increase the quality of the manuscripts published in *HER*, and thanks to **Joe Scimecca**, Chair of Sociology and Anthropology, for providing us with a much-needed laser printer.) Our publication schedule has also been speedy, but with increased submissions we are no longer able to promise publication within 6 months of acceptance. We would like to consider going to three issues a year, but that would depend on increasing the subscription base to pay for the third issue. We would particularly like to increase our library subscriptions, and so I again ask you to check with your library and make sure it subscribes to *HER*. The library rate is only $50 per year, a very reasonable price for a journal that makes a valuable contribution to the scholarship on human ecology.

Overall, it has been a good 18 months for *Human Ecology Review*. We appreciate your encouragement and support in our journey towards making *HER* a first choice publication option for scholars of human ecology.

# Scale of Interactions of Brazilian Populations (Caiçaras and Caboclos) with Resources and Institutions

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## *Abstract*

*One important question concerning the sustainability of local or native populations refers to their interactions with local and global institutions. We should expect that populations with the capacity to interact economically and politically with institutions, might have a better chance for ecological and cultural continuity as well as for trade and subsistence. The level of ecological and social interaction of local populations, following concepts from ecology, occurs at different scales: for example, from the territories of individual fishers in the Atlantic Forest coast to communal organized Extractive Reserves in the Amazon. The scale of organization (individual/family/community) may influence the capacity to deal with institutions. This study analyzes how Brazilian native populations, especially caiçaras of the Atlantic Forest coast, and caboclos from the Amazon, have interacted with regional, national and global institutions, concerning environmental demands. Concepts such as common management, natural capital, resilience and sustainability are useful when trying to understand these illustrative cases.*

***Keywords:*** *sustainability, Brazil, population, Atlantic Forest, Amazon*

## Introduction

The purpose of this study is to analyze sustainability associated with local management and with the scale of interactions of Brazilian native populations, such as the caiçaras of the Atlantic Forest coast, and the Amazonian caboclos. This approach takes into consideration the scale and types of interactions among native populations and institutions, in light of local and global environmental concerns. The association of human ecology with ecological economics brings together concepts (such as capital, common property and resilience) that are useful for management at local and global levels. The key point regarding sustainability is that it ranges from a fine (low) to a coarse (high) scale: local sustainable regimes are a foundation for global sustainability, even if global sustainability is not *only* based on sustainable local regimes, and it requires institutional shifts at global levels *as well*. Brazilian cases, from communities of the southeast coast of the Atlantic Forest, called *caiçaras*, and from Amazon communities, called *caboclos*, are examples of resource users in areas of high biodiversity and are potential cases for management.

## The Caiçaras and the Caboclos

The information that follows is detailed in Begossi (1995a, 1996a and 1998a). Populations living in the southern part of the Atlantic Forest coast are called *caiçaras*, and are a sort of analogue of the Amazon *caboclo*: both descend from Indians and Portuguese and depend on agriculture and fishing for cash and for subsistence. The *caiçara* communities in this study are located on the northern coast of São Paulo State and southern coast of Rio de Janeiro State. In general, these communities have small populations, ranging from 12 families (islanders) to 100 (coastal communities).

Among the *caiçaras* agriculture is usually based on manioc (the main crop), but it may include potatoes, yams, beans, and a variety of fruits. In the processing of manioc to produce flour they utilize techniques, which go back to indigenous practices. These practices rid the manioc of toxic cyanidric acid. Many different plant species are used by the *caiçaras* for food, medicine, handicrafts and construction (Begossi et al. 1993).

Fish is the main source of animal protein for the *caiçaras*, ranging from 52% at Puruba Beach to 68% at Búzios Island and Gamboa (see Table 1). Common marine animals used for food and sale at Búzios Island are bluefish (*Pomatomus saltatrix*), squid (*Loligo sanpaulensis*) and halfbeak (*Hemiramphus balao*); at Puruba they are snook (*Centropomus parallelus*) and mullets (*Mugil* spp.), along with freshwater catfish; and at Sepetiba Bay they are shrimp (*Pennaeus schmitti*), sand drum, weakfish (many Sciaenidae), mullets and kingfish (*Menticirrhus americanus*).

The caboclos: just as for the *caiçaras*, manioc cultivation and production of manioc flour are typical of *caboclo* subsistence activities. Slash-and-burn techniques are used for

*Table 1*. The local diet of caiçaras, illustrating their dependence on local resources, especially fish.

| Locality [Southeast Atlantic Forest Coast) | Percent of local fish in diet | Reference |
|---|---|---|
| Ponta da Almada | 60 | Hanazaki et al. (1996) |
| Gamboa* | 68 | Begossi (1995a) |
| Jaguanum* | 65 | Begossi (1995b) |
| Puruba Beach | 52 | Begossi (1995b) |
| Búzios Island | 68 | Begossi and Richerson (1993) |

cultivation. A variety of fruits from trees and from the highly diverse species of palms, are collected in the Amazonian forest. While we found communities showing a detailed knowledge of medicinal plants, other communities seem to have lost part of this knowledge.

*Caboclo* livelihood is based on small scale agricultural activities such as the cultivation of manioc, maize, rice, beans, water melon and papaya. *Caboclos* also fish in rivers, *igarapés* (small rivers) and *igapós* (flooded forest). River water level is usually important for the *caboclos* because their subsistence activities rely on river conditions: when the water is low ("summer") fishing is an important activity; when the water is high, in the wet season ("winter"), wildlife hunting in the forest tends to be important for subsistence. At the Upper Juruá Extractive Reserve, *mandí* (species of *Pimelodella, Pimelodina* and *Pimelodus*), surubim (*Pseudoplatystoma fasciatum*), Curimatidae (*Prochilodus nigricans*), as well as species of the families Loricariidae (*bodes*) and Anostomidae (*piau*) are very important for consumption. We observed that game was a very important protein source in the wet season at the Upper Juruá, when deer, peccaries, monkeys, and small-rodents are hunted (Begossi et al. 1996a). *Caboclos* and *caiçaras* both have a detailed knowledge of their environment. *Caiçaras* and *Caboclos* show different levels of interaction at the regional, national and at global scale.

## Sustainability: A Fuzzy Concept?

According to the well known definition of the Brundtland Report in 1987, sustainability concerns meeting the needs of present generations and preserving the opportunities available to future generations (Perrings 1994). Sustainability embodies a variety of additional meanings. Goldman (1995) provides different definitions of sustainability found in the literature, from food efficiency, to stewardship, to the capacity for indefinite survival of the human species. Gatto (1995) shows definitions given by the applied biologist (sustained yield), the ecologist (sustained abundance and biodiversity), and the economist (similar to the Brundtland Report definition). Goodland (1995) describes social, economic and environmental sustainability. These definitions show how sustainability is a difficult concept to grasp. Ehrlich (1994) alerts us to the fallacy of a general assumption (including here the Brundtland report), that global economic activity can be safely multiplied five- to ten-fold, or even more. The author stresses how the level of knowledge in ecology is still insufficient to determine how much biodiversity should be preserved in order to avoid large regional and even global collapses of ecosystem services.[1] For Holling (1994) sustainable development is a paradox because something must change and something must remain constant. One paradox suggests that the diversity of life is a function of a small set of variables, each operating at different speeds, with a few structuring processes occurring at different scales: ecosystem dynamics include a small number of nested cycles, each driven by a few dominant variables. Another paradox suggests that the management of ecological variables leads to more brittle ecosystems, more rigid management institutions, and more dependent societies.

One of the central questions is how to link sustainability in a gradient scale from local to global, including criteria, rules, rights, and institutions that work towards it. Local and small communities are linked to a global world, and local behaviors that transcend *in situ* responses are important variables that affect a community's ability to reach sustainable local development. These are central points to this study, illustrated with particular cases from the southeast coast (Atlantic Forest) and northern (Amazon) Brazil.

## The Global World

According to Ferreira and Viola (1996) globalization embodies different perspectives in different times of history, as follows: in the *military*, since 1950, when two poles were represented by the USSR and the USA, in *politics*, since 1945 when the United Nations Organization was conceived (including IMF, World Bank, and G7, among others), and in the *economy*, when the multinational corporations that arose in the 1950s were followed by transnational corporations. *Cultural* globalization was stimulated by the transmission of the American way of life associated with communication improvements, such as fax, e-mail, and world TV channels. *Environmental* world problems gained social attention in the 1980s. These included climate change, the ozone layer, biodiversity, chemical and radioactive contamination, energy conservation, population growth and health. Also in the 1980s, thanks to communication facilities, *technological and scientific* development became global with frequent exchanges and communication among universities and research centers on a worldwide scale.

In Brazil, new relationships concerned with politics and the environment are also the result of world global interactions. Viola (1996) shows a detailed sketch of these interactions, creating group categories such as nationalists, globalists, sustainabilists, progressive and conservative. Our study addresses what Viola (1996) calls "progressive-nationalists-sustainabilists" or "progressive-globalists-sustainabilists," which include actors interested in approaching sustainable development and social justice. The difference between the two is related to beliefs about the level of interference that the national state should be allowed to have in order to carry out a sustainable program. A supranational institution dealing with a planetary socioenvironmental crisis is considered important by globalists, but not by nationalists (Viola 1996).

This study asks the following questions. First, how do local communities respond to these new relationships and categories? Second, how are local approaches (such as local management) tied to the categories shown?

## Scale: Local Communities and Interactions

Scale is a basic question for general ecology, since different questions are drawn and analyzed according to the level approached (Begossi 1996b). Scale refers to resolution (such as spatial, grain size, time step), and to time, space, and number of components modeled (Constanza 1996). Solbrig (1992) shows that different levels of analysis on biodiversity are fundamental for management: moving from the biodiversity of genes, to that of species (the ultimate source of biodiversity), to the community (patterns of species richness), to biogeographical patterns such as spatial scale, immigration and extinction, and to ecosystem levels (the biosphere and global change).

Patterns of scale related to conservation, in a fine/low/local scale, include knowledge of species, population dynamics, resource uses and users, and the value of natural resources. At coarse/high/broad scales, they include common management,[2] landscape ecology, and political ecology (Begossi 1996b).

In both ecology and economics, primary information and measurement are collected at small scales (plots, firms) and are used to build models at regional or global scales (Constanza 1996). Levin (1992) stresses that there is no 'correct' scale on which to study populations or ecosystems, and that we should understand how information is transferred from fine to broad scales. According to Holling (1994) the lessons for both sustainable development and biodiversity are clear because the physical and temporal infrastructure of biomes at all scales sustain the 'theater.'

In human ecology, information is usually collected from local communities at small scales, such as individuals or families. As in general ecology and ecological economics, a tricky question is how to use local information to make general predictions and analyses that go beyond the local community and extend to global issues. For example, how is the information collected on local subsistence used for general propositions of management, integrated with regional, national and global institutions? The case studies in this research will illustrate this point.

## Scale of Interactions of the Communities

The caiçaras' strategies for decision-making concerning fishing or farming, or even local disputes, are variable among communities. In some communities, such as at Búzios island, the lineage system based on kinship is dominant. Decisions are usually a family task and leadership is an attribute of the older community members, who are usually consulted over problems related to the community (Begossi 1996a).

On the other hand, at Sepetiba bay, fishermen discuss communal problems at organized meetings and leadership is a consequence of local fishing activities. Fishermen perceive both the importance of the bay as a spawning and growing area for marine organisms, and the impacts caused by the industrial fishery. Fishermen involve local politicians and the local press in the defense of the bay against intruders, such as industrial fishermen (Begossi 1995a).

Contrary to the informality of most *caiçaras* in dealing with internal and external questions, *caboclos* are organized in associations and participate in local environmental politics. For example, fishermen from the Lower Amazon river have developed new management strategies for lake fisheries that involve excluding outsiders and regulating fishing activities (McGrath et al. 1993). Rubber-tappers (*seringueiros*) have organized themselves in associations and created Extractive Reserves, an example of common management practice.

Extractive Reserves are defined as "forest areas inhabited by extractive populations granted long-term usufruct rights to forest resources which they collectively manage" (Schwartzman 1989). Usufruct rights means that *caboclos* can exploit and manage the forest, but that they are not allowed to sell any area of the Extractive Reserve. The first Extractive Reserve (Upper Juruá) was legally established in 1990. This reserve is located in the State of Acre in Brazil. It includes about 860 families of rubber-tappers and small farmers and it is managed by the ASAREAJ (Association of Rubber-Tappers and Farmers of the Extractive Reserve of the Upper Juruá *Associação dos Seringueiros e Agricultores da Reserva Extrativista do Alto Juruá*) and by the CNS (National Rubber Tapper Council - *Conselho Nacional dos*

*Seringueiros*). The organization of the reserve is an activity involving local people in meetings, along with researchers, and representatives of the councils. As a result of local meetings, in 1994, the first management plan was proposed by the Rubber-Tapper Council and approved by the Environmental Federal Agency (IBAMA).

*Caiçaras* have responded to local conflicts involving industrial fishing and state environmental regulations (Begossi 1995a) at very specific levels, usually at an individual-family scale. *Caboclos*, influenced by the Liberation Theology and leftist parties, built strong political organizations and movements, that culminated in the common management of resources throughout the Extractive Reserves. In the case of the Alto Juruá, State of Acre, communications among the scattered families along the Juruá river were through the radio *Verdes Florestas* (Begossi 1998a). The range of *caboclo* action includes local communities (alliances of the Forest People), regional politics (Worker and Communist parties: *Partido dos Trabalhadores and Partido Comunista do Brasil*, among others), national politics (the creation of Extractive Reserves) and transnational behavior (such as *Chico Mendes* case). The different behavior of *caiçaras* and *caboclos* as well as their different approach to local and regional institutions led to different practices for management and conservation. Observe that to work towards a common management practice, it is important to interact at higher scales, beyond individual-family levels.

*Table 2.* Scale of resource distribution, ownership and management (based on Begossi 1996b).

| Resources | Scale of ownership | Management |
|---|---|---|
| Specific, defined patch | Individual, family | Local rules, kinship |
| Forest, bay, lake | Community, Village | Local, Common management: Extractive Reserve |

## Market Demands

Both *caiçaras* and *caboclos* local subsistence and economy is based especially on fish, on the production of manioc flour, and (in case of *caboclos*) on rubber and nuts, with participation in the regional market. Regional market demands affecting the *caiçaras* were associated with the economic cycles of the last century, such as sugarcane (before 1800), coffee (1800-1870), and again sugarcane (including the production of rum) in the first half of this century (França 1954). After the fifties, fishing replaced agriculture as a source of cash (Begossi et al. 1993).

The *caboclos* participation in the regional economy was especially through agriculture, such as the production of rice, juta (*Corchorus* sp) and malva (*Malva rotundifolia*), and among others; mining, timber extraction, cattle ranching and extraction of rubber and nuts (Fearnside 1991). Moran (1993) stressed the importance of cattle ranching as a source of deforestation in the Amazon. Deforested areas represent about 10.5% of the original forest. (Fearnside, 1995). Commercial fishing replaced agriculture in the area of the Amazon *varzea* (floodplain), as showed by McGrath et al. (1993). In contrast to the Atlantic Forest, the Amazon has always been an area of international attention. For example, international agencies, such as the World Bank and IDB (Interamerican Development Bank) lend funds for projects in the Amazon such as the Polonoroeste (Northwest Regional Development Pole), Planacre, and Grande Carajás (mineral deposits) (Fearnside 1987).

Besides the local subsistence and the regional economic cycles, associated with both *caiçaras* and *caboclos*, international attention, funding and projects have usually been a typical feature for the Amazon region. Because of this historically international focus on the Amazon, *caboclo* communities and culture have been more tied to the global economy and relationships than the *caiçaras* of the Atlantic Forest.

Local history along with political alliances, and international interactions might explain why we find a communicative and interactive behavior among the *caboclos*, and relatively isolated behaviors among the *caiçaras*. The importance of historical patterns of settlement, of colonization, and of economic interactions associated with environmental degradation are found in the literature (Amanor 1994; Franke and Chasin 1980).

The relative political isolation of *caiçaras* is currently helped by a high degree of religiosity, with many adepts of Pentecostal Churches (God Assembly, Christian Congregation, and Adventists, among others). Most adepts change their original lifestyle, participating intensely in church activities and avoiding social activities in which the church is absent (parties, meetings, TVs, radios). With regard to the *caboclos*, international concerns were historically associated with Amazonian areas. International environmental concerns regarding the Atlantic Forest are more recent and do not have the same tradition as that found in the Amazon.

## Scale and Resilience: From Local to Global Issues

The term *resilience* is an ecological concept associated with stability. It represents the ability of a system to maintain its structure and function after disturbance. It is characterized by events far from the equilibrium, it stresses the boundaries of stability, and it shows a high degree of adaptation and variability (Jansson and Jansson 1994). Holling (1992) defined

cycles organized by four functions: exploitation, conservation, release and organization. In this case, resilience is determined by the release and reorganization sequence.

Cultural behaviors may contribute to ecological resilience via practices that increase biodiversity or avoid overexploitation (Folke et al. 1998). Many have interesting attributes. On the one hand, it is the high flexibility of human behavior that made humans adaptable to different environments. On the other hand, human behavior may be very conservative and hard to change (or resistant), as seen in traditions. Changes of behaviors, or the maintenance of traditions, may or not be ecologically sound, depending on the context of the interaction between resources and users.

The high variability of *caboclo* interactions, and *caboclo* responses associated with their communicative interaction with institutions at various scales, has resulted in a resilient system of management (Extractive Reserves), when compared to the *caiçaras'* predominantly individual-family management practices. The implications of such behaviors, that transcend the local community to interact at various scales, are important for management, because:

a) the resilience of the ecological system increases, because locals are managers of natural resources. It is not a case where the State regulates some area, only officially defined, such as a conservation area without clear boundaries and supervision;

b) the resilience of the cultural system becomes strong, because community members may increase their capacity to survive in terms of the local economy, subsistence and cultural attitudes;

c) the community may guarantee, at a national level, the state contribution to local initiatives (such as the legalization of Extractive Reserves by the IBAMA). It is politically important for the so called "nationalists-sustainabilists";

d) the community may enforce their local/national management approach through international pressures (for example, Extractive Reserves, or the Chico Mendes case), a politically important attribute for "globalists-sustainabilists."

When incorporating the concepts of natural capital and human-made capital,[3] a sustainable society is defined by Ferreira and Viola (1996) as maintaining the natural capital available, or compensating for it through development of human made capital, and reducing the depletion of natural capital (allowing it for future generations). Daly (1994) observed that sustainability has also been incorporated into the definition of income as the maximum amount that a community can consume over some period and still have the same amount at the end of the period, as at the beginning. The author pointed out the definitions of *strong* and *weak* sustainability: the first considers natural and man-made capital as substitutes; the second view considers them as complements. Even if a weak sustainability might improve current practices, strong sustainability is what really matters in the global environmental context, because production of man-made capital depends on the availability of natural capital. Daily and Ehrlich (1996) stressed that carrying capacity embodies the concept of sustainability: it is any process maintained without interruption, weakening or loss of valued qualities.

The problem facing those who want to promote sustainability is to define the mechanisms needed to accomplish it. For example, global information, reforms of government and institutions, information on how to address sociological, political and ethical factors, on how we manage systems, on how to preserve genetic, ecological and indigenous knowledge, on how to equitably limit world population, and other factors, can help communities to reach sustainability (Folke et al. 1994). Recently, Daily and Erhlich (1996) addressed the relationship between sustainability and equity at different scales: they took into consideration food production and gender inequity. They also considered distribution of land among farmers, between urban and rural populations, and between nations.

Ecological economics deals with the problem of scarcity of resources, or with depletion of natural capital, a question not included in classical economics, which was performed for an "empty world", or a world without limits for exploitation (Hardin 1993). As pointed out by Constanza (1996), ecological economics views the socioeconomic system as part of the overall ecosphere, emphasizing carrying capacity and scale issues associated with human population growth, systems of property rights and wealth distribution. Folke et al. (1994) stressed that the approach of ecological economics should include the following points: a) evolutionary paradigm - it incorporates uncertainties, surprises, learning, multiple equilibria, and thermodynamic constraints; b) scale and hierarchy - or how hierarchical levels interact with each other, related to the question of scaling complex, regional, ecological and economic systems; and c) nature and limits of predictability - there may be limits to the predictability of a natural phenomenon at particular resolutions and we should access rules of how data and model predictability change with resolution.

Bergh and Straaten (1994) compared economic systems and their relation to the environment and their degradation capacity, over time. Hunting, agriculture and "modern" economies are compared. In hunting/fishing economies, the economy is viewed as stable with no technological changes and population increases; in agricultural economy, population and technological changes occur[4] and local environmental effects are noticed. In modern economy, mineral resources are introduced along with investments and residual processes. The examples described by Bergh and Straaten (1994) are

useful frameworks to consider when examining neo-traditional[5] populations of *caiçaras* and *caboclos* as agricultural economies (small-scale agriculture), where slight changes in technology and population may cause local degradation, but strong links to modern economies exists.

Sustainability for *caiçaras* and *caboclos* means a local managed system with institutional (local, regional and global) support. Still Extractive Reserves[6] are a fair example: they are common managed areas (*res communes*) with legal and governmental support in which local behaviors may be used for ecologically sound practices.

## Conclusions

The association of ecology, in particular of human ecology, with ecological economics brings with it the possibility of new approaches to management, using concepts such as scale, resilience, natural capital, and common management. National environmental policies are influenced by international and global variables, and by local Amazonian *caboclo* populations. Local influences are exemplified by Extractive Reserves, an example of common management. A less communicative or more isolated behavior is observed among the *caiçaras* of the Atlantic Forest coast: their systems of resource use and dispute resolution seldom go beyond family-community levels. On the other hand, *caboclos* interact at various scales with institutions, and have formed a variety of alliances, from other native populations (Forest People) to international institutions. Their behavior is consistent with progressive-globalists-sustainabilists categories. A central question, remains: how can *caiçaras* interact at higher scales? Initiatives that avoid patronizing by institutions (the state or universities) but include local decisions and participation are exemplified by *caboclo* experiences.

## Endnotes

1. Ecosystem or environmental services are the result of the structure and function of ecosystems. They include maintenance of air quality, climate, the hydrological cycle, recycling of nutrients, pollination, and maintenance of a genetic pool, among others (Berkes and Folke, 1994).
2. In a common property, communal property, or community-based management systems (*res communes*) individuals have claims on collective goods as members of groups. In these regimes, resources are managed by rules for user-groups and their continual use depends on other group members. Other regimes are open-access (*res nullius*, or free-for-all) and state property (*res publica*) (Berkes and Farvar, 1989; Gibbs and Bromley, 1989).
3. *Natural capital* includes non-renewable resources, renewable resources, and environmental services. *Human made capital* is generated through economic activity and technology (economist definition of capital). *Cultural capital* refers to factors that provide human societies with means and adaptations to deal with the environment and to modify it (Berkes and Folke 1992).
4. Following Boserup's (1981) theory.
5. Neo-traditional systems are defined as including elements from traditional and newly emergent systems (Berkes and Folke 1994). They include, besides traditional knowledge, new variants and knowledge that comes from outside the population. For this approach on *caiçaras* and *caboclos*, see Begossi (1998a).
6. The term extractive reserve is originally related to the extraction of rubber and nuts. Recent developments and practices show that extractive reserves must include a variety of other economic activities, such as small-scale agriculture, handicrafts and local markets for medicinal plants, among others (Begossi, 1998b).

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## References

Amanor, K. S. 1994. Ecological knowledge and the regional economy: Environmental management in the Asesewa District of Ghana. In D. Ghai (ed.), *Development and Environment*, 42-67. Oxford: Blackwell

Begossi, A. 1995a. Fishing spots and sea tenure: Incipient forms of local management in Atlantic Forest coastal communities. *Human Ecology* 23(3), 387-406.

Begossi, A. 1996a. The fishers and buyers from Búzios Island (Brazil): Kin ties and modes of production. *Ciência e Cultura* 48(3), 141-147.

Begossi, A. 1996b. Scale, ecological economics, and the conservation of biodiversity. Proceedings of the Workshop Environment, Development and Politics, Recife, April 22-25.

Begossi, A. 1998a. Resilience and neotraditional populations: The caiçaras (Atlantic Forest) and caboclos (Amazon). In Berkes, F. and C. Folke (eds.), *Linking Social and Ecological Systems for Resilience and Sustainability*, 129-157. Cambridge: Cambridge University Press.

Begossi, A. 1998b. Extractive Reserves in the Brazilian Amazon: An example to be followed in the Atlantic Forest? *Ciência e Cultura* 24-28.

Begossi, A., H. F. Litão-Filho and P. J. Richerson. 1993. Plant uses in a Brazilian coastal fishing community (Búzios Island). *Journal of Ethnobiology* 13 (2), 233-256.

Bergh, van den C. M. J. and Straaten, van der J. 1994. Historical and future models of economic development and natural environment. In C.M.J. van den Bergh and J. van der Straaten (eds.), *Toward Sustainable Development*, 209-234. Washington, DC: Island Press.

Berkes, F. and M. T Farvar. 1989. Introduction and overview. In F. Berkes (ed.), *Common Property Resources*, 1-17. London: Belhaven Press.

Berkes, F. and C. Folke. 1992. A system perspective on the interrelations between natural, human made and cultural capital. *Ecological Economics* 5, 1-8.

Berkes, F. and C. Folke. 1994. Linking social and ecological systems for resilience and sustainability. *Workshop Property Rights and the Performance of Natural Resource Systems*. Stockholm: The Beijer Institute of Ecological Economics, August 1994.

Boserup, E. 1981. *Population and Technological Change*. Chicago: University of Chicago Press.

Constanza, R. 1996. Ecological economics: Reintegrating the study of humans and nature. *Ecological Applications* 6(4), 978-990.

Daily, G. and P. R. Ehrlich. 1996. Socioeconomic equity, sustainability, and earth's carrying capacity. *Ecological Applications* 6(4), 991-1001.

Daly, H. E. 1994. Operationalizing sustainable development by investing in natural capital. In A. Jansson, M. Hammer, C. Folke and R. Costanza (eds.), *Investing in Natural Capital*, 22-37. Covelo, CA: Island Press.

Ehrlich, P. 1994. Ecological economics and the carrying capacity of earth. In A. Jansson, M. Hammer, C. Folke and R. Costanza (eds.), *Investing in Natural Capital*, 38-56. Covelo, CA: Island Press.

Fearnside, P. 1987. Deforestation and international economic development projects in Brazilian Amazonia. *Conservation Biology* 1(3), 214-221.

Fearnside, P. 1991. Uso de terra predominantes na Amazônia brasileira. In *Alternativas para o Desmatamento*, 1-25. Belém: Museu Paraense Emîlio Goeldi.

Fearnside, P. 1995. Quem desmata a Amazônia, os pobres ou os ricos? *Ciência Hoje* 19, 26-33.

Ferreira, L. C. and E. Viola. 1996. Introdução. In *Incertezas de Sustentabilidade Na Globalização*. 7-14. Campinas: Ed. Unicamp.

França, A. 1954. A *Ilha de São Sebastião*. Boletim 178, Geografia no.10., São Paulo: Universidade de São Paulo.

Franke, R. W. and B. H. Chasin. 1980. *Seeds of Famine*. New Jersey: Landmark Studies, Rowman and Allanheld.

Folke, C., M. Hammer, R. Costanza and A. Jansson. 1994. In A. Jansson, M. Hammer, C. Folke and R. Costanza (eds.), *Investing in Natural Capital*, 1-20. Covelo, CA: Island Press.

Folke, C., F. Berkes and J. Colding. 1998. Ecological practices and social mechanisms for building resilience and sustainability. In F. Berkes and C. Folke (eds.), *Linking Social and Ecological Systems for Resilience and Sustainability*, 414-436. Cambridge: Cambridge University Press.

Gatto, M. 1995. Sustainability: Is it a well defined concept? *Ecological Applications* 5(4), 1181-1183.

Gibbs, C. J. N. and D. W. Bromley. 1989. Institutional arrangements for management of rural resources: Common-property regimes. In F. Berkes (ed.), *Common Property Resources*, 22-32. London: Belhaven Press.

Goldman, A. 1995. Threats to sustainability in African agriculture: Searching for appropriate paradigms. *Human Ecology* 23(3), 291-334.

Goodland, R. 1995. The concept of environmental sustainability. *Annual Review of Ecology and Systematics* 26(1), 1-24.

Hardin, G. 1993. *Living Within Limits*. Oxford University Press.

Holling, C. S. 1992. Cross-scale morphology, geometry, and dynamics of ecosystems. *Ecological Monographs* 62(4), 447-489.

Holling. C. S. 1994. New science and new investments for a sustainable biosphere. In A. Jansson, M. Hammer, C. Folke and R. Costanza (eds.), *Investing in Natural Capital*, 57-73. Covelo, CA: Island Press.

Jansson, A. and B. Jansson. 1994. Ecosystem properties as a basis for sustainability. In A. Jansson, M. Hammer, C. Folke and R. Costanza (eds.), *Investing in Natural Capital*, 74-91. Covelo, CA: Island Press.

Levin, S. A. 1992. The problem of pattern and scale in ecology (The Robert H. MacArthur Award Lecture). *Ecology* 73(6), 1943-1967.

McGrath, D. G., Castro, F. Futemma, C. Amaral, B. D. and J. Calabria. 1993. Fisheries and the evolution of resource management on the Lower Amazon floodplain. *Human Ecology* 21(2), 167-195.

Moran, E. F. 1993. Deforestation and land use in the Brazilian Amazon. *Human Ecology* 21(1), 1-21.

Perrings, C. 1994. Biotic diversity, sustainable development, and natural capital. In A. Jansson, M. Hammer, C. Folke and R. Costanza (eds.), *Investing in Natural Capital*, 92-111. Covelo, CA: Island Press.

Schwartzman, S. 1989. Extractive Reserves: The rubber tappers' strategy for sustainable use of the Amazon rainforest. In J. Biowdev (ed.), *Fragile Lands of Latin America, Strategies for Sustainable Development*, 150-165. Westview Press.

Solbrig, O. T. 1992. The IUBS-SCOPE-UNESCO program of research in biodiversity. *Ecological Applications* 2(2), 131-138.

Viola, E. 1996. A multidimensionalidade da globalização, as novas forças sociais transnacionais e seu impacto na política ambiental no Brasil, 1989-1995. In L. C. Ferreira and E. Viola (eds.), *Incertezas de Sustentabilidadena Globalização*, 15-66. Campinas: Ed. Unicamp.

# Landscape Change in Yucatan's Northwest Coastal Wetlands (1948-1991)

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## *Abstract*

*A planimetric analysis was made of aerial photographs from 1948, 1979 and 1991, to observe changes in and loss of vegetation in the region between the ports of Progreso and Sisal, Yucatan, Mexico. This analysis shows that in the 43 years between 1948 and 1991, 174.4 km² of the region's vegetation has been altered, with a 4.05 km² annual absolute rate of change. The study area has been influenced by: 1) road construction; 2) opening of the Yucalpeten harbor; 3) population growth; 4) saltwater intrusion through coastal sandbar breaches; and 5) freshwater spring sedimentation. Some chronic, anthropogenic stressors can decrease the natural recovery process during rainy periods. The continuing restoration activities in the region are commendable as they improve coastal wetlands' ability to cope with stress, and control energy loss. An educational program should be developed that provides community members the opportunity to understand and conserve the environment.*

***Keywords:*** *landscape change, cyclic succession, human activities, mangrove forest, coastal zone, Mexico*

## Introduction

Coastal wetlands are self-maintaining landscape units that are responsive to long-term geomorphological processes and have continuous interactions with contiguous ecosystems. They are open systems with respect to both energy and matter (*i.e.*, they receive freshwater and nutrient inputs, and export organic matter toward the sea) and thus can be considered "interface" ecosystems, coupling upland terrestrial and coastal ecosystems (Lugo and Snedaker 1974, 39-64). Mangrove swamps are the most common type of wetland along the coast of the Yucatan Peninsula (Olmsted 1993, 637-677), and have played an important part in the local economy for thousands of years. They constitute a reservoir and refuge for many unusual plants and animals, as well as supporting commercial and recreational fisheries, and serving many other direct and indirect functions (Hamilton and Snedaker 1984).

Of 569 sites on the Ramsar list of wetlands of international importance, at least 84% are undergoing ecological changes, which are principally related to changes in the hydrologic regimen due to socio-economic activities (Dugan 1992). In Yucatan, one of the most severe problems that affect coastal wetlands are the construction of highways, railroads, dams, and ports (Paré and Fraga 1994). Presently, the government of the State of Yucatan is working on an Environmental Restoration and Improvement Program at the ports of Progreso and Sisal. This program includes the clearing of freshwater springs, culvert construction, natural drainage system reclamation, highway bridge construction, and community training involving information exchange.

In the present study a planimetric analysis was made of aerial photographs from 1948, 1979 and 1991 to estimate vegetation type changes in a 250 km² coastal region between the ports of Progreso and Sisal. A bibliographic review and empirical data are included to describe environmental characteristics and human activities. These descriptions are used to evaluate the main factors controlling coastal landscape dynamics, wetlands stress, succession patterns and mangrove tree mortality, in order to develop an hypothesis explaining local phenomena. It was anticipated that the coastal wetlands landscape in Yucatan has changed not solely because of human activities, but due to a combination of natural and anthropogenic stressors. However, human stressors can weaken wetlands, and make them more susceptible to further natural stress.

## Study Area

The study area is located on the northwest coast of the Yucatan Peninsula (Figure 1), between the ports of Progreso

(21˚ 17' 18" LN and 89˚ 39' 15" LW), and Sisal (21˚ 10' 06" LN and 90˚ 01' 30" LW). According to Garcia (1978), this zone has an arid and semi-arid climate (BSo(h')w(x')), with an average annual temperature variation between 25.5 and 26.5˚ C, and total annual precipitation between approximately 450 to 580 mm. Evaporation is the dominant hydrological process in the region, with values of 1959 mm per year.

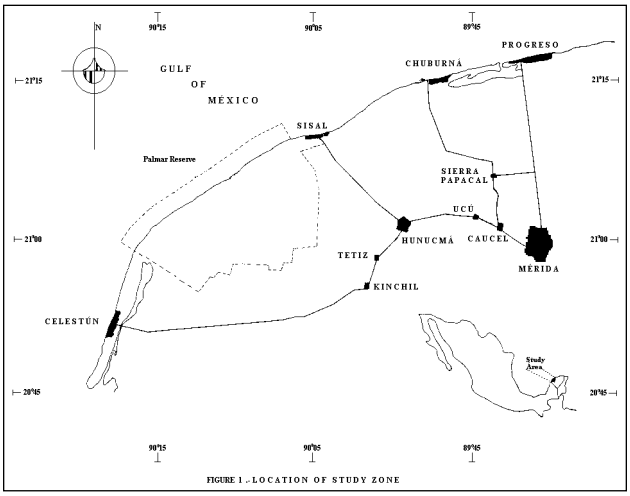


FIGURE 1 - LOCATION OF STUDY ZONE

This area is formed by marine Tertiary carbonates that have been subjected to extensive mechanical and chemical dissolution. Holes and cavities have been formed by rainfall infiltration and sea level fluctuations, creating a highly permeable aquifer. There are no surface streams and the high degree of karstification permits rapid infiltration. Collapse of cavities in the substrate produces the dolines and coastal springs known locally as *cenotes*. An extensive freshwater lens exists above a salt-water intrusion zone that penetrates more than 40 km inland. This lens is confined along the north coast by the coastal aquitard, a thin, planar, nearly impermeable calcareous layer. The interaction of saltwater inputs from the ocean and freshwater inputs from the confined underground aquifer forms the natural hydrology of wetlands (Perry et al 1989, 818-821). In the study area freshwater flow, from springs, controls the salinity gradient. Mangrove is a generic term referring to communities composed of trees usually not more than 8-12 m tall that permanently occupy coastal areas, or periodically inundated areas, where the main physiological trait is the plants' ability to grow in a regime of fluctuating salinity. The mangroves within the study area are classified in four types:

*Low swamp mangrove*. This mangrove occupies the lowest parts of the basin, located nearest the coastal sandbar. It tends to grow as shrubs, with heights of 3 to 5 m, and to form islands of vegetation within the swamp. It is inundated almost year-round, though principally during the fall rainy season, when inundation reaches its highest level and is affected by the marine tidal flux. This mangrove can grow in soils with high salinities, such as areas mixed with salt flats. Due to the swamp hydrologic dynamic, and the fact that water flow in these areas parallels the coast, this mangrove is affected by flow alterations caused by road and port construction that interrupt natural water flow and increase sedimentation. The principal species in this community is *Avicennia germinans*, followed in importance by *Rhizophora mangle*, the latter tending to die rapidly as it is apparently more affected by habitat alteration. Some marine grasses such as *Thallasia testudinum* and *Halodule wrightii*, and macroalgaes such as *Enteromorpha oerstedi*, are habitats of a great variety of resources as shrimps and fishes larvaes.

