Citizen Action to Preserve Wildlife Habitat in the United States (10/23/03): A Technical Report for the Ecotourism and Environmental Management Conference

Introduction

As in almost every other aspect of American life, citizen volunteers play central roles in the planning of wildlife habitat. In this study, we sought to uncover those aspects that distinguish citizen participation in matters related to planning wildlife habitat from participation in other arenas of public life and to a lesser extent from previous eras of wildlife management. Although not unique to volunteer efforts in wildlife habitat, the following five characterizations collectively distinguish American citizen participation in wildlife habitat planning today:

1. Large and diverse membership associations that extend from the grassroots to mainstream nongovernmental organizations to create an effective national movement for big, public, multiple-use wilderness;
2. Traditions of volunteer wildlife monitoring that form the foundation for the blossoming citizen science movement;
3. Extensive involvement in planning not only large and remote national preserves with relatively few users but also smaller, often fragmented, more accessible preserves with many urban users;
4. Cooperation to curb conversion of wildlife habitat lands to suburbs; and
5. The rise of neo-stewardship, a self-conscious effort to reconnect people to natural processes so that they voluntarily take better care of their local habitat, including the restoration of native wildlife habitat.

In this paper, we describe each of these characterizations, provide a brief historical context, review relevant literature on citizen participation, give recent case studies and speculate on how citizen roles affect land use patterns.

Large And Diverse Membership Associations Creating Big, Remote Wilderness

An Exception to Grassroots Volunteerism

Historically, voluntary organizations were primarily grassroots groups with little influence beyond their locality (Gans 1962; Francis 1984). This is true of most participatory efforts today, but volunteers in wildlife habitat activities are different. When compared to other volunteer

movements in the United States, the interests concerned with wildlife habitat boast large, diverse, and powerful membership associations (Blecher 1971; Castells 1983; Putnam 2000). The influence of these national membership organizations can be measured both in number of members and in amounts spent on lobbying.

Large and Diverse Membership Associations

The National Wildlife Federation claims over four million members. The World Wildlife Fund has over a million members. Ducks Unlimited adds nearly three-quarters of a million members. If just ten of the best-known wildlife organizations are added together, they have nearly ten million members. Although some people likely belong to multiple groups, these are impressive numbers. In comparison, the world's largest professional association -- the National Association of Realtors -- has 750,000 members. Most volunteer groups such as neighborhood councils and affordable housing advocates lack national membership organizations altogether.

One obvious advantage of such large membership organizations is the ability to use membership dues to mount national campaigns in the interest of wildlife. The largest organization, the National Wildlife Federation, has an annual budget of $115 million. Much of this provides a national network of legal advocates, policy development, and educational programs, all of which directly or indirectly press for preservation of wildlife habitat.

Traditions of Volunteer Wildlife Monitoring That Form the Foundation for the Citizen Science Movement

Inspirations for Citizen Science

On Christmas Day 1900, volunteers in Connecticut, New Hampshire, Massachusetts, New York, New Jersey, Pennsylvania, Ohio, Illinois, Wisconsin, Missouri, Louisiana, Colorado, California, New Brunswick, and Ontario, Canada spent a good part of their holiday counting birds. The volunteers counted 90 species and 18,500 individual birds. The Christmas Count was an alternative to the annual Christmas Side Hunt during which people competed to see who could kill the most animals. What began as a small volunteer effort of 27 individuals one hundred years ago expanded to an effort of approximately 52,000 volunteers in 2001. The Audubon Christmas Bird Count is the oldest continuous wildlife survey in North America. In many ways it is the inspiration for other volunteer activities as varied as breeding bird counts, birdbanding, citizen testing of local air and water quality, and indicators projects.

By the 1990s, volunteers were monitoring the environment in more holistic ways, probably unimaginable to the original 27 Christmas bird counters. Citizens now measure changes in entire ecosystems, the health of watersheds and many community environmental indicators. Citizens today are involved at the neighborhood level in testing air and water quality, measuring traffic volumes and parking demand, and counting park users. Low-income communities adopted the methods of the bird count volunteers to monitor toxins in neighborhood soils and air. These projects are often key to fights for environmental justice (Bullard 2000). Using online

environmental maps, lay people can determine what toxics, non-point source pollutants and Superfund sites are in their neighborhoods.

Citizen Science Today

Today these volunteer scientific efforts to monitor species and habitat are generally categorized as citizen science. In the wildlife arena, citizen science can be defined as information that is systematically gathered on wildlife by laypeople for use in data banks or experiments organized by wildlife professionals or for use in grassroots efforts often organized by amateur naturalists. The citizen focus has historically been on data gathering and monitoring rather than hypothesis building and testing. Often citizens monitor numbers, territories or movement of wildlife populations and quality or change in habitat in local situations to establish baselines in the face of unwanted land use changes.
Many of these efforts continue today, and many new citizen science projects have recently been initiated. Notably, the Citizen Science program at Cornell University's Lab of Ornithology and the Audubon Society enlists approximately 20,000 volunteers in backyard bird counts. Other projects that the Citizen Science Program is involved with include monitoring birds at feeders during the winter, monitoring location, habitat and number of eggs and nestlings of bird nests, and monitoring during the breeding bird season. The data that volunteers provide is combined with other data from scientists, to provide information about bird populations in North America. The results of this information, for example, include acquiring land for habitat protection and tracking the Golden-winged Warbler.

From Simple Beauty to Ugly Complexity

Historically citizen science disproportionately focused on birds and large mammals. Americans love birds and mammals, considering them beautiful and awesome. Beautiful, big or cute species have been most monitored by volunteers (Nixon 1999: 29). Fish and game species have also drawn citizen volunteers (Stanford 2000: 3). More recent monitoring has included less glamorous species like fish, turtles, and amphibians, some of which are downright ugly by American standards. But some species like freshwater mussels, fairy shrimp and the yellow-legged frog continue to decline for wont of citizen advocates. For example, the Nature Conservancy concludes that seventy-percent of freshwater mussel species are on the verge of extinction (Nixon 1999: 29).

