THE URBAN OPEN SPACE MANAGER

A newsletter about wildlife and nature conservation in urban areas

Volume 2, Number 1 1997

Editor's Note

This issue begins the second year of publication of *The Urban Open Space Manager*, and I've been gratified by subscriber response to date. I hope the publication continues to be useful. One of my goals for *The Urban Open Space Manager* is to spur interest in reader contributions. I'm particularly interested in experiences with success or failure dealing with urban open space management issues related to wildlife and nature conservation. Published work reviewed in the manner of past issues is appropriate as well. If you are interested in contributing to *The Urban Open Space Manager*, please get in touch. In addition to the communication media presented at the end of this newsletter, you can reach me by e-mail (la3@umail.umd.edu). Individual and institutional credit will be given to reader contributions.

--Lowell Adams

Accessible Greenspace in Towns and Cities

For most of human history, men and women have fought to "push back the wilderness," to gain the upper hand in the "struggle for existence." We've succeeded in our domination, but, in recent times, also have begun to realize that absence of nature does not serve our own self-interest. Sociological research is showing a human need for nature. The fact that we continue to urbanize makes the presence of nature in the form of urban parks and other open spaces ever more needed and valuable.

British researchers Carolyn Harrison, Jacquelin Burgess, Allison Millward, and Gerald Dawe recently authored a report (English Nature Research Report No. 153) that sheds further light on this subject. These authors emphasize the human aspects of urban greenspace, and begin their discussion by pointing out the popularity of urban parks and other open spaces. For example, a 1988 survey in an inner London borough showed that 68% of residents visited a park or open space more than once a month. *Accessibility* of such open space to various users is the focus of this report. Review of the literature shows that use varies from site to site (some sites are viewed as dangerous and inhospitable) as well as by age and social group (teenagers and young adults predominate; young children, the elderly, and non-whites are under-represented). Harrison and her colleagues explain several physical, social, and cultural reasons why people may not visit urban greenspaces.

Physical Constraints to Use of Urban Greenspace

Two groups of factors impact use of urban greenspace: 1) "Severance factors such as busy roads, private land, railway lines, poorly-lit underpasses and paths through institutions or residential estates all serve to impede walking and cycling and will deter adults and children alike," and 2) "Constraining factors are differentially experienced by particular social groups, for example, people in wheelchairs or with walking difficulties have problems with gradients of more than 1:12 as do mothers with pushchairs. Even a gradient of 1:20 means that the majority of people confined to a wheelchair would find these routes too difficult to negotiate..." These factors determine the distance people will walk from their homes to a local park, district park, or local wildlife site. Incorporating the work of the London Planning Advisory Committee, the authors recommend that this distance be viewed as a straight line radius of 280 m taken from known access points on the site boundary. Areas beyond this distance should be viewed as "Areas Deficient in Public Open Space" or "Areas Deficient in Natural Wildspace." Effort should be made to provide accessible greenspace in any identified Area of Deficiency, and accessible natural places "should be given at least the level of protection afforded to formal small and local parks."

Social and Cultural Constraints to Use of Urban Greenspace

Anxiety and fear for personal safety limit use of urban greenspace, particularly for women and girls, younger

children, and people of color (especially women and the elderly).

Children

Children are not permitted to range as far from home as they were a generation ago. Parent concern about increased traffic and sense of greater risk to children are apparent causes. Harrison and her colleagues conclude that "Under these circumstances small, accessible natural places on the doorstep can provide children with the familiar but challenging places they need for their health and well being. Sites which are supervised by staff, such as Local Nature Reserves, have a prominent role to play for young girls and their acquisition of life skills." Even sites smaller than 2 hectares, a minimum size often used to justify greenspace maintenance, are used by children. Therefore, there seems little justification for maintaining this past standard.

Adult Fear of Crime

Research shows that many urban residents harbor fear of being victimized in urban parks, commons, woodlands, and other natural spaces. Considered most vulnerable are women, children, and people of color. Both physical factors and social factors contribute to this fear. Physical factors include things like the presence of litter, dumped rubbish, vandalism, graffiti, and discarded syringes, indicating a lack of social control--that the space is uncared for and likely to be dangerous.