*Shrub mangrove*. Present in zones with severe growth and development limitations, this mangrove develops on marl soils (calcium carbonate and clay). It is temporally deluged, and reaches its maximum water level after the rainy season. The salinity regimen varies according to its relation to nearby freshwater, brackish or saline environments. These mangroves, *Rhizophora mangle* and *Avicennia germinans*, vary in density from extremely dense and impassable to dispersed. In extreme cases, the density is so low that they form savanna communities, dominated by grasses (Gramineae and Ciperaceae). They tend to grow as shrubs, with heights of 1 to 1.5 m, rarely surpassing 2–3 m, and occupy intermediate parts of the basin, forming a wide band between the low swamp and high basin mangrove.

*High basin mangrove.* A low, very dense arboreum community, consisting basically of *Conocarpus erecta*, *Laguncularia racemosa* and occasionally *Avicennia germinans* forms this. Since it is found in internal basin areas, it can form transitional zones (ecotones) with the inland low flooded or low dry forests. It is possible that this mangrove does not have marine influence, except in special conditions such as those during strong storms.

*Petenes (Hammocks)*. One of the most notable characteristics of the Yucatecan coast, is the presence of islands of vegetation commonly called *petenes*. The word *peten* comes of the Mayan and means high fields or plains. The *petenes* exist due to a soil level increase relative to adjacent areas. This increase controls the inundation period and permits the growth of mangrove and forest plants. All *petenes* within the study area have one or more springs, generally in their center. *Peten* vegetation is very diverse and can reach heights of more than 20 m. It consists of species such as *Rhizophora mangle, Laguncularia racemosa, Avicennia germinans, Typha dominguensis, Cladium jamaicencis, Manilkara sapota, Ficus tecolutensis, Sabal yapa, Bravaisia tubiflora,*

*Acrostichum aureum* and *Hymenocallis littoralis*, among others, and is mainly intercalated in the scrub mangrove.

*Low flooded forest and low forest with savanna*. Found on the southern border of mangrove vegetation and related coastal landscape, the low flooded forest is located in the transition zone between the low deciduous and mangrove forests, with seasonal freshwater inundation and good drainage. This sort of vegetation forms a rich mosaic with trees reaching to 12 m in height. Species in this forest include *Manilkara sapota, Brosimum alicastrum, Thevetia sp, Plumeria sp., Annona glabra, Bucida buceras, Metopium brownei, Haematoxilum campechianum, Conocarpus erectus* and *Thrinax radiata*. Inside this forest there are aquatic plants such as *Typha dominguensis* and *Nymphaea ampla*. Seasonally inundated with fresh to brackish water, the savanna has fewer species, with grasses such as *Eleocharis cellulosa* and *Cladium jamaicencis* and other Gramineae and Cyperaceae dominating, and isolated elements of *Crescentia cujete* and *Byrsomina crassifolia.* It is intercalated with some scrub mangrove trees (Olmsted 1993, 637-677).

## Socioeconomic Development

The northwest coast of Yucatan was settled by the Maya long before arrival of the Spanish, though significant development did not begin until the mid-1800's (Table 1). The major economic activities in this area were salt production and fishing, activities still quite important to Mayan descendents. Modern coastal development, and especially port development, was originally stimulated by commerce such as the export of goods such as *henequen* or sisal (Meyer-Arendt 1993, 103-117).

During most of the Colonial period, the city of Campeche, approximately 200 km southwest of Mérida, was the principal seaport for the Yucatan Peninsula. Beginning in the first decade of the 16th century, the fishing settlement of Sisal, approximately 50 km northwest of Mérida, was the official port of the State of Yucatan. Sisal saw the beginnings of *henequen* fiber export, and its history was strongly linked to this industry's vicissitudes. During the height of *henequen* production, the coast's population was concentrated at Sisal. However, Sisal was frequently inaccessible during the rainy season, and as the export market for *henequen* increased in the 1830's, a new port, Progreso de Castro, displaced the port of Sisal. Progreso was established in 1856 as a site closer to the state capital at Mérida.

At the end of the 19th century a crude 32-km road from Mérida to the new settlement was constructed, and the first railroad service between Mérida and Progreso began (Meyer-Arendt 1991, 327-336). The first public notice of human activities' environment impacts on Yucatecan coastal wetlands was published in the article called "The Health of Progreso City and Port" by Arturo Schafer in *El Horizonte* newspaper (published February 26, 1893 at Progreso Puerto; -R. Frías Bobadilla Hemerotec). According to the article "... [T]he sedimentation process that the Progreso Puerto swamp is suffering, due to the railroad, results in a flow obstruction that causes a water level decrease related to the high evaporation in this very hot climate... [and] promotes palustrine diseases... [I]t is necessary and urgent to construct more culverts to allow for water flow and, open two canals in the sand barrier to obtain incoming sea water and promote the movement of water masses — If not, there will be more problems in the water healt" (Batllori et al 1993).

Although the primary function of the railroad was to export *henequen*, Mérida residents quickly discovered Progreso's beaches, and wealthy families soon began to build summer homes. In 1928, the Mérida-Progreso highway was paved, and in 1947, the 2 km-long concrete wharf at Progreso was completed. Shorefront urbanization extended to the east and west of Progreso. In the middle of the present century the Mérida-Hunucmá-Sisal highway was paved. Sisal continues being a quiet port, engaged in fishing for local consumption, wood cutting and coconut cultivation. In the decades following the highway's paving, sport hunting (especially for wild ducks) by hunters from outside the region increased, with a large number of the local population serving as guides.

In 1968 the Yucalpetén harbor was opened for the Progreso fishing fleet as a solution to lack of adequate docking space, as well as for protection from storm waves. The port was created in the back barrier lagoon, and forced the relocation of the coastal highway to Chelem. A channel entrance was excavated through the coastal sandbar, and jetties built to prevent sedimentation. Yucalpeten harbor provides a base for the Mexican Navy, the Progreso fishing fleet, and a growing seafood processing industry (Meyer-Arendt 1993, 103-117).

As the *henequen* industry faltered in the 1970's and 1980's a huge population displacement occurred from inland, *henequen*-growing areas towards the coast. In 1980, Progreso's population was 28,902, with an annual growth rate of 4.8%. In 1988 the population grew to 41,686, with 6,836 permanent residences. This immigration-based population growth has resulted in the expansion of urban areas into the swamp as immigrants are forced to settle on swampland filled with garbage, sand, and stones. This on-going trend will be one of the contributing factors to the gradual deterioration of vegetation and wildlife in coastal ecosystems (Paré and Fraga 1994).

However, these same trends - the flow of capital to the port, land communication with the interior, the government policy of encouraging migration of *henequen* farmers toward

the coast - have not produced a real demographic revolution in Sisal. The General Censuses of Population of the State of Yucatan for 1970 and 1990 show a growth from 711 to 1,460 inhabitants in Sisal. Vacation home development in the area has continued throughout the 1990's, creating an urban area stretching from Chuburná Puerto east to Chicxulub Puerto. Fishing, hunting, tourism, salt extraction, agriculture and cattle, are the main economic activities in the area between Sisal and Chuburná Puerto. In Progreso, commercial fishing and the ultramarine trade are the principal economic activities, with both the fishing and building infrastructure industries being well-developed. Fishing is the most important activity at these two ports, though in the last decade development of industries such as shipyards, packing plants, tourism, and human settlements have increased considerably. All these activities introduce contaminants into the swamp, and deposit sewage in absorption wells constructed at the surface, near the wetlands.

At the present time, hunting has diminished drastically, salt exploitation is stagnant, commercial fisheries are overused and only the swamp resources such as shrimps, crabs, fishes and mollusks are used mainly by old people, women and children, during all the year and specially during the north wind season. In 1995 a Governmental Restoration Program started to enhance coastal wetlands' deteriorated functions.

*Table 1.* Human activities and hurricanes between Progreso and Sisal, Yucatan. (Sources: Gobierno del Estado de Yucatan, 1959; Meyer-Arendt, 1991; Paré and Fraga, 1994).

| | |
|---|---|
| 1566 | First construction of Sisal road, with five bridges |
| 1810 | Opening of Port of Sisal |
| 1811 | Construction of Sisal wharf |
| 1856 | New port construction begun, at Progreso de Castro, 32 km from Merida |
| 1861 | Crude road constructed from Mérida to the Port of Progreso |
| 1870 | Customs house transferred from Sisal to Progreso |
| 1881 | First train service begun between Mérida and Progreso |
| 1900 | Mérida residents discover beaches; wealthy families begin to build vacation homes |
| 1903 | Hurricane (?) |
| 1916 | Ditch cut through coastal sandbar at Progreso to allow lagoon waters to drain into the sea |
| 1928 | Mérida-Progreso highway paved |
| 1944 | Hurricane (?) |
| 1944 | Second ditch dug through coastal sandbar at the west end of Progresso to drain lagoon waters |
| 1947 | 2 km-long concrete wharf at Progreso completed |
| **1948 aerial images** | |
| 1959 | Hunucmá-Sisal highway paved |
| 1964 | Series of rock and timber groins installed in Progreso |
| 1966 | Hurricane Ines |
| 1967 | Hurricane Beula |
| 1968 | Harbor for Progreso fishing fleet opened, allowing sea water entrance |
| 1970-1980 | Continuing vacation home development; an urban strip emerges from Chuburná to Chicxulub Puerto; population growth due to immigration results in expansion of urban areas into swamps. |
| 1974 | Hurricane Carmen |
| **1979 aerial images** | |
| 1985 | Hurricane Juan |
| 1987 | Construction of Sisal safe harbor |
| 1988 | Hurricane Gilbert opens Chuburná and Carbonera breaches in coastal sandbar between Chuburná and Sisal, allowing sea water entrance |
| **1991 aerial images** | |
| 1991 | El Palmar Reserve Wetland Restoration Program begun with clearing of coastal springs |
| 1994 | Chuburna breach, created by Hurricane Gilbert, begins to serve as harbor |
| 1995 | Hurricanes Roxanne and Opal |
| 1995 | DUMAC builds dam in Chuburná harbor to prevent salt water intrusion |
| 1995 | Progreso Wetland Restoration Program begun with clearing of coastal springs |
| 1997 | Mangrove recovery near Dzula and Elepeten, between Chuburná and Sisal |
| 1997 | Whole Coastal Zone Restoration Program begun with clearing of coastal springs, and construction of bridges and culverts |

## Method

Black and white aerial photographs were analyzed for the area between Sisal and Progreso from 1948 (1:30,000; Aerofoto, S.A.), 1979 (1:80,000; National Institute of Statistics, Geography and Informatic/INEGI) and 1991 (1:75,000; INEGI). The 1948 photographs were reduced in scale from 1:30,000 to 1:79,000. The scale verification was done using the equation

$z = (y*s)/x$, where: z = aerial photograph scale, x = distance between two points on the photograph, y = distance between two map points, and s = map's scale (Sobrevila and Bath 1992).

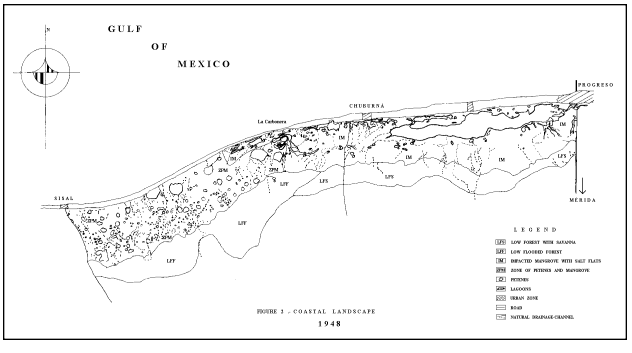
Photointerpretation was made using a stereoscope and 1:250,000 scale thematic maps for geology, topography, hydrology, soils and vegetation (INEGI), in order to recognize features such as coastline, urban zones, lagoons, roads, geomorphologic characteristics, and vegetation physiognomy. Annotations were made using acetate sheets, and aerial photograph north orientation determined by their superposition upon the maps.

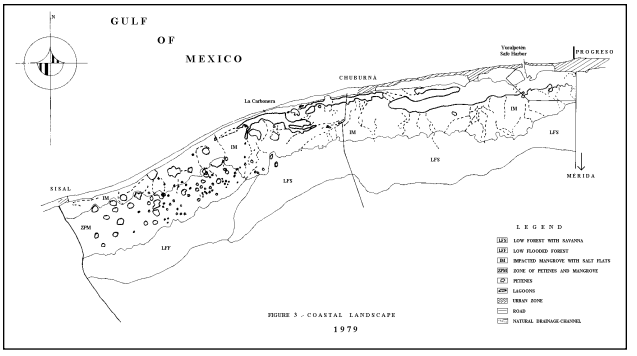
Batllori's landscape classification (1995) for the northwest coast of Yucatan was modified for the present study as follows:

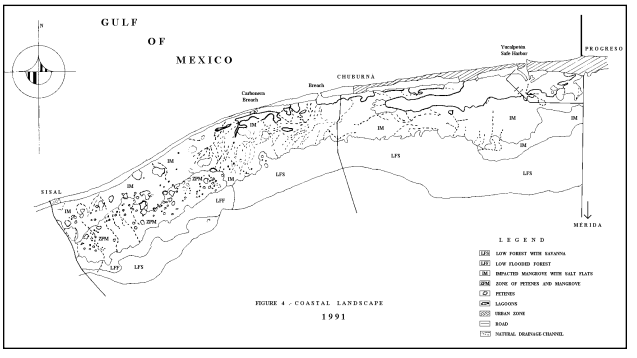
*Impacted mangrove with salt flats (IM)*: biogenic swamp, karstic, very low elevation(<1 m), permanently inundated with tide regimen, salty, with deep, organic solonchak and histosol soils, strong hydromorphism, low swamp mangrove vegetation and salt flats, degraded.

*Zone of petenes and mangrove forest (ZPM)*: biogenic swamp, cumulative, very low elevation (<1 m), seasonally inundated, with deep, organic solonchak and histosol soils, partially salty, with aquatic vegetation, scrub mangrove and mangrove with dry forest elements.

*Low forest with savanna (LFS) and Low flooded forest (LFF)*: partially denuded karst, seasonally inundated, with shallow rendzina soils; the LFS having solonchak soils, with savanna elements and scrub mangrove; and the LFF having histosol soils, forest vegetation, aquatic vegetation and high basin mangrove elements.




Each unit area was calculated using a planimeter, their total area being 250 km$^2$ (Figures 2, 3, and 4). Finally, a field verification and a bibliographical review were made to compare landscape unit features. Maps were digitized and edited using the Corel Photo Paint v.4 program.

## Results

### Landscape Change

During the 43 years between 1948 and 1991, 174.4 km$^2$ of the 250 km$^2$, or almost 70%, of the total study area have changed vegetation type. This an alteration rate of 4 km$^2$/year (Tables 2-5). Of the four landscape classifications, two have increased in area, and the remaining two have decreased. The *Low forest with savanna (LFS)* has expanded toward Sisal, with a total increase in area of 52.1 km$^2$, and the *Impacted mangrove with salt flats (IM)* has increased 35.2 km$^2$ in area, and now extends from Progreso to Sisal, threatening El Palmar Reserve. The *Low flooded forest (LFF)* has contracted 31.07 km$^2$ in area, and the *Zone of petenes with mangrove forest (ZPM)* has decreased by 55.8 km$^2$. The most alarming consequence of this vegetation type change has been the loss of some *petenes*, and the geohydrological alteration of others via spring sedimentation.

*Table 2*- Landscape surface (km²) between the ports of Progreso and Sisal, Yucatan, Mexico

| | 1948 | 1979 | 1991 |
|---|---|---|---|
| LFS | 31.90 | 74.07 | 84.0 |
| LFF | 43.27 | 29.15 | 12.0 |
| IM | 95.74 | 111.00 | 131.0 |
| ZPM | 79.43 | 36.00 | 23.6 |
| Total | 250.30 | 250.20 | 250.6 |

LFS = Low forest with savanna; LFF = Low flooded forest; IM = Impacted mangrove;
ZPM = Zone of *petenes* and mangrove

*Table 3*.- Relative landscape change (%) between the ports of Progreso and Sisal, Yucatan, Mexico

| | 1948 | 1979 | 1991 |
|---|---|---|---|
| LFS | 13 | 30 | 34 |
| LFF | 17 | 12 | 5 |
| IM | 38 | 44 | 52 |
| ZPM | 32 | 14 | 9 |

LFS = Low forest with savanna; LFF = Low flooded forest; IM = Impacted mangrove;
ZPM = Zone of *petenes* and mangrove

*Table 4*- Landscape change (km²) between the ports of Progreso and Sisal, Yucatan, Mexico

| | 1948-1979 (31 years) | 1979-1991 (12 years) | 1948-1991 (43 years) |
|---|---|---|---|
| LFS | +42.17 | +9.93 | +52.10 |
| LFF | -14.12 | -16.95 | -31.07 |
| IM | +15.26 | +20.00 | +35.26 |
| ZPM | -43.43 | -12.40 | -55.83 |
| Absolute | 114.90 | 59.28 | 174.46 |

LFS = Low forest with savanna; LFF = Low flooded forest; IM = Impacted mangrove;
ZPM = Zone of *petenes* and mangrove.

*Table 5*- Landscape change rate (km²/year) between the ports of Progreso and Sisal, Yucatan, Mexico

| | 1948-1979 (31 years) | 1979-1991 (12 years) | 1948-1991 (43 years) |
|---|---|---|---|
| LFS | +1.36 | +0.83 | +1.22 |
| LFF | -0.33 | -1.41 | -0.72 |
| IM | +0.49 | +1.66 | +0.82 |
| ZPM | -1.41 | -1.01 | -1.29 |
| Absolute | 3.59 | 4.94 | 4.05 |

LFS = Low forest with savanna; LFF = Low flooded forest; IM = Impacted mangrove;
ZPM = Zone of *petenes* and mangrove.

During the 31 years between 1948-1979, the greatest change in vegetation type occurred in the low forest with savanna, and the zone of *petenes* with mangrove. This may have been due to natural phenomena such as hurricanes and droughts, and human activities such as the opening of Yucalpeten harbor. In contrast, the 12 years between 1979 and 1991, saw an even greater alteration in vegetation type coverage, possibly due to socioeconomic development such as the opening of harbors, population increase, infrastructure, and tourism in Progreso, Chuburná and Sisal, and natural phenomena such as hurricane Gilbert on 1988. This increase cannot be attributed to a single factor, but is more likely the result of interaction between natural and human impacts (Jiménez et al 1985, 177-185).

## Discussion

**Successional Patterns**

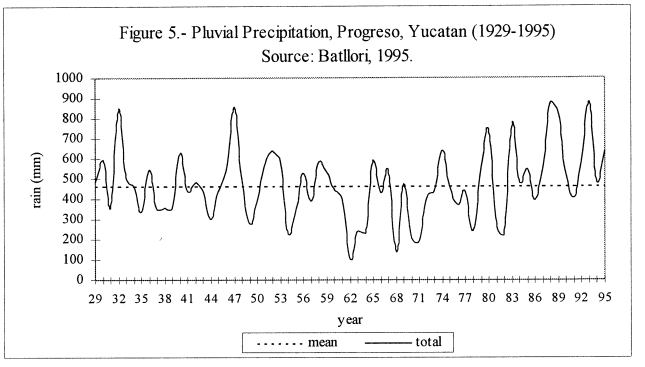
Chapman (1976) proposed the idea of cyclic succession as a more realistic way of conceptualizing coastal ecosystem succession. A cyclic succession is when two or more stages in a mangrove succession oscillate under the influence of environmental stressors such as hurricanes, the "cyclic stage" of the succession being maintained by the stressor's recurrence. According to Odum (1967, 81-138) coastal systems have characteristics as a result of periodic setbacks caused by acute but predictable environmental stressors, and exhibit a "pulse stability".

As long as each other and not non-mangrove species replace mangrove species, the mangrove ecosystem is the steady-state system for the area (Lugo 1980, 65-72). Thus mangrove forests that maintain themselves in spite of cyclic events with frequencies of 50-100 years should be considered steady-state systems. Since mangrove ecosystems can usually achieve maturity (maximum biomass) in 20-30 years (Lugo and Snedaker 1974, 39-64), this approach allows ample time for the systems to be viewed as steady state in that they are the optimal and self-maintaining ecosystems in low-energy tropical saline environments. In such a situation, high rates of mortality, dispersal, germination, and growth are necessary survival tools (Lugo 1980, 65-72).

Zonation is a response of the mangrove ecosystem to external forces rather than a temporal sequence induced by the plants themselves. The most important external factors, or stressors, to mangrove function are: tidal flushing, which removes stored potential energy in the form of detritus and dissolved organics; storm tides and waves, which may cause excessive siltation or erosion; periodic hurricanes or storm winds, which disrupt system structure; and climate. The latter influence is important as it regulates freshwater availability, nutrients from overland runoff and springs, soil, and temperature. In arid environments excessive evaporation concentrates salts in the soil, and terrestrial inputs are reduced (Cintrón et al 1978).

Temporal variations in these factors include tides, rainfall, runoff seasonality, and hurricane periods. These may have frequencies ranging from hours to decades. Superimposed on these are cycles with longer periodicities such as regional sedimentary cycles, and sea level changes. Cyclic rainfall patterns and hurricanes may act as succession speed and direction regulators. Rainy periods are associated with lower soil salinities and mangrove zone expansion, whereas drought periods result in high soil salinities, mangrove mortality, and salt flat expansion (Jiménez et al 1985, 177-185).

Batllori (1995) describes rainfall patterns at Progreso, Yucatan, showing that there have been years of high and low precipitation closely associated with wet and dry periods. For example, between 1953 and 1982 there was a dry period which may have effected vegetation change (Figure 5).




Massive tree mortality is a response to rapid environmental change, and affects all size classes (Jiménez et al 1985, 177-185). This occurs in addition to normal tree mortality, which is density dependent, and usually occurs in the smaller diameter size classes. Diseases and other biotic factors do not appear to be primary causes of massive mangrove mortalities. Rather, these factors appear to attack forests weakened by changes in the physical environment. Mangrove environments are dynamic and cyclic, and mangrove associations adapt to such environments by both growing and dying quickly.

As ecosystems develop toward steady state, they gain information that, in part, allows them to anticipate fluctuations in their environments. At the ecosystem level an event may cause mortality in certain sectors of the system, but the system as a whole may be able to adapt (Margalef 1975, 151-160). For example, hurricanes kill mangrove trees, but they are essential for mangrove forest survival (Cintrón et al 1978). Hurricanes are natural factors causing spring sedimentation and a subsequent reduction in freshwater influx that affects ecosystems through changes in water and soil salinity, lowering of soil pH, and excessive siltation (Lugo and Snedaker 1974, 39-64). In mangrove ecosystems, hurricanes cause death by direct mechanical action including trunk breaking, bark loosening, and severe defoliation, and indirect effects such as flooding and siltation (Jiménez et al 1985, 177-185). These factors can increase wetlands' physiologic stress level and induce changes in vegetation distribution and types, usually from low flooded forest to savanna (Zizumbo 1986).

Between 1900 to 1997, hurricanes crossed near the northwest coast of Yucatan (Table 1), resulting in several breaches in the coastal sandbar which caused seawater influx and sedimentation in the mangrove forests. In 1988, Hurricane Gilbert opened several breaches, among them the Chuburná, Carbonera, and El Palmar breaches between Celestún and Progreso. In fall 1991 the El Palmar breach was closed by natural phenomena related to the north wind season, and a strong deposition of seaweed and seagrass that formed a natural sand trap. The Chuburná breach began to function as a harbor, but in 1995, Ducks Unlimited of Mexico, A.C. (DUMAC) built a dam behind this harbor to prevent salt water influx. Presently, the Yucalpetén harbor, and Carbonera breach are still open, increasing water and soil salinity. Hurricane-induced sedimentation is likely the cause of a high soil level area within the swamp between the Carbonera breach and Sisal that diminishes the flooding period (SMAD/CDB,1996).

According to Craighead and Gilbert (1962), after hurricane Donna in 1960, Florida's mangrove mortality ranged between 25 and 75 % over some 384 km$^2$. The speed of successional recovery after a perturbation should vary among different mangrove types, and depends on the degree of matter and energy exchanged with nearby ecosystems and growth conditions at each site. For example, under riverine conditions primary productivity is high, and succession after a perturbation is rapid. After hurricanes these forests can recover in about 20 years (Lugo and Snedaker 1974, 39-64). However, scrub forests have very low primary productivity, grow slowly, and thus succession after a perturbation is slow (Cintrón et al 1978).

Hurricanes may shape the structure of forest as well as limit its overall development. Odum (1970, 191-289) notes that forests in the hurricane zone do not have emergent trees (*i.e.*, the crown surface is relatively uniform), unlike comparable forests outside the geographical influence of hurricanes. In Panama, for instance, mangrove forest biomass can attain levels approximately two times those reported for Florida and Puerto Rico, which lie within the hurricane zone. The probable mean hurricane frequency in Florida and Puerto Rico is between 20 and 24 years (Lugo et al 1975, 335-350), and mangroves in both areas are reported to reach maturity at around 20-25 years. Given this, maximum biomass and struc-

ture development are probably limited by hurricanes, all other environmental constraints being equal. Expected recovery time for mangroves destroyed by hurricanes is about 20 years, though Westing (1971, 893-898) suggests that recovery may take much longer.

Spatial differences are the result of mangrove forest location, the topographic position of the system delineating growth conditions (Lugo and Snedaker 1974, 39-64). The relative influence of marine and terrestrial factors changes with proximity to the sea. For example, soil salinity is higher in basin forests and arid environment scrub mangroves, and consequently these forests have lower transpiration rates (Lugo et al 1975, 335-350). Forest stature or complexity can be used as a reliable indicator of how favorable conditions are for mangrove growth, there being an inverse correlation between soil salinity and forest height (Cintrón et al 1978).

According to Thom (1967, 301-343), mangrove forest zonation and structure in Tabasco, Mexico, are responsive to sea level changes, and mangrove zones can be viewed as steady-state zones migrating toward or away from the sea in response to sea level changes. He postulates that mangrove zones are responsive to geomorphological changes in the regions where they grow. Substratum and water are important zonation-controlling factors, and each specie finds its place, given its salinity tolerance range, within the environmental gradient created by the substratum and water flow regimes. Finally, he suggests that salinity is simply a competition eliminator and not a zonation-determining factor. This is likely true in this region of México, as the Grijalva and Usumacinta river systems introduce large quantities of fresh water into the area, maintaining salinity at low levels most of the year.

In contrast to natural cycles, human impacts are unpredictable events that interfere with natural ecosystems because they do not necessarily follow recognizable patterns, and do not operate long enough to allow adaptation development.

**Natural and Anthropogenic Stressors**

Stressors have been defined as any factor or situation that forces a system to mobilize its resources and expend energy to maintain homeostasis (Seyle 1956). Stressors are energy drains because they involve diversion of potential energy flows that might otherwise be used for useful work in a system (Odum 1967, 81-138). An environmental change that reduces total energy flow results in a rapid decrease in structural complexity, particularly if the system loses its main energy source. Systems with high organic productivity but low species diversity and complexity usually export their production to other systems and, in so doing, lose the capacity to diversify. This is certainly true of mangrove forests and other systems stressed with high organic matter loads. These systems' apparent stability is due to uninterrupted input of certain energy sources that represent a significant fraction of their total energy. Stability is a function of stable energy input, and in most systems stability disappears with diversion of the main energy source.

In Yucatan, freshwater springs (*petenes*) are an important energy source responsible for the mangrove's high production levels. Through flushing of toxins and nutrient transport, these springs' provide energy to the system. It may be that in mangrove forests such as *petenes*, the low, stable temperature, high nutrient input and low salinity allow the system to expend energy on increasing diversity (Batllori 1995). For example, in the low swamp mangrove and scrub mangrove greater salt concentrations were detected between 1991 and 1996. Average salinity during this period was 31.8 parts per thousand (ppt) with a variation range of 96 ppt, whereas the *petenes* had an average of 1.47 ppt with a 2 ppt variation. Average swamp temperature was approximately 30˚C, with a variation range from 23 to 38˚C, and average *peten* temperature was 26˚C with a variation range from 21.5 to 32˚C (SMAD/CDB 1996).

In their literature review of mangrove response to salinity fluctuations, sedimentation and long-term flooding, Odum and Johannes (1975, 52-62) comment that radicular gas exchange is the mangrove forest's "Achilles heel". Siltation interferes with both the forest's nutrient cycling, and gas exchange between the rhizosphere and the water column or atmosphere (Lugo et al 1981, 129-153). It is to be expected that any increase in stressor intensity, whether that be roots' respiratory demands or blockage of the gas exchange involved in root respiration, should have a significant effect on trees' ability to concentrate and transport fresh water and nutrients to their leaves. This may lead to a progressive increase in leaf-fall and eventual defoliation if the condition is chronic. Under normal conditions, mangrove leaf production and loss is seasonal; leaves fall and are produced faster during the rainy season than during dry periods (Pool et al 1975). Lugo and Snedaker (1974, 39-64) suggest that excessive drought may lead to an abnormal leaf-fall pulse, essentially thinning the canopy, as leaf growth is almost non-existent during such conditions. Excessive leaf-fall results in a decrease in the system's photosynthesis capacity, and can lead to eventual ecosystem collapse if the stressor's effect is chronic or prolonged.

Other mangrove stressors discussed in the literature include hypersalinity (Cintrón et al 1978), high and low rates of water flushing (Hicks and Burns 1975), the effects of sand deposition on the forest soil (Cintrón and Pool 1976), and road construction (Patterson-Zucca 1982, 105-124). Roads cut superficial water flow in flooded coastal basins, mainly in the low swamp, the consequent water stagnation altering gas

exchange between roots and sediments, causing toxin and salt incrementation, and favoring sedimentation (Snedaker and Getter 1985). Humans may tilt the balance in favor of higher mangrove mortality rates by introducing chronic stressors that inhibit regeneration mechanisms, as occurs in mangrove stressed by high salinity or alterations in drainage patterns (Lugo and Patterson-Zucca 1977, 149-161). These responses involve additive effects among stressors that accelerate energy losses and rapidly reduce a system's capacity to negotiate more stress.

The idea that stressors have the effect of reducing species diversity by increasing adaptation costs is likely accurate, because a stressor, by imposing energy barriers on a system, decreases its ability to support complexity. Theoretically, lower stress should increase an environment's carrying capacity. This occurs in high salinity environments after a storm decrease salinity stress, at which time species diversity increases for a short period, later decreasing to its original value as stressful conditions return to their original, high intensity. In the study area, a homologous situation occurred after hurricane Gilbert. Breaches in the coastal sandbar resulted in a strong increase in marine species in the swamp, these new conditions in turn causing a biological growing. This only temporarily benefited the local coastal fishery as it soon decreased.

In Florida, Cintrón et al (1978) recorded a maximum mangrove salinity tolerance, especially for red mangrove (*Rhizophora mangle*), of approximately 60-65 ppt, with germination ceasing above 65 ppt. They observed mean soil salinities of 44 ppt for live tree zones, 72 ppt for dead tree zones, and 87 ppt for salt flats. Red mangrove was reported as growing in salinities of up to 70 ppt, though optimal soil salinity for this species is 50–55 ppt. Tree height was inversely proportional to soil salinity, which measures from 17 to 72 ppt, with trees reaching up to 15 m in height in low salinity areas. When soil salinities exceeded 65 ppt, dead tree basal area was greater than live tree basal area. Carter et al (1973) suggest that trees in high salinity environments tend to transpire less than in low salinity conditions, thus at very high salinities one would expect a decrease in mangrove net productivity.

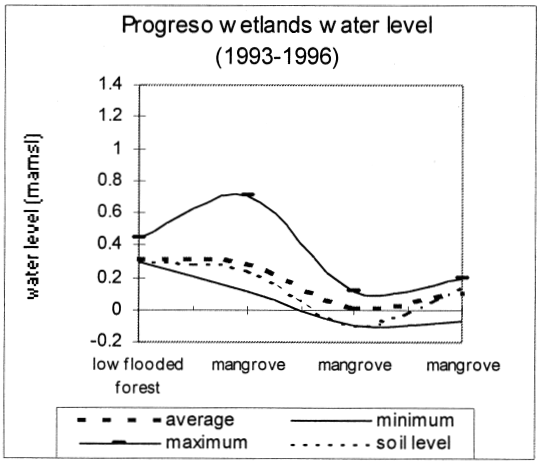
Valdés et al (1994, 61-75) studied water salinity in the Progreso-Chelém lagoon documenting the existence of three regions: the east zone, with large salinity variations (10-71 ppt) due to natural factors (rain, springs, evaporation), and human alterations (domestic and industrial water pollution, and lagoon areas isolated by roads, highways, and railroads); the central zone, with stable salinity conditions (23-42 ppt), due to the great dynamic exchange through the Port of Yucalpeten entrance; and the western zone that crosses the lagoon to Chuburná, a generally hypersaline zone (71 ppt) due to its isolation from the rest of the lagoon.

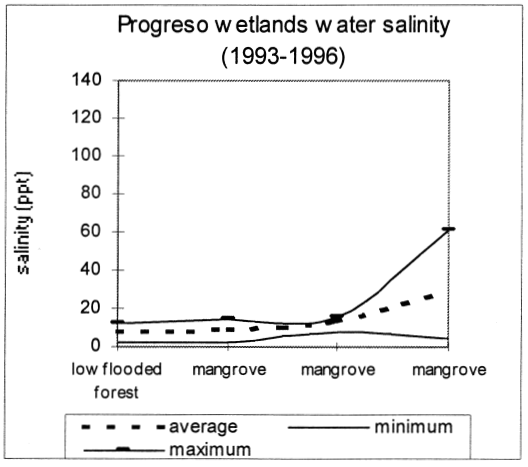
Salinity in the study area has been reported as increasing westwardly (SMAD/CDB 1996), with dry season levels at ca. 60 ppt in Progreso, 70 ppt at El Palmar Reserve and 140 ppt near Sisal. This increase is caused by incoming sea water, high evaporation, and wind-driven water movements. The lowest observed water level, in reference to mean sea level, was recorded during an extremely dry season in March 1995, and the highest level (recorded at Sisal and El Palmar Reserve) during extreme flooding associated with hurricanes Opal and Roxanne in October 1995. There is an inverse relation between water level and salinity during both the dry season and strong flooding periods such as the northwind season and hurricanes (Figure 6).