As volunteers continue to address both the challenges of monitoring fish, amphibians, reptiles, and invertebrates as well as evaluate habitat, volunteers are engaged in increasingly complex monitoring. It is understandable that a volunteer might want to go beyond counting birds to banding or habitat evaluation. The programs developed at Cornell's Sapsucker Center reflect both this citizen desire and scientists' need for more professional lay volunteers. As a result, workshops are now offered to teach lay people how to do bird banding.

Likewise, the Bobwhite Brigade created by Dale Rollins through the Texas Agricultural Extension Service is an intense five-day curriculum for high school youth. It teaches quail biology, nest predation studies, plant identification, radio telemetry, habitat analysis and improvement, as well as hunting skills. Other groups teach delicate skills such as banding and water quality testing. The Monarch Watch Program coordinates adults and students in the United

States and Canada on how to tag and raise monarch butterflies. Citizen scientists were, in fact, integral in two most critical discoveries regarding the monarch butterflies, including the form of the eastern migration and the Mexico wintering sites. Both resulted from training volunteers to band butterflies and to monitor patterns throughout the migration (Prysby 2001/2002).
Other citizen science projects monitor a range of species and habitats. Some are regional in scope with highly organized partnerships with government agencies like Washington State's Nature Mapping that supplements professional studies by mapping sightings of mammals, birds, reptiles, and amphibians. Roughly 50,000 trained volunteers participate (Lerner 1999: 24).

A modest partnership in Maryland monitors Chesapeake Bay Tributaries. The grassroots environmental group Save Our Streams coordinates with the Governor's Tributary Strategic Teams to pinpoint habitat threats such as deforested lands prone to erosion, abandoned boats with potentially polluting fuel tanks, small point sources of pollution, and illegal dumping sites (Lee 2000: 2).

Some of the monitoring efforts are initiated by volunteer organizations, some by individuals. The National Wildlife Federation's Keep the Wild Alive^{TM} program works with some of its more active members to help monitor the endangered Kemps' Ridley sea turtle. Between 1978 and 1993, 22,500 young captive-raised turtles were released. Since the turtles will be unable to reproduce until they are at least 11 years old, monitoring is a long-term, time-consuming effort. Scientists rely on volunteer efforts to monitor the success of the reintroduction and many other studies.

In contrast, the Great American Fish Count was started in 1999 by an individual, Dr. Gary Davis, at the Channel Islands National Park as a way to encourage sport divers to systematically report fish sightings. Keeping Track, the Vermont-based program to train citizens to study wildlife patterns and territories, was begun by one person, Susan Morse. However initiated, for these efforts to succeed, they must engage more volunteers and provide increasingly coordinated partnerships.

Participatory Benefits for Volunteers and Science

There are multiple benefits beyond the typical rewards of volunteering [Godschalk 1972; Ogilvie 1997]. Specifically, they get the satisfaction of contributing to research and new knowledge that may be central to a species' health or an ecosystem's survival, combined with the pleasures of outdoor recreation.

What is a source of satisfaction and pleasure to volunteers is an essential part of wildlife management in the United States. Professional wildlife management in the U.S. has long been dependent upon citizen volunteers doing scientific work. The systematic monitoring of wildlife is too time-consuming a task for an otherwise relatively small professional field as pointed out in the Backyard Bird Count, the Nature Mapping Program and the Ridley Sea Turtle Monitoring. As a result, most wildlife professionals embrace the citizen volunteers. Phil Norton, former superintendent of the National Wildlife Refuge Bosque del Apache, probably spoke for many other professionals when he noted that volunteers are "a way to get projects accomplished that otherwise just would not get done." Sam Droge from the U.S. Geological Survey states that the volunteers in the North American Breeding Bird Survey are essential. He says, "Most of what is

now known about the status of the U.S. birds in the breeding season has come from the efforts of these volunteers" (Tangley 2001: 14). Wildlife scientists continue to innovate with citizens to do research on less glamorous species and to do more complex scientific work.

Criticism of Citizen Science

Citizen science is not without criticism. Some professionals and scientists in wildlife management are suspicious of the quality of the research conducted by lay people. The criticism takes several forms. One, citizens are not scientifically rigorous. They may not follow protocols or report data accurately. Two, they lack the sometimes highly technical skills to do field research. A leading wildlife habitat scientist cautions against citizen science for exactly these reasons. He points out that citizens lack the years of study required to be scientists, that they cannot be considered experts and that science must uphold rigorous standards. He concludes that it is the rare exception when a nonscientist meets these criteria (Noss 2001/2001: 15-17). Three, they may be biased, wanting to prove a point to influence a policy decision. There is evidence that scientific seeming wildlife information is sometimes gathered or implied and used by local activists. The simple claim that an area is prime habitat can be a cover for NIMBY actions (Hester, Blazej, and Moore 1999). Certainly, this can lead to the protection of low-priority, fragmented habitat unless more complete science is presented. Four, citizens may feel more qualified than they actually are to interpret findings and take actions.

There is ample evidence that volunteer groups sometimes take ecologically ill-informed actions. One classic example is the introduction of the starling into New York through the efforts of Eugene Scheiffelin. He successfully released 60 starlings into Central Park in 1890. More recently, wildlife managers point to citizen resistance to culling overpopulation of deer as further evidence of citizen action that literally fly in the face of good science (Diefenbach and Palmer 1997: 378-379). In California, citizen resistance to removal of non-native eucalyptus slows habitat restoration in critical habitat areas (Boyd 1997; Williams 2002) and in Chicago citizen resistance to prairie reestablishment hampers efforts to bring back indigenous species (Gobster 2000).