Social factors contributing to fear of open space include a number of things. Less trust now is placed in strangers, and they are viewed as more threatening. Verbal abuse, invasion of personal space, and men exposing themselves to women and children are factors. Media sensationalism of rare, violent crimes add to fears, although research suggests that sex crimes are no more or less common today than in the past. Media coverage and local social networks help to stigmatize certain kinds of environmental settings and reinforce a sense of fear and anxiety. Anxieties about personal safety are reduced where open spaces encourage through movement of pedestrians. "...open spaces on busy and well used pedestrian routes are likely to be some of the most accessible spaces to adults and children alike."

Woodlands are settings with the least number of crime incidents, but these sites are perceived as the most risky. The characteristic of "enclosure" is important in this regard. "Specifically, dense woodland and shrubs offer places where potential aggressors can hide, where unsuspecting individuals become entrapped and isolated from assistance." There is evidence to indicate that regular use and familiarity with woodland sites counteracts some of the public anxiety toward these greenspaces.

Size of woodland and distance from home influence use of these greenspaces. To be worth visiting by adults, woods need to be about 2-2.5 hectares in size. Narrow linear woodlands are less popular than compact patches of similar area. Woods within 0.6 kilometers, or a 6-8 minute walk, are visited most frequently. Three recommended design strategies for lessening the anxiety of users and potential users are to: 1) improve sightlines and permeability of natural areas; 2) reduce hiding and entrapment spots, and; 3) improve lighting.

Uniformed rangers and site wardens, by their presence, are effective in reducing peoples fear of urban greenspaces. The authors believe that more women rangers, and rangers from ethnic minorities, are needed as role models, as are programs and activities that broaden the range of people using urban greenspaces.

Harrison and her colleagues conclude that "the opportunity to acknowledge, conserve and create accessible natural spaces in towns and cities is enormous. But to be accessible, natural spaces have to be in the right place--within five minutes walking distance of the home, and they have to be places where individuals feel they are in control rather than feeling vulnerable to unprovoked attack...Accessible natural places provide the qualities of adventure and restoration which contribute much to people's health and well-being and thereby contribute most to sustainable communities."

Reference: *Accessible Natural Greenspace in Towns and Cities: A Review of Appropriate Size and Distance Criteria*, English Nature Research Report No. 153, Peterborough, UK, 1995.

Urban Open Space Planning and Design

Until quite recently, little guidance was available to decision makers regarding the design of urban open space for wildlife. Wildlife biologist Daniel Leedy and his colleagues, in *Planning for Wildlife in Cities and Suburbs*, recommended development of a continuous open space-wildlife corridor system at the regional level of design. Almost a decade later, landscape architect John Lyle, in a paper published in *Integrating*

Man and Nature in the Metropolitan Environment, pointed out that planners and designers "need to establish some approaches and a broad, useful conceptual basis for planning and design for wildlife." According to Lyle, "...providing suitable conditions for plant and animal communities is a goal for every landscape everywhere, including urban, suburban, and rural landscapes, and a goal that should be seriously pursued at every level of environmental planning and design. Ideally, every regional plan, urban general plan, and design for a city park or a backyard should include specific provisions for wildlife habitat."

For landscape planning purposes, Lyle distinguished six habitat classifications. At the macrolevel are "wild areas," which are large enough to accommodate the full range of species native to the site, including top carnivores. "Wild patches" are somewhat smaller and lack top predators. "Wild enclaves" are smaller than patches and are not large enough to be self-sustaining systems. Nonetheless they support significant wildlife populations. Connecting enclaves and patches are "wild corridors," which provide movement pathways for wildlife. Man-made landscapes associated with school grounds, urban parks, cemeteries, college campuses, and residential development are classed as exotic greens. Lastly, wildlife parks are specifically designed and managed to accommodate mostly exotic wildlife populations for human education and recreation. Wild animal parks and zoos fall into this category. Lyle pointed out that this approach provides a coherent means of dealing with wildlife concerns at each scale of planning.

Wildlife biologists Lowell Adams and Louise Dove, in *Wildlife Reserves and Corridors in the Urban Environment*, reviewed the literature and research on this subject and presented guidelines to ecological landscape planning and resource conservation. They, too, recommended an interconnected network of reserves and corridors to minimize detrimental impact to wildlife. Progress being made in South Africa in implementing these ideas was highlighted earlier in *The Urban Open Space Manager* (please see Vol. 1, Nos. 3 and 4, 1996). Another example follows.