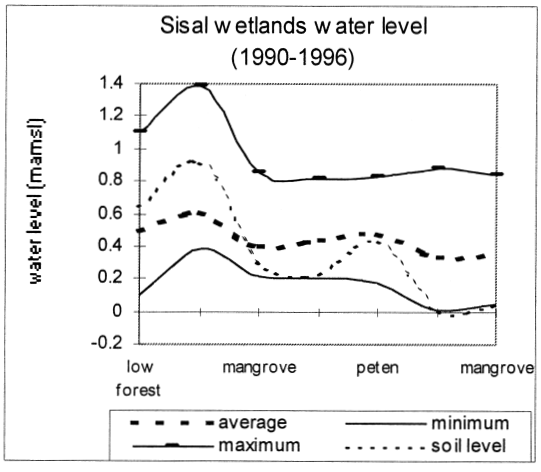
The deposition produced and discharges received during hurricanes and tropical storms have opened breaches in the coastal sandbar, mainly in fragile areas. As mentioned previously, the principal changes to coastal morphology after the 1988 Hurricane Gilbert were due to the opening of 12 breaches between the swamp and the sea on the northwest coastal zone of Yucatan. Three breaches were present in the study area: El Palmar, La Carbonera, and Chuburná. After the closing of the El Palmar breach the average wetland water level rose slightly. However, water level variability compared to average water level increased considerably after the closing, with water level ranging from 0.2 m before the closing to 0.44 m after, and maximum flood level ranging from 0.08 mamsl (meters above mean sea level) before to 0.33 mamsl after. Also of note is that average salinity decreased by half from 46.8 ppt before to 27.3 ppt after. The maximum recorded salinity value remained similar before and after the closing (54.8 to 57 ppt, respectively), though the minimum value decreased drastically from 37 ppt before to only 5 ppt after. There were also notable changes in the hypersalinity period. Before the closing the hypersalinity period, that with more than 40 ppt, lasted 6 months, from April to September 1990. During these months the soil was always flooded with at least a thin layer of water in the swamp mangrove. After the breach closing in 1991, the hypersalinity period was reduced to the two months of June and July, with a period during which the soil dried and cracked. These changes are an indicator of how marine processes can dominate low swamp processes, changing vegetation types over time. Just this as has occurred in Chuburná and Yucalpeten, where large salt flats now exist (Batllori 1995).

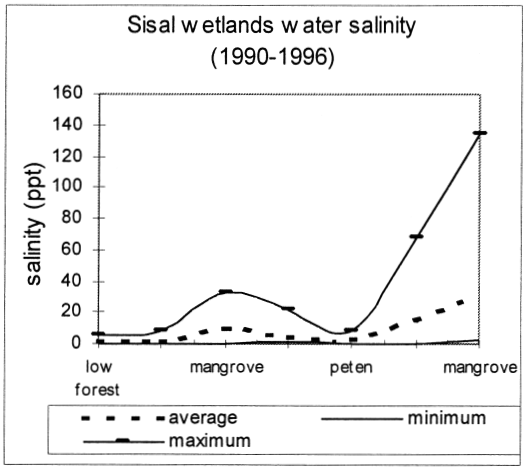
Seyle (1956) suggests that most environmental situations can become stressful to given individuals and that stress is a normal environment condition. The realization that stressors and energy drains are part of any natural environment is an important step in generalizing about stressors and their impact on ecosystems. Thus, it is very important to differen-

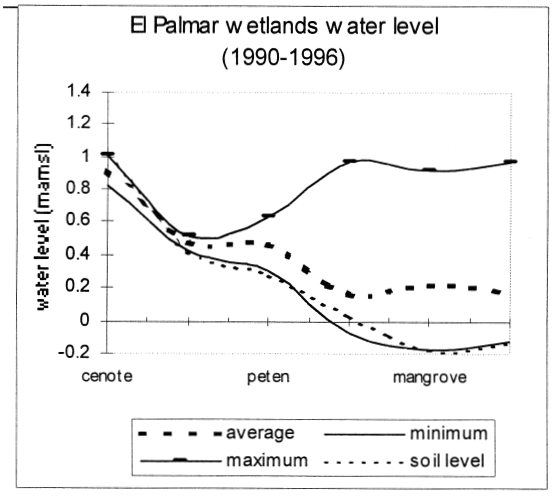
Figure 6.- Water level and salinity in Yucatan's northwest coastal wetlands between 1990 and 1996 (Source: SMAD/CDB,1996).

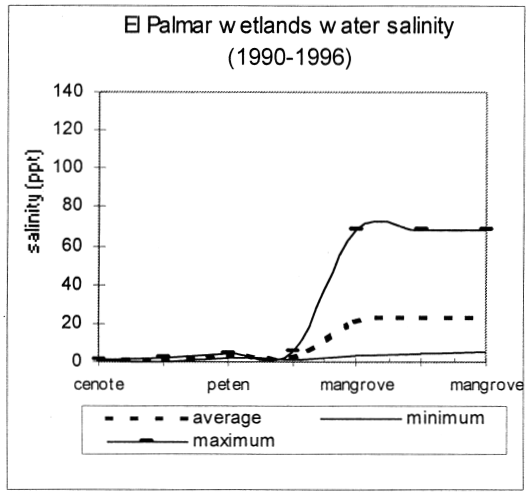


tiate between normal stress and additional stress caused by allogenic forces. The capacity of a system to regenerate depends on the availability of enough energy sources to reorganize it's disordered structure. Since the availability of energy is a function of environment, the type of environment dictates recovery rates and degree of complexity in steady-state (Lugo 1980, 65-72).

Mortality and expansion of mangrove forest in response to cyclic climatic events appears to be a common feature on arid coastlines. This association has at least two implications for mangrove management. First, managers should consider open water areas and salt flats part of the mangrove ecosystem and not as separate ecosystems. Failure to recognize this results in incompatible land uses that may affect the normal mangrove forest expansion during periods of high rainfall and lower soil salinities. Second, periods of high mangrove mortality are normal occurrences in these environments, and care should be taken before attributing this mortality to other factors, including human activities (Jiménez et al 1985, 177–185).

In general, catastrophic die-offs can be interpreted as the result of brief but extremely stressful episodes typical of many mangrove areas. Thus, massive die-offs are not "catastrophic" as mangroves are able to cope with these conditions. The real catastrophes occur when human misunderstanding of these systems functioning permits irreversible environmental changes from which no recovery is possible (Jiménez et al 1985, 177-185).

## Conclusion

We conclude from our work that the coastal ecosystem is a stationary system subject to different natural environmental factors, including: a) soil hypersalinity and fresh water availability, which effect transpiration and photosynthetic capacity; b) sedimentation, which reduces nutrient and dissolved gas interchange between roots, soil, water and/or atmosphere.

Second, cyclic events associated with dry and wet years, as well as the recurrent presence of hurricanes, regulate the mangrove dynamic. In the present study area the 29-year drought between 1953 and 1982, and the 7–10 year hurricane period, are accompanied by hypersaline conditions, and low fresh water and nutrient availability, from which is to be expected a loss of natural vegetation and increase in salt flats. The system can adapt itself in order to survive since these stressors regulate growth rates, produce periodic set-backs in succession, are responsible for "young" ecosystem characteristics, and for the number of species able to survive in the system. However, it is precisely during periods of natural stress that human activities add non-selective, intense, unpredictable stressors to the system, such as canalizations for water, exportation of organic matter, and excessive sedimentation.

Third, during the previously mentioned period is when the greatest anthropogenic impacts began: a) Principal among these is the modification of the hydrological regime through permanent connection of the sea with the swamp, which results in the dominance of tidal flows in a new coastal morphology with large canals that export organic material to the littoral zone, sedimentation patterns that modify the substrate, and an increase in salinity; b) of continuing importance is the permanent obstruction of the parallel flow of water masses by coastal road construction, which principally effects the low swamp mangrove; c) dredging and filling of the swamp for harbor and living areas promotes sedimentation and loss of springs; and d) massive population migration towards the coast, with new settlement on unhealthy, trash fill along the swamp margin.

Aerial photograph analysis for the 1948-1979 period showed the greatest vegetation changes fundamentally in *peten* and scrub mangrove zones, with an annual loss of 1.41 $km^2$. In these areas, hypersalinization and sedimentation promote savanna vegetation to a great degree, and salt flats to a lesser degree.

After 1982, a rainy period began which continues to the present. Among this period's principal catastrophic events has been the 1988 Hurricane Gilbert, which opened various breaches such as those at El Palmar, Chuburná and Carbonera, the latter one remaining open to date. Even though it is hoped that these high precipitation conditions will be favorable for the ecosystem, those anthropogenic stressors mentioned above in #3 have caused residual and chronic effects. These effects can be seen in that the new vegetation structures that have developed exhibit little vigor and a low energy maintenance capacity, which inhibits their regeneration. If these chronic anthropogenic stressors, fundamentally the permanent communications with the sea and coastal roads, had been mitigated in the past decade mangrove recuperation would be much more vigorous, and the accelerated loss of low flooded forest would not be on the threshold of being considered an irreversible process.

In the 1979-1991 photographs, it was observed that though the *peten* and scrub mangrove zones show strong annual losses, the greatest change has been in the low basin mangrove, where extensive salt flats have been forming at a rate of 1.66 $km^2$ annually. This is a result of permanent change in the hydrological regime, marine sediment introduction, loss of springs, hypersalinity and erosion, which are promoting the accelerated transformation of low flooded forest into forest with savanna at a rate of 1.41 $km^2$ annually.

Finally, it is recommended that the State Government continue restoration activities in an effort to reduce the

effects of chronic ecosystem stressors and increase energy retention capacity during this rainy period to allow for regeneration of the system. This work should develop a success index monitoring system, such as surficial and intersticial water salinity; mangrove growth; and mangrove community structure, to evaluate the rehabilitation activities. The characteristic vegetation in this area is mangrove classified as shrub type, which exhibits low structural development, indicating that it has been strongly impacted, analysis of changes in mangrove development will permit an estimation of the restoration success.

## Endnote

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## References

Aerofoto, S.A. Black and white aerial photographs. 1948 (scale 1:30,000) between ports of Progreso and Sisal. Yucatán, México.

Batllori, E., J.L. Febles, R. Gutierrez, J. C. Trejo, P.P. Dzib and R. Tuyub. 1993. Programa de manejo hidrológico de la cuenca costera noroccidental de la Península de Yucatán. 4th World Academic Conference on Human Ecology, July 22-27, CINVESTAV-IPN, Mérida, Yucatán.

Batllori, E. 1995. Hidrología de la región costera noroccidental del estado de Yucatán. Doctoral thesis. Facultad de Geografía de la Universidad de la Habana, Cuba.

Carter, M.R., L.A. Burns, T.R. Cavinder, K.R. Dugger, P. L. Fore, D.B. Hicks, H. L. Revels and T.W. Schmidt. 1973. Ecosystems Analysis of the big Cypress Swamp and Estuaries. Athens, Ga.:USEPA; NTIS: Springfield, Va. In Press.

Chapman, V. J. 1976. *Mangrove Vegetation*. Germany: J. Cramer.

Cintrón, G. and D.J. Pool. 1976. Efectos de la deposición de arena e inundación en un manglar en Puerto Rico. Tercer Simposio Latinoamericano de Oceanografía Biológica. San Salvador, El Salvador.

Cintrón, G., A.E. Lugo, D.J. Pool and G. Morris, 1978. Mangroves of arid environments in Puerto Rico and adjacent islands. *Biotrópica* 10, 110-121.

Craighead, F.C. and V.C. Gilbert. 1962. The effects of Hurricane Donna on the vegetation of Southern Florida. *Quarterly Journal of the Florida Academy of Sciences* 25(1),1-28.

Dugan, P.J. (ed.). 1992. Conservación de Humedales. Un Análisis de temas de actualidad y acciones necesarias. Gland, Suiza: UICN.

García, E. 1978. Modificación al sistema de clasificación climática de Köppen (para adaptarlo a las condiciones de la República Mexicana). México, D.F. : Offset Larios, S.A.

Gobierno del Estado de Yucatán. 1959. Ensayo monográfico de Sisal. Dirección de prensa y publicidad. Mérida, Yucatán, México.

Hamilton, L.S. and S.C. Snedaker. 1984. *Handbook for Mangrove Area Management*. Hawaii: EPI, IUCN,UNESCO and UNEP.

Hicks, D. B. and L.A. Burns. 1975. Mangrove metabolic response to alterations of natural freshwater drainage to southwestern Florida estuaries. In G. Walsh, S. Snedaker and H.Teas (eds.), *Proc. Int. Symp. on Biol. and Management of Mangroves*, 238-255. Gainesville, Florida: Inst. Food Agr. Sci., University of Florida.

Instituto Nacional de Estadística, Geografía e Informática (INEGI). Black and white aerial photographs. 1979 (scale 1:80,000) and 1991 (scale 1:75,000) between ports of Progreso and Sisal. Yucatán, Mexico.

Jiménez, J.A., A.E. Lugo and G. Cintrón. 1985. Tree mortality in mangrove forests. *Biotrópica* 17, 177-185.

Lugo, A. and S. Snedaker. 1974. The ecology of mangroves. *Annual Review Ecology Systematics* 5, 39-64.

Lugo, A., G. Evink, M. Brinson, A. Broce, and S. Snedaker. 1975. Diurnal rates of photosynthesis, respiration and transpiration in mangrove forests of south Florida. In F.B. Golley and E. Medina (eds.), *Tropical Ecological Systems*, 335-350. New York: Springer-Verlag.

Lugo, A.E., and Patterson-Zucca. 1977. The Impact of Frost on Mangrove Ecosystems. *Tropical Ecology* 18(2), 149-161.

Lugo, A. E. 1980. Mangrove ecosystems: successional or steady state? *Biotrópica* 12 (supplement), 65-72.

Lugo, A.E., G. Cintrón and C. Goenaga. 1981. Mangrove ecosystems under stress. In G. W. Barrett and R. Rosenberg (eds.), *Stress Effects on Natural Ecosystems*, 129-153. New York: Wiley.

Margalef, R. 1975. Diversity, Stability and Maturity in Natural Ecosystems. In W.H. Van Dobben and R.H. Loowe-McConell (eds.), *Unifying Concepts in Ecology*, 151-160. The Hague, The Netherlands: Dr. W. Junk, B.V. Publishers.

Meyer-Arendt, K.J. 1991. Tourism Development on the North Yucatan Coast: Human response to shoreline erosion and hurricanes. Kluwer Academic Publishers. *Geojournal* 23(4), 327-336.

Meyer-Arendt, K.J. 1993. Shoreline changes along the North Yucatan coast. In S. Laska and A. Puffer (eds.), *Coastlines of the Gulf of Mexico*, 103-117. Proceedings of the Eighth Symposium on Coastal and Ocean Management. July 19-23, New Orleans. New York: American Society of Civil Engineers.

Odum, H.T. 1967. Work circuits and system stress. In H.E. Young (ed.), *Symposium on Primary Productivity and Mineral Cycling in Natural Ecosystems*, 81-138. Orono, Maine: University of Maine Press.

Odum, H.T. 1970. Summary: An emerging view of the ecological systems at El Verde. In H.T.Odum and R.F. Pigeon (eds.), *A Tropical Rain Forest*, 191-289. USAEC Report TID-24270, U.S. Atomic Energy Commission, NTIS.

Odum, W.E., and R.E. Johannes. 1975. The response of mangroves to man-induced environmental stress. In E. J. Ferguson Wood and R.E. Johannes (eds.), *Tropical Marine Pollution*, 52-62. Amsterdam, Netherlands: Elsevier Oceanography Series.

Olmsted, I. 1993. Wetlands of Mexico. In D.F. Whigham, Dagmar Dykyjova, and Slavomil Hejny (eds.), *Wetlands of the World I*, 637-677. Netherlands: Kluwer Academic Publishers.

Paré, L. and J. Fraga. 1994. La Costa de Yucatán: desarrollo y vulnerabilidad. Cuadernos de investigación. No 23. Instituto de Investigaciones Sociales. México, D.F.: UNAM.

Patterson-Zucca, C. 1982. The effects of road construction on a mangrove ecosystem. *Tropical Ecology* 23(1), 105-124.

Perry, E, J. Swift, J. Gamboa, A. Reeve, R. Sanborn, L. Marin and M. Villasuso. 1989. Geologic and environmental aspects of surface cementation, North Coast, Yucatán, Mexico. *Geology* 17, 818-821.

Pool, D.J., A. E. Lugo and S.C. Snedaker. 1975. Litter production in mangrove ecosystem. Master's Thesis. University of Puerto Rico at Rio Piedras, Puerto Rico.

Seyle, H. 1956. *The Stress of Life*. New York: McGraw-Hill.

Sistema de monitoreo ambiental y análisis de datos y Centro de datos de biodiversidad (SMAD/CDB). 1996. Informe Técnico Final (tercer año). Mérida, Yucatán, México: CINVESTAV-IPN/PRONATURA-Yucatán/NAWCC.

Snedaker, S.C. and C.D. Getter, 1985. Costas: Pautas para el manejo de los recursos costeros. Pub. 2 sobre Manejo de Costas. Ser. Inform. Rec. Renov., National Park Service, USDI y USAID.

Sobrevila, C. and P. Bath. 1992. Evaluación Ecológica Rápida. Un manual para usuarios de América Latina y el Caribe. Edición preliminar. Programa de Ciencias para América Latina. Arlington, VA: The Nature Conservancy.

Thom, B.G. 1967. Mangrove ecology and deltaic geomorphology: Tabasco, Mexico. *Journal of Ecology* 55, 301-343.

Valdés, S., V. Ceja, O. Zapata and E. Real de Leon. 1994. Comportamiento de la salinidad en la laguna de Chelem, Yucatan. *Oceanológica* 2, 61-75.

Westing, A. 1971. Ecological effects of military defoliation on the forests of South Vietnam. *BioScience* 21, 893-98

Zizumbo, D. 1986. El Deterioro del Sistema Ecológico Ciénaga de Progreso, Yucatán. Centro de Investigación Científica de Yucatán (CICY). Secretaría de Ecología. Gobierno del Estado de Yucatán. Mérida, Yucatán, México.

# Values, Emotions and Desired Outcomes Reflected in Public Responses to Forest Management Plans

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## *Abstract*

*This paper reports the results of analyses of six years of written public comments on forest management plans and projects pertaining to the Hoosier National Forest in Indiana. The goal of the research was to gain an understanding of public concerns for the use of the forest lands, within the fabric of their underlying values and emotions. Research methods included the development of a comprehensive taxonomy of expressed values, emotions, and desired outcomes found in the data set, followed by the computerized coding and analysis of the text. Quantitative and qualitative analyses revealed a wealth of information on emotions and values expressed by the public, and provide support for previous theoretical positions and empirical findings.*

***Keywords:*** *environmental values, emotions, public involvement, forest management, content analysis, qualitative analysis*

Managers of agencies overseeing public lands are confronted with an ever increasing volume, intensity, and diversity of public concern and comment regarding the use and disposition of these lands. Although the overt content and intent of the comments may seem clear, land managers are often at a loss for how to deal with voluminous, heated, and conflicted public comment. Members of the public may perceive that their comments are misunderstood or simply disregarded by the managers. In order to improve responsiveness to the public and to develop more successful management plans, it is necessary to derive a deeper understanding of who the interested publics are, what their concerns and desires are, and what values, beliefs, and feelings underlie these concerns. This is also a moral imperative in a democratic society.

The purpose of the research reported here was to reach an improved understanding of the various publics responding to Forest Service plans through qualitative and quantitative content analysis of an archive of public commenting letters. In this study, we created a taxonomy of values, emotions, and desired outcomes expressed in a sample of the entire set of letters from the public commenting on the development and revision of the Forest Plan for the Hoosier National Forest in Indiana.

## Background

Values and emotions are crucial elements of public involvement in natural resource planning and management. Creighton (1983) views the public participation process as an adaptive process by which a broad range of values and world views may be reconciled. Based on the premise that "the purpose of public participation is to ensure consideration of the total range of values held by the public" (p. 152), he argues that public values constitute the most important information that a planner may receive.

A vast amount of social and psychological research has been conducted on the definition, characteristics, and measurement of human values (e.g., Rokeach 1968, 1973, 1979; Kluckhohn 1951, 1961; Perry 1954, 1968; and Williams 1979). Kluckhohn (1951, 395) has defined a value as an element of individual and social psychological processes:

> *a conception, explicit or implicit, distinctive of an individual or characteristic of a group of the desirable which influences the selection from available modes, means, and ends of action.*

More recently, an impressive amount of research has been conducted on environmental values, and on forest values in particular (e.g., Axelrod 1994; Bengston 1994a, 1994b; Dwyer, Schroeder and Gobster 1990; Hetherington, Daniel and Brown 1994; Kellert 1996; Kempton, Boster and Hartley 1995; Merchant 1992; and Stern, Dietz and Kalof 1993).

Among the disputed characteristics of values is the distinction between that which is valued ("a quality that an object or set of objects possesses either inherently or by

ascription)," and the "standards or conceptions of the desirable within an individual that guide behavior" (Adler 1956). Others make the same distinction between assigned and held values (e.g., Brown 1984).

Many researchers have grappled with the problem of developing scaling systems related to human values for testing purposes (Braithwaite and Scott 1991), but few of these specifically examine the environmental values we are concerned with here. Testing instruments that do touch on environmental values include the pioneering "Value Survey" developed by Rokeach (1968), which includes the beauty of nature and the arts as one of eighteen basic value elements. Rokeach addresses values as both a mode of conduct, or instrumental values, and as an end-state of existence, or terminal values. In the Value Survey, subjects are asked to rank order each of eighteen instrumental values and eighteen terminal values in terms of their importance as guiding principles in their lives.

Braithwaite and Law (1985) developed the Goal and Mode Values Inventories based on Rokeach's concept of values, but with an expanded set of goals and modes of conduct and a distinction between social and personal goals. Added value categories include concern for physical exercise as part of the personal goal of physical well-being and preserving the natural environment as part of the social goal of international harmony and equality (Braithwaite and Scott 1991).

Other value scales that are of relevance to this research include the East-West Questionnaire developed by Gilgen and Cho (1979) and Kluckhohn and Strodtbeck's Value Orientations (1961). The East-West Questionnaire is designed to measure Eastern versus Western orientations in belief systems and includes a *Man and Nature* element. The Value Orientation measures the orientations of respondents toward four common dilemmas. These dilemmas include human-nature scenarios that contrast humans as dominant over nature, subjected to nature, and in harmony with nature.

The particular value of the forest environment to individuals in a spiritual and cultural sense has also been addressed. For example, Dwyer, Schroeder and Gobster (1990) note the very personal ties that members of the public have towards forests, and the deep psychological, social and cultural roots of this attachment.

Evidence of the importance of forests to people is also found in a variety of empirical studies of environmental preference and experience (e.g., Altman and Wohlwill 1983; Appleton 1975; Kaplan 1989). Schroeder (1988, 10) uses this evidence to argue that forest managers should recognize the psychological and cultural value of trees, and seek to balance them with biological and economic values. The spiritual value of trees and forests is also given special attention by Schroeder (1992) who sees the lack of understanding of the importance of this dimension as a contributor to the crisis in forest management.

Addressing the use of values in the public participation process, Creighton (1983, 143) argues that "feelings and emotions are indicators of values, and differences in values are what citizen participation is all about." From this assumption, Creighton offers the following indicators of the presence of values in public testimony:

- Use of Values-Laden Language: Phrases such as "raping the land" or "bureaucratic juggernaut" reflect specific value orientations.
- Predicting a Dire Consequence: Various predictions of job loss, environmental destruction, and intolerable traffic levels indicate concern about valued objects.
- Referring to a Venerable Source: By quoting the Bible, a law, or a famous author, commenters attempt to fortify their position.

Vining (1992a, 1992b) has argued that emotionality is a commonplace, necessary, and functional characteristic of public involvement in issues of environmental concern, for a number of reasons. First, emotion serves a functional role of helping to interpret and organize information. Cognitive processes such as information storage or retrieval are accompanied by emotional processes. Thus, emotions associated with an event or object are stored and retrieved together. If an environmental issue calls up a similar event confronted earlier by the individual, it will tend to bring with it the emotions experienced previously.

A second function of emotion is to help summarize complex information. It is cognitively easier for the individual to recall the emotional conclusion associated with a complex environmental concern confronted in the past, than to remember the series of events that led to that conclusion. For example, anger associated with off-road vehicles (ORVs) or disgruntlement associated with management practices may be recalled when the events leading to those conclusions are not.

A third function of emotion is motivational. Strong emotion may bring people to public hearings to make their views known, notwithstanding associated inconveniences or fear of public speaking. With emotion serving as such a motivator, the common practice of discounting it could be dangerous. Similarly, emotion performs a highly effective communicative role through facial expression, body posture, and voice tone; means that are in many ways more expressive than verbal communication.

Finally, emotion helps to reveal value conflict. According to Mandler's (1984) conflict theory, emotions stem from discrepancies between desired and actual values. This is consistent with Lazarus' (1991) idea that emotion derives from goal achievement and goal frustration. Through

the mobilization of energy and resources, emotional arousal associated with value conflict may drive resolution of the conflict.

For a variety of reasons, public land managers have tended to discount the importance of emotion and value-laden responses of the public. In the United States, the National Environmental Policy Act of 1969 (NEPA) requires that land managers invite public comments on management plans and activities, but offers no insight into how these comments should be gathered, analyzed, interpreted, or integrated into decision making processes. Managers struggle with an avalanche of public comments with few guidelines on how to organize and summarize them. The most frequent type of analysis is the counting of votes for or against the planned activity or one of the alternatives. Codinvolve, a content analysis system developed by the USDA Forest Service (see Creighton 1981 for a description), is designed to formalize this process, but in our experience it is not widely used.

Neither Codinvolve, or "vote-counting" takes into consideration the values and emotions underlying the desired outcomes expressed in public comments. Managers are increasingly coming to understand the importance of values and emotions as rational motivators for the public to become involved and to voice their concerns.

If decision-makers do not satisfy the public that they are listening and considering what members of the public say, then the political process begins to break down. Because management decisions involve the weighing of value conflicts, the management decision-making process will engender some level of emotion on the part of the decision-makers themselves (Vining 1987, 1992b; Janis and Mann 1977). Yet, decision-makers and managers often deny the presence of this inevitable emotional component and find themselves at a loss for how to understand and respond to levels of emotion expressed by the public.

These arguments regarding the importance of values and emotions in public comments form the foundation for the current research. We sought to determine whether underlying value and emotional content of public commentary that is so often missed or dismissed could be detected systematically. We combined a grounded theoretical approach with the theoretical frameworks described above to develop a taxonomy of values and emotions that is driven both by the data and by theory.

## Method

### The Setting

The Hoosier National Forest in southern Indiana was the setting for this research. The Hoosier was chosen for its close proximity to several types of communities with a diverse, interested public, and the availability of a large body of written public comment spanning a number of years. These public comments, which stemmed from the Hoosier's land use planning process, formed the data set for our study.

The Hoosier National Forest covers 188,000 acres in the limestone belt of southern Indiana, which is noted for a karst-type topography of caves, sinkholes, disappearing streams, and mineral springs. The Hoosier is the only National Forest and the largest holding of public land in the State. This forest is characterized by a large number of private in-holdings, and is quite dissimilar to the more uniform holdings in national forests in the western United States. The Hoosier features scenic drives and hiking and bridle trails in a wooded setting. It offers camping and hunting during season and fishing and boating opportunities on four major lakes. Other features of the Hoosier include the 13,000-acre Charles C. Deam Wilderness, which offers hiking opportunities in a primitive setting, and the Pioneer Mothers' Memorial Forest, which is a tract of virgin timber often used in ecological studies.

The Hoosier is a highly valued resource to Indianans as well as to those in nearby portions of Ohio, Kentucky, and Illinois. The large number of population centers in and near the forest, as well as the patchwork of private in-holdings result in a good deal of population pressure on the forest and associated user and use conflicts. The importance of this forest resource to its public has led to a rich body of public comment.

### The Data Set

The archival data evaluated as part of this research consists of three major phases of written public comment spanning a six-year time period[1] during which Hoosier National Forest officials were developing and revising the Forest Land Use Resource Management Plan. The first phase consisted of comments to the Hoosier on the Land Use Resource Management Plan as it was initially released in 1984. The second phase consisted of comments on a proposed amendment to the Plan that would have permitted off-road vehicle use in a portion of the Hoosier. The third phase consisted of letters commenting on a revised Forest Land Use Resource Management Plan, following litigation on the initial Plan and its amendments. There was a total of 4,832 letters received during these three phases of the planning process. Copies of the letters were obtained from the Hoosier National Forest Supervisor's Office. Identifying references were deleted from the text of the letters that was entered into a uniform electronic format for analysis.

**Procedure**

The unit of analysis that we chose for content code development and assignment was the paragraph. Several alternatives were possible, including a line of text, sentence, or entire letter. After careful consideration, we chose the paragraph because it allowed a better context of meaning than the line or sentence, and more specificity than the entire letter.

To develop a content taxonomy for the Hoosier data set we took an approach based on grounded theory (Strauss and Corbin 1994). We began by taking the narrative of the subjects as a basis, or ground, working up from these narratives to a listing of content categories. Although the value scales described earlier proved useful in developing ideas for relevant value categories, preparation of an entirely new taxonomy or system of description, constructed from the materials in the data set, was necessary in order to fully capture the complexity of the commenters' attitudes and belief systems. As a first step in this process, three experimenters independently reviewed the entire data set. The three experimenters were graduate students with varying academic backgrounds (environmental planning, social work, and political science). Two of the experimenters were blind to content categories that could be derived from theory on values and emotion. In their review of the data set, the experimenters sought an intuitive feel for the content of the letters and to develop early impressions of potential content categories and themes. This portion of research was similar to the field study approaches and techniques of data collection saturation and hypothesis building found in the ethnographer's approach to qualitative field research (Browne 1976; Taylor and Bogdan 1984; Weiss 1966; Whyte 1984) and in grounded theory (Glaser and Strauss 1967; Strauss and Corbin 1994).

Following an initial review of the letters, each experimenter independently developed a listing of content categories. Content categories were also established on an a priori basis from a review of the literature and meetings with Hoosier National Forest officials at the beginning of the research project. With the assistance of the senior author, an iterative process was employed to reach agreement on the specific content categories to be used. First, the content categories identified by each experimenter were reviewed. In many cases the three experimenters generated categories of meaning that were clearly the same. Consensus on other categories was achieved by comparing categories with possible overlap in meaning and clarifying category definitions. This often entailed a return to the data set in order to clarify content meanings. Once a set of content categories was established, definitions of each category were written by the group. A coding manual, which included the content categories and definitions was developed and used by the experimenters for subsequent coding of the data set (Dorsey, Larsen, Tyler, and Vining 1994).

In order to measure inter-coder reliability, a sample of fourteen letters was coded by the three experimenters. A coding outcome was defined as the assignment of a code category by at least one of the experimenters. There was a total of 371 coding outcomes. Reliability coefficients were calculated for all possible pairs of coding outcomes within each of the letters. The coefficients ranged from .45 to .92 with an average of .69. Given the complexity and size of the coding scheme, and the conservative determination of the coding outcome, this is a reasonable reliability value.[2]

A representative random sample of 1,237 (25.6%) of the letters was then coded by the three original experimenters based upon the coding scheme in Table 1. Each of the 8,453 paragraphs in that sample of the letters was reviewed and codes were assigned to it. Multiple codes were often assigned to a paragraph, but no code was used more than once per paragraph. Thus, a particular code may have been used more than once in a letter. The outcome codes were assigned to the entire letter only and were intended to capture the overall intent of the writer in terms of desired or undesired outcomes. The Text Analysis Program (Drass 1986) was then used to generate frequencies of codes overall.

## Results

Forty eight content categories were identified and are listed in Table 1. For clarity, we organized these content codes into meta-categories. The description of the code categories below is followed by an analysis of code frequencies and initial qualitative analyses of selected content categories.

**Content Meta-Categories**

*Values.* The *Well-Being* content categories reflect content pertaining to the writer's well-being and sense of environmental quality. These categories include expressions of the spiritual and sacred aspects of nature and recreational activities, appreciation or concern for the aesthetics of the public lands, indications of the individual's mental or physical well-being related to the management plans, and indications of pleasure or love that were related to the forest or to activities therein.

*Environmental Values* is a large cluster of values with an environmental content or orientation. These are organized as either *Orientations* corresponding to held values or *Attributes*, corresponding to assigned value. Both of these may be present where an individual values an environmental attribute using a particular orientation. This distinction is often made in the literature on psychological values and was also found in grounded analyses of this data set.

The *Time* category was originally intended to be an organizational category by which to examine changes in frequencies of other codes that could be attributable to past, present, or future time frames. However, these categories may also indicate more fundamental concerns regarding heritage and posterity.

*Negative Consequences* refer to concerns expressed for the negative implications of an action on one or more specific values. Originally intended as organizational categories, these codes are also very useful to identify respondents' concerns for environmental attributes and associated strong emotions.

The *Ethics/Responsibility* categories indicate the presence of moral tone or reasoning, and reveal the writer's moral code, or rules for what should happen and how humans should behave. This meta-category includes Creighton's (1983) Venerable Source which refers to the writer's citation of another individual or moral code whose credibility is beyond reproach.

The *Individual Values* content categories refer to values associated with the writer's sense of personal worth. Indications of personal sacrifice are important indicators of how much the individual cared about the resource or the issue. Personal gain, in contrast, simply indicated what the writer had to gain by the suggested plan modification. *Personal Validation* is discussed below. The *Social Values* codes represent statements of social or societal values.

*Emotions*. Five emotion content categories were identified: *Anger/Disgust, Sadness/Fear/Distress, Hope/Optimism, Pleased/Satisfied,* and *Passion/Fervency*. The first four of these are most appropriately labeled as emotions while the fifth, *Passion/Fervency* is best understood as an expression of affect or intensity of feeling. Thus, by cross-tabulating an emotion with the affective code, one would be able to distinguish between strong and weak emotions.

*Outcomes*. Fifteen outcome codes were developed, representing the commenters' preferences for forest land use or disposition. These codes are most similar to the formal and informal systems by which public comments are often tabulated in the management context where a simple vote-counting process is often used.

**Code Frequencies**

Code frequencies for all of the categories except the outcomes were calculated as percents of total paragraphs coded and are presented in Table 2. Inspection of the frequencies reveals that nearly all of the code categories were used in the analysis of the data set. Although some of the code categories have low frequencies, all of the categories were grounded in the data. The ten most frequent codes are listed in italics in Table 2.

Environmental values were expressed frequently and often vociferously. The *Forest/Vegetation/Tree* code was assigned more frequently than any other, at 13.27% of paragraphs. Because the subject of the letters is the Hoosier National Forest, the frequency of the concern for and reference to the forest is logical. However, passages coded with this category often reflect deeper and more subtle content and are discussed in more detail in the qualitative analyses below.

*Human Centered Concerns* (10.34%) and *Economic Concerns* (6.40%) were also frequently expressed. The Hoosier National Forest contains many private inholdings and faces relatively intense population pressure and competition for commodities and recreational activities, many of which are in conflict with each other. The frequent presence of human and economic concerns is not surprising in this context. However, one would expect that similar analyses of public response to plans in other more remote public lands would present a different profile. The issues of preservation and protection of the resource and of wildlife and wildlife habitat were also frequently noted (7.5% and 6.85% respectively).

Other high frequency codes include *Sadness/Fear/Distress* (9.51%), *Damage* (9.69%), and *Destruction* (6.66%). An analysis of the co-occurrence of these codes is beyond the scope of this article. However, the frequent presence of these codes, along with the high frequency of the preservation code, is reminiscent of studies by Vining (1987) and Vining and Schroeder (1987) in which negative emotions and preservation values were associated. Further analyses will examine this and other questions regarding code category co-occurrences.

*Moral Judgments* (9.58%) were also frequently found, as were the writer's efforts at validating his or her stance (7.68%). A qualitative analysis of these content categories is presented below.

The frequencies of the *Outcome* codes are presented in Table 3. As noted previously, *Outcomes* were used only once in each letter, though more than one *Outcome* could be assigned to a letter. Thus, the percentages in Table 3 were calculated using the number of letters rather than number of paragraphs and the frequencies are not directly comparable with those of the other code categories. The *Off-Road Vehicle* codes were very frequently used, mirroring the importance of this issue during the Hoosier National Forest planning process. The sentiments regarding ORV's are divided nearly equally, emphasizing the difficulties faced by managers trying to balance multiple conflicting uses. *Timber* harvest opinions were also expressed frequently, with more than twice as many against harvesting than supporting it. This undoubtedly is not news to Forest managers who have struggled with public opinion regarding timber harvest for nearly forty years. Further qualitative analyses of the *Forest/Vegetation/Trees* code presented below provides additional insight into the complexity of the timber issue.