The scientists concerned about citizens going beyond data collecting think citizens may be skilled enough to collect but not interpret the data for habitat management. However, a 1997 scientific study of stream quality that compared lay citizens to professional scientists concluded that volunteers who matched professionals in field collection were not as precise in laboratory identification but recognized the same overall trends in stream degradation as the scientists (Ely 2001/2002: 24-27.). Other scientists blame citizens for the failure of the many stream habitat restoration projects relying on construction of in-stream structures such as V-weirs, groynes, bank armor and wing deflectors that have failed. The failure rate varies from 18 to 60 percent (Miles 1998), but we can find no evidence that the failures are due to citizen volunteers. Although there is little evidence other than anecdotal accounts, citizens may have contributed to these failures in several ways. Popular demand for restoration of fish habitat has increased, possibly as a result of public awareness of declining fish populations (Frissell and Nova 1992). Agencies responding to public demand may have opted for high visibility quick fixes relying on engineered structures in streams rather than on long term strategies such as revegetating flood plains, rehabilitating failed roads and other sediment sources and preventing inappropriate development (Frissell and Nova 1992: 193). Geomorphologists played little role in designing

these river restoration projects until recently but have been critical of the lack of appropriate training of the professionals who did (Kondolf 1998; Miles 1998). This criticism focuses on the use of simplistic, cookbook approaches to stream restoration and the use of ill-trained citizens (Kondolf 1998; Miles 1998). In one documented case, the data gathered by volunteers were inappropriate to evaluate the success of the projects (Kondolf 1998). This review suggests the following serious problems with stream restoration projects: agency funding of short-sighted measures, poorly trained professionals designing the short-sighted measures with simplistic solutions, the inability of geomorphologists to effectively educate a public constituency of the need for holistic watershed management, poor post-construction evaluation, and citizen eagerness to do something to reverse the decline of fish populations. Most of these parallel conflicts between landscape architect professionals and citizens in city projects (Linn 1968; Hester 1975; Clavel 1994). Although citizen science plays an insignificant role in these failures, the implication of citizen volunteers raises a cautionary flag, especially in aquatic habitat restoration.

Tension Between Citizens and Scientists

It is likely that lay people will increasingly play roles in wildlife science, and scientists will depend upon citizen volunteers for much research. With additional training, citizens will expect to not only gather data but interpret and apply the findings. This understandably will continue to create tension with scientists and professionals whose expertise may be challenged by citizens and whose scientific findings may not be understood by citizens.

Impacts of Citizen Science on Wildlife Habitat Planning

Citizen science affects wildlife habitat planning directly and indirectly. The direct impacts are most dramatic when research leads to the establishment of a new wildlife reserve. This occurs at the national and transnational levels. Citizen science also influences local environmental planning and land use decisions directly. Bird or other wildlife counts may show species trends, discover endangered species or establish the importance of an area as a critical habitat or wildlife corridor. This citizen-generated data allows lay people to present defensible “scientific” information in land use, zoning, and development debates.

Vermont’s Keeping Track is one example of a citizen science program that is using field data for more effective habitat planning. Founder Susan Morse stated that Keeping Track offers “the average citizen something they can do for wildlife in the community to stop the damage they see happening” (Lerner 1999: 23). That is exactly what the citizens of The Piscataquog Watershed Association in New Hampshire did. They used Keeping Track’s monitoring training and guidelines, particularly engaging landowners to participate in transect studies and learning first-hand the special wildlife habitat features of their properties. This resulted in the protection of 1,500 acres of land.

These cases suggest that lay people are likely to become more skilled at monitoring local wildlife and more effective in using that information to influence local land use planning (Frontiera 2000). Depending upon the contextual completeness and quality of this citizen-generated science this may lead to either the protection of most critical wildlife habitat or the preservation of lands that are less valuable habitat but serve other vested interests.

Opportunities and Challenges

In general, this review concludes that citizen science attracts large numbers of volunteers, that this is likely to continue and that lay citizens will be engaged in data gathering, synthesis and application of the science to land use decision-making. Citizen science presents particular benefits and challenges. Voluntary citizen science, with origins in weather records and wildlife management fields, has spread to many other areas of science and public life. Citizen science is now a critical part of urban planning in many areas outside the domain of wildlife habitat management. Volunteer monitoring is an important tool in fighting environmental injustices in poor communities (Bullard 2000).

The benefits of citizen science include the following: 1) important contributions to scientific research, 2) increased appreciation for wildlife science in which lay people become advocates for better science, more informed decision-making, and more complex transjurisdictional thinking, 3) heightened awareness of local habitats that lead to stewardship activities.

The challenges aroused by citizen science include the following: 1) continually negotiate tensions between scientists, wildlife professionals and citizen scientists, 2) scrutinize citizen science to counter studies that are poorly done, inaccurate, or obviously biased by vested interests to manipulate decision-making, and 3) reconceive wildlife research such that its conclusions better integrate ecological science into democratic processes (Hester 1995: 16).

Extensive Involvement in Planning Not Only Large and Remote National Preserves with Relatively Few Users…

Big Plans, Remote and Nearby

Citizens as volunteers and associations are often involved in habitat planning for public lands, typically working with professional planners, scientists, and public agencies to determine which lands to acquire, what sensitive habitats to protect and regulate, what uses to allow and encourage and where to provide access. This involvement has led to two patterns of habitat for wildlife: big, remote wilderness with few users and small, urban wilderness with many users.

Bigger Still

The big habitat areas are most often federal lands such as wildlife refuges, national parks and forests, and wild and scenic rivers. These usually consist of thousands of acres in remote locations access to which guarantees low use per acre. As described previously, these big wilderness areas are part of American identity. Big as they are, conservation biology science suggests that they are inadequately small and need to be expanded if the long-term health of ecosystems in North America is to be maintained. A small group of the most respected conservation biologists and environmental activists have become convinced that without much

greater connectivity, top predators and metapopulations will be lost leading to dramatically less biological diversity. Working under the auspices of the Wildlands Project, a nonprofit organization, these scientists and citizens intend to produce a plan for "an interconnected, continental scale system of protected wildlands linked by habitat corridors."

Through collaboration with regional wildlife groups, the Wildlands Project is developing land use and policy plans for habitat protection at a scale never before envisioned in the United States. The plans originate from the best ecosystem science that can be brought to bear upon a given area, usually multi-state regions like the San Juan Sangre de Christo Bioregion which includes parts of both Colorado and New Mexico or the Sonoran Desert Biome which includes parts of Baja, California, Arizona, and Mexico. In developing these plans, much time is spent in expert scientific data collection and interpretation plus a formal scientific review of the draft proposal. In an effort to be more feasible, attention is also paid to how the visionary plans might be implemented.