Portland, Oregon

Under the direction of urban naturalist Mike Houck, Portland Audubon Society initiated an effort to establish a metropolitan wildlife refuge system in the mid-1980s (see *Wildlife Conservation in Metropolitan Environments*). Success in generating interest in the project centered around several key elements. Critically important early on was preparation of a concept map of the area to promote management of interconnected ecosystems and wildlife corridors. Attention focused on spectacular or highly publicized animals to achieve habitat protection strategies. For example, the great blue heron was adopted as the official city bird in 1986, and this led to wetland protection. Threatened and endangered species also were highlighted, including wintering populations of the bald eagle, dusky Canada goose, and tundra swan. The importance of wetlands and riparian areas in meeting clean water and flood abatement objectives also was stressed. Finally, corporate and citizen amenity values were stressed--the refuge system would help to protect and enhance quality-of-life measures for humans. In this regard, it was pointed out that a big part of what makes the region a nice place to live is wildlife and wildlife habitat.

As the program evolved, it became evident that public interest was broader than just wildlife. Concern also included loss of open space, lack of a coordinated recreational trails system, lack of an integrated, regional environmental education program, and absence of a regional land acquisition strategy. The metropolitan refuge system was inadequate to address all of these. So, in 1989, the regional planning body, which included the city of Portland and the surrounding tri-county urbanized area, instituted a Metropolitan Greenspaces Program. The purpose of the program was to ensure a cooperative regional system of natural areas, open space, trails and green spaces for wildlife and people. The Greenspaces Program is complimentary to the wildlife refuge system.

References: *Integrating Man and Nature in the Metropolitan Environment*, Natl. Inst. for Urban Wildl., Columbia, Md., 249pp., 1987.

Planning for Wildlife in Cities and Suburbs, Rep. No. FWS/OBS-77/66, U.S. Fish and Wildlife Service, Washington, D.C., 64pp., 1978.

Wildlife Conservation in Metropolitan Environments, Natl. Inst. for Urban Wildl., Columbia, Md., 264pp., 1991.

Wildlife Reserves and Corridors in the Urban Environment: A Guide to Ecological Landscape Planning and Resource Conservation. Natl. Inst. for Urban Wildl., Columbia, Md., 91pp., 1989.

Public Involvement in Open Space Issues

Extensive planning was devoted to design of the "new

town" of Columbia, Maryland, located about halfway between Baltimore and Washington, D.C. The original new town zoning, approved in May 1965, called for a minimum of 20% open space to be retained following development. The development design concept incorporated 10 villages, each with distinct neighborhoods.

Open space committees of local citizens operate within villages and have direct input to the local governing body. In addition to dealing with "tot lots" for children, and pedestrian pathways, committees get involved with wildlife habitat issues.

This editor served on the open space committee of the Village of Hickory Ridge during its early years and helped to implement a community-based program to revegetate village open space with trees and shrubs. Seedlings of various species were obtained from the state nursery and planted in the village's own "nursery" in one of its open space sites. Next, we established guidelines and procedures whereby residents (at no cost) could transplant material from the village nursery to public open space adjoining their property. In some cases, they were allowed to plant the material on their own property that adjoined open space. Planting plans were submitted by residents to the committee for review and evaluation. Sometimes plans were returned to a resident for revision before approval. The program was well received and successful. It helped to revegetate the village inexpensively and it got local folks personally involved with open space design and management in their neighborhood.

Urban Red Foxes and Dispersal Corridors

Little research has been conducted on urban red foxes in North America. Recently, as part of his graduate program at Humboldt State University, Jeffrey Lewis studied the dispersal of introduced red foxes in northwestern Orange County, California. The area of investigation was a mix of urban-suburban development interspersed with open spaces including golf courses, parks, airfields, cemeteries, wetlands, agricultural fields, powerline corridors, industrial properties, and undeveloped land.

Red foxes are native to high elevations of the Sierra Nevada and southern Cascade Mountains of California. However, establishment of fur farms and import of foxes for hunting have resulted in reproducing populations outside historical native range. In the early 1900s, foxes from Missouri were moved to Orange County for fox hunting. Probably by a combination of fur farm escapes, fox-hunt survivors, and perhaps released pet or captive foxes, wild populations became established in the county.

Lewis was interested in studying the dispersal of inland foxes to coastal habitats supporting the endangered light-footed clapper rail and the California least tern. The rail is a year-round resident of coastal wetlands and the tern migrates there to breed in spring and summer. Decline in populations of both species has been attributed largely to introduced red foxes.