*Table 1.* Code meta-categories, categories, and descriptions.

| CODE | DESCRIPTION |
|---|---|
| **WELL BEING** | Values contributing to and affirming an individuals' physical, mental, and spiritual well-being. |
| Spirituality / Sacredness | Spiritual reverence or religious concerns. |
| Aesthetics | Appreciation for beauty (or concern about lack thereof). May also include non-visual sense modalities. |
| Well-Being | Positive and negative effects on an individuals' well-being, from a mental, emotional, or physical standpoint. May include reference to feelings of serenity, renewal, and physical vigor. |
| Pleasure / Like | Positive feelings of pleasure, enjoyment, and appreciation associated with certain environments and activities. |
| **ENVIRONMENTAL VALUES** | Values with an environmental content or orientation. |
| **Environmental Orientations** | Held values indicating attitudes or philosophical orientation towards the natural environment. |
| Stewardship/ Management | Belief that humans have a responsibility to take care of the natural environment. |
| Intrinsic Worth | Belief that an environment or feature has value for its own sake or state of being, and not for any particular utility to others. |
| Interconnectedness / Ecological | All aspects of the environment, including humans, are interconnected, so that the survival and health of any one component affects all others. |
| Preservation / Protection | Desire for an environment or other valued attribute to be preserved and protected in its current or natural state, without human interference, and with minimal human use. |
| Conservation / Restoration | Humans should act to maintain and improve the natural environment. |
| Utilitarian | The natural environment as a resource base for human use and consumption. |
| Human Culpability | Human responsibility and blame for environmental events or conditions. |
| **Environmental Attributes** | Values assigned by an individual to environmental features. |
| Forest / Vegetation / Trees | Concern or appreciation for the forest environment, vegetation or plant life in general, and/or for trees. |
| Wildlife and Habitat | Concern or appreciation for particular animals, wildlife in general, and/or for wildlife habitat. |
| Land / Soil / Trails | Concern or appreciation for land as an component of the environment, for soil quality or loss (erosion), and for effects of trail building or use. |
| Air / Atmosphere / Ozone | Concern or appreciation for air quality, weather patterns, and air pollution, including ozone depletion. |
| Water | Concern or appreciation for water features (lakes, rivers, creeks, ponds), water quality, and water usage. |
| Unique Areas / Features | Concern or appreciation for particular areas or features of the environment that are unique in identifiable ways. Includes specific areas of the Hoosier NF, historic or cultural sites, etc. |
| Human Centered Concerns | Concern for particular elements of the environment that have direct implications for human health and safety. Includes traffic safety and hazards, fire hazard, crime, vandalism, and trespass. |
| Environment / Earth | Broad concern or appreciation for the environment as a general concept, including reference to planet earth as a whole. |
| Nature / Wilderness | Broad concern or appreciation for nature and/or wilderness as a general concept. |
| Scarcity / Rareness | Added value or concern may be applied to any attribute due to its perceived scarcity or rareness and fear of its loss. |
| **TIME** | Temporal values arose as the writers struggled to place his/her concerns into a larger perspective. |
| Heritage | Concern for the past, whether in the form of historical significance, a legacy, nostalgia, or personal memories. |
| Posterity | Concern for the future, usually with respect to future generations, or for the long-term implications of an action. |
| The Present | Concern for the here and now or the current generation, often with a sense of urgency. |
| **NEGATIVE CONSEQUENCES** | Fear or concern for the negative implications of an action on one or more specific values. |
| Damage | Disturbance, damage or harm to any aspect of the environment. |
| Destruction | Irreparable destruction of any aspect of the environment or other value. Sometimes indicates the ultimate apocalyptic vision of doom when applied globally. |
| **ETHICS / RESPONSIBILITY** | Moralistic stance on what should or should not happen, and how humans should behave. |
| Moral Judgements / Moral Tone | Judgement as to what is morally right or wrong. May include a moralistic tone as to what should or should not happen. |
| Integrity / Trust | Values of honesty and trust or questions about the motivations and honesty of certain groups or individuals. |
| Rights / Entitlement | Perceived rights or entitlement to aspects or uses of the environment by a particular individual or group. |
| Equity | Concern for fairness and equity in the use of the environment. |
| Responsibility | Concern for responsibility, duty or obligation, whether the respondent's own, or someone else's. Also irresponsibility. |
| Venerable Source | Reference or quotation from a source which is deeply respected or held in high esteem, in an effort to add credence and strength to the respondent's position. |

*Table 1.* Code meta-categories, categories, and descriptions. ***(Continued)***

| CODE | DESCRIPTION |
|---|---|
| **INDIVIDUAL VALUES** | |
| Personal Validation | Effort to validate or strengthen a position and cause a viewpoint to be taken more seriously through reference to certain facts about the writer. |
| Personal Sacrifice | Personal losses or hardships suffered or that may be endured should particular actions take place. |
| Personal Gain | Personal gains or benefits enjoyed or that may be accrued should particular actions take place. |
| **SOCIAL VALUES** | These values focus on the individual from a social perspective. |
| Family / Children | Concern for the basic family unit, or one's children in particular, in terms of certain activities or uses of the environment. |
| Fellowship / Bonding | The sharing of experiences with friends and others as a means of bonding in relationships and building of fellowship. |
| Cooperation / Compromise | Concern for and a belief in the power of human cooperation, sharing, and compromise in dealing with environmental concerns. |
| Recreation | Concern for and appreciation of recreational opportunities and activities in the environment. |
| Patriotism | Local, state, and/or national pride and loyalty with respect to the use and disposition of the environment. |
| **MONETARY VALUES** | |
| General Economic Concerns | Reference to any monetary or economic concerns. Because one group's loss may be another's gain, these concerns are not separated into positive versus negative impacts. |
| **EMOTIONS** | |
| Anger / Disgust | An active negative emotion, indicating the respondent's anger and/or disgust at certain actions, events, or concerns. |
| Sadness / Fear / Distress | A passive negative emotion, indicating the respondent's feelings of sorrow, distress or worry. |
| Hope / Optimism | A passive positive emotion expressing the respondent's hopeful or optimistic feelings. |
| Pleased / Satisfied | An active positive emotion expressing the respondent's happiness, pleasure or satisfaction. |
| Passion / Fervency | Includes strong, but indeterminate feelings. |
| **III. OUTCOMES** | |
| Off-Road Vehicle (ORV) Use | Support of or opposition to continued or expanded use of off-road vehicles in the forest. |
| Hunting | Support of or opposition to continued or expanded hunting opportunities in the forest. |
| Wilderness Preservation | Support of or opposition to continued or expanded preservation or wilderness (usually roadless areas) in the forest. |
| "Not In My Backyard" | Concerns for activities in nearby properties. |
| Timbering | Support of or opposition to continued or expanded logging activities in the forest. |
| Multiple Use | Support for the concept of multiple uses of the forest. |
| Mineral Leasing | Support of or opposition to continued or increased leasing of mineral extraction rights to forest land. |

## Initial Qualitative Analysis of Selected Codes

We selected several codes for exploratory qualitative analyses. Some of these codes were selected because they occurred frequently, and others such as Venerable Source were chosen for their importance in understanding values and emotions. These analyses were conducted by extracting all of the text assigned to each of these codes. We then reviewed this text, often numbering hundreds of paragraphs, with the goal of extracting meanings that could bear on the implementation of a management plan or on the study of human environment interactions.

*Trees and Animals*. Writers often referred to trees and forests, and animals and habitat. In addition, the timber harvest outcome codes were among the most frequently employed. The apparent simplicity of these assigned value codes is belied, however by the depth of meaning that further analysis of the text revealed.

The importance of trees borders on the sacred in our society (Cronon, 1991). In the past forty years, controversies have erupted surrounding the cutting of trees for nearly any purpose including timber harvest, street widening, ecosystem restoration, and residential or commercial development. A number of authors have proposed that our reverence of trees is revealed in myths and religions as well (e.g., Dwyer et al., 1990; Schroeder, 1992). In the present data set, writers found forests or vegetation significant for utilitarian, aesthetic, and spiritual reasons, often with a reverent and emotional tone:

> *What is a tree? A place to run to for shelter from the rain to keep yourself dry. To kick off your shoes and sit under with someone you love for a picnic — to hide from the sun. A place for little boys to climb and learn their lesson from the big fall. Love your trees, nurture them.*

*Table 2.* Code category frequencies expressed as percentages of total paragraphs coded (N=8453). The ten most frequent categories are in italics.

| CODE CATEGORY | % | CODE CATEGORY | % |
|---|---|---|---|
| **Well-Being** | | **Negative Consequences** | |
| Spirituality/Sacred | 0.97 | *Damage* | *9.69* |
| Aesthetics | 5.16 | *Destruction* | *6.66* |
| Well-Being | 3.21 | **Ethics/Responsibility** | |
| Pleasure | 4.16 | *Moral Judgment or Tone* | *9.58* |
| **Environmental Values** | | Integrity/Trust | 4.13 |
| Stewardship/Management | 0.86 | Rights/Entitlement | 6.08 |
| Intrinsic Worth | 1.22 | Equity | 4.99 |
| Interconnectedness | 1.74 | Responsibility | 5.17 |
| *Preservation/Protect* | *7.50* | Venerable Source | 1.11 |
| Conservation/Restoration | 4.52 | **Individual Values** | |
| Utilitarian | 5.05 | *Personal Validation* | *7.68* |
| Human Culpability | 2.82 | Personal Sacrifice | 2.73 |
| *Forest/Vegetation/Trees* | *13.27* | Personal Gain | 0.52 |
| *Wildlife and Habitat* | *6.85* | **Social Values** | |
| Land/Soil/Trails | 4.86 | Family/Children | 2.63 |
| Air/Atmosphere | 0.86 | Fellowship/Bonding | 0.40 |
| Water | 2.14 | Cooperation/Compromise | 1.54 |
| Unique Areas/Features | 2.77 | Recreation | 5.68 |
| *Human-center. Concerns* | *10.34* | Patriotism | 0.57 |
| Environment/Earth | 3.45 | *Monetary Concerns* | *6.40* |
| Nature/Wilderness | 5.42 | **Emotions** | |
| Scarcity/Rareness | 3.58 | Anger/Disgust | 4.55 |
| **Time** | | *Sadness/Fear/Distress* | *9.51* |
| Heritage | 1.36 | Hope/Optimism | 0.64 |
| Posterity | 3.54 | Pleased/Satisfied | 3.37 |
| The Present | 0.86 | Passion/Fervency | 4.50 |

Similarly, passionate references to animals and their habitats were often expressed:

> *Imagine having a big business come into your home town destroying the places you know from playing on or experiencing as a child, teenager, young adult or elder. Having a bulldozer cut your home or school or park or church in half. So they could put in a sidewalk. That is what happens when a road goes thru a forest, animals, plants are destroyed, their communities, their feeding areas are altered forever. Put aside what we can get out of their existence. What about their existence? Nowhere is it written that man can do with the earth as he chooses.*

The importance of qualitative analyses of apparently clear-cut content categories such as this one is illustrated here. A simple measure of the frequency of comments about trees or animals would not reflect the depth of the meaning of such environmental features.

*Human Centered Concerns*. In passages coded with this category, writers focused on particular elements of the environment or of certain activities that have direct or indirect implications for human health and safety. This includes traffic safety and hazards, fire hazard, excessive noise, crime potential, vandalism, littering and trespass. Many of the human-centered concerns were expressed by owners of in-holdings or property adjacent to the Hoosier with respect to the effects that Forest users, projects and activities could have on their lifestyle and property.

> *The proposed area for this "Off Road Vehicle" course is shown to be directly adjacent to our property. If so, we are very concerned about the amount of traffic . . . which would be generated on the road from Waymansville to the Lutheran Lake area. This road already has had a*

*Table 3.* Outcome codes expressed as percentages of total number of letters (N=1237)

| CODE CATEGORY | % |
|---|---|
| Off-Road Vehicle Use - For | 27.32 |
| Off-Road Vehicle Use - Against | 30.23 |
| Pro-Hunting | 9.54 |
| Wilderness Preservation - For | 8.33 |
| Wilderness Preservation — Against | 4.37 |
| Not in My Backyard | 6.63 |
| Timber Harvest - For | 14.55 |
| Timber Harvest - Against | 29.83 |
| Multiple Use | 8.00 |
| Mineral Leasing - For | 0.73 |
| Mineral Leasing - Against | 18.76 |

> *number of accidents and if traffic is increased, and particularly if there is any possibility of alcohol use, this road can become one of the highest accident roads in this area.*

Many residents were upset about the prospect of increased or continued ORV presence near their properties:

> *We are concerned with the type of people that would use the trails because we have seen what most motorcycle gangs do to property. We are also very concerned about safety from fire started by sparks since our woodland joins the Hoosier National Forest on two sides, and we know what forest fires can do.*

References to motorcycle gangs, which may or may not be an accurate picture of ORV-users, were common in the letters. This may reflect direct experience, rumors, or it could be a strategic exaggeration. Nonetheless, strong fears and distress were frequently associated with ORV riders.

*Venerable Sources.* The citation of a venerable source was originally identified by Creighton (1983) as an indicator of underlying values and emotion. He suggested that citations of venerable sources are often employed as a means of bolstering the commenter's opinion and providing unimpeachable documentation for the position being espoused. As such, venerable sources provide insight into the writer's beliefs about appropriate standards for assessing land management decisions. In addition, we suggest that the citation of a venerable source indicates that the writer believes his or her own credibility to be insufficient to make a suitably forceful point. Thus, the presence of a venerable source may indicate the strength of the writerís convictions as well as the extent to which the writer expects to be ignored. Venerable sources were used consistently throughout the Hoosier letters and included such elements as laws, government documents, news articles, books, letters, individuals, and groups.

> *I am surprised that the State of Indiana could even consider sacrificing 11,000 acres of land for this type of use [off-road vehicles]. Theodore Roosevelt said "A nation is obligated to manage its resources for the greatest good of the greatest number over the long run." Does this plan really represent the majority of people in Indiana? Not only is this proposal short-sighted, it unjustly imposes the will of a small few upon all the residents of this state.*

This passage also illustrates another of Creighton's indicators of values and emotion, value-laden language. The references to the sacrifice of lands to ORV use and the imposition of the will of the few are expressed in forceful language that reveals the values of the writer. Thus land which is designated for ORV use is lost to this writer, and the act of providing for ORV use on public lands is unjust.

*Personal Validation.* The personal validation category was developed when it was noted that many writers made statements that justify subsequent comments and positions on issues. For example, a writer might indicate that he/she is a taxpayer, a landowner, or a long-term resident in an effort to give subsequent comments more weight.

This category reveals what the writer believes to be the criteria by which Forest Service officials will judge the importance of the comments in the letter. Similar to the citation of a venerable source, the use of personal validation frequently implies that the writer feels that his/her words must be given additional weight or validation in order to strengthen the commenter's position. There was a variety of ways in which writers accomplished this.

Perhaps the most common and innocuous personal validation device was identifying oneself, and this was usually done by providing age, name, and family position. Place of residence was also used to establish the writer's credentials. For example, one individual wrote that she was a native Hoosier currently residing in California who would soon return home. This probably indicates that she believed that the opinions of a California resident would be viewed as less important than those of an Indiana resident, and she identified herself accordingly. Other writers revealed that the proximity of their residence to the Hoosier or the length of their residence in Indiana are believed to be important weighting factors. The amount of money the individual (or group) spent either on activities and taxes related to public lands is also used to establish the writer's credentials. Other devices included relevant professional experience, personal or first-hand knowledge of the forest or forest issues, or the manner in which the writer uses public lands. Although it is

not possible to determine the extent to which these validation strategies work, this is an interesting question for future research.

Often commenters presented themselves as pillars of the community who had a stake in the outcome of the decision, and who had a valuable perspective to offer. They emphasized their position or status in the community to insure that their viewpoints would be given serious attention.

> *As a Taxpayer I require that the State and Federal Governments provide a legal and safe place for me to pursue my chosen Recreational Activity. I was a paratrooper in the United States Army, and I need the physically demanding sport of Dirt Biking. People gave their lives in wars so this would be a free country. What would they think if they knew that right here in Indiana good American Veterans are being denied a legal place to enjoy their country and their freedom?*

*Moral Judgements/Moral Tone*. The presence of this code indicated a judgement on the part of the respondent as to what is morally right or wrong or to what should or should not happen. Moral judgements were often associated with negative emotions and were characterized by strong or exaggerated language, sarcasm, rhetorical questions, name-calling, antagonism, and even threats. Thus, in the following example, the writer provides a wealth of insight into his/her interpersonal as well as environmental morals. Here we see that equal access to forests is a moral (or ethical) principle, that differing opinions should be respected, and that cutting trees is tantamount to immorality.

*It nearly gags me, to read some of the narrow minded, nearsighted, and childish, reasons, some of these people have for denying, equal use of the forest, to those who differ with their opinion.*

*I call Indiana the state that hates trees, because in other states I don't see or hear of the massive cutting of the precious life giving forest.*

Moral judgments were often accompanied by clear statements of the writer's sense of fairness and accompanied, as in the following quote, by references to heritage or posterity and personal sacrifice:

> *Just because they bought their playthings before they had a place to ride I am asked to sacrifice my safety, lifetime investments, and the heritage of generations to come.*

Morality is also reflected in the quote cited as an example of statements regarding wildlife above.

*Destruction, Damage, and Scarcity*. In passages coded with these categories, respondents discussed concepts of destruction and damage, such as how to avoid disturbance, the need to assess damages, and relative damages. Some things appeared to be more valued because of their perceived scarcity or rareness. That they could be lost forever concerned many writers, as in the following example:

> *I am vehemently opposed to the construction of ORV trails in Hoosier National Forest . . . It is unthinkable that the people of Indiana would allow such mechanical intrusion and degradation to occur to the Forest. Indiana is not exactly blessed with natural wonders compared to some other states; it would be a great shame to see something negative happen to one of Indiana's finest natural areas.*

These code categories also revealed underlying values:

> *The trails are damaged quickly and deeply. When a trail is obstructed, the ORV makes a new trail, increasing the destruction. The noise of ORVs destroys the value of these public lands for the overwhelming majority of people who are seeking a place of relative peace and quiet.*

*Nature/Wilderness*. Commenters often expressed their desire for an area to be kept in a natural or wild state. Oftentimes, as in the example below, the writers expressed a strong belief that the wilderness contributes to their sense of well-being.

> *I'd like to express to you the importance I place on having primitive wooded areas near to where I live. Knowing that they are mine to see and to spend time in gives me the encouragement to build toward a better life, for other people and for myself. My experience in the wild, however remote, has enriched beyond measure my own sense of place and time in this world. Taking away such a resource can have disastrous effects on the ability of people to achieve self-love and understanding and to relate to others.*

*Emotion and preservation*. Consistent with previous experimental studies (Vining, 1987, 1992b), qualitative analyses revealed that the wish to preserve wild or natural land was often accompanied by negative emotions. Sadness and fear were found more often than other emotions, and more often than most of the other content categories. These emotions were often expressed when the writer wanted to preserve the forest as it was.

> *We thought that the Hoosier National Forest Management Plan was to protect the Forest. Walking through the forest and looking at it I thought it would always be there. Now reading your Hoosier National Forestry Management Plan I would not be so sure.*

As in previous research, sadness and fear were also associated with the idea that natural beauty is gone forever once it is altered.

> *Surely you cannot be blinded to this mutilation of such beauty to total destruction, once destroyed never again to be the same. No amount of time will ever bring it back.*

*Emotion and Motivation*. Strong emotion during the public involvement process is often dismissed as irrational by land managers. This is perhaps understandable because the negative emotions are either directed at the manager or at his/her work, often causing a defensive reaction. An argument can be made, however, for the wisdom of listening carefully to strong emotion and attempting to understand its basis. Emotion plays a major role in motivation, and is an indicator of caring. The act of writing a letter itself would probably not occur without some level of emotion, and testimony at a public hearing, a daunting prospect for most, is undoubtedly motivated by the strongest emotions. An angry or sad passage in a letter may indicate the degree to which an individual cares about a particular issue. This must be interpreted carefully, however. Strong emotions are sometimes associated with relatively trivial events such as breaking a glass. Also, emotions may motivate an action, but fail to endure. The key is the expression of strongly-held values that underlie the emotion. In the following passage the writer used strong emotion to express values of family, solitude, and reverence for nature. In addition, deep disappointment that the agency values were apparently not in line with the writer's was expressed.

> *I used to find some solace in living surrounded by National Forest. It was peaceful and there was a certain beauty not found on a lot of woods. A person could walk for hours without seeing another person except for maybe during mushroom season. I always thought one day I would be able to enjoy these forests with my children. Now I have a 1 year old son and the Forests are being exploited. At least all the ones around where I grew up are. I can count at least 10 clearcuts within a mile radius from my home. And now the possibility of a Public cycle trail. Why concentrate all the destruction in one place? Maybe you feel that if you mess up just a few peoples solitude that would be better than having a bunch complaining. I can possibly see how some wild game could benefit from clear cuts. But then you defeat your purpose by allowing cycles [ORVs] to disrupt the wildlife habitat. This last issue of outdoor Indiana talks about the decline of grouse in the wake of mans exploitation of the Forests. In fact there was beginning to be a considerable increase in grouse in the pine Forest around here. Since these cycles have been around you don't jump near as many grouse, and I'm only talking about maybe 5 or 6 cycles a couple of times a weekend right now! Why isn't some of this timber money going to replant some of these clearcuts? Where does the money go?*

## Discussion

The results of this study have the potential to inform public involvement and management processes. These results also raise important questions for further research that would inform our knowledge of human-environment interactions.

The eloquence and emotionality of the comments emerges clearly from the public comments. A deeper understanding of this type of content could help managers to comprehend and perhaps even empathize with the motivations underlying public responses to management plans and actions. What, then, can we offer the manager who wishes to understand public commentary in a deeper way? In order to begin to answer this question, we visited with representatives of the Hoosier National Forest on several different occasions after we developed the content taxonomy.

It is evident from this study and from our discussions with Hoosier National Forest managers that tabulating desired outcomes, or "vote-counting" is not sufficient to understand the public perspective. It must be realized, however, that National Forest offices have few resources to devote to analyses such as the ones we conducted here. Although most of the offices have individuals (usually just one) responsible for reviewing public commentary, there is generally little time or resources available for summarizing the input and systematically integrating it into management plans. Although our coding manual includes clear definitions and signals to the presence of content to be coded, it is not a practical tool for field use, and was not intended to be. What this study can offer is some insight into the nature of the values and emotions that are expressed as well as ideas for training activities that might assist managers to become more accepting of and attuned to this type of content. Certainly a coding scheme designed for managers to use would have to be a great deal simpler than the one we have generated.

Our meetings with Hoosier officials (and with officials of other forests in a different context; see Vining, 1992a and 1992b) revealed that most managers share the public reverence for nature and much of the emotionality that goes with it. Managers may experience emotional reactions, but operate in a milieu in which those reactions are not often expressed. Encouraging managers to empathize more with the public by recognizing their own emotions and values

could help in communication efforts. Given the degree to which land managers are socialized into an agency in which rational (i.e., non-emotional) process are emphasized, this may be a difficult prospect. However, it is encouraging to note that many of the managers with whom we worked on this project were willing to recognize the values and emotions that they share with the public. Theirs is a difficult job in which criticism seems to come from every corner: the suppression of emotions is understandable.

Many of the code categories that reflect values and emotions are relatively easy to detect in written commentary. For example, the *Personal Validation* and *Venerable Source* categories are easy to see, and offer insight into the assumptions of the writer regarding the credibility of his or her comments. Others, such as *Moral Judgments* or *Ethics* require a little more diligence to discover, but reveal a great deal about the basis for public perceptions and comments. References to environmental attributes are often expressed in terms of held as well as assigned values. This distinction is important, but not difficult to make, and certainly could form the basis for training activities which would sensitize officials to the presence of these factors in public comments.

The presence of emotion in public commentary is easy to detect for the most part. Creighton's (1983) indicators of emotion, the citation of a venerable source, predicting a dire consequence, and the use of value-laden language were readily apparent throughout this data set. These are useful when clear emotion references are absent. However, value-laden language is present so often that it is not a category with good discriminative validity.

A more problematic issue for the integration of emotional responses into public involvement interpretations, however, is that the importance and value of emotion is so frequently underestimated or even dismissed as irrational or irrelevant. As noted above, it is crucial that managers understand that emotion plays a vital role in communication and motivation, including their own. Emotion is frequently a signal that powerful underlying values are at stake. Barriers to the recognition and understanding of emotion are often found, however, in the rational management culture in which most forest management takes place as well as in our societal norms that discredit emotion. It is also vital for public officials to learn to recognize the rationality, or functional value of emotion. When so many National Forests are having difficulty gaining acceptance for their plans due to public outcry, the price for ignoring emotional and value-laden content in public commentary is very high.

The results of this study also have the potential to help understand basic interactions between humans and natural environments. The Hoosier letters were characterized by remarkably eloquent and passionate pleas for a variety of outcomes, accompanied by a wealth of data on rationales for these positions. One of the most important elements of these letters was the moral or ethical basis for conclusions about environmental management and a variety of rules for proper behavior and for proper judgments were found. For example, ideals of fairness were frequently evident in calls for multiple uses of forest lands, but were sometimes overridden by other rules such as "squatter's rights," or "we were here first."

With respect to values, our quantitative analyses showed that the expression of held values dominated assigned values. This may call into question the common use of research instruments in which assigned values predominate. At a minimum, such questions should be accompanied by items that enable respondents to offer their held values as well, and qualitative analyses should play a greater role in studies of values. We have begun to link the values identified in this and other qualitative data sets to a variety of established psychological value scales in order to inform this process.

Social relationships between managers and commenters were also evident in the Hoosier letters, most notably in terms of attempts by writers to reinforce their positions through the citation of venerable sources or through attempts at personal validation. These results clearly illustrate the assumption of many writers that without some type of bolstering, their comments might fall on deaf ears. This data set offers enormous potential for examining the coded content that co-occurs when these validation attempts are present, a possibility that has ramifications for the study of social cognition as well as for management.

Consistent with other research (Dwyer et al., 1990; Schroeder, 1992), the deep importance of natural environments emerges clearly in this study. The meaning and significance of places was described with great poignancy by a number of writers. There is great potential to use this data set and others like it to understand how the meaning of nature is constructed as well as to examine respondents' senses of place.

Previous studies have indicated that negative emotions, preservation decisions, resource scarcity, and conflict between users are linked (Vining, 1987, 1992a; Vining and Schroeder, 1987). Our analyses found some support for this association, at least in terms of the frequency with which such elements are noted by commenters. Additional analyses will examine more directly the co-occurrence of negative and positive emotions with values and outcomes.

There are many other analyses that can and should be performed with the coded data. There are exploratory analyses that can be conducted as well as the testing of many hypotheses regarding relationships among values, emotions, and desired outcomes. Another logical extension of the process of understanding the bases for public comments on

land management options would be to repeat our analytic process in the context of a different forest planning process, perhaps in a National Forest with different environmental, social, and planning characteristics than the Hoosier. Such an analysis of comments from a forest with fewer inholdings, different use conflicts, and perhaps less population pressure would possibly result in the emergence of some different codes, but surely some overlap as well. Ultimately, the taxonomy developed here could be adapted into a standardized model for use by U.S. Forest Service units and other agencies interested in pursuing content analysis of public comments. Such a tool could be valuable in assessing large bodies of textual data without losing the important elements of value and emotion. If the values and emotions of the public can remain part of the picture throughout the process, then perhaps a better understanding of the public's needs can be achieved and improved decisions can follow.

## Endnotes

1. This time period may seem excessive, but it has proven difficult for National Forests to successfully implement plans at all due in part to extensive public comment and litigation on Environmental Impact Statements. The Hoosier is one of only a few Forests that have been able to revise and implement a plan.
2. Inter-coder agreement was established on one letter at a time. Reliability coefficients in the lower end of the range tended to occur when the first few sets of letters that were coded, with increasing levels of agreement over time. It is reasonable to assume that the .69 mean coefficient is a conservative estimate of inter-coder reliability.

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## References

Adler, F. 1956. The value concept in sociology. *The American Journal of Sociology* 62, 272- 279.

Altman, I. and J. F. Wohlwill (eds.). 1983. *Behavior and the Natural Environment*. New York: Plenum Press.

Appleton, J. 1975. *The Experience of Landscape*. London: John Wiley and Sons.

Axelrod, L. J. 1994. Balancing personal needs with environmental preservation: Identifying the values that guide decisions in ecological dilemmas. *Journal of Social Issues* 50, 85-104.

Bengston, D. 1994a. Changing forest values and ecosystem management. *Society and Natural Resources* 7, 515-533.

Bengston, D. 1994b. Reply from a neighboring village. *Society and Natural Resources* 7, 547- 550.

Braithwaite, V. A. and W. A. Scott. 1991. Values. In J. P. Robinson, P. R. Shaver, and L. S. Wrightsman (eds.), *Measures of Personality and Social Psychological Attitudes*. New York: Academic Press, Inc.

Braithwaite, V. A. and H. G. Law. 1985. Structure of human values: Testing the adequacy of the Rokeach Value Survey. *Journal of Personality and Social Psychology* 49, 250-263.

Brown, T. C. 1984. The concept of value in resource allocation. *Land Economics* 60, 231-246.

Browne, J. 1976. Fieldwork for fun and profit. In P. A. Golden, (ed.), *The Research Experience*. Itasca, IL: F. E. Peacock Publishers, Inc.

Creighton, J. L. 1981. *The Public Involvement Manual*. Cambridge MA: Abt Books.

Creighton, J. L. 1983. The use of values: Public participation in the planning process. In G. A. Daneke, M. W. Garcia, and J. Delli Priscolli (eds.), *Public Involvement and Social Impact Assessment*. Boulder: Westview Press, 143-160.

Cronon, W. 1991. *Nature's Metropolis*. New York: Norton.

Dorsey, D., M. C. Larsen, E. Tyler, and J. Vining. 1994. *Perceptions and Values Reflected in Public Responses to Hoosier National Forest Management Plan*. Report, Cooperative Agreement 23-92-59. Evanston, IL: USDA Forest Service North Central Forest Experiment Station.

Drass, K. 1986. *Text Analysis Package.*

Dwyer, J. F., H. W. Schroeder, and P. H. Gobster. 1990. The significance of urban trees and forests: Toward a deeper understanding of values. *Journal of Arboriculture* 17, 276-284.

Gilgen, A. R. and J. H. Cho. 1979. Questionnaire to measure eastern and western thought. *Psychological Reports* 44, 835-841.

Glaser, B. and A. Strauss. 1967. *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Chicago,: Aldine.

Hetherington, J., T. C. Daniel and T. C. Brown. 1994. Anything goes means everything stays: the perils of uncritical pluralism in the study of ecosystem values. *Society and Natural Resources* 7, 535-546.

Janis, I. L. and L. Mann. 1977. *Decision Making: A Psychological Analysis of Conflict, Choice, and Commitment*. New York: The Free Press.

Kaplan, R. 1989. *The Experience of Nature: A Psychological Perspective*. Cambridge UK: Cambridge University Press.

Kellert, S. R. 1996. *The Value of Life: Biological Diversity and Human Society*. Washington D. C.: Island Press.

Kempton, W., J. S. Boster, and J. A. Hartley. 1995. *Environmental Values in American Culture*. Cambridge, MA: MIT Press.

Kluckhohn, F. R. 1951. Values and value-orientations in the theory of action: An exploration in definition and classification. In T. Parsons and E. Shils, (eds.), *Toward a General Theory of Action*, Cambridge, MA:Harvard University Press, 388-433.

Kluckhohn, F. R. and F. Strodtbeck. 1961. *Variations in Value Orientations*. Evanston, IL: Row, Peterson.

Lazarus, R. S. 1991. *Emotion and Adaptation*. New York: Oxford University Press.

Mandler, G. 1984. *Mind and Body: Psychology of Emotion and Stress*. New York: Norton.

Merchant, C. 1992. *Radical Ecology: The Search for a Livable World*. New York: Routledge, Chapman and Hall.

Perry, R. B. 1954. *General Theory of Value*. Cambridge, MA: Harvard University Press.

Perry, R. B. 1968. *Realms of Value*. New York: Greenwood Press.

Rokeach, M. 1968. *Beliefs, Attitudes and Values: A Theory of Organization and Change*. San Francisco, CA: Jossey-Bass.

Rokeach, M. 1973. *The Nature of Human Values*. New York: Free Press.

Rokeach, M. 1979. *Understanding Human Values: Individual and Societal*. New York: Free Press.

Schroeder, H. W. 1988. Psychological and cultural effects of forests on people. In *Proceedings of the 1988 Society of American Foresters National Convention, October 17, Rochester, NY*. Bethesda, MD: Society of American Foresters, 10-14.

Schroeder, H. W. 1992. The spiritual aspect of nature: A perspective from depth psychology. In *Proceedings of the 1991 Northeastern Recreation Research Conference, April 8, Saratoga Springs, NY*. General Technical Report NE-160. Radnor PA: USDA Forest Service, Northeastern Experiment Station, 25-30.

Stern, P. C., T. Dietz, and L. Kalof. 1993. Value orientations, gender, and environmental concern. *Environment and Behavior* 25, 322-348.

Strauss, A., and J. Corbin. 1994. Grounded theory methodology: An overview. In N. K. Denzin and Y. S. Lincoln (eds.), *Handbook of Qualitative Research*. Thousand Oaks, CA: Sage Press, 273-285.

Taylor, S. J. and R. Bogdan. 1984. *Introduction to Qualitative Research Methods*. New York: John Wiley and Sons.

Vining, J. 1987. Environmental decisions: The interaction of emotions, information, and decision context. *Journal of Environmental Psychology* 7, 13-30.

Vining, J. 1992a. Environmental emotions and decisions: A comparison of the responses and expectations of forest managers, an environmental group, and the public. *Environment and Behavior* 24, 3-34.

Vining, J. 1992b. Environmental values, emotions, and public involvement. In D. C. Le Master and G. R. Parker (eds.), *Ecosystem Management in a Dynamic Society*. West Lafayette, IN, Dept. of Forestry and Natural Resources, Purdue University.

Vining, J. and H. W. Schroeder. 1987. Emotions in environmental decision-making: Rational planning vs. the passionate public. In M.L. Miller, R. Gale, and P. J. Brown (eds.), *Social Science in Natural Resource Management Systems*. Boulder, CO: Westview Press, 181-192.

Weiss, R. S. 1966. Alternative approaches in the study of complex situations. *Human Organization* 25, 198-206.

Whyte, W. F. with K. K. Whyte. 1984. *Learning From the Field, A Guide from Experience*. Newbury Park, CA: SAGE Publications.

Williams, Jr., R. M. 1979. Change and stability in values and value systems: A sociological perspective. In M. Rokeach (ed.), *Understanding Human Values: Individual and Societal*. New York: Free Press, 15-26.

# Navigating the Confluence of Two Streams of Social Research: Contingent Valuation and Normative Standards

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## *Abstract*

*Interdisciplinary research on contingent valuation and normative standards is reviewed and integrated. The objectives of the study are to identify issues of concern to both areas of research and to describe findings from each area of research that might inform the other. Seven theoretical and methodological issues are identified and reviewed. Based on this analysis a series of conditions are described in which contingent valuation and normative standards research are most applicable and effective, and recommendations for future research are developed.*

***Keywords:*** *contingent valuation, normative standards, literature review, theoretical issues, methodological issues, interdisciplinary research*

## Introduction

Contingent valuation (CV) and normative standards (NS) represent two streams of social research. CV has become a common approach to measuring the economic value of public goods, such as parks and aesthetic beauty. NS is becoming an increasingly common approach to measuring acceptable conditions in parks and related recreation areas. These two streams of social research have been developed independently — CV research has evolved primarily out of the discipline of economics, while NS research has evolved from the disciplines of sociology and social psychology - but share several theoretical and methodological issues. This paper reviews and synthesizes CV and NS research. The objective of the paper is to identify findings from CV research that may inform NS research and vice-versa. In this way, we hope to contribute to the advancement of more efficient and effective methods of CV and NS research.

## CV Research

Economists traditionally rely on observation of the actions of buyers and sellers in a market in order to identify the values individuals place on goods and services. CV was developed as a means of estimating the economic value of goods for which no explicit market exists. CV draws upon consumer theory and the methods of survey research to elicit the values individuals place upon these "non-market" goods (Mitchell and Carson 1989).