Although none of the plans has been implemented, each will likely have major impact upon regional thinking and national policy. The boldness of the scale of the proposals is unsettling at first glance, but the conservation biology logic is clear upon investigation. The 20-million-acre San Juan-Sangre de Christo Bioregional proposal for new national parks, protected underrepresented vegetation types and landscape linkages provides a dramatic picture of what is needed in the next generation of big wildlife habitat.

The Wildlands Project depends not only on science but also on grassroots organizations. Workshops train local groups. The journal Wild Earth communicates complex ecological science. State of Ecosystem Reports call attention to critical needs. All of these support civilian volunteers in this fledgling effort to take the biggest wildlife habitat actions yet imagined.

Urban Wilderness Systems

At the other end of the spectrum, there is extensive citizen involvement in planning smaller but connected and functional public wilderness surrounding and within urban areas. Although continuous urban wildlife habitats were proposed over a hundred years ago by Frederick Law Olmstead, most were ignored in favor of urban parks and recreation facilities. By the 1960s, park professionals were again thinking in terms of urban open space systems (Cranz 1982), but few of these systems were based on wildlife needs. The Raleigh, North Carolina Greenway illustrates. It was envisioned by citizens and planners as a continuous trail along the cities' rivers and creeks to provide recreation and prevent development in floodplains. Today, over 30 miles of trails and a thousand acres of floodplain lands provide the intended functions. Although not a focus of the greenway, wildlife habitat is provided (Flink and Searns 1993: 4-6).

By the 1980s, citizen demand for access to wildlife recreation in urban areas and sophisticated wildlife science began to reinforce each other to more directly influence urban open space planning. The resulting urban wilderness lands generally serve multiple purposes of nature recreation, wildlife habitat and protection from natural hazards like flooding, fires, and landslides. They provide small core habitats and corridors to provide for species movement. The most successful ones provide enough habitat to support large carnivores and entire ecosystems. The impetus for such wilderness is public demand.

One measure of the public demand for effective habitat is bond issues. In 1998, there were 240 state initiatives for open space or restricting development. Seventy-two percent of these initiatives passed, setting aside $7 billion for land protection. In 1999, a nonelection year, activists in 22 states put 139 measures for habitat, parkland, and open-space before voters; seventy-seven percent passed (Kosova 2000: 69).

In Los Angeles, a series of such local bond issues have given form to a greenbelt that now nearly encircles Los Angeles providing a series of linked core habitats. This system likely will preserve the terrestrial ecosystem from which Los Angeles arose and the full range of native wildlife including the badger, bobcat, and mountain lion. The passage of the multiple bond issues is only a part of the story, but it suggests the broad-based public support for wildlife protection in urban areas, even cities like Los Angeles not noted for environmental values. This public support crosses traditional lines of race, income and education levels. For example, Proposition 180, a bond measure for land acquisition with few inner city benefits, passed only because nearly three quarters (74%) of the voters in the poor and minority districts supported it (Lewis 1995).

The more relevant aspect of the Los Angeles greenbelt is the role citizen volunteers played in envisioning and planning it to serve wildlife needs. In 1978, the Santa Monica Mountains National Recreation Area was established but only after years of citizen efforts and then only in a compromised form with little regulation and funding. In the following year, the Santa Monica Mountains Conservancy was created to acquire land in the national recreation area. In the early years, the Conservancy focused attention on land acquisition within the boundary of the recreation area, racing against encroaching suburban development to protect a network of connected open spaces. Some of the battles with developers had raged for over twenty years, requiring extraordinary perseverance from citizen volunteers. Each plan was contentious and each land acquisition was a separate fight requiring a land use planning process with new citizen participants, usually residents from nearby neighborhoods, representatives from a growing coalition of environmental and hillside neighborhood associations, vested interest groups like advocates for dog walking and mountain bikers, land owners and their developer representatives.

As a result of landowner resistance and narrowly focused citizen goals as well as science that was unintelligible to the public, the open space being acquired was in fragmented, incomplete ecological units. Some lands critically important to wildlife were being saved, but at a pace too slow for Joe Edmiston, the Executive Director of the Conservancy. Over a period of years, Edmiston initiated a bolder strategy. He had to expand his jurisdiction, educate a broader constituency regarding the mountain ecosystem to encourage stewardship, get defensible wildlife science into the public debate, engage citizen participants with the landscape in hands on experiences and refocus citizen visions more broadly than their narrow neighborhood interests. Through legislation and joint powers agreements, he expanded his authority and influence to cover potential habitat throughout Ventura and Los Angeles Counties. His ability to cross traditionally rigid jurisdictional lines has been central to effectively acquiring lands necessary to the long-term health of wildlife populations. This has also greatly expanded the number of participants who volunteer to help plan the various land acquisition projects.

To achieve educational and stewardship goals, the Conservancy created the Mountains Education Program in 1989. The program provides interpretation of the mountain's natural and cultural resources. It has successfully sought to "form a community united by environmental stewardship" (McNally 1995: 44). One of the intentions is to introduce every Los Angeles child to the Santa Monica Mountains before graduating from high school. Over 15,000 children and adults participate each year (McNally 1995: 44). Many of these participants become active in planning the urban wilderness projects.

Most involvement of volunteers in planning continues to focus on plans for individual land acquisitions, but the participatory process has become increasingly informed by wildlife habitat science and citizens' first-hand experiences in the landscape. Additional effort has been made to cast each individual project in the bigger vision for a connected habitat system. Methods to achieve these transformations in the participatory planning process were developed in creating Mulholland Gateway Park, a thousand acres of disconnected land acquisitions along the dirt portion of Mulholland Drive. Planners transformed the findings of wildlife studies from jargon inaccessible to the public into more public-friendly principles, charts, and maps that citizens were able to employ during the planning process. In retrospect, this seems obvious: if you want the participatory process to make use of wildlife science, it needs to be in a form that the public can understand. But at the time it required considerable effort to integrate the remote science into the democratic discussion. The planners also concluded that citizens "could more readily understand complex technical issues on site than in a public meeting" (McNally 1995: 43).

A series of well-advertised site tours got citizens into the landscape where impacts of suburban development and roads could be observed first hand. The site tours attracted many first time volunteers who had no axes to grind and who broadened the discussion beyond the entrenched vested interests. The site tours made the science come alive. Even citizens who previously supported highway construction through Mulholland Gateway Park paid attention to the more accessible science as they walked wildlife corridors and experienced the wild. One newcomer said, "It's like I'm a million miles from LA" (McNally 1995: 43). The conclusion was that citizen participants with high-quality, accessible wildlife science confirmed by field experience will come to similar conclusions as wildlife scientists. In some cases, because of knowledge of nuance of both social and ecological systems, citizens make better decisions (McNally 1995: 44). One outcome of the Mulholland Planning Process was the widespread citizen understanding and support for expanding Mulholland Gateway Park from a thousand acres wildlife fragment to a twenty-thousand-acre core habitat that came to be called Big Wild. The public vision of Big Wild came from a first-hand experience of accessible science. That vision of Big Wild placed each smaller action in the broader context essential to make fragmented urban wildlife habitats functional ecosystems.

Another example of such local efforts is the Metropolitan Conservation Alliance (MCA) that works with five formerly rural small town in the 4,000-acre Great Swamp in New York State. Since 1997, MCA has been partnering with these towns to educate citizens about their wildlife heritage. Volunteers are involved in wildlife tracking programs, workshops, and school projects. After two years of setting the stage by raising community interest, as well as establishing a database of wildlife information, MCA is beginning to train community officials on using wildlife habitat data in land-use planning in order to preserve biodiversity. Under consideration

is the establishment of an intermunicipal council for wildlife conservation, transportation, and infrastructure (Lassila 1999: 21).

Obstacles to Urban Wilderness Systems

All of these efforts to create large connected urban wildlands face three obstacles related to citizen values. First, most participants in urban planning are initially involved in neighborhood-based issues, often related to threats to property values or quality of life. There is a tendency among such groups to be concerned almost exclusively with neighborhood open space and habitats without consideration for the big ecosystem interconnectivity. Second, most Americans now live in subdivisions with only disconnected fragments of natural places that will require great expenditures of money to be effectively reconnected. Even new subdivision regulations that require open space infrequently provide connected habitat. Third, city plans almost never include requirements for connected wildlife habitat that would bring a biologically diverse range of wildlife to the neighborhood. These obstacles create an inertia that is difficult to overcome; the efforts in Los Angeles, New York, and other cities to engage citizens in big urban wilderness planning will likely succeed only when this inertia is overcome by citizens' love for wildlife, anti-development sentiments, general concerns about biological diversity, and rewarding experiences in the visionary planning.

New Participatory Processes Big and Small

In sum, many citizens and voluntary associations are engaged in planning wildlife habitat through efforts that can be characterized as big remote wilderness with few users and little urban wilderness with many users. In recent years, the citizens groups have initiated plans to expand wildlife habitat through both continental and urban habitat strategies. At both scales, the plans are increasingly aimed at overcoming habitat fragmentation. A few precedent-setting cases are successfully creating larger, effective core habitats linked by wildlife corridors.

There have been significant changes in these participatory planning efforts. First, there is a new emphasis on transjurisdictional plans supported by both traditional wildlife groups and, in the urban areas, a diverse coalition of interest groups and citizen volunteers. Second, a high priority is placed on education programs as part of or parallel with planning processes to encourage stewardship. Third, there are substantial efforts to transform abstract and inaccessible science about wildlife and ecosystems into forms citizens can use transactively. Fourth, emphasis is placed on participatory techniques that engage citizens, scientists, agencies, and policy makers with each other and the landscape directly resulting in science-informed and experientially-informed collaborative decisions. Fifth, planning processes are carefully chosen to create an attractive image of the big wilderness that supersedes but embraces smaller, fragmented neighborhood wildlife habitats.

Cooperation to Curb Conversion of Wildlife Habitat Lands to Suburbs

Nexus Between Urban Form and Wildlife Extinctions

Although wildlife enthusiasts have long been involved in efforts to preserve high visibility local habitats of glamorous species and in some cases, as just shown in the planning section, local wildlife ecosystems, wildlife organizations have not typically led the local efforts to control growth and systematically curb the amount of land lost to suburban development at the urban edge. This is beginning to change as research makes an even stronger connection between habitat conversion for suburbanization and wildlife extinctions (Peck 1998: 69-70; Dobson et al. 1999: 129-131). Sprawl consumes farmland at a rate of 1.2 million acres a year. Adding forest and other land consumed by sprawl brings the rate to 2 million acres a year (Mitchell 2001: 58).

One report concludes that habitat destruction and degradation threaten 95 percent of threatened or endangered species. The states with the greatest percentage of population growth -- Washington, California, Nevada, Arizona, Arkansas, and Florida -- also have the greatest rate of species extinction and decline. Another report by Defenders of Wildlife also noted that many of the states with the greatest threats to wildlife had high development pressures (Noss and Peters 1995: 9). Defenders of Wildlife ranked states according to each state's number of endangered ecosystems, number of rare species and amount of development. Defenders' ten states with the greatest overall risk of ecosystem loss were Florida, California, Hawaii, Georgia, North Carolina, Texas, South Carolina, Virginia, Alabama, and Tennessee. Most of these states are experiencing rapid growth and score high on the Threat to Wildlife Index (Noss and Peters 1995). Habitat at the urban edges in these and other states is being destroyed at a dramatically increasing rate.

Although the United States' population grew by less than fifty percent from 1960 to 1990, the amount of developed lands doubled (Lassila 1999: 18). Again, between 1992 and 1997, the rate of land development in the United States more than doubled (Lassila 1999: 18). Suburban development takes more than twice as much land per capita as it did less than a decade ago. The cumulative effects of low-density sprawl lead directly to ecosystem destruction and species decline (Lassila 1999).