Surveys are used by CV researchers to present respondents with a scenario describing a baseline and a hypothetical alternative level of provision of a non-market good or resource. Respondents are asked to state their maximum willingness-to-pay (WTP) or minimum willingness-to-accept compensation (WTA) for the hypothetical change in the quality or quantity of the good described in the scenario. Individual WTP or WTA values are averaged for the sample and then aggregated over the relevant population to estimate the total economic benefits associated with the scenario. Other questions typically included in a CV survey ask respondents about their socioeconomic characteristics (e.g., income, education, gender) and their use of the resource (Mitchell and Carson 1989).

CV was introduced in the 1960s by Robert K. Davis, who used questionnaires to estimate the benefits of outdoor recreation in a Maine backcountry area (Mitchell and Carson, 1989). Since the 1970s, CV has been used by economists to measure the benefits of a wide variety of non-market goods, including outdoor recreation (Walsh, Miller and Gilliam 1983), reductions in morbidity and mortality risk (Rowe and Chestnut 1984; Tolley and Babcock 1986; Brajer, Hall and Rowe 1991), congestion in a wilderness setting (Walsh and Gilliam 1982; Walsh et al. 1983), wildlife populations (Cocheba and Langford 1978), water quality (Gramlich 1977; Mitchell and Carson 1981, 1984; Carson and Mitchell 1993b), and visibility (Rowe, d'Arge and Brookshire 1980; Schulze, Cummings, Brookshire, Thayer, Whitworth and Rahmatian 1983).

Many economists have debated the validity of economic value estimates generated using the CV method. Two developments in environmental regulation have heightened the significance of this debate. In 1986, the Department of the Interior declared that passive or non-use values should be included among the losses parties are responsible for under the Comprehensive Environmental Response, Compensation,

and Liability Act (CERCLA). Non-use values are the benefits individuals derive from a resource without actively using it. Because non-use values are derived from non-market behavior, they cannot be estimated directly from the transactions of buyers and sellers in a market (Arrow, Solow, Portney, Learner, Radner and Schuman 1993).

The second development took place in 1990, when Congress enacted the Oil Pollution Act of 1990 (OPA). The OPA requires responsible parties to provide compensation for damages caused by oil spilled into waters or on shorelines under the jurisdiction of the United States, including non-use values.

In order to include non-use values, the implementation of both CERCLA and OPA required a method to assess the magnitude of natural resource damages not captured from observations of market transactions. The National Oceanic and Atmospheric Administration (NOAA) commissioned a panel of economic experts, co-chaired by Nobel laureates Kenneth Arrow and Robert Solow, to evaluate the use of CV in making natural resource damage assessments including non-use values. The panel concluded that the CV method could be used for such purposes, subject to numerous conditions regarding the design and administration of the survey instrument.

A substantial body of CV research has focused on the survey design and administration issues inherent in the CV method. Some of the topics CV research has focused on include minimizing the potential for bias in responses (Sutherland and Walsh 1985; Brown and Duffield 1995; Loomis 1996), selecting the appropriate format of the elicitation questions (Kealy and Turner 1993; Boyle and Bishop 1988), and conducting statistical analysis of CV data (Lindsey 1994).

## NS Research

Developed in the fields of sociology and social psychology, NS have attracted considerable attention as an organizing framework in recreation research and management. As applied to parks and related areas, norms are generally defined as standards that individuals and groups use for evaluating behavior and social and environmental conditions (Donnelly, Vaske and Shelby 1992; Shelby and Vaske 1991; Vaske, Graefe, Shelby and Heberlein 1986). If visitors have norms concerning relevant aspects of recreation experiences, then such norms can be studied and used to guide management of parks and related areas.

Application of norms in outdoor recreation is most fully described by Shelby and Heberlein (1986) and Vaske et al. (1986). These applications rely heavily upon the work of Jackson (1965), who developed a methodology — return potential curves — to measure norms. Typically, respondents are asked to evaluate the acceptability of a range of social and/or resource conditions. Data on the personal norms of individuals can then be aggregated to test for the existence of social norms, or the degree to which norms are shared across groups.

NS research in outdoor recreation has focused largely on the issue of crowding (e.g., Heberlein, Alfano, and Ervin 1986; Patterson and Hammitt 1990; Shelby 1981a; Vaske et al. 1986; Whittaker and Shelby 1988; Williams, Roggenbuck, and Bange 1991), but also has been expanded to include other social and ecological variables, including ecological impacts at wilderness campsites (Shelby, Vaske and Harris 1988), wildlife management practices (Vaske and Donnelly 1988), and minimum stream flows (Shelby and Whittaker 1995). As research on NS in recreation has matured, attention has turned to a variety of conceptual and methodological issues, including the theoretical basis of norms and their application to outdoor recreation (Heywood 1996a, 1996b; Noe 1992; Roggenbuck, Williams, Bange and Dean 1991; Williams et al. 1991; Shelby and Vaske, 1991; Manning, Lime and Hof 1996b); alternative evaluative measures (Manning, Valliere and Jacobi 1997), visual representation of social and environmental conditions (Manning, Lime, Hof and Freimund 1995a; Hof, Hammett, Rees, Belnap, Poe, Lime and Manning 1994; Manning, Lime and McMonagle 1995b; Manning et al. 1996b; Manning, Lime, Freimund and Pitt 1996a); congruence between norms and behavior (Hammitt and Rutlin 1995; Patterson and Hammitt 1990; Lewis, Lime and Anderson 1996; Manning et al. 1996a; Manning et al. 1996b; Vaske et al. 1986); and question formats designed to reduce respondent burden (Shelby 1981b; Vaske et al. 1986; Manning et al. 1997).

## Common Issues

From a broad conceptual standpoint, both CV and NS research are concerned with uncovering information about people's preferences with respect to the provision of various resources (e.g., the economic value of visiting a national park, or the acceptable number of other park visitors). Moreover, from a similarly broad methodological standpoint, both areas of study rely primarily on survey research (i.e., they elicit from respondents a dollar value of visiting a park or the acceptability of encountering selected numbers of other park visitors). The broad similarities between CV and NS are evident upon review of the literature in these two areas of research. The theoretical foundations underlying each area of research, and their practical application are confronted by similar issues and challenges. Issues common to both areas of research are illustrated in Table 1 and are described below.

*Table 1*. Theoretical and methodological issues in contingent valuation and normative standards research

| Issue | Concerns | |
|---|---|---|
| | Contingent Valuation | Normative Standards |
| 1. Can questions be answered meaningfully? | CV surveys ask respondents to place economic values on goods that they may be unfamiliar with, or goods that they may not be used to pricing. | NS surveys ask respondents about issues for which they may or may not have well-developed norms. |
| 2. Influence of information on responses | The amount and/or type of information provided to respondents has been shown to influence study findings. | Information provided to respondents can be presented in a narrative/numerical format or in a visual format. The choice of format can influence study findings. |
| 3. Inherent biases | Survey research is inherently susceptible to various forms of bias, including hypothetical bias; compliance bias; strategic bias; starting point bias; and embedding effect. | Norm congruence provides a test of study bias, or the "validity" of study findings, by comparing responses to visitor behavior. |
| 4. Influence of question format on responses | Variation has been observed in values obtained from closed-ended and open-ended questions for the same good. | "Long" and "short" question formats affect respondent burden, but may also influence the amount and quality of resulting information. |
| 5. Effect of evaluative measure on validity of responses | CV estimates of WTA values often exceed CV estimates of WTP values for the same good. | While NS research often asks about acceptability, questions about preference, tolerance, and what should be might be more pertinent depending on the management context. Varying wording can yield different results. |
| 6. Effect of making response implications salient | Reminders about budget constraints and availability of substitutes has been shown to influence CV estimates of WTP in some cases. | Respondent knowledge of study implications can influence study findings. |
| 7. How type and scale of analysis effects results | Decisions about the extent of the study population, measures of central tendency, and methods for dealing with protest zero bids and outliers have been shown to have a significant influence on WTP values in some cases. | Alternative statistical measures and reporting formats yield different insights into study findings. |

## Can Questions Be Answered Meaningfully?

A fundamental issue underlying both CV and NS research concerns the extent to which respondents possess economic values and normative standards for the issues under study. In the CV literature, this issue has been characterized by alternative philosophies: a philosophy of articulated values versus a philosophy of basic values (Fischoff 1991). The former suggests that survey respondents have relatively well-developed economic values for a host of possible goods and services and that these values can be drawn upon and articulated given appropriate strategies of question formulation. The latter philosophy suggests that respondents have informed economic values on only a relatively small set of issues of immediate importance, and that answers to at least some WTP questions may simply be made up at the time the questions are asked.

### Market Context

Can respondents answer such questions meaningfully? Individuals may have difficulty providing meaningful answers to CV questions if respondents are unfamiliar with or uncomfortable about identifying a dollar value for goods that are not commonly traded in a market. Bishop and Heberlein (1979) suggest that consumer behavior is quite different in a market than their response behavior in CV surveys. It was noted, for example, that a decision in a market context may take a person weeks or even months to consider the alternatives, compared to the short time the respondent has to consider the alternatives in a personal interview, telephone, or mail survey.

Cummings, Brookshire, and Schulze (1986) recommend limiting the use of CV to situations emulating markets (i.e., subjects understand or are familiar with the good, and subjects have had or are allowed to obtain prior valuation and choice experience with respect to considering levels of the good in question). Mitchell and Carson (1989) respond to this argument, stating that individuals are frequently asked to state or reveal their preferences about potentially unfamiliar concepts or items. In addition, these decisions are often made within a framework that individuals have little experience with. For example, public issues are decided regularly based

on voting behavior. An individual's vote is considered to reveal their true preferences despite the fact that voters often make spontaneous decisions and respond to some relatively unfamiliar items on the ballot (Arrow et al. 1993). Limited research also suggests that most respondents are reasonably confident of the validity of their answers. Schkade and Payne (1994), for example, conducted a verbal protocol analysis, allowing respondents to self-assess how they answered a series of WTP questions. While 20 percent of respondents reported they merely guessed, most felt that they had carefully weighed the value of the resource under study and that they had considered their personal budget constraints before answering.

**Familiarity with the Resource**

Critics of the CV method also argue that "respondents do not understand what it is they are being asked to value" (Arrow et al. 1993, 4603). According to critics, the WTP responses provided by individuals who do not understand or are unfamiliar with the good being valued are not meaningful (Arrow et al. 1993).

Several CV studies have been conducted to investigate the influence of respondents' familiarity with the good being valued on WTP estimates. Lindsay, Halstead, Tupper and Vaske (1992) found WTP to protect coastal beaches from erosion was higher for individuals who were familiar with coastal laws. In addition, Kealy and Turner (1993) found that WTP estimates are more robust for a familiar private good (chocolate candy) than a less familiar public good (aquatic ecosystem protection) when several question formats are used in the CV survey. On the other hand, Boyle, Welsh and Bishop (1993) found no significant difference between experienced and inexperienced whitewater boaters with respect to their WTP for different flow levels on the Colorado River. Mitchell and Carson (1989) conclude that when confronted by an unfamiliar, hypothetical situation, respondents tend to construct meaning based on previous experience and to arrive at an opinion that does reflect their true tastes and preferences.

**Suggestions for Implementation**

CV researchers have made efforts to increase the reliability of CV responses by attempting to create realistic decision frameworks that respondents are familiar with. For example, Walsh, Loomis and Gillman (1984) asked Colorado residents to indicate how much they would be willing to pay into a special fund used exclusively for protecting wilderness. The fund was selected as the payment vehicle because of its similarity to the nongame wildlife preservation fund Colorado residents can elect to contribute to on their state income tax return.

Some authors have suggested that, given uncertainty over the ability of respondents to provide meaningful responses to CV questions, researchers should include a "no vote" response option. Providing a "no vote" option would allow respondents who do not have well-informed responses to so indicate (Arrow et al. 1993: Fischoff 1991).

The NOAA panel indicated that a CV survey must include an accurate and thorough description of the good or service being valued. In addition, the NOAA panel recommended the use of pre-tests and focus groups to determine whether the information provided to respondents is adequate for answering the CV question. CV studies that follow these recommendations are likely to enhance the reliability of WTP responses.

**Existence of Norms**

NS researchers have begun to address the issue of whether survey questions about normative standards can be answered meaningfully. First, the theoretical foundations of norms have been reexamined (Heywood 1996a, 1996b; Noe 1992; Roggenbuck et al. 1991; Williams et al. 1991; Shelby and Vaske 1991; Manning et al. 1996a). As noted earlier, normative theory has been borrowed from the disciplines of sociology and social psychology. Within these disciplines, norms are characterized by several distinguishing features, including the fact that they are obligatory, they are enforced by sanctions, they guide behavior, and they are shared by social groups. Application of normative theory to NS research in outdoor recreation has adopted a more expansive view of norms suggesting that (1) recreation often involves emerging norms for which a strong sense of obligation and sanction has yet to fully evolve; (2) recreation-related norms can apply to social and resource conditions as well as behavior because such conditions are often a function of individual behavior; (3) recreation-related norms often regulate collective rather than individual behavior, and (4) research has documented some degree of consensus regarding a number of recreation-related norms (Shelby and Vaske 1991).

Second, empirical findings of NS studies are suggestive of the extent to which norms may exist. Most studies have found that visitors to recreation areas are able to respond to NS questions and that, as noted earlier, these studies have addressed a variety of social and resource conditions. The extent to which there is agreement or consensus about such norms is less certain (see, for example, Roggenbuck et al. 1991; Shelby and Vaske 1991; Williams et al. 1991). While there are a number of ways to measure consensus, there is no broad agreement about the degree of consensus needed to establish normative standards. Moreover, the degree of consensus is affected by a number of intervening variables.

These issues are considered in greater depth later in this paper.

**"No Vote" Option**

Third, as in CV research, NS researchers have considered the advisability of incorporating a "no vote" option for respondents (Roggenbuck et al. 1991; Hall and Shelby 1996). This option would allow respondents to indicate that the impact under consideration is important, but that they can't specify a maximum amount of impact acceptable. This would allow respondents who do not have well-informed opinions to so indicate. Initial studies suggest that a minority of respondents will select this option (Hall and Shelby 1996). However, the advisability of this strategy is not universally acknowledged. One study suggests that respondents who choose this option are similar to those who report a norm, and that this response option may simply be an easy way for some respondents to avoid a potentially burdensome question (Hall and Shelby 1996).

Finally, in keeping with the theoretical foundations of norms, some researchers have suggested that NS questions be formulated with a more direct emphasis on notions such as obligation (e.g., the maximum amount of impact that should be allowed), internal or informal sanctions (e.g., a sense of personal responsibility), and the extent to which they are thought to be shared by others (e.g., what "others" are believed to think) (Heywood 1996a; Roggenbuck et al. 1991).

## Influence of Information on Responses

In both CV and NS surveys a tension exists between providing adequate information and overloading respondents with such information. Past research suggests the amount and type of information provided can influence responses obtained in both CV and NS research. In the CV literature, this issue is often termed "information bias." Varying amounts of information on the ecological and social services of wetlands were found to influence WTP for wetland protection; the more services described, the higher the WTP estimates (Bergstrom, Stoll and Randall 1990). Ajzen, Brown and Rosenthal (1996) concluded that the nature of the information provided can profoundly affect WTP estimates, and that subtle contextual cues can seriously bias these estimates, especially when the good being valued has low personal relevance to respondents. Information on the WTP of other respondents has been found to influence individual WTP responses (Rowe et al. 1980). Early in the development of CV, it was assumed that only the nature of the good and the amount of the amenity being valued should influence WTP; all other information (such as the payment vehicle) should be neutral (Rowe et al. 1980). But Arrow (1986), Kahneman (1986) and Randall (1986) have argued that important conditions of the scenario *should* be expected to affect WTP amounts. In their view, respondents are valuing a policy that includes the amenity under certain conditions (Mitchell and Carson 1989).

The role of information on NS has been explored in the context of examining narrative versus visual approaches to resource description. Traditionally, the resource under study is described to the respondents in a brief narrative. For example, respondents may be asked to consider a situation in which they are hiking a wilderness trail and encounter five other groups at a scenic attraction. Alternatively, respondents could be presented with a picture or visual simulation of the situation (Hof et al. 1994; Manning, Lime, Hof and Freimund 1995a; Manning et al. 1995b; Manning et al. 1996a; Manning et al. 1996b). Initial research on this issue suggests that visual presentations of normative scenarios may result in higher crowding norms (Manning et al. 1996a). Respondents may cognitively "process" some people in the visual representation at a subconscious level because they are perceived to be "like" the respondent and therefore do not substantially contribute to perceived crowding. In contrast, narrative descriptions call explicit attention to all people "encountered."

## Inherent Biases

As with all applications of survey research, CV and NS studies are subject to numerous forms of potential bias. "Hypothetical bias" concerns the degree to which responses to survey questions may not reflect actual behavior. CV researchers have explored this issue both theoretically and empirically. In its most fundamental form, hypothetical bias is a manifestation of the sometimes weak and inconsistent relationships documented between verbal measures of attitude and observation of actual behavior. This suggests that hypothetical bias may be a substantial problem in WTP research (Fishbein and Ajzen 1975). Mitchell and Carson (1989) argue that the key problem in CV is the novelty of valuing a public good — that respondents have a varying degree of familiarity with the good and how they currently pay for its provision. In an empirical test for hypothetical bias, Neill, Cummings, Ganderton, Harrison, and McGuckin (1994) found hypothetical values of respondents to be significantly higher than real economic commitments.

There is a significant amount of research that suggests the relationship between attitudes and behavior is not weak and inconsistent. In fact a number of studies argue that there is a positive relationship between attitudes and behavior (Canary and Seibold 1983; Schuman and Johnson 1976; Stouffer and Lumsdaine 1949; Brannon, Cyphers, Hess,

Hesselbart, Keane, Schuman, Vaccaro and Wright 1973; Kelly and Mirer 1974; Vinokur-Kaplan 1978). Additionally, Bishop and Heberlein (1986) argue that attitudes encompass intended behavior. Perhaps the findings of these studies explain why, in a summary of studies comparing hypothetical CV markets and markets simulated by using real money, Mitchell and Carson (1989) found that various validity assessments are generally favorable to CV's potential for measuring valid WTP amounts

NS researchers have recently begun to address the potential for hypothetical bias through study of "norm congruence," or the degree to which respondent behavior and/or evaluation of conditions corresponds to previously reported normative standards. While study findings are not uniform, they generally suggest that hypothetical bias is not a substantial problem (Hammitt and Rutlin 1995; Lewis et al. 1996; Manning et al. 1996a, 1996b; Williams et al. 1991; Patterson and Hammitt 1990). For example, respondents who report encountering more groups of hikers than their personal norm tend to report higher levels of perceived crowding than do respondents who report seeing fewer groups of hikers than their personal norms. In addition, those respondents who report encountering more groups of hikers than their personal norm are more likely to report adopting some action to avoid such encounters.

Several other sources of bias may affect results of CV and NS research, though these issues are addressed exclusively in the CV literature. "Social desirability bias," or "compliance bias" concerns the degree to which respondents might be influenced by perceived social norms or cues from the context or administration of the survey (Snyder and Swann 1976; Harris, Driver and McLaughlin 1989). For example, a questionnaire addressing the value of free-flowing rivers may implicitly or explicitly imply that free-flowing rivers are important, thereby influencing respondents. Or interviewers may unknowingly impart subtle cues to respondents.

"Strategic bias" may occur if respondents wish to intentionally influence study findings in one direction or another (Fischoff, 1991). For example, respondents may deliberately understate their WTP if they feel they may be asked to actually pay for a resource based on study findings. Or they may overstate their WTP if they want more of the resource, but feel it is unlikely they will be asked to actually pay.

"Starting point bias" is a more technical, methodological issue concerning the degree to which an initial value proposed in a study may ultimately influence WTP. Starting point bias is an issue in the case of CV studies that use multiple-bounded dichotomous choice questions. The respondent is asked to indicate with a "yes" or "no" response, whether they would be willing to pay a proposed dollar amount for the resource. The next question poses a higher dollar value for those individuals who selected a "yes" response to the previous question, and a lower dollar value to those individuals who responded "no." Starting point bias is a concern if the initial dollar amount proposed effects the magnitude of WTP estimated in the study (e.g., larger starting bids result in larger WTP values than lower starting bids). Several studies have explored this issue, but findings are inconclusive (Rowe et al. 1980; Desvousges, Smith and McGivney 1983; Thayer 1981).

A final type of potential bias in CV studies is termed "embedding bias." Some economists argue that to be consistent with economic theory, CV responses should vary depending upon the magnitude of the environmental amenity. Boyle, Desvousges, Johnson, Dunford and Hudson (1994) found no significant differences in WTP of nonusers to prevent 2000, 20,000, or 200,000 migratory waterfowl deaths in the Central Flyway of the United States. Kahneman and Knetsch (1992) presented empirical evidence that values derived from CV for any one public good may be somewhat arbitrary because value estimates may vary depending on whether the good is valued by itself or as part of some broader package. Loomis, Lockwood and DeLacy (1993) tested for embedding effects in contingent valuation of forest protection and concluded that while there was some evidence of embedding bias, the effects were less when respondents were clearly informed of the regional context of the good being valued. Carson and Mitchell (1993a, 1995), however, based on evidence from the CV literature, and empirical evidence from their own study, concluded that respondents are sensitive to the scope of the good being valued.

Mitchell and Carson (1989) cite several studies that identify a similar issue to embedding bias called the "adding up effect" — that WTP values for two goods elicited individually might be significantly different than the WTP for the two goods valued together. Mitchell and Carson (1989) argue that individually measured WTP cannot be added without some over-counting effect. Instead, respondents tend to value each good sequentially as if it were a small, incremental (marginal) addition to the existing set of environmental amenities they enjoy, instead of valuing each good separately. Mitchell and Carson (1989) argue that this method of valuing additional units of a good is consistent with economic theory, but Randall and Hoehn (1996) state that although economic theory anticipates embedding, it is possible that CV exacerbates and even amplifies these effects. The adding up effect remains a matter of contention in contemporary CV research.

A final issue that has been investigated in the CV literature is whether respondents answer all WTP questions with the same response. Economic theory suggests that WTP

responses should differ significantly when respondents are faced with WTP choices involving different objects (Smith 1996). Smith (1996) evaluated two WTP questions - one to expand a popular flower planting program and a second to facilitate the use of recycled tires in making asphalt for highways. Smith found significant differences between estimated WTP for the two plans, suggesting that respondents can discriminate between questions for different goods when answering CV survey questions.

## Influence of Question Format on Responses

CV and NS research rely on survey methods. Thus, issues of question format are pertinent. A principal issue concerns attempts to reduce respondent burden: how can questions be asked so they are easier or less time-consuming to answer? The choice of question format has a significant influence on the complexity or amount of time involved in responding to survey questions. Question formats, or "elicitation techniques", as they are often referred to, have evolved as researchers learn more about the strengths and weaknesses of such techniques. Mitchell and Carson (1989) identify nine elicitation methods, categorized by whether actual maximum WTP is obtained and whether a single WTP question or a series of questions is asked.

The most widely used elicitation methods have been open-ended (direct question), and dichotomous choice (yes or no). In open-ended questions, respondents are asked to state a maximum dollar amount they would be willing to pay for the hypothetical scenario. In dichotomous choice (close-ended) questions, respondents are told how much each individual would have to pay if the hypothetical scenario is adopted and then asked to vote "yes" or "no". The dichotomous choice method is so named because only two responses ("yes" and "no") are available (Arrow et al. 1993).

Several studies have examined the WTP values obtained using both open-ended and dichotomous choice formats (e.g., Kealy and Turner 1993; Loomis 1990; Loomis, Brown, Lucero and Peterson 1997; Randall, Hoehn and Brookshire 1983). While there is no clear consensus among researchers about which question format is more valid, several studies suggest that close-ended questions may yield higher WTP values than open-ended questions.

Both the open-ended and dichotomous choice question formats have advantages and disadvantages (Loomis 1990). Using open-ended questions is a more direct measure of maximum WTP. However, the open-ended format is more burdensome to respondents as it requires them to offer a dollar amount with little or no assistance. As a consequence, there tends to be an unacceptably large number of nonresponses and zero bids from individuals with actual WTP values greater than zero (Desvousges, Smith and McGiveny 1983).

The dichotomous choice approach has the disadvantage of requiring more sophisticated statistical techniques in order to derive WTP indirectly from responses to the CV question (Boyle and Bishop 1988). In addition, responses to dichotomous choice questions only provide a bound on individuals' actual WTP, and therefore a large sample size is needed to get an acceptable level of statistical precision. However, efficiency can be increased if the dichotomous choice question is followed up by further single dichotomous choice questions with the dollar values being revised upward or downward depending on the respondent's initial answer (Carson, Hanneman and Mitchell 1986).

The NOAA panel report provides a strong recommendation in favor of the dichotomous choice format of the CV question (Arrow et al. 1993). The first argument the NOAA panel presents against the use of open-ended CV questions is related to the "familiarity" issue discussed in the previous section of this paper. According to the NOAA panel, the open-ended format "lacks realism since respondents are rarely asked — to place a dollar value on a particular good" (Arrow et al. 1993, 4606). Because respondents are unfamiliar with this task of pricing goods, the reliability of their responses is questionable. In addition, the open-ended format provides respondents with an opportunity to overstate or understate their true WTP in an attempt to influence the outcome. The dichotomous choice format, on the other hand, provides a more familiar and realistic situation for respondents since — "referenda on the provision of public goods are not uncommon in real life" (Arrow et al. 1993, 4606). In addition, the close-ended format eliminates the opportunity for strategic bidding.

An analogous issue in the NS literature concerns "long" — sometimes called the "repetitive item format" (Shelby 1981b; Vaske, Graefe and Dempster 1982) — versus "short" question formats. Early applications of NS research employed the long question format by asking respondents to evaluate a range of resource or social conditions. For example, studies of crowding norms might have asked respondents to evaluate the acceptability of seeing 0, 5, 10, 15, and 20 other groups while hiking a trail. To reduce respondent burden, it has become common to employ a short, open-ended version of NS questions where respondents are asked to simply state the maximum amount of impact (or number of other groups, in the above example) they feel is acceptable. Only one study has explored the comparability of these two question formats (Manning et al. 1997). The long or close-ended question format was found to yield somewhat higher norms than the short or open-ended question format.

## Effect of Evaluative Measure on Validity of Responses

In CV and NS studies respondents are asked to make evaluative judgements. For example, respondents to a CV survey may be asked to evaluate the economic value of a day hike, while respondents to an NS survey may be asked to evaluate the acceptability of different levels of crowding along a hiking trail. However, alternative evaluative measures are possible in both areas of study, and may lead to conflicting estimates of value or normative standards. In CV research, WTP and WTA are the two most commonly used evaluative measures of economic welfare. Economic theory provides guidelines about which measure is most appropriate for a particular scenario. The guidelines are based on assumptions about the study population's property rights with respect to the good being valued. For example, a CV survey may present a hypothetical scenario involving a program to reduce the concentration of contaminants in a local river. If the researcher assigns the study population property rights to the status quo condition of the river, then the correct measure of economic welfare is the maximum amount of money individuals are willing to pay for the improved river condition. However, if the researcher assigns the population property rights to the improved condition of the river, then the correct measure of welfare associated with the program is the minimum amount of money individuals are willing to accept as compensation to forgo the river improvement program (Freeman 1993).

According to economic theory, the two measures of welfare, WTP and WTA, should be similar when empirically estimated for the same good. However, WTA estimates are typically three to five times greater than WTP values in CV studies eliciting both measures (Adamowitz, Bhardwaj and Macnab 1993). A number of theories have been proposed to explain the divergence between WTP and WTA estimates. According to the "endowment effect" explanation, individual behavior is driven in part by an aversion to loss. Individuals will act on their loss aversion by demanding more in compensation for the removal of a good from their possession than they would pay to obtain the good in the first place.

A second explanation for the tendency of WTA estimates to exceed WTP estimates, the "substitution effect," was first introduced by Hanneman (1991). Hanneman suggested that the magnitude of the divergence between WTA and WTP is dependent on the number and quality of substitutes available for the good in question. According to Hanneman, the fewer alternatives available to the individual, the greater the divergence between WTA and WTP. Hanneman's theory is based on the notion that if consumers are able to get the same or similar services from an available private good, there will not be much difference between WTP and WTA for a public good. However, if the public good in question has few substitutes (e.g., Yosemite National Park), "WTP could equal the individual's entire (finite) income, while WTA could be infinite" (Hanneman 1991, 635-636).

Boyce, Brown, McClelland, Peterson and Schulze (1992) suggest another explanation for WTA estimates exceeding WTP. They assert that there is greater moral responsibility involved in not giving up certain public goods than in paying to obtain them. For instance, individuals may feel a greater moral obligation to refuse compensation in exchange for allowing water quality to deteriorate than they do to pay to enhance water quality.

Substantial research has been conducted to examine the validity of the above explanations for discrepancies between WTP and WTA values (e.g., Morrison 1997; Adamowicz et al. 1993; Boyce et al. 1992), however, the findings have been inconclusive. Thus far, CV researchers have responded to the divergence between WTP and WTA by relying primarily on the more conservative WTP measure to calculate welfare estimates. The NOAA panel report included the use of the WTP format as one of their guidelines for designing a CV survey. In addition to providing more conservative welfare estimates, the WTP format is favored because it provides a more realistic and familiar decision framework for survey respondents (Arrow et al. 1993).

NS studies have only recently begun to examine the validity and appropriateness of alternative evaluative measures. The traditional evaluative measure in NS research has been "acceptability." However, the use of other evaluative measures are possible, including preference, tolerance, and more purely normative notions of what conditions *should* be. Initial tests of measuring preference, tolerance, and attitudes about what should be suggest that they result in estimates of normative standards that differ significantly from those measured by asking about acceptability (Manning et al. 1997; Shelby and Whittaker 1995). However, there is yet no basis on which to favor one evaluative measure over another; each may offer different insights to managers and policy makers.

## Effect of Making Response Implications Salient

The validity of responses to CV and NS questions is based on the assumption that respondents are at least generally aware of the personal and/or management implications of the information they provide in such studies. However, this assumption is generally untested. In CV research, the NOAA panel specifically recommended that the implications of any response should be described in detail. More specifically, the CV scenario description or the CV question should

include a reminder to respondents that they have a limited budget and that electing to spend money for the public good means a reduction in other kinds of goods that can be purchased (Arrow et al. 1993). This recommendation is in keeping with economic theory, which suggests that the availability of substitutes for a good and the individual's income are important determinants of an individual's willingness to pay for the good.

Several studies have examined the effect of including reminders about the availability of substitutes and individuals' budget constraints on CV estimates of WTP. Loomis, Gonzalez-Caban and Gregory (1994) administered two versions of a CV survey, one that included a reminder about substitute goods and budget limitations, and one that did not include these reminders. The researchers found no significant difference between mean WTP to prevent old-growth forest fires estimated from the two survey instruments. However, several studies have found that WTP estimates are significantly lower when respondents are reminded of the availability of substitute goods (e.g., Whitehead and Blomquist 1991; Cummings, Ganderton and McGuckin 1994).

NS research has only recently begun to focus on ensuring that respondents consider the management implications of their responses to NS questions. In NS research, reminders about the management implications of responses have been primarily based on previous research findings. For example, if studies of crowding norms at parks and recreation areas indicate little tolerance for high use levels, then it is likely that management actions will be taken to limit public access, and this will affect a respondents' ability to use these areas. Initial research suggests that explicit knowledge of such implications can have a significant affect on the crowding norms reported (Manning et al. 1997).

## How Scale of Analysis Effects Results

Both CV and NS research use surveys to uncover information about individuals' tastes and preferences, with respect to public goods. The individual values or standards are then aggregated by multiplying the average response by the total number of individuals in the study population.

Several aspects of CV research confound the process of moving from individual responses to total social values. One challenge CV researchers face is determining the extent of the relevant study population for the non-market good they wish to analyze. Frequently, political boundaries are used to define the extent of the market or study population for CV studies (e.g., Desvousges et al. 1983; Lindsey 1994; Loomis 1987). However, the CV researcher risks underestimating the true value of a good if the market boundaries selected are too restrictive, and risks overstating economic benefits if the population over which values are aggregated includes distant individuals who are indifferent to the good (Loomis 1996).

Sutherland and Walsh (1985) estimated a relationship between WTP to protect water quality in a Montana lake and distance of the individuals' households from the lake. The relationship between WTP and distance was used to estimate total WTP for Montana and for a larger market including 7 states and 3 Canadian provinces. The results indicate that aggregate WTP values can be highly sensitive to the definition of the market for the good (Sutherland and Walsh 1985, 209). Loomis (1996) found that when the extent of the market for public goods with national significance (e.g., salmon in the Pacific Northwest or dam removal in national parks) is limited to the local area rather than including the entire nation, estimates will measure as little as 3 percent of the actual economic benefits.

The decisions CV researchers make about what measure of average individual WTP to use to extrapolate to the total population can also significantly influence welfare estimates. Several issues must be considered before generalizing individual values to the population. First a decision must be made whether to use the mean or median of individuals' WTP to multiply by the total number of individuals in the population. The mean individual WTP is usually used in CV studies, however, a small number of unusually high values can significantly influence the mean WTP of the good in question. The alternative is to use the median WTP, which tends to limit the influence of a few outlying bids, and is likely to yield more conservative WTP estimates (Lindsey 1994).

Secondly, the CV researcher has to develop a decision rule for handling protest zero bids and outliers. An individual's response of zero to a CV question is defined as a protest zero bid when the respondent's true WTP is greater than zero (Lindsey 1994). Outliers are responses to the CV question that seem unlikely to be true given their magnitude. If protest bids and outliers are included in calculating average individual WTP, the results will provide inaccurate information about the true economic value of the good in question.

In order to determine whether an individual who provides a zero bid in a CV survey is providing a true value or a protest bid, the NOAA panel recommended that CV questions be followed up with a question asking respondents to explain their answer (Arrow et al. 1993). Explanations of zero bids that are typically classified as protest bids include "object to the question," "opposed to new taxes," "not enough information," and "industry should pay."

A variety of decision rules have been used in the CV literature to eliminate outliers. For example, researchers have eliminated bids greater than a selected number of standard deviations from the mean or bids greater than a selected per-

centage of the individual's income, or by using statistical diagnostics to isolate extreme bids (Lindsey 1994, 125).

NS research tends to favor median values over means. However, in NS research there is more concern over the issue of central tendency because social norms are defined as some level of agreement about appropriate conditions or behaviors. The extent of agreement is technically referred to as "crystallization" and is analyzed through several measures of central tendency, including standard deviations, coefficients of variation, semi-interquartile ranges, and inspection of frequency distributions.

In NS research, personal norms are aggregated to derive broader social norms for larger populations. However, recent research suggests that a more direct societal unit of analysis, or at least a stronger societal context, may have some applicability to both CV and NS research. That is, researchers may wish to allow or even encourage respondents to consider broad societal perspectives and obligations when formulating answers to CV and NS questions. As noted earlier, this is especially in keeping with the underlying principles of normative theory, which suggest widely understood and accepted social obligation. In this context, the operative question in NS research shifts from what is personally acceptable, preferable, tolerable, etc., to what conditions should be maintained by a broader society. In CV research, the question shifts from what would the individual be willing to pay to what society should pay.