Latecomers to Urban Densification

So, if the research is clear, why have the wildlife groups not played more prominent leadership roles in curbing suburban land conversion through growth management and urban densification? Certainly, the wildlife organizations' appropriate emphasis on public acquisitions of large, remote lands is one explanation. Those land purchases protected critical habitat and were less costly and contentious than equal amounts of suburban land would have been. Those lands also provided limited public access that may also have appealed to the leadership of wildlife groups. Possibly wildlife enthusiasts have preferred the low-density suburban lifestyle that sprawling development has produced. Densification and living in smaller houses is an anthema to most Americans. So urban conservation efforts have tended to focus on everything from energy-efficient appliances, recycling, non-toxic building materials, landscaping with native plants but not the most critical habitat loss caused by sprawl (Hren 1998: 15). Low-density housing does provide contact with some birds and edge species in the privacy of one's own home. Although the numbers of wildlife and amount of biomass may not decline, the species diversity falls dramatically (Lassila 1999: 19). One study by scientist Helen Thompson found that non-native species increasingly occupied gaps in forests near urban and suburban areas of Baltimore

(Lassila 1999: 18). Lassila (1999) notes that part of the present threat to wildlife habitat comes from the public desire to live in beautiful places such as coastal areas and other ecotones rich in biodiversity where they can see and hear wildlife. Another often cited reason for the distance between urban growth planning and wildlife interests is that federal policy has both focused wildlife efforts in the remote areas and encouraged suburban sprawl into habitat around cities (Lassila 1999).

New Initiatives to Curb Suburbanization

For whatever reasons, wildlife organizations were slow to act on the link between the form and density of urbanization and species extinctions. That is changing with a rush of new initiatives. Wildlife organizations are joining cooperative efforts to curb suburban wildlife habitat conversion to suburban development through comprehensive local planning which proposes compact, integrated, higher density urban form. A combination of growth boundaries and new urbanism is giving concrete form to the slogans of sustainable development that protects wildlife habitat as well as reforming city design.

The Izaak Walton League, among other venerable wildlife organizations, began in the mid-1990s to broaden its conservation position to embrace the urban ecology movement. The organization acknowledges the central importance of integrated land use design and transportation systems. In addition to calling for the preservation of open space and restoration of degraded ecosystems, the League also appealed for increased mixed-use and mixed income development, not the traditional turf of conservation groups. The Izaak Walton League began a series of local workshops around the country to help urban communities develop strategies to revise official growth plans with an emphasis on regional infrastructure, social equity and community empowerment (Hren 1998: 22). This was supplemented with a series of workshops to guide other community groups in similar efforts.

Another example is the recently announced Smart Growth and Wildlife Campaign of the National Wildlife Federation. Smart Growth is a decade-old strategy in city design, one of the many popular titles given to planning approaches that try to reverse years of sprawl inducing public policy by changing laws and regional plans. Smart Growth focuses on comprehensive consideration of and integrated implementation of public actions regarding land use, housing, transportation and other infrastructure. Long advocated by progressive city planners, such approaches concentrate development in higher density, mixed use neighborhoods that encourage walking, biking, and public transit rather than automobile use. In some American communities, these smart growth strategies have been adopted with support from land use and city design organizations from the President's Council on Sustainable Development to the Congress on New Urbanism. The National Wildlife Federation hopes that by joining this established city design movement, wildlife habitat "at greatest risk from uncontrolled development on the outskirts of U.S. cities" will be protected.

The National Wildlife Federation will hold workshops to integrate the thinking of "experts in wildlife conservation, land-use planning and grassroots organizing." The goal is to develop regional growth strategies that will take wildlife habitat into account, reshape land-use policies and reverse subsidies that encourage sprawl. If successful, not only would growth be directed away from critical wildlife habitat, but also neighborhoods and cities would be reformed over

time to reclaim wildlife corridors that, in turn, would shape the form of human habitation. To achieve this, The National Wildlife Federation hopes to organize and educate "grassroots activists to demand smart growth in their communities."

Potential for Significant Changes in Urban Form

Although efforts are still sporadic, it appears that the latest frontier of volunteer activism on behalf of wildlife is the attack on rapid conversion of habitat at the suburban edge and the reformulation of city design to not only concentrate and densify urbanization but also derive its form in part from wildlife habitat patterns. For volunteers enthused by wildlife this will require new behavior, sacrificing preferred lifestyles in low-density suburbs and building coalitions with heretofore alien urban constituencies. For city design and environmental planning, this could create the most significant changes in land use policy and the form of cities of all the forces described herein.

The Rise of Neo-Stewardship, A Conscious Effort To Reconnect People To Ecological Processes

Stewardship and Neo-Stewardship

Stewardship in modern America was and is an ethic of caring for the land or community as part of one's civic responsibility (Leopold 1949: 204). Neo-stewardship is a conscious effort to reconnect people to natural processes of their locality from which they have become divorced so that they voluntarily take care of their habitat, including the habitat of wildlife. The thesis of neo-stewardship is that modern, freedom seeking, specialized people whose livelihoods and daily lives became independent from nature lost their sense of stewardship and suffer from environmental anomie without a sense of civic responsibility regarding the environment. Stephen Long notes that "The nation of small farmers envisioned by Thomas Jefferson has evolved into a nation of small landowners whose livelihood is not dependent on the land, and who have little understanding of using the land well" (1998: 28). Neo-stewardship counters this through both scientific understanding and personal experiences that reunite people with the natural ecosystem in which they dwell and of which they are apart.

What stimulates this self-conscious effort to reconnect to natural processes? One factor is the widespread general concern about human impact on nature. Another related factor is the fundamental need to be outside and to actively be a part of the natural world. For many, stewardship is a religious duty (Barlow 1996:5). Some people have recognized that they are disconnected from nature in their everyday lives and have made conscious efforts to reconnect to the natural world by volunteering to clean up creeks and beaches, to plant native plants and remove exotics from wildlife habitats.

Education, Incentives and Hands-On Involvement

Other stimulation for neo-stewardship is coming from government and non-government programs that provide environmental education and organized opportunities for neophyte volunteers in habitat management. Education programs like the previously mentioned Mountains

Education Program, Keeping Track, and the Bobwhite Brigade all share the philosophy that acts of stewardship must be preceded by factual knowledge and ecological understanding, learned in the field by personal experience. The Bobwhite Brigade illustrates. It teaches holistic thinking about the ecosystem. It provides skills that empower students with specific practical things to do. It emphasizes the importance of personal action.

The emphasis on field study, hands-on involvement and hard physical work in nature is no accident. Organizations nurturing stewardship stress hands-on experiences in nature and physical labor because urbanites typically lack such opportunities and receive personal satisfaction and a sense of accomplishment from them. And positive action concretizes stewardship and leads to other environmental responsibility.

Additionally, some public agencies depend on volunteers for wildlife management and habitat restoration activities. For example, during the last two decades, the Bosque Apache Wildlife Refuge suffered reductions in staff and extremely tight budgets. During this time, Superintendent of the Refuge Phil Norton developed volunteer groups who more than offset the tight budgets. In 1986 there were two volunteers; by 2000 there were 40 refuge volunteers and a friends group of 600 members. The volunteers undertake essential activities like crop harvesting for winter feed for sandhill cranes and other migratory birds. Other volunteers remove exotic salt cedar to restore cottonwoods, create native gardens and viewing areas. Some volunteers serve as roving naturalists and community ambassadors.

Public and nongovernmental funding also encourages neo-stewardship. For example, the federal government's matching grants of an estimated one billion dollars per year provide incentives to help farmers meet stewardship obligations through conservation programs. River restoration programs receive are likewise funded through federal and state programs. At a smaller scale the National Wildlife Federation awards grants of $3,000-$5,000 to local groups for stewardship projects ranging from constructing artificial habitat for red-cockaded woodpeckers to planting Mauna Kea Silversword plants in protected areas of Hawaii.

Restoration of Damaged Habitats

In wildlife habitat management, neo-stewardship acts would include all of the previously discussed voluntary efforts like joining wildlife associations, scientific monitoring, planning for habitat acquisitions and working to curb suburban growth. Additionally, much neo-stewardship focuses on wildlife habitat restoration from streams and wetlands to terrestrial habitats. Volunteer participation in habitat restoration includes removing invasive species to plant propagation to planting to repopulating wildlife species.

In the San Francisco Bay Area where a new, invasive species enters the bay every three months (Cohen and Tarleton 1992, originally cited in Vitousek 1997: 498), a more hopeful project has taken shape in recent years along the city's shore: The restoration of Crissy Field in San Francisco's Presidio National Park. Thanks to the efforts of over 3,000 volunteers as well as the San Francisco Conservation Corps Program, the former paved airfield and army base site is now a beautiful marsh inlet with restored grasslands and beach along the San Francisco Bay. Volunteers propagated plants, removed non-natives, cleared debris, participated in planning the

habitat site, planted 100,000 plants, and educated other volunteers on the 100-acre restoration site.

One example of volunteer restoration is the Chesapeake Bay oyster restoration volunteer group. Volunteers play a key role in oyster and reef restoration by assisting staff in raising and transplanting oysters as well as monitoring oyster reef sanctuaries. In one year, volunteers transplanted more than two million oysters. With the Chesapeake Bay's oyster population at a fraction of its abundance in John Smith's time, restoring the bay takes countless volunteer hours in both restoring the oyster population and managing wildlife habitats. Chesapeake Bay volunteers raise oyster spat to repopulate the oyster beds, plant and monitor underwater grasses, and educate community decision-makers.

The restoration of these and other habitats on publicly owned land simply could not occur without citizen volunteers. At the Bosque del Apache Wildlife Reserve volunteers work approximately 35,000 hours per year in removing exotics and restoring native plant communities, enhancing habitat and other activities. These are essential not just for wildlife recovery on public lands but also in reconnecting the public to natural processes. Likewise, the various creek groups in Oakland, Berkeley, and Richmond, California, hold monthly work parties to remove invasive species and plant native species along several East Bay Creeks. Some of these organizations also train volunteers to monitor water quality and record bird sightings.

Neo-stewardship on Private Lands

Some farmers, ranchers and other large private landowners have long stewarded their lands in compassionate and informed ways. With approximately half of the U.S. (47%) belonging to private landowners (Long 1998: 28), encouraging widespread stewardship of private lands is essential to the survival of wildlife.

One most notable effort to improve wildlife habitat is The National Wildlife Federation's backyard certification program. Over 26,000 households were certified by The National Wildlife Federation for managing yards for wildlife. In order to be certified, a family first assesses existing backyard habitat and then figures out how to upgrade the habitat by providing more native vegetation, food, plants, water, and nesting material. The Backyard Certification Program is a massive grassroots effort supported by The National Wildlife Federation.

Equally important are the actions of farmers, ranchers, and forest land owners. In one case near Fort Storkton, Texas, a rancher started building humps in his roads to stop gullies and washes. The humps created spreader dams, holding water and growing grass and forbs. This stopped erosion, provided better cattle grazing and, biologists think, made oases for wildlife, especially quail. The rancher, Sherman Hammond, estimated that his thousands of small spreader dams, holding no more than twelve inches of water each, has turned 14 inches of annual rainfall into 30 inches of effective watering. In only twenty years, Hammond has turned a run-down, overgrazed ranch into prime habitat while increasing the cattle carrying capacity of his ranch. (In addition to creating the oasis habitats, he rests pastures from grazing during prime growing season). Scientists studying his ranch think quail have increased because the vegetation in the spreader dams attracts insects and provides protection from predators. This produces significant wildlife habitat from simple acts of land stewardship.