Unlike CV research, NS research often aggregates individual responses into a graphic form of reporting. "Norm curves" (or "impact acceptability curves") are graphs which illustrate the relationship between a range of resource conditions and aggregate evaluative ratings of these conditions. An example of a norm curve is shown in Figure 1. While study data are usually reported in tabular format as well, these graphs provide an alternative way of reporting study findings

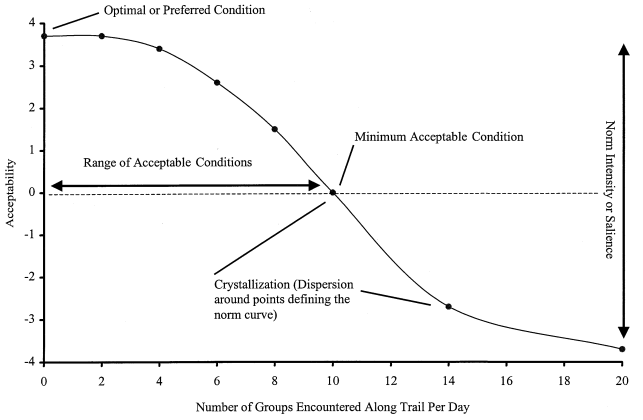


Figure 1. Hypothetical norm curve.

that adds important insights into research results. For example, a social norm curve can illustrate the range of acceptable conditions, the preferred or optimal condition, the minimum acceptable condition, and "norm intensity" (a measure of the relevance or salience of the issue under study). The range of acceptable conditions includes all impact conditions which receive aggregate evaluative ratings above the neutral line on the evaluative scale of the graph. The preferred or optimum condition is the impact condition that receives the highest aggregate evaluative rating. The minimum acceptable condition is the impact condition denoted by the point at which the norm curve crosses the neutral point on the evaluative scale. Norm intensity is the distance from the norm curve to the neutral line. Norm curves can also readily indicate when there may be bi- or multi-model norms in which case commonly used measures of central tendency such as means or medians may be misleading (Shelby and Whittaker 1995; Whittaker and Shelby 1988).

## Conclusions and Recommendations

The above discussion indicates that there are a number of theoretical and methodological issues common to CV and NS research. In some cases, both areas of research may have addressed the same (or a very similar) issue, and research findings can be mutually reinforcing. In other cases, research in one area may suggest and address an issue that is applicable to the other area. We hope the comparative interdisciplinary review and synthesis of both bodies of research literature provided here is effective at informing theoretical and methodological concerns related to CV and NS.

Based on the literature review and synthesis, we make the following recommendations:

1. Both CV and NS research should further develop and adopt tests of validity. In particular, self-assessment protocols developed in CV research should be further refined and applied and should be adapted for use in NS research. Moreover, "no vote"/"don't know"/"don't care" response options should be further tested to determine their effect on CV and NS values.

2. Both CV and NS research should further explore the issue of hypothetical bias. In both cases, this research should examine the degree to which WTP and NS values relate to corresponding measures of behavior. In CV research, this should focus on the degree to which WTP values relate to actual economic behavior. In NS research, this should focus on the degree to which NS values relate to evaluations of actual recreation conditions and associated behaviors.

3. Both CV and NS research should further explore the tradeoffs between providing too much and too little information to respondents. Pretesting of survey instruments may be

especially useful in addressing this issue. Special consideration should be given to exploring the effectiveness of visually-based information where this might be applicable.

4. Both CV and NS research should further explore the potential effects of social desirability/compliance bias, strategic bias, starting point bias, and embedding bias. Social desirability and compliance bias should be addressed through careful attention to question construction to help ensure objectivity or neutrality. Careful training of interviewers is also necessary when surveys are administered personally or by telephone. CV researchers should test for strategic bias to the extent possible and remove outliers and protest bidders to reduce the strategic effect. Starting point bias should be addressed in CV research by varying the initial bids presented to respondents and empirically testing for potential starting point effects. NS research should test the extent to which starting point bias may influence study findings.

5. Both CV and NS research should further test the effects of alternative question formats. In CV research, this effort should focus on the effects of open-ended, and single and multiple bounded close-ended elicitation techniques on WTP values. In NS research, this effort should focus on the effects of long and short versions of normative questions on the NS values derived.

6. Both CV and NS research should continue to explore alternative evaluative dimensions. Generally, WTP is to be favored over WTA compensation in CV research because it results in more conservative estimates. "Acceptability" is the traditional evaluative dimension used in NS research, but other evaluative dimensions, including preference, tolerance, acceptability to others, and management action, may result in alternative NS estimates. Incorporation of multiple evaluative dimensions in both CV and NS research may be wise as a method to enrich resulting information to planners, managers, and policy makers.

7. Both CV and NS research should incorporate potential implications of study questions and findings more directly into research designs. In CV research, respondents should be reminded explicitly of their personal budget constraints and the availability of alternative resources. In NS research, respondents should be informed of potential management actions based on study findings. However, researchers should be careful that such information does not lead to potential strategic bias.

8. CV research should explore the usefulness of graphic approaches to reporting study findings where applicable.

9. NS research should further explore the applicability of alternative measures of central tendency. The issue of consensus is especially pertinent to NS research and more experimentation and agreement about such measures is needed. CV research should continue to investigate the influence of using different measures of average WTP (mean and median) on aggregate WTP estimates. In addition, CV studies that use both mean and median WTP to calculate total social values are likely to provide planners, managers, and policy makers with a richer set of information.

## Endnote

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## References

Adamowitz, W.L., V. Bhardwaj and B. Macnab. 1993. Experiments on the difference between willingness to pay and willingness to accept. *Land Economics* 69, 416-27.

Ajzen, I., T.C. Brown and L.H. Rosenthal. 1996. Information bias in contingent valuation: Effects of personal relevance, quality of information, and motivational orientation. *Journal of Environmental Economics and Management* 30(1), 43-57.

Arrow, K., R. Solow, P. Portney, E. Learner, R. Radner and H. Schuman. 1993. Report of the NOAA Panel on contingent valuation. *Federal Register* 58(10), 4601-4614.

Arrow, K.J. 1986. Comments. In R.G. Cummings, D.S. Brookshire and W.D. Schulze (eds.), *Valuing environmental goods*. Totowa: Rowman and Allanheld.

Bergstrom, J.C., J.R. Stoll and A. Randall. 1990. The impact of information on environmental commodity valuation decisions. *American Journal of Agricultural Economics* August, 614-621.

Bishop, R.C. and T.A. Heberlein. 1979. Measuring values of extra-market goods: Are indirect measures biased? *American Journal of Agricultural Economics* 61(5), 926-930.

Bishop, R.C. and T.A. Heberlein. 1986. Does contingent valuation work? In *Valuing Environmental Goods. An Assessment of the Contingent Valuation Method*, 123-147. Totawa: Rowman and Allanheld.

Boyce, R.R., T.C. Brown, G.H. McClelland, G.L. Peterson and W.D. Schulze. 1992. An experimental examination of intrinsic environmental values as a source of the WTA-WTP disparity. *American Economic Review* 82(5), 1366-1373.

Boyle, K.J. and R.C. Bishop. 1988. Welfare measurements using contingent valuation: A comparison of techniques. *American Journal of Agricultural Economics* 70(1), 20-28.

Boyle, K.J., W.H. Desvousges, F.R. Johnson, R.W. Dunford and S.P. Hudson. 1994. An investigation of part-whole biases in contingent-valuation studies. *Journal of Environmental Economics and Management* 27(1), 64-83.

Boyle, K.J., M.P. Welsh and R.C. Bishop. 1993. The role of question order and respondent experiences in contingent-valuation studies. *Journal of Environmental Economics and Management* 25, S80-S99.

Brajer, J., J.V. Hall and R. Rowe. 1991. The value of cleaner air: An integrated approach. *Contemporary Policy Issues* 9(2), 81-91.

Brannon, R., G. Cyphers, S. Hess, S. Hesselbart, R. Keane, H. Schuman, T. Vaccaro and D. Wright. 1973. Attitude and action: A field experiment joined to a general population survey. *American Sociological Review* 38, 625-636.

Brown, T.C. and J.W. Duffield. 1995. Testing part-whole valuation effects in contingent valuation of instream flow protection. *Water Resources Research* 31(9), 2341-2351.

Canary, D.J. and D.R. Siebold. 1983. *Attitudes and Behavior: An Annotated Bibliography*. New York: Praeger.

Carson, R.T., W.M. Hanemann and R.C. Mitchell. 1986. *Determining the Demand for Public Goods by Simulating Referendums at Different Tax Prices*. San Diego: University of California, San Diego.

Carson, R.T. and R.C. Mitchell. 1993a. The issue of scope in contingent valuation studies. *University of California, San Diego Department of Economics Working Paper*, 93-37.

Carson, R.T. and R.C. Mitchell. 1993b. The value of clean water: The public's willingness to pay for boatable, fishable, and swimmable quality water. *Water Resources Research* 29(7), 2445-2454.

Carson, R.T. and R.C. Mitchell. 1995. Sequencing and nesting in contingent valuation surveys. *Journal of Environmental Economics and Management* 28(2), 155-173.

Cocheba, D.J. and W.A. Langford. 1978. Wildlife valuation: The collective good aspect of hunting. *Land Economics* 54, 490-504.

Cummings, R.G., D.S. Brookshire and W.D. Schulze. 1986. *Valuing Environmental Good: An Assessment of the Contingent Valuation Method*. Totawa: Rowman and Allanheld.

Cummings, R., P. Ganderton and T. McGuckin. 1994. Substitution effects in CVM values. *American Journal of Agricultural Economics* 72(2), 205-214.

Desvousges, W.H., V.K. Smith and M.P. McGivney. 1983. A comparison of alternative approaches for estimating recreation and related benefits of water quality improvements. *U.S. Environmental Protection Agency*, EPA 230-05-83-001.

Donnelly, M.P., J. Vaske and B. Shelby. 1992. Establishing management standards: Selected examples of the normative approach. In B. Shelby, G. Stankey and B. Shindler (eds.), *Defining Wilderness Quality: The Role of Standards in Wilderness Management - A Workshop Proceedings*. USDA Forest Service General Technical Report PNW-305.

Fischoff, B. 1991. Value elicitation: Is there anything in there? *American Psychology* 46, 835-847.

Fishbein, M. and I. Ajzen. 1975. Attitudes towards objects as predictors of single and multiple behavior criteria. *Psychological Review* 81(1), 59-74.

Freeman, A.M. III. 1993. *The Measurement of Environmental and Resource Values: Theory and Methods*. Washington, D.C.: Resources for the Future.

Gramlich, F.W. 1977. The demand for clean water: The case of the Charles River. *National Tax Journal* 30(2), 183-194.

Hall, T. and B. Shelby. 1996. Who cares about encounters? Differences between those with and without norms. *Leisure Sciences* 18(1), 7-22.

Hammitt, W.E. and W. Rutlin. 1995. Use encounter standards and curves for achieved privacy in wilderness. *Leisure Sciences* 17, 245-262.

Hanneman, M.W. 1991. Willingness to pay and willingness to accept: How much can they differ? *American Economic Review* 81(3), 635-47.

Harris, C.C., B.L. Driver and W.J. McLaughlin. 1989. Improving the contingent valuation method: A psychological perspective. *Journal of Environmental Economics and Management* 17, 213-229.

Heywood, J. 1996a. Social regularities in outdoor recreation. *Leisure Sciences* 18(1), 23-27.

Heywood, J. 1996b. Conventions, emerging norms and norms in outdoor recreation. *Leisure Sciences* 18, 355-363.

Heberlein, T.A., G.E. Alfano and L.H. Ervin. 1986. Using a social carrying capacity model to estimate the effects of marina development at the Apostle Islands National Lakeshore. *Leisure Sciences* 8(3), 257-274.

Hof, M., J. Hammett, M. Rees, J. Belnap, N. Poe, D. Lime and R. Manning. 1994. Getting a handle on visitor carrying capacity: A pilot project at Arches National Park. *Park Science* 14(1), 11-13.

Jackson, J. 1965. Structural characteristics of norms. In I. D. Steiner and M.F. Fishbein (eds.), *Current Studies in Social Psychology*. New York: Holt, Rinehart, Winston, Inc.

Kahneman, D. 1986. The review panel's assessment. In *Valuing Environmental Goods: An Assessment of the Contingent Valuation Method*. Totawa: Rowman and Allanheld.

Kahneman, D. and J.L. Knetsch. 1992. Valuing public goods: The purchase of moral satisfaction. *Journal of Environmental Economics and Management* 22, 57-70.

Kealy, M.J. and R.W. Turner. 1993. A test of the equality of closed-ended and open-ended contingent valuation. *American Journal of Agricultural Economics* 75, 321-331.

Kelly, S. and T.W. Mirer. 1974. The simple act of voting. *American Political Science Review* 68, 572-591.

Lewis, M.S., D.W. Lime and D.H. Anderson. 1996. Paddle canoeists' encounter norms in Minnesota's Boundary Waters Canoe Area Wilderness. *Leisure Sciences* 18(2), 143-160.

Lindsey, G. 1994. Market models, protest bids, and outliers in contingent valuation. *Journal of Water Resources Planning and Management* 120(1), 121-129.

Lindsay, B., J.M. Halstead, H. Tupper and J. Vaske. 1992. Factors influencing the willingness to pay for coastal beach protection. *Coastal Management* 20, 291-302.

Loomis, J. 1987. Balancing public trust resources of mono lake and los angeles' water right: An economic approach. *Water Resources Research* 23(8), 1449-1456.

Loomis, J.B. 1990. Comparative reliability of the dichotomous choice and open-ended contingent valuation techniques. *Journal of Environmental Economics and Management* 18, 78-85.

Loomis, J.B. 1996. How large is the extent of the market for public goods: Evidence from a nationwide contingent valuation survey. *Applied Economics* 28(7), 779-784.

Loomis, J.B., T. Brown, B. Lucero and G. Peterson. 1997. Evaluating the validity of the dichotomous choice question format in contingent valuation. *Environmental and Resource Economics* 10(2), 109-123.

Loomis, J.B., A. Gonzalez-Caban and R. Gregory. 1994. Do reminders of substitutes and budget constraints influence contingent valuation estimates? *Land Economics* 70(4), 499-506.

Loomis, J.B., M. Lockwood and T. DeLacy. 1993. Some empirical evidence of embedding effects in contingent valuation of forest protection. *Journal of Environmental Economics and Management* 24, 45-55.

Manning, R.E., D. Lime, W. Freimund and D. Pitt. 1996a. Crowding norms at frontcountry sites: A visual approach to setting standards of quality. *Leisure Sciences* 18 (1), 39-59.

Manning, R.E., D. Lime and M. Hof. 1996b. Social carrying capacity of natural areas: Theory and application in the national parks. *National Areas Journal* 16(2), 118-127.

Manning, R.E., D. Lime, M. Hof and W. Freimund. 1995a. The Visitor Experience and Resource Protection (VERP) process: The application of carrying capacity to Arches National Park. *The George Wright Forum* 12(3), 41-55.

Manning, R., D. Lime and R. McMonagle 1995b. Indicators and standards of the quality of the visitor experience at a heavily used national park. *Proceedings of the 1994 Northeastern Recreation Research Symposium USDA Forest Service General Technical Report NE-198*, 24-32.

Manning, R.E., W.A. Valliere and C. Jacobi. 1997. Crowding norms for the carriage roads of Acadia National Park. *Proceedings of the 1996 Northeastern Recreation Research Symposium USDA General Technical Report NE-232*.

Mitchell, R.C. and R. T. Carson. 1981. *An Experiment in Determining Willingness to Pay for National Water Quality Improvements.* Draft report to the U.S. Environmental Protection Agency, Washington, D.C.

Mitchell, R.C. and R.T. Carson. 1984. *A Contingent Valuation Estimate of National Freshwater Benefits: Technical Report to the U.S. Environmental Protection Agency*. Washington, D.C.: Resources for the Future.

Mitchell, R.C. and R.T. Carson. 1989. *Using Surveys to Value Public Goods: The Contingent Valuation Method*. Washington, D.C.: Resources for the Future.

Morrison, G.C. 1997. Willingness to pay and willingness to accept: Some evidence of an endowment effect. *Applied Economics* 29(4), 411-417.

Neill, H.R., R.G. Cummings, P.T. Ganderton, G.W. Harrison and T. McGuckin. 1994. Hypothetical surveys and real economic commitments. *Land Economics* 70(2), 145-54.

Noe, F. 1992. Further questions about the measurement and conceptualization of backcountry encounter norms. *Journal of Leisure Research* 24(1), 86-92.

Patterson, M.E. and W.E. Hammitt. 1990. Backcountry encounter norms, actual reported encounters, and their relationship to wilderness solitude. *Journal of Leisure Research* 22 (3), 259-275.

Randall, A. 1986. The possibility of satisfactory benefit estimation with contingent markets. In R. G. Cummings, D.S. Brookshire and W.D. Schulze (eds.), *Valuing Environmental Goods*. Totawa: Rowman and Allanheld.

Randall, A. and J.P. Hoehn. 1996. Embedding in market demand systems. *Journal of Environmental Economics and Management* 30, 369-380.

Randall, A., J.P. Hoehn and D.S. Brookshire. 1983. Contingent valuation surveys for evaluating environmental assets. *Natural Resources Journal* 23, 635-648.

Roggenbuck, J.W., D.R. Williams, S.P. Bange and D.J. Dean. 1991. River float trip encounter norms: Questioning the use of the social norms concept. *Journal of Leisure Research* 23, 133-153.

Rowe, R.D. and L.G. Chestnut. 1984. *Valuing Changes in Morbidity WTP Versus COI Measures* Denver: Energy and Resource Consultants.

Rowe, R.D., R.C. d'Arge and D.S. Brookshire. 1980. An experiment on the economic value of visibility. *Journal of Environmental Economics and Management* 7, 1-19.

Schkade, D.A. and J.W. Payne. 1994. How people respond to contingent valuation questions: A verbal protocol analysis of willingness to pay for environmental regulation. *Journal of Environmental Economics and Management* 26, 88-109.

Schulze, W.D., R.G. Cummings, D.S. Brookshire, M.A. Thayer, R. Whitworth and M. Rahmatian. 1983. *Methods Development in Measuring Benefits of Environmental Improvements: Experimental Approaches for Valuing Environmental Commodities*. Washington, D.C.: Office of Policy Analysis and Resource Management, U.S. Environmental Protection Agency.

Schuman, H. and M.P. Johnson. 1976. Attitudes and behavior. In A. Inkeles (ed.), *Annual Review of Sociology*, vol. 2, 161-207. Palo Alto: Annual Reviews, Inc.

Shelby, B. 1981a. Crowding models for backcountry recreation. *Land Economics* 56(1), 43-55.

Shelby, B. 1981b. Encounter norms in backcountry settings: Studies of three rivers. *Journal of Leisure Research* 13, 129-138.

Shelby, B. and T.A. Heberlein. 1986. *Carrying Capacity in Recreation Settings*. Corvallis: Oregon State University Press.

Shelby, B. and J.J. Vaske. 1991. Using normative data to develop evaluative standards for resource management: A comment on three recent papers. *Journal of Leisure Research* 23(2), 173-187.

Shelby, B., J.J. Vaske and R. Harris. 1988. User standards for ecological impacts at wilderness campsites. *Journal of Leisure Research* 20(3), 245-256.

Shelby, B. and D. Whittaker. 1995. Flows and recreation quality on the Delores River: Integrating overall and specific valuations. *Rivers* 5, 121-132.

Smith, V.K. 1996. Can contingent valuation distinguish economic values for different public goods? *Land Economics* 72(2), 139-151.

Snyder, M. and W.B. Swann Jr. 1976. When actions reflect attitudes: The politics of impression management. *Journal of Personality and Social Psychology* 34(5), 1034-1042.

Stouffer, S.A. and A.A. Lumsdaine. 1949. *The American Soldier: Combat and Its Aftermath vol. 2*. Princeton: Princeton University Press.

Sutherland, R.J. and R.G. Walsh. 1985. Effect of distance on the preservation value of water quality. *Land Economics* 61(3), 282-291.

Thayer, M.A. 1981. Contingent valuation techniques for assessing environmental impacts: Further evidence. *Journal of Environmental Economics and Management* 8, 27-44.

Tolley, G.S. and L. Babcock. 1986. *Valuation of Reductions in Human Health Symptoms and Risks*. University of Chicago, final report to the Office of Policy Analysis, U.S. Environmental Protection Agency.

Vaske, J.J., A.R. Graefe and A. Dempster. 1982. Social and environmental influences on perceived crowding. In *Proceedings of the Wilderness Psychology Group Conference*, 221-227. Morgantown: West Virginia University.

Vaske, J.J., A.R. Graefe, B. Shelby and T. Heberlein. 1986. Backcountry encounter norms: Theory, method, and empirical evidence. *Journal of Leisure Research* 18(3), 137-153.

Vaske, J.J. and M.P. Donnelly. 1988. *Normative evaluations of wildlife management.* Paper presented at the Annual Congress of the National Recreation and Park Association, Indianapolis, Indiana.

Vinokur-Kaplan, D. 1978. To have - or not to have - another child: Family planning attitudes, intentions, and behavior. *Journal of Applied Social Psychology* 8(1), 29-46.

Walsh, R.G. and L.O. Gilliam. 1982. Benefits of wilderness expansion with excess demand for Indian Peaks. *Western Journal of Agricultural Economics* 7, 1-12.

Walsh, R.G., J.B. Loomis and R.A. Gillman. 1984. Valuing option, existence, and bequest demands for wilderness. *Land Economics* 60(1), 14-29.

Walsh, R.G., N.P. Miller and L.O. Gilliam. 1983. Congestion and willingness-to-pay for expansion of skiing capacity. *Land Economics* 60(1), 14-29.

Whitehead, J.C. and G.C. Blomquist. 1991. Measuring contingent values for wetlands: Effects of information about related environmental goods. *Water Resources Research* 27(10), 2523-2531.

Whittaker, D. and B. Shelby. 1988. Types of norms for recreation impacts: Extending the social norm concept. *Journal of Leisure Research* 20(4), 261-273.

Williams, D. R., J.W. Roggenbuck and S.P. Bange. 1991. The effect of norm-encounter compatibility on crowding perceptions, experience and behavior in river recreation settings. *Journal of Leisure Research* 23,154-172.

# Development, Dependence, Population Pressure, and Human Rights: The Cross-National Evidence

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## *Abstract*

*Why does the provision of human rights vary across countries of the world-system? Three alternative macrosocial narratives address this question: modernization theory, dependency theory, and human ecology theory. Cross-national researchers have examined one or two of these theories, but no researcher has examined all three theories simultaneously with recent data. This paper reports results of such a study. Human rights performance for 77 countries in 1991 was modeled as a function of economic development, economic dependence, population growth, and several control variables. Regression results suggest strong support for the modernization and human ecology narratives, but little support for the dependency narrative. Implications of the results are briefly discussed.*

***Keywords:*** *Human Rights, Population Pressure, Economic Dependence, and Economic Development*

## Introduction

Why does human rights performance (understood in terms of civil, political, economic, social, and cultural rights) vary so dramatically across countries of the world-system? Three alternative macrosocial narratives of this phenomenon seem to exist: modernization theory, dependency theory, and human ecology theory. Modernization theorists contend that industrialization and the attendant economic development foster respect for human rights (e.g., Lipset 1959, 1994). Dependency theorists argue that economic dependence restricts human rights performance (e.g., Chase-Dunn 1989). Proponents of human ecology theory maintain that population pressure reduces human rights performance (e.g., Catton 1980).

Cross-national researchers of human rights performance have examined one or two of these three theories, but they have failed to examine all three theories simultaneously with recent data (see, e.g., Henderson 1982, 1991, 1993, 1996; McCormick and Mitchell 1997; Meyer 1996; Mitchell and McCormick, 1988; Park 1987; Poe and Tate 1994; Pritchard 1989). This paper reports the results of such a study. A human rights index (consisting of forty indicators of civil, political, economic, social, and cultural rights outlined in major United Nations' treaties on human rights) for 77 countries in 1991 was modeled as a function of economic development, economic dependence, population growth, and several control variables.

## Alternative Theoretical Perspectives

### Modernization

Modernization theorists contend that industrialization and the ensuing economic development promote the provision of human rights (Lipset 1959, 1994; Marks and Diamond 1992). This is the case because industrialization reduces inequalities and increases political stability, thereby reducing the need for elites to repress the economically excluded. In other words, the increased income, education, and occupational diversity accompanying industrialization reduce class antagonisms and foster tolerance and social interdependence. Results of existing cross-national research indicate a robust positive relationship between industrialization (and alternative measures of economic development) and diverse measures of human rights performance, including the integrity of the person, civil and political liberties, and socioeconomic rights (Bollen and Jackman 1985, 1995; Burkhart and Lewis-Beck 1994; Crenshaw 1995; Diamond 1992; Firebaugh and Beck 1994; Henderson 1991, 1993; Lipset et al. 1993; Londregan and Poole 1996; Mitchell and McCormick 1988; Moon 1991; Muller 1995a, 1995b; Park 1987; Pritchard 1989; Ragin and Bradshaw 1992; but see

McCormick and Mitchell 1997; Poe and Tate 1994; Przeworski and Limongi 1997).

**Dependency**

The proponents of dependency theory contend that the asymmetrical power relations between countries of the world economic system reduce the development potential of the peripheral countries (see, e.g., Amin 1974; Chase-Dunn 1989; Frank 1979). Dependent relations produce distorted patterns of development and inequality in the peripheral countries, resulting in instability and conflict. The resulting instability and conflict give rise to elite efforts to repress and control the economically excluded in ways that violate basic human rights. Despite substantial differences among proponents of the dependency perspective (Packenham 1992), they would concur that dependence reduces the provision of human rights.

Findings of existing comparative research on the link between various measures of dependence and human rights performance are mixed. Existing case study research provides some support for a negative link between dependence and human rights performance (O'Donnell 1979; Rueschemeyer et al. 1992). The existing quantitative cross-national research provides little support for the hypothesized negative link between dependence and various forms of human rights performance, including civil and political liberties and socioeconomic rights (Bollen 1983; Crenshaw 1995; Diamond 1992; Firebaugh and Beck 1994; Frey and Al-Mansour 1995; Henderson 1996; Lipset et al. 1993; Meyer 1996; Mitchell and McCormick 1988; Moon 1991; Muller 1995a; but see Ragin and Bradshaw 1992).

**Human Ecology**

According to proponents of human ecology theory, population pressure is a major driving force of many societal problems (e.g., Catton 1980; Ehrlich and Ehrlich 1990; Hardin 1993; Harrison 1993). The link between population growth and human rights performance is not well developed, but rapid population growth is thought to increase demands on limited resources and increase the risk of conflict. The situation is stabilized through various political means, including exclusion, repression, and related strategies that violate basic human rights (Henderson 1993; Homer-Dixon et al. 1993).

Despite the existence of a highly contentious debate about the effects of population pressure (whether negative, positive, or minimal) on various forms of human well-being (see, e.g., Catton 1980; Cohen 1995; Commoner 1990; Ehrlich and Ehrlich 1990; Hardin 1993; Harrison 1993; Homer-Dixon 1995; Schnaiberg 1980:59-112; Simon 1996), surprisingly little empirical research has examined the link between population pressure and human rights performance. Findings of several case studies (examining the link between rapid population growth, inequality, conflict, and authoritarian regimes in the less developed countries) suggest a negative relationship between rapid population growth and human rights provision (Goldstone 1991; Homer-Dixon et al. 1993; Howard and Homer-Dixon 1995). Most of the cross-national research on civil and political liberties, political repression, and socioeconomic rights indicates a negative link between population pressure and alternative forms of human rights performance (Frey and Al-Mansour 1995; Henderson 1993; McCormick and Mitchell 1997; Moon 1991; Williamson 1987; but see Poe and Tate 1994).

## Data and Method

**Sample**

The unit of analysis is the nation state. Seventy-seven countries with populations of one million or more for which there were complete data on all variables were included in the study. Although few command economy countries were included, estimates are based on a fairly representative sampling of the less developed and developed countries. Countries are listed in Table 1.

*Table 1.* Sample of Countries

| | | | |
|---|---|---|---|
| 1. Afghanistan | 26. India | 51. Peru | 76. Zaire |
| 2. Algeria | 27. Indonesia | 52. Philippines | 77. Zambia |
| 3. Angola | 28. Iran | 53. Portugal | |
| 4. Argentina | 29. Iraq | 54. Romania | |
| 5. Australia | 30. Ireland | 55. Rwanda | |
| 6. Austria | 31. Israel | 56. Saudi Arabia | |
| 7. Belgium | 32. Italy | 57. Sierra Leone | |
| 8. Benin | 33. Jamaica | 58. Singapore | |
| 9. Bolivia | 34. Japan | 59. South Africa | |
| 10. Brazil | 35. Jordan | 60. Spain | |
| 11. Cameroon | 36. Kenya | 61. Sri Lanka | |
| 12. Canada | 37. South Korea | 62. Sudan | |
| 13. Chile | 38. Libya | 63. Sweden | |
| 14. Colombia | 39. Malaysia | 64. Switzerland | |
| 15. Denmark | 40. Mexico | 65. Syria | |
| 16. Dom. Republic | 41. Morocco | 66. Thailand | |
| 17. Ecuador | 42. Mozambique | 67. Togo | |
| 18. Egypt | 43. Netherlands | 68. Trinidad | |
| 19. El Salvador | 44. New Zealand | 69. Tunisia | |
| 20. Finland | 45. Nicaragua | 70. Turkey | |
| 21. France | 46. Norway | 71. Uganda | |
| 22. Germany | 47. Pakistan | 72. United Kingdom | |
| 23. Greece | 48. Panama | 73. Uruguay | |
| 24. Guatemala | 49. P. New Guinea | 74. United States | |
| 25. Honduras | 50. Paraguay | 75. Venezuela | |

## Dependent Variable

Human rights performance is a difficult concept to define, but we find the following definition by Humana (1992, 4) to be as good as most: "the laws, customs, and practices that have evolved . . . to protect ordinary people, minorities, groups, and races from oppressive rulers and governments." Others have defined human rights performance more broadly to include the provision of political and civil rights, integrity of the person, and socioeconomic rights (see, e.g., Bollen 1986; Howard 1995; Nickel 1987; Sachs 1996). Efforts to measure the human rights performance of individual countries have been criticized for being politically and ethically biased (Barsh 1993; Howard 1995, 1-20; Perry 1997), but we maintain like many others (Howard 1995) that it is possible to measure human rights performance in a defensible fashion. This claim is based on the fact that there are internationally recognized human rights. Most countries, for instance, have signed United Nations' (UN) human rights documents outlawing the violation of various economic, social, political, civil, and cultural rights (Buergenthal 1997; Howard 1995; Humana 1992).

Gupta et al.'s (1994) revised version of the Humana (1992) Index of Human Rights was used in estimates. Humana's index is based on a differential weighting of the 40 items listed in Table 2. The 40 items were chosen by Humana (1992, 4) to reflect important elements of three major UN human rights instruments: the Universal Declaration on Human Rights (UDHR) adopted in 1948, the International Covenant of Civil and Political Rights (ICCPR) adopted in 1966, and the International Covenant on Economic, Social, and Cultural Rights (ICESCR) adopted in 1966. Humana (1992, 5-7) weighted items 7-13 more heavily than the other 33 items because he deemed them more important.[1] Humana's index has been used by several researchers (United Nations 1991), but it has been criticized (Barsh 1993; Gupta et al. 1994). Gupta et al. (1994:141) contend that the differential weighting of items 7-13 is "arbitrary." They created a revised index based on the relative weighting of each of the 40 items listed in Table 2 according to the results of a discriminant analysis (Gupta et al., 1994, 140-148).[2] Data for the index in 1991 were taken from Gupta et al. (1994, 159-161).

*Table 2.* Forty Indicators Used in the Construction of the Human Rights Index

**Freedom to**
1. Travel in own country
2. Travel outside own country
3. Peacefully associate and assemble
4. Teach ideas and receive information
5. Monitor human rights violations
6. Publish and educate in ethnic language

**Freedom from**
7. Serfdom, slavery, forced or child labor
8. Extrajudicial killings or "disappearances"
9. Torture or coercion by the state
10. Compulsory work permits or conscription of labor
11. Capital punishment by the state
12. Court sentences of corporal punishment
13. Indefinite detention without charge
14. Compulsory membership of state organizations or parties
15. Compulsory religion or state ideology in schools
16. Deliberate state policies to control artistic works
17. Political censorship of press
18. Censorship of mail or telephone tapping

**Freedom for or Rights to**
19. Peaceful political opposition
20. Multiparty elections by secret and universal ballot
21. Political and legal equality for women
22. Social and economic equality for women
23. Social and economic equality for ethnic minorities
24. Independent newspapers
25. Independent book publishing
26. Independent radio and television networks
27. All courts to total independence
28. Independent trade unions

**Legal Rights**
29. From deprivation of nationality
30. To be considered innocent until proved guilty
31. To free legal aid when necessary and counsel of own choice
32. From civilian trials in secret
33. To be brought promptly before a judge or court
34. From police searches of home without a warrant
35. From arbitrary seizure of personal property

**Personal Rights**
36. To interracial, interreligious, or civil marriage
37. Equality of sexes during marriage and for divorce proceedings
38. To practice any religion
39. To use contraceptive pills and devices
40. To noninterference by state in strictly private affairs

SOURCE: Humana (1992)

## Independent Variables

Three independent variables were included as major predictor variables. Each variable represents a major driving force identified by proponents of the three alternative theoretical narratives. The variables are economic development, dependence, and population growth.

*Economic development.* Economic development was measured as the real gross domestic product per capita (GDP) in 1991. Several alternative measures of economic development (including the ratio of industrial employment to the total labor force, energy consumption per capita, gross national product per capita, and proportion of the agricultural labor force to the total labor force) were used to make estimates, but these estimates did not vary substantially from GDP/capita estimates so they are not reported. Data were col-

lected from the United Nations (1994, 129-131). The variable was logged to correct for a skewed distribution.

*Economic dependence.* Dependence has been measured in various ways, including investment dependence, trade dependence, debt dependence, aid dependence, and world system position (e.g., Bollen 1983; Bornschier and Chase-Dunn 1985; Crenshaw 1995; Dixon and Boswell 1996a, 1996b; Ehrhardt-Martinez 1998; Firebaugh 1992, 1996; Henderson 1996; Muller 1995a; Ragin and Bradshaw 1992). Investment dependence was used as the primary measure of dependence. Two measures of trade dependence were also used in a series of auxiliary analyses to test the robustness of the effects of dependence. The three measures of dependence were lagged by several decades because several cross-national researchers have argued that the adverse effects of dependence take time to manifest themselves (Bornschier and Chase-Dunn 1985; Kentor 1998).

Bornschier and Chase-Dunn's (1985) controversial transnational corporation penetration (PEN) measure (see Bornschier and Chase-Dunn 1993; Dixon and Boswell 1996a, 1996b; Firebaugh 1992, 1996; Firebaugh and Beck 1994; Kentor 1998) was used to measure investment dependence. This measure is the book value of TNC investments in millions of 1967 dollars, divided by the square root of the product of two terms: population size in millions and the domestic stock of capital in billions of US dollars. Data for 1967 were taken from Bornschier and Chase-Dunn (1985, 156-159).

Trade dependence is the degree of a country's participation in the world economy. Two measures of trade dependence were used: export commodity concentration (COMM) and degree of external trade (TRADE). Export commodity concentration was measured as the sum over 56 export commodity groupings of the squares of the proportions of total exports accounted for by each grouping (Taylor and Jodice 1983, 232). Degree of external trade dependence was measured as total trade (the sum of exports and imports) divided by the GNP (Taylor and Jodice 1983, 228). Data for 1975 were taken from Taylor and Jodice (1983, Tables 6.7 and 6.9). Trade as a percent of GNP (TRADE) was logged to correct for a skewed distribution.

*Population pressure.* Population growth (POP) was measured as the percent change in population between 1980 and 1990. Data were taken from the World Bank (1992a, 1992b) and the World Resources Institute (1994). The variable was logged to correct for a skewed distribution.

**Control Variables**

Several additional variables were included as controls: British colony status (BRIT), protestant influence (PROT), militarization (MIL), and income inequality (INEQ). These variables were chosen because researchers report that they covary with various measures of human rights performance (Bollen and Jackman 1985, 1995; Crenshaw 1995; Henderson 1982; Moon 1991; Muller 1995a, 1995b; Park 1987; Poe and Tate 1994). Specifically, British colony status and protestant influence have been found to covary with human rights in a positive fashion, militarization has been found to covary with human rights performance in a negative fashion, and income inequality has been reported by several researchers (but disputed by others) to have a negative effect on human rights performance. Countries were coded 1 if they were former British colonies and 0 otherwise. The percent of the population protestant in 1980 was used to measure protestant influence. The number of armed forces per 1,000 population in 1991 was used to measure militarization. The proportion of a nation's total income received by the top 20 percent of households in 1970 was used to measure income inequality. (This variable was included in several auxiliary analyses based on 61 cases because data were not available for the full sample of 77 cases.) The most current data available for the control variables were gathered from various sources (Barrett 1982; Whitaker 1995:779-1065; World Resources Institute 1994:260-261, Table 15.3).