The story of Winemucca, Nevada rancher Tony Tipton provides another case of successful private stewardship. Tipton was an active member of the Sagebrush Rebellion who, after learning about Holistic Resource Management, formed the Toiyabe Wetlands and Watershed Management Team which seeks to restore their dying ranch land to thigh-high grasslands of a hundred years ago. In one celebrated experiment, the Tipton team restored a barren ten-acre gold mining dam into a thigh-high grass by seeding, covering with hay and turning their cattle to the hay, thereby fertilizing, tilling, and planting (Daggett 1997: 11). The cow-cultivated site produced more grass than some nearby irrigated hay fields (Daggett 1997: 11). Tony describes himself by saying that he is out of the cattle business and into the land management business (Daggett 1997: 11). The Tipton team produces beef, transforms "near monocultures of Sagebrush into diverse stands of grass, forbs, and shrubs" (Daggett 1997: 12). They now work to be more than caretakers of the land, "to bring elk back to the Toiyabes and to restore the numbers of sage grouse and curlews" to the watershed (Daggett 1997: 11).

Another most impressive effort is Vermont's Coverts, an education and wildlife habitat-improvement nonprofit that has led to the formation of different landowner efforts. Vermont Coverts was established because, despite the amount of federal funding, landowners were not participating in land management. With 81 percent of the state's forested lands belonging to private individuals, a mechanism to involve landowners was sorely needed. The Vermont Forest Service had been focusing on educating landowners about getting the greatest economic returns from timber harvests. However, surveys showed that landowners preferred to manage and harvest their forests to improve wildlife habitat, to create vistas, or to improve recreational opportunities rather than receive purely economic incentives. A small group of landowners chose to forego short-term economic gains in favor of protecting wildlife (Long 1998: 28-32).

Adjoining landowners elected to participate in wildlife cooperatives, many of which act as informal networks although others have some land regulation such as transferable development rights. One especially notable one is the 50-member Wildlife Habitat Improvement Group (WHIG) whose collective members own and manage 7,000 adjoining acres. WHIG's activities include coordinating timber cuts and activities such as mowing and cultivating berry patches, mapping out important wildlife habitat and enhancing habitat for different species. The cooperative approach has successfully protected 110,000 acres in Vermont in the past 10 years, which is more than the amount of public land that the state acquired (Dobbs 1998: 120).

Impacts on Habitat and Volunteers

Acts of stewardship are essential to preserve, manage and restore wildlife habitat. The immediate impact is more and better habitat for both public and private lands. When repeated many times around the country, actions like the removal of a thousand acres of exotic plants to restore native riparian habitat of public lands along the Rio Grande River make significant improvements in the quality of diverse and productive habitat. Private lands stewardship potentially can be even more significant. Sherman Hammond's ranch includes 33,000 acres of better cared for Texas habitat. The WHIG's 110,000 acres of carefully managed Vermont forestland likewise represents a significant amount of and improvement to habitat. Widespread efforts to encourage, reward and maintain acts of stewardship are likely the only way to preserve connected continental

ecosystems and reintroduce locally extinct species, particularly large predators. Even with large-scale public lands purchases, stewardship of private lands will be especially critical.

Producing more and better habitat immediately is just one aspect of stewardship. The stewardship programs studied here all emphasize knowing, understanding, caring for and acting to improve habitat. Most reconnect people to ecosystems from which they were disconnected. Attention is paid to more than production and real estate profits from land. With continued growth of stewardship programs, more people should become reconnected to the ecological processes of their locality. This should result in a revitalized land ethic envisioned by Leopold in which the boundaries of self-interests are enlarged to include soils, waters, plants and animals, collectively; the land (Leopold 1949, p204). This land ethic, inculcated through acts of neo-stewardship, might develop better public understanding of the complexity of ecological systems and of the large-scale actions needed to preserve wildlife habitats and spur public political action to preserve and restore more effective wildlife habitats.

SUMMARY

Participatory Distinction

Of all the citizen volunteer movements in the United States, citizen participation in wildlife habitats is distinctive for a variety of reasons. First, wildlife enthusiasts have created large membership organizations with power to litigate disputes and influence national legislation that few nonprofessional volunteer associations do. Second, these organizations in turn recognize the value of grassroots participation and provide support for local efforts, making participation in wildlife habitat planning well organized and informed, well represented legally, and innovative. The Backyard Habitat certification program is just one of the bottom-up-top-down innovations. Third, involvement in citizen science provides benefits to volunteers that few other participation opportunities do. Likewise, stewardship activities in service of wildlife habitat seem to be especially attractive to volunteers. Both provide opportunities to be reconnected with nature via scientific knowledge and, in the case of stewardship, through hands-on labor to restore habitats.

Citizen participation in planning for wildlife habitat is like many other participatory planning efforts with the possible exception that conservation biology science, when well-communicated, impacts citizen planning more directly than science does in city or neighborhood planning. Likewise, as discussed, city and regional planning have been largely divorced from wildlife habitat planning, but that is changing.

The Form of Protected Wildlife Habitat

Just as voluntary efforts in wildlife habitat are distinctive from other forms of citizen participation in the United States today, the involvement of citizens has led to particular patterns of protected wildlife habitat. Volunteer groups have played a critical role in creating big public wildlife habitat in remote areas. The 93 million acres in wildlife refuges and 622 million acres of national parks and forests (Cody et al. 1995) represent a significant commitment to large wildlife habitats. Recent citizen initiatives based on conservation biology science have pointed out that

even these large habitats are too small for long term viability of wildlife; they call for regional and transcontinental lands protected for wildlife, areas much larger than previously imagined.

The patterns of protected wildlife habitat at the local urban level are less distinct. Habitats are often fragmented by land ownership and development. Wildlife advocates have been successful in protecting some backyard habitats and in securing small habitats for highly visible species. This has contributed to a piecemeal pattern of protected lands. The conversion of lands at the suburban fringe creates further piecemeal habitat. Wildlife organizations, until recently, have been notably absent from regional growth management and densification of urban development.

Three recent trends of citizen participation likely will create larger, more connected urban wilderness. First, in a few cities there has been a concerted effort to create plans that will connect cores of wildlife habitat, big enough to support large carnivores and the entirely of the local wildlife ecosystem. Second, related cooperative efforts to curb land conversion for low density suburban development may also create larger, better connected urban wilderness that will provide more effective wildlife habitat. Third, citizen volunteer efforts in restoration, while not likely to add significantly to the total acreage of lands protected for wildlife, will likely make functional damaged habitats and reconnect corridors previously lost to urban development.

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