**Method of Analysis**

Ordinary least squares (OLS) regression was used to estimate the effects of the independent and control variables on human rights performance. Reweighted least squares (RLS) estimates were made to assess the stability of the OLS estimates. RLS is an alternative to OLS regression that yields estimates that are not affected by unusual cases in either the residuals or carriers (Dietz et al. 1991).

## Results

Results of six separate tests of the three hypotheses derived from the modernization, dependency, and human ecology narratives are presented in Table 3. Model 1 represents a test of the core model. The remaining models represent auxiliary tests undertaken to assess the stability of estimates: models 3-6 are based on the alternative measures of dependence, and models 2, 4, and 6 include income inequality as a control variable.

Economic development had a strong positive effect on human rights performance for all 6 models. The effect of this variable declined somewhat when income inequality was included in models 2, 4, and 6, but economic development remained a strong predictor of human rights performance for all 6 models. Estimates were not seriously degraded by collinearity, because variance inflation factors (VIFs) were never greater than 2.78.

*Table 3.* Results of the Regression of the Adjusted Version of Humana's (1992) Human Rights Index on Selected Independent and Control Variables

| Predictor Variables | Model 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| GDP91 | 3.357* | 2.606* | 3.481* | 2.939* | 3.477* | 2.932* |
| | (0.649) | (0.813) | (0.594) | (0.770) | (0.620) | (0.776) |
| POP80-90 | -1.390* | -1.761* | -.624 | -1.565* | -1.229* | -1.778* |
| | (0.561) | (0.764) | (0.567) | (0.773) | (0.540) | (0.769) |
| PEN67 | 0.000 | 0.000 | — | — | — | — |
| | (0.000) | (0.000) | — | — | — | — |
| COMM75 | — | — | -5.560* | -3.223 | — | — |
| | — | — | (2.004) | (2.174) | — | — |
| TRADE75 | — | — | — | — | -1.054 | -0.922 |
| | — | — | — | — | (0.899) | (0.884) |
| PROT80 | 0.370 | 0.385 | 0.327 | 0.369 | 0.423 | 0.432 |
| | (0.214) | (0.237) | (0.204) | (0.237) | (0.216) | (0.241) |
| BRIT | -0.850 | -0.886 | -0.799 | -0.454 | -0.602 | -0.337 |
| | (1.067) | (1.208) | (1.006) | (1.154) | (1.054) | (1.170) |
| MIL91 | -2.559* | 1.384 | -2.541* | -1.581 | -2.470* | -1.345 |
| | (0.652) | (0.861) | (0.610) | (0.843) | (0.657) | (0.884) |
| INEQ70 | — | 0.051 | — | 0.122 | — | 0.107 |
| | — | (0.089) | — | (0.082) | — | (0.082) |
| Constant | 34.398* | 43.593* | 36.975* | 38.261* | 38.866* | 42.679* |
| Adjusted R2 | .555 | .553 | .595 | .557 | .559 | .547 |
| N | 77 | 61 | 77 | 61 | 77 | 61 |

Note: Unstandardized coefficients reported and standard errors reported in parentheses.

* $p < .05$.

Dependence had an inconsistent effect on human rights performance. TNC penetration (PEN) had little effect. Commodity concentration (COMM) had a negative effect on human rights in both tests (models 3 and 4) and it had a significant effect in one of these tests (model 3). Trade concentration had a negative, but nonsignificant effect on human rights in both tests (models 5 and 6). Collinearity did not degrade estimates, for VIFs never exceeded 1.40.

Population pressure had a strong negative effect on human rights performance. It had a significant effect in 5 of the 6 tests. Unlike the pattern reported for economic development, inclusion of income inequality as a control variable in models 2, 4, and 6 increased the strength of the effect of population pressure. In fact, in every case the beta coefficient increased by 50 percent or more. The highest VIF was 3.44, suggesting that estimates were not seriously degraded by collinearity.

The effects of the control variables on human rights performance deviated somewhat from expectations. Protestant influence had a consistent positive effect on human rights performance, but all 6 tests were statistically insignificant at conventional levels. Former British colony status had a negative but nonsignificant effect on human rights in each of the 6 tests. Militarization had a negative effect on human rights in each of the 6 tests and this effect was significant for 3 tests. Income inequality had little effect on human rights performance for all 3 tests.

The indirect effects of the three measures of dependence were also examined in a series of path analyses not reported here. None of the three measures of dependence had an important indirect effect on human rights through economic development, population pressure, income inequality, or militarization. Estimates of a number of other path models did not contradict findings reported in Table 3.

Reweighted least squares regression (RLS) estimates of the 6 models were also made to see if the estimates were unduly affected by unusual observations in the residuals and carriers. RLS estimates did not vary substantially from the OLS estimates. Additional estimates based on the 57 less developed countries of the sample did not deviate substantially from the OLS and RLS estimates for the full sample of countries. In sum, estimates were not unduly affected by outliers or sample composition.

## Discussion

We began this discussion with a question: Why does human rights performance vary across countries of the world-system? Our tentative answer to this complex question is quite simple: economic development promotes human rights performance, population growth reduces human rights performance, and economic dependence has ambiguous effects on human rights performance. With the exception of militarization, other characteristics of countries (including protestant influence, former British colony status, and income inequality) have little or no impact on human rights performance. The weight of the existing cross-national evidence (including our own and that of others cited above) suggests strong support for the modernization and human ecology theoretical narratives, but little support for the dependency narrative.

The link between economic development and human rights performance is fairly well articulated within the modernization narrative (Diamond 1992; Lipset 1959, 1994), but the link between population pressure and human rights performance is not very well developed within the human ecology narrative (Catton 1980; Hardin 1993). Several unresolved questions exist. How does population pressure reduce human rights performance? Does population pressure lead to resource scarcity and conflict? If so, under what conditions? Are resource scarcity and conflict stabilized through exclu-

sion, repression, and related strategies that violate basic human rights? Until these questions are adequately addressed, the human ecology narrative represents an incomplete response to the question of why human rights performance varies so dramatically across countries of the world-system.

## Endnotes

1. The maximum value of the index (before conversion to a percentage score) is 162 or (33 X 3) + (7 X 3 X 3), where items 1-6 and 14-40 in Table 2 are assigned scores ranging from 0 to 3 and items 7-13 are assigned scores ranging from 0 to 3 and weighted by 3 (Humana 1992, 6). Humana (1992, 5) assigned scores of 0-3 to each of the 40 indicators according to the following criteria: 0 = "constant pattern of violations of freedoms, rights or guarantees...of the indicator..."; 1 = "frequent violations of the freedom, rights, or guarantees of the...indicator..."; 2 = "occasional breaches of respect for the freedoms, rights, or guarantees...of the indicator..."; and 3 = "unqualified respect for the freedoms, rights, or guarantees of the...indicator..." (Humana 1992, 5). Data were obtained from a diverse set of organizations and publications, including Amnesty International, Human Rights Watch, *The Times*, *The Washington Post*, *The New York Times*, *The Economist*, U.S. Department of State Country Reports on Human Rights Practices, and the like (Humana 1992, xx, 5).
2. For a detailed discussion of how the index was created, see Gupta et al. (1994, 144-149). We recoded Gupta et al.'s index to tap human rights provision (rather than human rights abuse) by subtracting the calculated discriminant score for each country from 100. Estimates based on the original Humana (1992) index do not differ substantially from estimates based on the Gupta et al. (1994) adjusted index reported above.

## References


Amin, S. 1974. *Accumulation on a World Scale: A Critique of the Theory of Under-Development*. New York: Monthly Review Press.

Barrett, D.B. (ed.). 1982. *World Christian Encyclopedia*. Oxford: Oxford University Press.

Barsh, R.L. 1993. Measuring human rights: Problems of methodology and purpose. *Human Rights Quarterly* 15,87-121.

Bollen, K. 1983. World system position, dependency, and democracy: The cross-national evidence. *American Sociological Review* 48,468-479.

Bollen, K. 1986. Political rights and political liberties in nations: An evaluation of human rights measures, 1950-1984. *Human Rights Quarterly* 8,567-591.

Bollen, K.A. and R.W. Jackman. 1985. Economic and noneconomic determinants of political democracy in the 1960s. *Research in Political Sociology* 1,27-48.

Bollen, K.A. and R.W. Jackman. 1995. Income inequality and democratization revisited: Comment on Muller. *American Sociological Review* 60,983-989.

Bornschier, V. and C. Chase-Dunn. 1985. *Transnational Corporations and Underdevelopment*. New York: Praeger.

Bornschier, V. and C. Chase-Dunn. 1993. TNCs and underdevelopment. Unpublished Paper. Johns Hopkins University, Department of Sociology.

Buergenthal, T. 1997. The normative and institutional evaluation of international human rights. *Human Rights Quarterly* 19,703-723.

Burkhart, R.E. and M.S. Lewis-Beck. 1994. Comparative democracy: The economic development thesis. *American Political Science Review* 88,903-910.

Catton, W.R. 1980. *Overshoot*. Chicago: University of Illinois Press.

Chase-Dunn, C. 1989. *Global Formation*. Cambridge, MA: Basil Blackwell.

Cohen, J.C. 1995. *How Many People Can the Earth Support?* New York: W.W. Norton.

Commoner, B. 1990. *Making Peace with the Planet*. New York: Pantheon.

Crenshaw, E. 1995. Democracy and demographic inheritance: The influence of modernity and proto-modernity on political and civil rights, 1965 to 1980. *American Sociological Review* 60,702-718.

Diamond, L. 1992. Economic development and democracy reconsidered. In G. Marks and L. Diamond (eds.), *Reexamining Democracy*, 91-139. Newbury Park, CA: Sage.

Dietz, T., L. Kalof, and R.S. Frey. 1991. On the utility of robust and resampling procedures. *Rural Sociology* 56,461-474.

Dixon, W.J. and T. Boswell. 1996a. Dependency, disarticulation, and denominator effects: Another look at foreign capital penetration. *American Journal of Sociology* 102,543-562.

Dixon, W.J. and T. Boswell. 1996b. Differential productivity, negative externalities, and foreign capital dependency: reply to Firebaugh. *American Journal of Sociology* 102,576-584.

Ehrhardt-Martinez, K. 1998. Social determinants of deforestation in developing countries: A cross-national study. *Social Forces* 77,567-586.

Ehrlich, P. and A. Ehrlich. 1990. *The Population Explosion*. New York: Simon and Schuster.

Firebaugh, G. 1992. Growth effects of foreign and domestic investment. *American Journal of Sociology* 98,105-130.

Firebaugh, G. 1996. Does foreign capital harm poor nations? New estimates based on Dixon and Boswell's measures of capital penetration. *American Journal of Sociology* 102,563-575.

Firebaugh, G. and F.D. Beck. 1994. Does economic growth benefit the masses? Growth, dependence, and welfare in the third world. *American Sociological Review* 59,631-653.

Frank, A.G. 1979. *Dependent Accumulation and Underdevelopment*. New York: Monthly Review Press.

Frey, R.S. and I. Al-Mansour. 1995. The effects of development, dependence, and population pressure on democracy: The cross-national evidence. *Sociological Spectrum* 15,181-208.

Goldstone, J. 1991. *Revolution and Rebellion in the Early Modern World*. Berkeley: University of California Press.

Gupta, D., A.J. Jongman, and A.P. Schmid. 1994. Creating a composite index for assessing country performance in the field of human rights: Proposal for a new methodology. *Human Rights Quarterly* 16,131-162.

Hardin, G. 1993. *Living Within Limits*. Oxford: Oxford University Press.

Harrison, P. 1993. *The Third Revolution*. New York: Penguin.

Henderson, C.W. 1982. Military regimes and rights in developing countries: A comparative perspective. *Human Rights Quarterly* 4, 110-123.

Henderson, C.W. 1991. Conditions affecting the use of political repression. *Journal of Conflict Resolution* 35,120-142.

Henderson, C.W. 1993. Population pressure and political repression. *Social Science Quarterly* 74,322-333.

Henderson, C.W. 1996. Dependency and political repression: A caveat on research expectations. In D.L. Cingranelli (ed.), *Human Rights and Developing Countries*, 101-114. Greenwich, CT: JAI Press.

Homer-Dixon, T. 1995. The ingenuity gap: Can poor countries adapt to resource scarcity? *Population and Development Review* 21.587-612.

Homer-Dixon, T.F., J.H. Boutwell, and G.W. Rathjens. 1993. Environmental change and violent conflict. *Scientific American* (February),38-45.

Howard, P. and T. Homer-Dixon. 1995. *Environmental Scarcity and Violent Conflict: The Case of Chiapas, Mexico*. Toronto: University of Toronto.

Howard, R. 1995. *Human Rights and the Search for Community*. Boulder, CO: Westview Press.

Humana, C. 1992. *World Human Rights Guide*, 3rd Edition. New York: Oxford University Press.

Kentor, J. 1998. The long-term effects of foreign investment dependence on economic growth, 1940-1990. *American Journal of Sociology* 103,1024-1046.

Lipset, S.M. 1959. Some social requisites of democracy: Economic development and political legitimacy. *American Political Science Review* 53,69-105.

Lipset, S.M. 1994. The social requisites of democracy. *American Sociological Review* 59,1-22.

Lipset, S.M., Kyoung-Ryung Seong, and J.C. Torres. 1993. A comparative analysis of the social requisites of democracy. *International Social Science Journal* 136,155-175.

Londregan, J.B. and K.T. Poole. 1996. Does high income promote democracy? *World Politics* 49,1-30.

Marks, G. and L. Diamond (eds.). 1992. *Reexamining Democracy*. Newbury Park, CA: Sage.

McCormick, J.M. and N.J. Mitchell. 1997. Human rights violations, umbrella concepts, and empirical analysis. *World Politics* 49,510-525.

Meyer, W.H. 1996. Human rights and MNCs: Theory versus quantitative analysis. *Human Rights Quarterly* 18,368-397.

Mitchell, N.J. and J.M. McCormick. 1988. Economic and political explanations of human rights violations. *World Politics* 40,476-498.

Moon, B.E. 1991. *The Political Economy of Basic Human Needs*. Ithaca: Cornell University Press.

Muller, E.N. 1995a. Economic determinants of democracy. *American Sociological Review* 60,966-982.

Muller, E.N. 1995b. Income inequality and democratization: Reply to Bollen and Jackman. *American Sociological Review* 60,990-996.

Nickel, J.W. 1987. *Making Sense of Human Rights*. Berkeley: University of California Press.

O'Donnell, G.A. 1979. *Modernization and Bureaucratic Authoritarianism*. Berkeley: Institute of International Studies, University of California.

Packenham, R.A. 1992. *The Dependency Movement.* Cambridge, MA: Harvard University Press.

Park, H.S. 1987. Correlates of human rights: Global tendencies. *Human Rights Quarterly* 9,405-413.

Perry, M.J. 1997. Are human rights universal? The relativist challenge and related matters. *Human Rights Quarterly* 19,461-509.

Poe, S.C. and C.N. Tate. 1994. Repression of human rights to personal integrity in the 1980s: A global analysis. *American Political Science Review* 88,853-872.

Pritchard, K. 1989. Human rights and development: Theory and data. In David P. Forsythe (ed.), *Human Rights and Development: International Views*, 329-345. New York: St. Martin's Press.

Przewoeski, A. and F. Limongi. 1997. Modernization: Theories and facts. *World Politics* 49,155-183.

Ragin, C.C. and Y.W. Bradshaw. 1992. International economic dependence and human misery, 1938-1980: A global perspective. *Sociological Perspectives* 35,217-247.

Rueschemeyer, D., E.H. Stephens, and J.D. Stephens. 1992. *Capitalist Development and Democracy*. Chicago: University of Chicago Press.

Sachs, A. 1996. Upholding human rights and environmental justice. In L.R. Brown and others (eds.), *State of the World* 1996, 133-151. New York: W.W. Norton.

Schnaiberg, A. 1980. *The Environment*. New York: Oxford University Press.

Simon, J. 1996. *The Ultimate Resource 2*. Princeton, NJ: Princeton University Press.

Taylor, C.L. and D.A. Jodice. 1983. *World Handbook of Political and Social Indicators*, 3rd Edition. New Haven: Yale University Press.

United Nations. 1991. *Human Development Report*, 1991. New York: Oxford University Press.

United Nations. 1994. *Human Development Report*, 1994. New York: Oxford University Press.

Whitaker. 1995. *Whitaker's Almanac*. London: J. Whitaker.

Williamson, J. 1987. Social security and physical quality of life in developing nations: A cross-national analysis. *Social Indicators Research* 19,205-227.

World Bank. 1992a. *World Tables*. Baltimore, MD: Johns Hopkins University Press.

World Bank. 1992b. *World Development Report*. New York: Oxford University Press.

World Resources Institute. 1994. *World Resources*, 1994-1995. New York: Oxford University Press.

# Jinxed Lynx?
# Some Very Difficult Questions with Few Simple Answers

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In Colorado Canadian lynx have recently been reintroduced to areas where they once roamed. This highly controversial project brings to light some concerns about reintroduction efforts and humans' role in trying to control nature. Critics believe that it's hurried and ill-planned. Colorado represents the southern most portion of the lynx's historical range. Lynx will be taken from Canada and, according to a wildlife manager (public meeting, October 1, 1998) in the Colorado Division of Wildlife (DOW), they'll be "dumped out" into a rather different ecosystem in Colorado with an expectation of at least 50% mortality, some due to starvation. John Seidel (DOW) views the reintroduction as "an experiment of sorts" (Boulder Camera, January 10, 1999, p. 10A). In the same article, Dale Reed (DOW), who no longer works on the project, agrees that Colorado's plans are a gamble because of the possibility that there won't be enough food for translocated animals. Should such experiments be conducted with such poor odds of success?

The reintroduction of lynx is justified by some people because the animals "will be killed anyway by trappers." This reasoning simply buys into a system that supports animal exploitation. Just because animals might be killed in one way doesn't justify killing them in other ways. Conservationists (and others) would be well-advised to think of better reasons to undertake reintroduction projects. Furthermore, additional lynx likely will have to be trapped in Canada to meet the demand for pelts. Thus, in addition to the death of translocated lynx, others will die to replace them. On January 5, 1999, a local news program showed lynx who were going to be translocated to Colorado struggling violently with trappers. Some trapping is being done by inexperienced trappers and lynx are escaping from traps and some have been injured. These facts raise numerous practical and ethical concerns.

The importance of blending rigorous science and public support in reintroduction programs can't be emphasized too strongly. It's necessary to know if lynx show enough behavioral flexibility to allow them to adapt to ecosystems differing in climate, vegetation, and food resources. It's also essential that suitable habitat be protected indefinitely. Lynx are difficult to reintroduce in the best of conditions. A well-planned effort in New York State was unsuccessful and Swiss biologists have been working for years on a similar project.

It is unethical and disingenuous to perform reintroduction experiments when it is believed at the start that half the animals will die. It's also unethical to undertake reintroduction programs simply to prevent species from being listed as endangered or threatened under the Endangered Species Act (ESA). When the ESA is invoked, local control over land use (for example) is trumped by federal control, and some people understandably want to keep the federal government out of local concerns. One way to keep the federal government out is to attempt to reintroduce animals to keep their numbers up. In Colorado, Mr. Seidel (setitalClawmarksendital, 1998, volume 1, p. 1) noted "If we don't begin work on this reintroduction, the federal government will take the lead within the next several years." Indeed, action by the Federal government could occur as soon as June, 1999. Along the same lines, in an article in the Bozeman (Montana) Daily Chronicle (September 12, 1998, page 5) concerning the reintroduction of lynx into Idaho, it's noted that "Idaho officials acknowledge granting permission to relocate lynx is partly an effort to block possible Endangered Species Act restrictions in the state."

Needless to say, I wish these programs and all animals well, but rushing into reintroduction efforts because of political and other pressures is ill-advised. Moving slowly and carefully is essential. Let's hope the lynx weren't jinxed from the start.

## Is More Better?

Reintroduction programs also raise other questions. For example, it's not clear that species preservation and conservation always have to be valued, why "more is better," why biodiversity should be conserved, or if we can improve nature. With rare exceptions, carnivore reintroduction programs are unlikely to do much for preservation, conservation, or biodiversity given the high mortality of reintroduced animals even in well-planned efforts (witness the fate of recently reintroduced Mexican wolves). In 1995, Benjamin Beck, then Chair of the American Zoo and Aquarium Association's Reintroduction Advisory Group, lamented " . . . we must acknowledge frankly at this point that there isn't overwhelm-

ing evidence that reintroduction is successful." Two reintroduction experts, Richard Reading (at the Denver Zoo) and Tim Clark (Yale University) stressed in a recent review of carnivore reintroduction projects that "It is clearly desirable to improve approaches to reintroduction."

Given that even many experts are extremely skeptical of attaining the goals of reintroduction efforts, it's important to reassess what we are doing and why. Just because we *can* do something doesn't mean we *ought* to do it. Indeed, there are numerous factors beyond the control of scientists and others who so dearly want them to succeed. Recently, three biologists argued that personal attitudes, human shortsightedness, and greed, would, with few exceptions, be insurmountable stumbling blocks in attempts to manage animal populations.

## Can We Achieve More By Doing Less?

I raise the questions I have not because I'm a kill-joy who's against all reintroduction efforts. I deeply appreciate the good intentions and efforts of all involved, but sometimes good intentions aren't enough. And, there's no room for failure. I ponder these questions because the issues aren't as clear as many people want them to be. Nature is complex, but many people want simple, quick solutions when tinkering with her. There aren't any. Successful proactive planning takes time. Making compassion choices often requires patience and restraint. When trying to conserve species or restore ecosystems we must be concerned with all animals who are involved, not only human-centered goals. Many lives are at stake. Should individuals be moved and perhaps suffer and die because of what we want? Should individuals be traded off for the good of their species? Should individuals who have lived without certain predators or competitors be confronted with them? Should populations and ecosystems that have developed and sustained themselves in the absence of predators be altered? It may turn out in some cases that it's impossible to regain what was lost. It may be infeasible to recreate what once existed because times have changed and we can't recreate what once was. In the end we may simply be faking nature.[2]

## Endnotes

1. Marc Bekoff (marc.bekoff@colorado.edu) is a fellow of the Animal Behavior Society and a Guggenheim Fellow. He teaches in the Department of Environmental, Population, and Organismic Biology at the University of Colorado, Boulder, and has studied the behavioral ecology of coyotes, adelie penguins, and other animals. This essay was adapted from the Daily Camera (January 24, 1999, page 3E). Relevant web sites for the lynx issue are:
http://rmad.org.lynxfact.html
http://www.bouldernews.com/opinion/columnists/mark.html
http://www.bouldernews.com/news/local/03alynx.html
http://www.bouldernews.com/news/local/25alynx.html
http://www.bouldernews.com/opinion/letters/0305lett.html
http://csmonitor.com/durable/1999/03/11/fp2s2-csm.shtml
http://insidedenver.com/news/0325lynx5.shtml
http://www.bouldernews.com/news/local/28alynx.html
http://www.bouldernews.com/opinion/letters/28alette.html
http://InsideDenver.com/news/0329lynx6.shtml
http://cfapps.insidedenver.com/opinion/8.cfm

2. Sadly, four lynx have already starved to death. Gene Byrne, a DOW official was quoted as saying "We're kind of bummed out." Well, they should be as this was entirely predicted before the reintroduction began.

## *Green Versus Gold: Sources in California's Environmental History*

**Edited by Carolyn Merchant**

**Washington, D.C. and Covelo, California Island Press, 1998**
**pp. vii-xxii, 1-489.**
**ISBN 1-55963-580-0**

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*Green Versus Gold* is a fine collection of 62 primary documents and 42 scholarly essays, drawn from previously published articles, monographs, and books, that explore California's environmental history from approximately the mid-nineteenth century to the present. Carolyn Merchant ties the collection together with insightful introductory and concluding essays. The documents and essays are divided into 13 roughly chronological chapters, each concluding with a helpful list of further readings. The book's title, Merchant writes, "characterizes the many changes and tensions between environment and economy and between nature and humanity that took place in California's natural and human history" (xvii). The pervasive theme of the collection is the conflict between alternative visions of California: an early one based on immediate returns from resource extraction and exploitation of the environment, and a later, ecologically-minded one based on sustainability. Paralleling this theme, and driving the uneven transition from the former view to the latter, are changing human perceptions of the meaning and value of nature and of our relationship to it. The book is intended for a wide audience, including high school, college, and university students, as well as policymakers, restoration ecologists, and citizen activists. It is therefore both a valuable educational tool and a call to action.

The book opens with a focus on California's geological history and natural environment and the ways in which that environment has been altered since Anglo-American contact. Raymond Dasmann discusses the extinction or drastic reduction of once-abundant wildlife, including the grizzly bear, elk, pronghorn antelope, bighorn sheep, whale, sea lion, and otter. Felix E. Smith and Anne Sands concentrate on changes in the San Joaquin Valley, the southern half of California's Great Central Valley, especially in terms of the destruction of riparian habitat in the wake of the Gold Rush of the 1850s.

Speaking through the works of ethnographers, the Wintu, Karok, Modoc, and Maidu peoples describe their traditional, spiritual relationships with this rapidly disappearing natural world. Arthur McEvoy complements these primary sources with a description of aboriginal fishing practices, including how, "unlike modern fishers, the Indians sustained whatever yields they did take for centuries" (52). Kat Anderson clearly describes sustainable Native American harvesting and burning practices and concludes that: "A future challenge for us all will be to develop viable land-management strategies for California which sustain both the resource base and the cultural integrity of indigenous peoples" (49).

Spanish missionaries and settlers and Russian hunters of sea lions, seals, and whales left their mark on California's environment prior to the arrival of Anglo-Americans, of course, and it is appropriate that a chapter is devoted to the Spanish and Russian frontiers. Norris Hundley's essay provides an incisive explanation of Hispanic water rights during the Spanish period. Under the Plan of Pitic, water was to be allocated with "equality and justice" by the local *ayuntamiento* or town council whose members were elected by local residents (82). Such an arrangement reflected the Hispanic commitment to *bien procumunal*, the common good. Documents and essays that appear later in the book make quite clear the profound differences between this Hispanic notion of water rights and the various notions upheld by Anglo-Americans who later settled the West. During the Spanish period, there was limited contact between the missions and presidios and the Native Americans who lived much beyond the coastal regions. Albert Hurtado points out that during the Mexican period, Hispanic influence spread to the interior of California; Indians in that region were increasingly drawn into an international fur trading system, increasing both their dependence and their vulnerability.

The Gold Rush permanently altered California's landscape, not only by the massive influx of new settlers, but also by the impact of hydraulic mining, which quickly replaced placer mining as surface deposits were exhausted. Selections from the Sawyer Decision of 1884 and an essay by Robert Kelley highlight the legal struggle between the hydraulic mining interests, whose blasting away of entire hillsides caused debris flows and downstream flooding, and the proprietors of farms, orchards, and vineyards, who watched as their property was repeatedly inundated. Kelley writes that in the wake of Sawyer, "By 1895, the hydraulic mining industry in the northern Sierra was no longer a major element in the state's economy. Bustling mining towns died, schools closed, and much of the mountain country lapsed into drowsy somnolence, a region of ghost towns and quiet forest. The long struggle was over, and the farmer was dominant in the Sacramento Valley" (125).

The next three chapters of *Green Versus Gold* turn toward three of California's most valuable resources: its forests, rangelands, and water, respectively. Although most of the chapter on forests focuses on the nineteenth century, Judi Barry's brief account of the recent Timber Wars in Northern

California is a useful tie to contemporary struggles. Her account of that conflict, which has pitted environmentalists in a fierce battle against Maxxam Corporation, provides a nice complement to Tamara Whited's essay on the Humboldt forests, in which she argues against the historical "inevitability" of the wholescale logging of the redwood forests (159). Instead, she contends that during the first three decades of Humboldt County's existence, settlers conceived of their locale as supporting a mixed economy of "farmers..., fruit growers, raisers of livestock, and fishers in addition to the loggers" (162).

Despite decades of wholescale logging of its forests, perhaps no part of California has been transformed more than its rangelands. Raymond Dasmann discusses how grazing—first by cattle and, after the floods and droughts of the 1860s, increasingly by sheep—altered the grasslands. Native perennial grasses of two principal forms, bunch grasses and sod-forming grasses, succumbed to the pressures of overgrazing and were gradually replaced by exotic annuals such as wild oats and mustards. Yet, Paul Starrs argues that it was ranching that first provided a base for California's economy and an incentive for subsequent settlement. California's initial success during the *Californio* (Mexican) period rested upon "the blossoming relationship between the hide and tallow industry, the rise of California ports and cities from which these commodities were shipped, and the role of ranching society in bringing newcomers to California in the 1830s and 1840s" (203). When taken together, these two essays point to a central, recurring theme in California's environmental history. Exploitation of the natural environment has brought economic success, but at the same time has threatened the resource base of that success.

The documents and essays of the chapter, "Building the Hydraulic Empire," provide important information about the fascinating history of Anglo-American water law in California and the massive Central Valley and State Water Projects. David Igler presents the infamous *Lux v. Haggin* case not only as the seminal battle between advocates of "riparian" water rights and "appropriation" water rights, but as a window into nineteenth-century representations of nature. Both riparians and appropriators, he argues, "largely portrayed nature as orderly, consistent, and definable — a socially constructed nature both adaptable to the permanancy of human law and amenable to the preservation of private property rights" (240). By holding this view, both groups failed to take into account the autonomy of nature. "Reimagining" nature, Igler suggests, requires such an understanding (245). Whether one accepts Donald Worster's hydraulic thesis, based on the domination of common citizens by giant water bureaucracies, or Norris Hundley's position that control of California's water has resulted from a complex interaction of individuals, local organizations, and state and federal agencies, it is clear from the selections of this chapter that the underlying theme of California's water development has been the "control of nature," rather than a recognition of its autonomy.

The plight of California's agricultural laborers, past and present, is vividly portrayed in poignant selections from John Steinbeck's *The Grapes of Wrath* and Cesar Chavez's "Farm Workers at Risk," as well as in Sucheng Chan's essay which argues that Chinese tenant farmers and laborers were integral to the development of the Sacramento-San Joaquin Delta as one of the richest agricultural areas in the world. Donald Pisani provides the context for the plight of farm laborers in his essay, which argues that by the early 1930s "most Californians acknowledged, though not always directly, that the health of their economy and society did not depend on the existence, perpetuation, or proliferation of the family farm" (276). He contends that, especially after World War II, irrigation ceased to be an agent to transform society, and became an ally of the agricultural establishment.

The latter nineteenth century witnessed the rise of the conservation movement, in many ways the precursor of modern environmentalism. A chapter on preserving parks points not only to shifting value judgments about nature, but also to specific examples of the schisms within the conservation movement over conflicting views of the appropriate "use" of nature. Roderick Nash's essay discusses the well-known split between John Muir and Gifford Pinchot over the damming of Hetch-Hetchy. Susan Schrepfer discusses the ideological fracture that emerged in the early 1960s between the Save-the-Redwoods League and the Sierra Club over the establishment of Redwood National Park.

The last four chapters of *Green Versus Gold* have a decidedly contemporary flavor, as they focus on battles over energy, the growth of California cities, the rise of environmental science, and contemporary environmental movements, respectively. Unobtrusively, the tone of the documents and essays becomes less purely historical and takes on an increasing sense of urgency, subtly calling on the reader to become involved.

The chapter on energy presents both the history of California's energy development and some of the contested views of the state's energy future. James Williams shows how California twice diverged from the national course, first in the 1910s, when Californians pioneered hydroelectric power development, and again in the 1970s, when residents promoted renewable energy industries as an alternative to reliance on fossil fuels and nuclear power. Thomas Wellock relates the early 1960s battle over Pacific Gas and Electric's plan to build a nuclear power plant on California's Bodega Head peninsula. The plant was never built, defeated largely by

decentralized public activism. Wellock argues that this struggle marks a turning point in the environmental movement, a precursor of "a resurgent desire for participatory democracy" (349).

The title of the chapter "Second Nature: California's Cities" points to a growing consensus among environmental historians that our cities, built by humans who are ourselves part of the natural world, are also part of nature. Documents in this chapter describe the mostly successful campaign of the 1960s to reverse, or at least halt, the environmental degradation of San Francisco Bay caused by pollution and by landfill for development. Essays address other issues of pressing importance to many Californians. Barry Commoner describes Los Angeles smog, William P. McGowan explores the political legacies of governors Ronald Reagan, Jerry Brown, and George Deukmejian to explain why the state's freeways and bridges are being seismically retrofited at such a painfully slow pace, and Mike Davis argues that the "new urban environmentalism"—the politics of slow-growth—is essentially a "reassertion of social privilege" that simultaneously ignores the plight of the inner cities (389).

Practitioners of environmental history are increasingly realizing the importance of both environmental science and ecology to their discipline. It is therefore most fitting that the collection contains a chapter entitled "The Rise of Environmental Science." Documents address the topics of agricultural experiment stations, biological pest management, the maturation of state forestry, and the protection of biodiversity. Michael Smith's essay discusses nineteenth-century California scientists whose goal and social vision was "to complete an inventory—and, they hoped, construct a design—for the entire planet and everything living on it" (410). In this short piece, the reader is rewarded with glimpses of Josiah Dwight Whitney, John Muir, Joseph Le Conte, and Alice Eastwood, among others. Smith points out how the grand social vision of these early scientists and naturalists was superseded by the more practically-minded nascent discipline of ecology early in the twentieth century. John Perkins' essay provides a useful overview and summary of the principles of integrated pest management (IPM) as it has evolved since the 1950s. The chapter concludes with an essay by Michael Barbour et al., in which the authors offer an economic and ethical argument for the preservation and restoration of California's vegetation.

The last chapter of the book focuses on contemporary environmental movements. The documents in this chapter are particularly rich. Beginning with an excerpt from Ernest Callenbach's 1975 novel *Ecotopia*, additional documents read like primers on bioregionalism, deep ecology, and ecofeminism. There are also selections on African-Americans and social justice, and on how Hispanic farmworkers stopped the construction of a toxic waste incinerator near their homes in Kettleman City, California. Robert Gottlieb's essay on grassroots environmentalism highlights once again the power of groups of local citizens to resist the destruction of their environment. "Since the 1970s, there has emerged, distinct from the mainstream groups, a powerful current in contemporary environmentalism focused on issues of empowerment, environmental justice, equity, and urban and industrial restructuring" (457). The remaining two essays in the chapter relate, in different ways, to how we "know" nature. Mike Davis' piece complements an earlier selection from John McPhee's *The Control of Nature*, by a discussion, informed by ecological theory, of the "chaos" inherent in nature. Gary Snyder, in the concluding essay, offers a suggestion relevant to all those who work—or play—in some capacity with nature. He writes: "Beyond all this studying and managing and calculating, there's another level to knowing nature....One must be tuned to hints and nuances" (460).

Merchant's concluding essay on environmental ethics points toward one way of arriving at an understanding of nature and how best to protect it. She suggests that we transcend egocentric, homocentric, and even ecocentric ethics, and adopt a partnership ethics that "considers the human community *and* [italics in original] the biotic community to be in a mutual relationship with each other" (471). Such a partnership ethic entails "a new consciousness about nature as an actor and equal subject" (472). Our distant ancestors, perhaps more than our recent ones, would have recognized the wisdom of this view.

When compiling any collection of primary and secondary sources, an editor is always faced with the challenge of rendering the final product into a coherent whole. Carolyn Merchant has met this challenge admirably. Her book emerges not as a history of environmentalism, but as a clear and multilayered story of the history of California's environment. While each of the 13 chapters ostensibly focuses on a different topic, they are held together by the book's recurrent themes of attitudinal changes toward nature and of the interrelationship between resource use and human ecology. The plight of agricultural workers, for example, cannot be understood without an understanding of the hydraulic empire and, in turn, of how the presumptions of that empire differed from earlier concepts of water rights. Therefore, while the chapters can be read—or taught—independently, they speak to each other in such a way that readers will come away from the book with a distinct sense of change over time, and of a holistic picture of the state of California's environment at distinct points in time. The chapters on mining, forests, rangelands, and water define the central issues of the second half of the nineteenth century, for example, while the chapters on energy battles, cities, environmental science, and contemporary

environmentalism define the most pressing issues of the second half of the twentieth, including a taste of the cultural diversity issues inherent in the modern movement.

The documents and essays are excerpted from longer works, and, for the most part, Merchant has successfully edited them without diminishing their intelligibility. In only a few instances do ellipses cloud meaning. Within the individual chapters, there is generally a strong correlation between these primary and secondary sources. In many cases, such as Adele Ogden's essay on Russians and sea otters, and Hans Jenny's essay on Eugene Hilgard and the birth of soil science, the essays parallel the content of particular documents. In other cases, the documents and essays address a variety of issues relevant to the chapter topic, but do not necessarily have a one-to-one correspondence. This is not a criticism, as both approaches work effectively, and the book would appear too forced if Merchant had tried to match each document with an essay, even if this were possible. Still, while conscious of Merchant's attempt to "make the collection accessible and cost-effective," I think the reader—especially the non-specialist—would have benefited from a very brief historical introduction to the content of each chapter (xxi).

In her introduction, Merchant writes: "No collection can cover every region, resource, and subculture in a place as vast and diverse as California" (xxi). This statement, of course, is absolutely true, and excuses omission of a full treatment of topics such as the infamous water wars between the City of Los Angeles and the Owens Valley. Merchant does include a document on Mono Lake, however, and it is difficult to resist wishing she had included excerpts from the 1994 California State Water Resources Control Board Decision 1631, which ordered the protection of Mono Lake based on the public trust doctrine, a promising avenue of future legal redress for environmental degradation. These criticisms and suggestions are minor, however. Overall, the work stands as an extremely valuable contribution to the burgeoning fields of both California history and environmental history. Students, scholars, and general readers alike will gain insights into the contested and complex history of the "Golden" State.

## *Good Natured: The Origins of Right and Wrong in Humans and Other Animals*

**By Frans de Waal**
**Cambridge, Mass.: Harvard University Press, 1996**
**296 pages**
**ISBN: 0674356608**

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Frans de Waal, the author of *Good Natured: The Origins of Right and Wrong in Humans and Other Animals*, is a primatologist who has done much of his research at the Yerkes Regional Primate Research Center. This book, together with *Chimpanzee Politics* (1982) and *Peacemaking Among Primates* (1989), is testimony to his wealth of knowledge about primate behavior. The anecdotes and accompanying photo essays in *Good Natured* give the book a popular appeal and will keep nonspecialists who are interested in animals engaged in the text. De Waal's inquiries into the origins of right and wrong are of a piece with other contemporary writers who have urged on us the biologicising of morality, in particular, Richard Alexander (1987) and E.O. Wilson (1975). In this review essay I single out and comment on those remarks by de Waal that bear on the issue of morality.

In a number of places de Waal describes morality in a metaphorical way as the sort of thing that is composed of building blocks (3), or component parts (211), or as a tower made up of floors, the bottom floors occupied by animals and the top floors or "summit" occupied by humans (212). I focus first on what de Waal takes morality to be beyond these parts to whole metaphors of morality. Second, I suggest that de Waal's investigation into the origins of morality have something in common with what Darwin says about the evolution and development of human moral psychology, or the "moral sense." By specifying what is essential to human morality de Waal also apparently believes that we learn something about the morality of animals. His project is, as he puts it, to investigate whether the "building blocks of morality are recognizable in other animals" (3, 39). So there is a kind of extrapolation from human capacities that he believes are morally relevant to seeing that these very same capacities are shared by humans and animals. So, my third task here is to clarify the sense in which de Waal believes animals are moral and to evaluate the plausibility of such a claim.

## The Nature of Morality

Although de Waal does not argue for any particular moral theory his views fall clearly into the tradition of David Hume and Adam Smith. Benevolence, he believes, ". . . nourishes and guides all human morality. . . Moral sentiments come first; moral principles, second" (87). The relevant sentiment, of course, in keeping with Hume and Smith is sympathy and this is taken up by de Waal in Chapter Two. De Waal begins this discussion by mentioning examples of leviathan care, cases where dolphins have saved companions by biting through harpoon lines and whales have come to the defense of other injured whales being hunted by capsizing the hunter's boat. De Waal asks whether such behavior is correctly described as sympathetic. This leads him to distinguish animal succorance from sympathy. The cases he describes involving dolphins and whales do count as cases of animal succorance in virtue of satisfying the following definition: ". . . helping, caregiving, or providing relief to distressed or endangered individuals other than progeny" (41). In contrast, sympathy is characterized as "concern about another's situation." To claim that dolphin and whales sympathize with others is a harder case to make, admits de Waal.

To his credit de Waal is careful to distinguish two kinds of explanations of behavior. Evolutionary or causal explanations of behavior are designed to explain why a behavior is present by reference to how beneficial it is to the survival or reproduction of an individual or group. In contrast, "vernacular" explanations are those that make reference to motivation, emotions, and intentions on the part of the agent who acts. When de Waal claims the "Human moral judgment always looks for the intention behind the behavior" (15), he has in mind distinctions we make in attributing moral praise and blame to a person on the basis of whether or not she intended to perform an act. Our moral appraisals depend in many cases on the motivation of the agent.

> . . . perceived intentions are the stuff of moral judgment . . . With praise and blame being meted out on the basis of our reading of other people's intentions, it is important to know if animals recognize knowledge or intention behind the behavior of others (73).

For the same reason it is important for us to recognize the intention behind the animal's behavior in order to know whether or not that animal is deserving of moral praise or blame.

One way of interpreting de Waal's part to whole metaphors of morality is to suppose that these parts are cog-

nitive capacities that are necessary conditions for being a moral person. De Waal says, for example, that "It is hard to imagine human morality without the following tendencies and capacities found also in other species" (211). Included in the list of ingredients for human morality are "sympathy-related traits," norm-related characteristics, such as prescriptive social rules," "reciprocity," "peace-making, and avoidance of conflict" (211). De Waal seems to appreciate that these traits or characteristics can be defined in a number of ways. For example, the definition of succorant behavior makes no reference to intentional states, while sympathy does entail that the subject to whom this state is attributed has a conception of another's situation and feels concern for another. Likewise for the distinction between cognitive empathy and learned adjustment. A dog may learn that his owner is disabled from the loss of a limb and adjusts by bringing the ball only to that side of his owner that can catch and throw. But this behavior, de Waal suggests, does not imply that the dog understands the disability of his owner in the sense that the dog can picture himself in his owner's position (48). De Waal also says that "conscious community concern is at the heart of human morality" (208). He then goes on to define "community concern" as "The stake each individual has in promoting those characteristics of the community or group that increases the benefits derived from living in it by that individual and its kin" (207). By de Waal's own admission this definition makes no reference to motives or intentions on the part of the subject to whom community concern is attributed. But one might add that what is morally relevant about each capacity that de Waal lists as an ingredient of morality are the intentions and motivations to act on the part of the agent. For example, it is precisely in virtue of those intentional states that motivate a human being to act for the sake of the community that makes us want to say that community concern is morally relevant to begin with.

What evidence do we have that it is concerned to attribute either cognitive empathy or conscious community concern to animals? At least this much seems to follow from de Waal's explicitly stated views about morality. According to de Waal, moral appraisals depend on knowing the intentional states of the agent. He also believes that in many cases these states cannot be read off straightforwardly from the behavior displayed by the animal. The intentionality of animals is not available to us without additional experimentation (96). So what de Waal should conclude on the basis of this is that we do not yet know whether or not animals have the sort of intentionality required to regard them as the proper subjects of moral appraisal. Instead, what de Waal concludes is that animals have the components of morality, one or two bottom floors of morality, an element, or the origins of morality. The last of these claims is on a slightly different footing that the part to whole metaphors of morality de Waal favors. I explore one interpretation of what de Waal might mean by the "origins of morality" in the next section.

## The Origins of Morality

De Waal's investigation into the "origins of right and wrong" is an attempt to explain the biological and causal origins of human moral psychology, or perhaps the causal origins of certain moral principles like reciprocity or altruism. Darwin's views about the origins of morality are close to the surface in de Waal's book, enough so as to serve as an instructive framework for understanding de Waal's project. The debt to Darwin is explicit, for example, when de Waal asserts that ". . . anyone adopting an evolutionary perspective . . . would argue that there must be continuity between the behavior of humans and that of other primates. No domain, not even our celebrated morality, can be excluded from this assumption" (1).

Here de Waal appears to endorse a principle that Darwin also holds, one that I will refer to as the "continuity thesis." This is the thesis that there is ". . . no fundamental difference between man and the higher mammals in their mental faculties" (Darwin 1930, 66). On Darwin's account, mental development is gradual ranging in degrees of complexity from the lower animals, to higher apes, barbarians, and finally to civilized men. Darwin attempted to demonstrate a continuous and gradual mental development between the lower animals, apes, savages, and civilized men by examples of animals having human-like characteristics which included emotional states. The continuity thesis seems to imply that there is no psychological state that humans have and animals lack, though there are some states that humans have quantitatively more of, or to a greater degree than animals. Darwin suggested that this was so even with respect to moral disposition. So, if there is a gradual development of a "moral sense" that culminates in civilized man, then there must be traces of this moral sense in beings who are lower on the phylogenetic scale that Darwin believed characterized evolutionary development. In other words, to claim that the origins of morality can be found in animals when seen through the lens of the continuity thesis is to imply that animals literally have a share in morality, though this moral sense would be less developed than in savages, and even less so than in civilized man.

But this interpretation is inconsistent with other remarks Darwin makes explicitly denying morality to animals. Darwin says,

> A moral being is one who is capable of comparing his past and future actions or motives, and of approving or disapproving of them. We have no reason to suppose

> that any of the lower animals have this capacity; therefore, when a Newfoundland dog drags a child out of the water, or a monkey faces danger to rescue its comrade, or takes charge of an orphan monkey, we do not call its conduct moral. But in the case of man, who alone can with certainty be ranked as a moral being, actions of a certain class are called moral, whether performed deliberately, after a struggle with opposing motives, or impulsively through instinct, or from the effects of slowly-gained habit (Darwin 1930, 113).

Only certain kinds of beings have a moral sense, namely civilized humans, because only civilized humans satisfy a number of other conditions that are necessary for a thing to have a moral sense. Anything that has a moral sense must also have social instincts. What we do apparently share with animals are these social instincts. These include a rather wide range of emotional states like affection, sympathy, courage, fidelity, obedience, and love. For Darwin the moral sense is only partly constituted by a psychological state or a feeling of right or wrong in the agent. In addition, anything with a moral sense must have suitably developed intellectual powers, in particular, the capacity to remember past actions and motives, and to compare these with future actions and motivations for acting. Having a language is also a necessary condition for having a moral sense since it is through language that the wishes of the community and the nature of the common good are communicated to individuals. Moreover, a moral agent must be capable of forming habitual practices in conformance to the wishes of the community who act as judges of permissible and impermissible actions (Darwin 1930, 99-100). So what Darwin means by the moral sense is a collection of complex intellectual capacities and social practices that situate an individual.

The continuity thesis says that there is no difference in kind between the mental powers of animals and humans. This allows Darwin to claim with some plausibility that there are gradations or degrees of human psychological traits that can be attributed to animals. But the continuity thesis does not imply a corresponding conclusion about the presence of a moral sense in animals because the moral sense is not merely a psychological state. According to Darwin, the moral sense does develop out of certain affective instincts found in animals and savages. But since animals can have these social instincts without having a moral sense, having these instincts is not sufficient for morality, nor would it seem that emotional states like sympathy or fidelity literally entail the moral connotations ordinarily associated with them. While this may provide something of an explanation of the causal origins of human moral psychology as Darwin conceives it, it does not imply that animals have a less developed or a lesser degree of a moral sense. Darwin says,

> The moral sense perhaps affords the best and highest distinction between men and the lower animals; but I need say nothing on this head, as I have so lately endeavored to show that the social instincts, — the prime principle of man's moral constitution — with the aid of active intellectual posers and the effects of habit, naturally lead to the golden rule, "As ye would that men should do to you, do ye to them likewise;" and this lies at the foundation of morality (Darwin 1930, 128-129).

De Waal's apparent endorsement of the continuity thesis suggests that he is aiming for an explanation of the evolutionary development of our moral psychology. In this respect his project coincides with Darwin's, but does not offer anything innovative to this line of argumentation that has had many recent advocates. But de Waal does seem to part company with Darwin on the issue of the morality of animals.

## The Morality of Animals

In the conclusion of *Good Natured* de Waal claims that he "hesitates to call the members of any species other than our own moral beings," although he believes that the ". . . cognitive abilities underlying human morality antedate the appearance of our species on this planet" (210). This remark is reminiscent of Darwin's explanation of the origin of the moral sense in humans. As we have seen Darwin is willing to say that the social instincts which are necessary for the evolution of the moral sense are present in nonhuman animals, but for Darwin the presence of social instincts in an animal is not itself sufficient for morality. Animals are not a little bit moral, according to Darwin, nor are they moral in some derivative sense. However, de Waal goes on to say,

> The question of whether animals have morality is a bit like the question of whether they have culture, politics, or language. If we take the full-blown human phenomenon as a yardstick, they most definitely do not. On the other hand, if we break the relevant human abilities into their component parts, some are recognizable in other animals (210).

The abilities relevant to the moral appraisal of human behavior are those that make reference to the intentions and motivations of the agent who acts. So the morality of animals should be gauged by whether or not their behavior is explicable by reference to intentions and motivations for acting. But it is here that de Waal misses the mark entirely. He not only fails to establish that animals have those intentional states that are necessary to regarding an animal as the proper subject of moral appraisal, he at times suggests that this issue is uncontroversial or that it is merely a semantic prejudice to deny to animals those morally relevant intentional states.

> Animals, particularly those close to us, show an enormous spectrum of emotions and different kinds of relationships. It is only fair to reflect this fact in a broad array of terms. If animals can have enemies they can have friends; if they can cheat they can be honest, and if they can be spiteful they can also be kind and altruistic. Semantic distinctions between animal and human behavior often obscure fundamental similarities; a discussion of morality will be pointless if we allow our language to be distorted by a denial of benign motives and emotions in animals (19).

To establish that animals have the right sorts of intentional states to warrant moral praise or blame requires more than merely pointing out that animals behave in ways that are similar to the ways in which humans behave when we extend moral praise and blame to humans. At times de Waal seems to appreciate this point insofar as he recognizes that cognitive ethologists have an important contribution to make by investigating what "motivates" animals to act, whether they "realize" how their behavior affects others, and whether they "know," "want," or "calculate" (3). Nonetheless, de Waal ignores this issue when discussing actual examples, preferring instead to interpret the animal's behavior in such a way that the case is already made that animals have the morally relevant intentionality. For brevity I cite only three examples.

Attachment underlies sympathy, and the capacity for sympathy is a morally relevant intentional state according to de Waal (53). If so, then attachment to loved ones who have died will be evidenced by grief. Do animals have the emotional state of grief? De Waal explains that monkeys react to the death of another monkey in ways that are outwardly similar to human grieving. De Waal describes the following anecdote. The wild chimpanzee Flint, who was only 8½ years, died 3 weeks after the loss of his mother upon whom he was unusually dependent. As quoted by de Waal, Jane Goodall suggests that perhaps Flint died of grief since, "His whole world had revolved around Flo, and with her gone life was hollow and meaningless." De Waal correctly suggests that there may be an alternative explanation namely, that Flo and Flint fell victim to the same disease and Flint had merely held out a little longer (54). But de Waal goes on to add,

> Seeing the termination of a familiar individual's life, chimpanzees may respond emotionally as if realizing, however vaguely, what death means — or at least that something terrible has befallen the other (55).

De Waal's interpretation seems to be that Flint's dying implicitly credits him with exactly those intentional states that capture what is morally relevant about the emotion of grief as experienced by humans. This is surprising in the case described since de Waal provides the reader with no additional evidence to support the attribution of these intentional states beyond the fact that Flint died.

Recall de Waal's distinction between learned adjustment and cognitive empathy. Does de Waal believe that any animals experience cognitive empathy? Yes, but again he does not actually argue for this view. In describing chimpanzees who tend the wounds of other chimpanzees de Waal says that he "intuitively agrees" that when chimpanzees tend wounds by licking they are motivated by empathy where this implies that they are "aware of the needs of the wounded and demonstrate empathy for the pain resulting from such wounds." But shortly following this de Waal concedes that the "tending of wounds, per se, tells us nothing about the underlying mental processes" (58). Of course, it is exactly the presence of those underlying intentional states that makes being motivated by empathy morally relevant in the first place. We are not tempted to extend either moral praise or blame to things whose behavior is merely explicable by what de Waal calls learned adjustment.

De Waal might reply that psychological states like empathy come in different degrees, and that there is a range of psychological states from mere agitation at the distress of others to full understanding of another's predicament that might count as experiencing empathy. In de Waal's words, "empathy is not an all or nothing phenomenon." So, if some "element" or degree of human empathy is recognizable in animals, and if the attribution of empathy to humans is relevant to the moral appraisal of their actions, then it is sometimes appropriate to extend our moral appraisals to animals. But this argument suffers from lack of precision about the concept of empathy in which we are interested. Suppose the attribution of empathy in the morally relevant sense necessarily requires the attribution of the "full understanding of another's predicament"? Then it won't be true that cases of mere agitation are instances of empathy in the *morally relevant sense* at all. And if so, it will not turn out that animals are the proper subjects of moral praise and blame *because* they are motivated by empathy.

In Chapter Three, titled "Rank and Order," de Waal directs our attention to the group organization of primates. What is striking about bands of chimpanzees is the social regularity and hierarchies that govern the activities of individuals in such groups. What is morally relevant about the hierarchical organization of groups, according to de Waal, is that they are rule-governed. The sorts of rules we are interested in from a moral point of view are prescriptive rules, rules that specify how one ought to behave (90). But to refer to behavior as rule-governed is ambiguous between two kinds of explanations of this behavior — one intentional, the other not. Chimps (or humans) may behave as if an individual of the group has transgressed a rule that we, as observers,

believe is operative in the organization of that group. In this case a rule that individuals seem to conform to is superimposed on the behavior by the observer herself in order to explain that behavior. It is in this sense, for example, that computers are said to follow rules insofar as they instantiate an algorithm in the program running. But what is *morally* relevant to the notion of rule-governed behavior is that the individuals who appear to conform to a prescriptive rule do so by virtue of recognizing that there is a rule that ought to be followed. This is a very different kind of explanation because it makes reference to how or in what way a rule is represented in the mind of the rule-follower. One might wonder additionally what sort of cognitive representation of the rule is required in order to say that one follows a *moral* rule, as opposed to a rule of etiquette, or a rule of prudence. De Waal does not tackle this difficult conceptual issue, but he does correctly remark that when we, as observers, judge that a rule is enforced in a monkey group we do not know if the rule "exists as a rule" in the animal's head. This is just the sort of thesis that may be proven in the course of additional experimentation.

De Waal is certainly right to distinguish the morally relevant description of rule-governed behavior, one that makes reference to the intentional state of the animal, from descriptions of behavior that make no such references. Given this distinction the appropriate conclusion to draw is that without additional experimentation or evidence to reveal that monkeys are aware of rules that ought to be followed we just do not know whether animals follow rules in the sense that matters to morality. But without bothering to supply the reader with a substantive reason for doing so de Waal goes on to suggest an interpretation of an anecdote that implies that animals do, in fact, have the morally relevant cognitive states.

> A high-ranking female, Puist, took the trouble and risk to help her male friend, Luit, chase off a rival, Nikkie. Nikkie, however, had a habit after major confrontations of singling out and cornering allies of his rivals, to punish them. This time Nikkie displayed at Puist shortly after he had been attacked. Puist turned to Luit, stretching out her hand in search of support but Luit did not lift a finger to protect her. Immediately after Nikkie had left the scene, Puist turned on Luit, barking furiously. She chased him across the enclosure and even pummeled him.
>
> If Puist's fury was in fact the result of Luit's failure to help her after she had helped him, the incident suggests that reciprocity in chimpanzees may be governed by obligations and expectations similar to those in humans (97).

This last remark strongly suggests exactly what de Waal earlier had disavowed that a morally laden explanation of an animal's behavior can be read off the behavior alone. But the evidence for the presence of the right sorts of intentional states, namely, those involving some awareness of obligations of reciprocity prescribed by rules of conduct is nowhere to be found. De Waal provides the reader with no warrant for describing Puist as a rule-follower where this reflects cognition of the rule's prescriptive character in the mind of the chimp.

## Conclusion

De Waal's conclusions about the origins of right and wrong depend on a number of assumptions. First, is a view about the nature of morality itself. De Waal does not argue for any particular moral theory. The Humean tradition of moral sentiments has its adherents but de Waal does little to convince us that this is, in fact, the right approach to understanding human morality given the plethora of normative ethical theories to choose from. Second, de Waal's own contribution is to propose a list of ingredients or "component parts" of morality which are then construed as capacities or behavioral characteristics displayed by humans and animals. One might take issue either with the arbitrary collection of "ingredients" that de Waal believes are central to morality, or his interpretation of what counts as a behavior that is, in fact, morally relevant. De Waal is on the right track by singling out definitions for sympathy, community concern, prescriptive rule-following, and cognitive empathy that specify the intentional states that matter to our moral appraisals of agents. But in discussing actual cases he fails to establish that animals have these morally relevant intentional states. So I venture to add that he has failed to establish what I believe he wishes to show namely, that animals are moral.

De Waal may believe that if an animal's behavior is describable as an instance of "animal succorance," "learned adjustment," or as being "rule-governed," then he is entitled to claim that animals "occupy a few of the bottom floors of morality." This metaphor is seriously misleading if it implies that animals have a share in morality, or a little bit of morality, or morality in some literal but derivative sense. For what is missing from such an argument is some reason for believing that animal succorance, for example, when defined without reference to the intentional states of the animal is sufficient for moral appraisability. By de Waal's own admission we need to know what an animal believes, knows, or understands in order to extend moral praise or blame to that animal, and this is information about the animal's mental states that we do not presently have.

De Waal believes that expressions like "primate culture," "ape language," and "chimpanzee politics" are innocuous ones. This way of talking, he suggests, ". . . stimulates debate about how much or little animals share with us" (212). But what he fails to note is how such expressions also function to disguise or gloss over differences between animals and humans. De Waal apparently believes that a reluctance to talk this way constitutes an overzealous commitment to "academic" questions of semantics, which he regards as a waste of time (212). I believe otherwise. There is a semantic issue here but it is not *merely* a semantic issue as the pejorative use of that term implies. What is at stake is whether or not animals should be regarded as having some enhanced moral status in virtue of sharing with humans those cognitive capacities that have moral implications, such as sympathy or empathy. The reason why such emotions have moral connotations in the first place is because they figure into the moral evaluation of human agents who act when they are motivated to act from sympathy or out of empathy. We might, for example, follow Aristotle in taking these motivational states to reflect something about an agent's virtuous character. So to suggest that animals literally do have these emotional states and that they function as motivations for acting is a substantive philosophical claim about what the concepts of character and moral virtue entail, and the sorts of things that are capable of forming virtuous characters. These questions are only obscured by the use of metaphors.

De Waal may think that it is an asset of his investigation that it invokes no philosophical discussion of morality at all since in the concluding chapter he writes, "We seem to be reaching a point at which science can wrest morality from the hands of philosophers" (218). I believe this is a premature assessment. Ideally, philosophers and biologists can collaborate in an investigation of the empirical and conceptual issues that surround the question "Are animals moral?" The issues that de Waal tackles in *Good Natured* are interesting and difficult. But for this very reason there is a need to do the kind of precise conceptual analysis of moral issues that philosophers have traditionally undertaken.

## References

Alexander, R. D. 1987. *The Biology of Moral Systems*. New York: Aldine.

Darwin, C. 1930 (1871). *The Descent of Man, and Selection in Relation to Sex*, 2nd Edition. New York: D. Appleton and Company.

de Waal, F. 1982. *Chimpanzee Politics: Power and Sex among Apes*. London: Jonathan Cape.

de Waal, F. 1989. *Peacemaking Among Primates*. Cambridge, Mass.: Harvard University Press.

Wilson, E. O. 1975. *Sociobiology: The New Synthesis*. Cambridge, Mass.: Bellknap Press, Harvard University Press.

## *Guns, Germs, and Steel: The Fates of Human Societies*

**By Jared Diamond**

**New York: W.W. Norton & Co., 1997**
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What explains the history of conquest in the world? Why was it that Europeans and Asians decimated, subjugated or exterminated the Native Americans, Africans and Aboriginal Australians instead of the other way around? Diamond's catchy title — *Guns, Germs, and Steel* — turns out to be only part of the answer.

Diamond advances the remarkably bold argument that "the striking differences between the long-term histories of peoples of the different continents have been due not to innate differences in the peoples themselves, but to differences in their environments" (405). Dr. Diamond, a professor of physiology at the UCLA School of Medicine, is a highly regarded scientist and theorist in the field of evolutionary biology. Given the nature of his research he is well positioned to identify and draw linkages between the variability in human development as influenced by geographical and environmental factors. Diamond claims that three sets of factors lay behind Eurasian dominance. The first relates to continental differences in the wild plant and animal species suitable for domestication. Areas blessed with rich access to such resources could move from the hunter-gatherer stage to agriculture and sedentary living more rapidly. And it was sedentary living that produced the agents of conquest: guns, germs, writing, technology and central political organization.

Ecological and geographical barriers make up the second set of factors Diamond identifies. He reasons that the east-west axis of Eurasia made intercontinental spreading of crops, livestock and technology easier than in Africa and the Americas, where the north-south axis created major geographic and ecological barriers. Diamond writes: "The cool highlands of Mexico would have provided ideal conditions for raising llamas, guinea pigs, and potatoes, all domesticated in the cool highlands of the South American Andes. Yet the northward spread of those Andean specialties was stopped completely by the hot intervening lowlands of Central America" (187). In the case of Africa, the tsetse flies hampered the spread of domestic animals and in terms of agriculture, "the 2,000 miles of tropical conditions between Ethiopia and South Africa posed an insuperable barrier" (186). North America was hampered not only by the north south axis, but also by barriers on the same latitude. Crop diffusion was slow and selective between U.S. Southeast and Southwest mainly because of the intervening area of Texas and the southern Great Plains, which was unsuitable for agriculture. Consequently, "No waves of native grain ever stretched from the Atlantic to the Pacific coast of North America, from Canada to Patagonia or from Egypt to South Africa, while amber waves of wheat and barley came to stretch from the Atlantic to the Pacific across the spacious skies of Eurasia" (190-191).

The third set of factors is related to continental differences in population density and total population size. Higher population density is closely connected to sedentary living, which was introduced with agriculture and the domestication of animals. The domestication of animals in combination with sedentary living is thought to be a key factor behind the development of diseases such as measles and small pox in Eurasia. "The continental difference in harmful germs resulted paradoxically from the difference in useful livestock. Most of the microbes responsible for the infectious diseases of crowded human societies evolved from very similar ancestral microbes causing infectious diseases in the domestic animals with which food producers began coming into daily contact with around 10,000 years ago. Eurasia harbored many domestic animal species and hence developed many such microbes, while the Americas had very few of each" (357). Since smallpox, measles, influenza, plague, tuberculosis, etc. visited Eurasia regularly, parts of the population developed immune or genetic resistance, contrary to the Native Americans, who without such built-in resistance, were extremely vulnerable to the influx of these germs, when introduced by the Europeans.

The three sets of factors come together in Diamond's hypothesis, that the spread of agriculture and sedentary living may be the prime factor behind the Eurasian dominance. Together they made it possible for the Eurasian continent, not only to develop agriculture and sedentary living, but also the right societal organization to promote technological inventions and spur outward expansion. Although aspects of the three factors can be found in several areas of the world, it is the striking combination that gave the Eurasian continent its advantage. In the words of Diamond, "Thus, we have identified three sets of ultimate factors that tipped the advantage to European invaders of the Americas: Eurasia's long head start on human settlement; its more effective food production, resulting from greater availability of domesticable wild plants and especially of animals; and its less formidable geographic and ecological barriers to intracontinental diffusion" (370).

Diamond does not rule out factors such as culture, strong and/or intelligent individuals, religion or economic systems, but he states that they are of secondary importance. In the case of technological development, he writes, "All human societies contain inventive people. It's just that some environments provide more starting materials, and more favorable conditions for utilizing inventions, than do other environments" (408). There are obviously areas in the world where the environmental conditions are similar, but where the development has taken different paths. Here, the influence of culture, political organization, and great men/women may have played a significant role.

One could ask why Diamond places geographical factors before social and cultural factors. The answer may lie, in part, in his professional agenda. Diamond's intention with *Guns Germs and Steel* is to further an historical science — a science that would be able to learn from and complement evolutionary biology, geology, and climatology. He declares, "I am thus optimistic that historical studies of human societies can be pursued as scientifically as studies of dinosaurs — and with profit to our own society today, by teaching us what shaped the modern world, and what might shape our future" (425). Hence, Diamond sees culture, religion and market systems as less deterministic than physical environment. Human ecologists will find much to agree with in Diamond's analysis, however, many of us will disagree with his dismissal of the importance of social, cultural, economic and psychological factors that shape intersocietal relations as well as relations between humans and nature.

While reading *Guns, Germs and Steel*, I was reminded of *Global Rift, the Third World Comes of Age* by L. S. Stavrianos (1981). That book also attempted to tackle the question of how the world order has developed, although Stavianos takes a social science perspective. Just as Diamond did, Stavrianos recognizes geographical accessibility and interaction as essential factors explaining the western dominance. There is one main difference, however, Stavrianos sees capitalism as the major influence. The development of a strong merchant class in Europe in the mid 1400s was part of the evolution of a body of economic theories and practices known as mercantilism, a new and inherently expansionist commercial order that stimulated the discovery of new lands, and the acquisition of colonies, overseas. Diamond does not connect capitalism with expansionism.

Diamond analyzes the differences in development between China and Europe, which both seemingly had the "right" prerequisites for being world conquerors. He concludes that the political disunity of Europe is the reason. China's unity was disadvantaged by despotic rule. A decision by one despot could and repeatedly did halt innovation and progress. Diamond asks how this could happen; and again he finds the answer within the realms of geography. "Europe has a highly indented coastline, with five large peninsulas that approach islands in their isolation, and all of which evolved independent languages, ethnic groups, and governments" (414). China on the other hand, had a smooth coastline, few barriers in form of mountains, and long navigable rivers. As a result, China very early became dominated by two huge geographic core areas of high productivity, themselves only weakly separated from each other and eventually fused into a single core.

This is a book with an anthropocentric focus, and hence, it deals very little with the environmental consequences that the development and usage of certain tools have had on ecosystems around the world. However, this should not be seen as a weakness since the author never set out to do anything but explain human history.

*Guns, Germs, and Steel* attempts to be objective and describe human history without judging the historical development as right or wrong. Diamond states: "My motive for investigating these geographic differences in human societies is not to celebrate one type of society over another but simply to understand what happened in history" (18). This (post) positivistic approach makes the book easy to buy into, although it would have been interesting if the author would have included a more subjective analysis of the ecological and social consequences of human development.

To conclude, the book is very well written and it is worth reading. *Guns, Germs and Steel*, which won the Pulitzer Prize 1998, can be of interest for human ecologists as it gives a thorough and innovational rationale for the development of the human environment. There are dimensions to human history that Diamond does not emphasize, and although the geographical emphasis is both relevant and interesting, it may not be sufficient. Hence, I think that it should be seen as one of several contributions to the discussion about human history.

## Acknowledgements

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## References

Diamond, J. 1997. *Guns Germs and Steel: The Fates of Human Societies*. New York: W. W. Norton.

Stavrianos, L.S. 1981. *Global Rift: The Third World Comes of Age*. New York: William Morrow.

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***Sample References***

Schoenfeld, A. C., R. F. Meier and R. J. Griffin. 1979. Constructing a social problem: The press and the environment. *Social Problems* 27, 38-61.

Cohen, J. 1995. *How Many People Can the Earth Support?* New York: W. W. North.

Altman, I. and S. Low (eds.). 1992. *Place Attachment*. New York: Plenum.

Varner, G. 1995. Can animal rights activists be environmentalists? In C. Pierce and D. VanDeVeer (eds.), *People, Penguins, and Plastic Trees*, 2nd Edition, 254-273. Belmont, CA: Wadsworth.

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- Build cooperative arrangements among human ecology programs and organizations throughout the world
- Facilitate the exchange of this information throughout our international network of individuals interested in human ecology

The Society holds regular conferences, conducts workshops and symposia, and co-sponsors a variety of related activities to further integrate work among professionals in fields pertaining to human ecology. SHE is an affiliate of INTERCOL (International Association for Ecology) and IAIA (International Association for Impact Assessment) and works in a consortium with other national and regional human ecology organizations throughout the world. Members of SHE receive a subscription to *Human Ecology Review*; special purchase rates for the *International Directory of Human Ecologists* containing descriptions of the background, current work and areas of interest of human ecologists around the world; reduced rates on other selected journal publications; reduced registration fees at SHE conferences; the opportunity to join the society's special interest working groups on planning, health, modeling, theory, and education. Membership fees are $50 for regular members, $150 for contributing members, $1,000 for sustaining members, and $25 for student members. For membership information contact: Melville P. Cotè, College of the Atlantic, 105 Eden Street, Bar Harbor, ME 04609, USA.

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***Submission Guidelines***

Four copies of the manuscript must be submitted for review. Manuscripts should be typed (in English), double-spaced on one side of 8½" x 11" white paper, using at least 1" margins. All manuscripts receive double-blind peer review. The Editor will make the final decision whether to accept, not accept, or request revision of the paper. Manuscripts will be reviewed with the clear understanding that the paper has not been previously published and is not under consideration for publication elsewhere. Any figure, table, or more than 50 running words of text from previously published material must be accompanied in the final submission for publication by a written permission to publish by the copyright holder. Once the manuscript has been accepted for publication in *Human Ecology Review*, a copyright form will be sent to the corresponding author as the acting agent for any coauthors. The author must provide three copies of the accepted manuscript and a copy of the document on a 3-1/2" pc-compatible disk. Page proofs will be sent to the corresponding author.

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Title page containing the title of the manuscript, authors' names, affiliations, and mailing addresses; Abstract (150 words or less with 3 to 5 key words); text (free of any information that could identify the author); Endnotes; Acknowledgments; References; Tables and Figures. The entire manuscript should be free of any underlining or boldface type; use italics only for emphasis and in references (see below). Headings should be centered with initial capitalization only, subheadings should be flush left.

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Tables should be clear and concise, and should be able to "stand alone" i.e., complete headings and footnotes should be used to clarify entries. Figures should be of professional quality and ready for publication. Figures that are not available on disk will be scanned electronically for final production. To have clear, precise reproduction, all figures should be original proofs. Photographs must be glossy prints. All tables and figures should be referred to in the text and notation should be made in the manuscript indicating approximately where each should be placed.

***References***

Citation of references in the text should follow this format: Henry (1998, 42) or (Henry and Wright 1997) or (Henry et al. 1996, 22-24) or (Henry 1995, 1998; Wright 1994). The list of references should be arranged alphabetically by author. All authors of a work must be listed.

***Sample References***

Schoenfeld, A. C., R. F. Meier and R. J. Griffin. 1979. Constructing a social problem: The press and the environment. *Social Problems* 27, 38-61.

Cohen, J. 1995. *How Many People Can the Earth Support?* New York: W. W. North.

Altman, I. and S. Low (eds.). 1992. *Place Attachment*. New York: Plenum.

Varner, G. 1995. Can animal rights activists be environmentalists? In C. Pierce and D. VanDeVeer (eds.), *People, Penguins, and Plastic Trees*, 2nd Edition, 254-273. Belmont, CA: Wadsworth.

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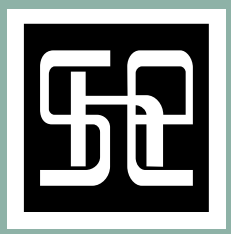

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