Lewis radio-collared 23 foxes during 1990-1992 and tracked their movements. Home ranges in Orange County averaged 4.83 km^2 outside of Mile Square Park where they averaged 0.63 km^2. Mile Square is a county regional park with a high fox population, no doubt influenced by human feeding activity. Recorded densities vary between 14-18 foxes/km^2.

Six of the 23 radiocollared animals dispersed an average distance of 7.8 km between the months of August and January throughout the study period. Habitat used during dispersal included flood channels, highway and powerline corridors, and parks. Flood channels in the area empty at several locations along the coast and thus provide direct access to coastal wetland habitat for dispersing foxes. These areas have been invaded and populated by foxes and Lewis concluded that foxes are a threat to the birds, particularly during the nesting season. Based on his study, he projects that foxes will annually disperse to the coast between August and January from inland sites unless dispersal routes are eliminated.

Reference: *Dispersal of Introduced Red Foxes in Urban Southern California*, by Jeffrey C. Lewis. M.Sc. Thesis, Humboldt State University, Arcata, Calif., 57pp., 1994.

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Forest Conservation Around Urban Centers in Nepal

In many developing countries, people depend on wood for fuel. Particularly around urban centers, fuel wood harvesting places increasing demand on surrounding forests, leading to degradation and loss of habitat (and lack of fuel wood), increased runoff and erosion, and other problems. Researchers Gopal Thapa and Karl Weber, both of the Asian Institute of Technology in Bangkok, Thailand, studied the issue with regard to the regional town of Pokhara and its surrounding countryside. In 1988, the human population of Pokhara was 67,000 (and increasing). Some 95% of households were using fuel wood as the primary source of energy.

The central question posed by these investigators was whether or not private tree plantations would reduce destruction of the native forests and provide economic return equal to or greater than on-going cereal crop cultivation. Traditionally, fuel wood has been obtained free from surrounding forests, a practice that does not reflect cost of production and maintenance of the forests. From a cost-benefit analysis, Thapa and Weber found private forestry to be relatively less profitable than traditional field crop cultivation for most types of land, but cultivation of field crops in the mountainous area presents greater erosion problems, which were not accounted for in the analysis.

There are a number of other stumbling blocks to private forestry efforts in the Pokhara region. Without an adequate road system, no real opportunity exists for surrounding residents to get their wood product to market in Pokhara. Also, it has been long-established social norm to cultivate field crops on farmlands and secure fuel wood from commonland forests. Farmers point out that the smallness of their land holdings preclude their foregoing the raising of food crops to plant trees. Tree protection is another issue. Outside the cropping season, livestock roam freely and would inhibit tree growth. Lack of an adequate labor force and of capital are other obstacles that must be overcome. Farmers are particularly suspicious of any governmental effort to plant trees because a 1957 decree nationalized all forests. Further, current law requires registration of land with the government in order to obtain assistance with the forestry program. People fear they will lose more of their land.

Recognizing all of the above, Thapa and Weber still believe there is good prospect for gradual adoption of private forestry for fuel wood around urban centers in Nepal. What's needed, in their view, is a strategy focused on motivation, institutional reform, assistance, and monitoring.

Extension agents can motivate residents by organizing and holding meetings with farmers and creating an awareness of the benefits of private forestry. This effort should focus on lands not traditionally used for cereal crops and lands considered infertile for such. Demonstration plots should be established to show how private forestry works for rich and poor farmers alike.

Institutional reforms need to clearly reflect maintenance of private property rights. The required registration of woodlots in order to become eligible for assistance should be abolished. There is need to provide multi-year land-tenure security to tenant farmers, perhaps in a long-term leasehold agreement. Traditional share-cropping agreements in the area are set on a 1-year time frame. Thus, there is no incentive for a share-cropper to plant trees that normally would take several years to yield any return.

The custom of open grazing of livestock outside the cropping season must be changed. Fencing of woodlots is not economically feasible. During the crop growing season, herders keep animals from fields. Perhaps the practice could be expanded. Government and private organizations need to work together to ensure program success.

Farmers need financial and material assistance in developing private forestry for things like labor, land preparation, seedlings and planting equipment, as well as technical assistance from seedling production to wood harvesting. The program should be monitored in short intervals of time and space to evaluate success and to detect problems early on for easier correction. The authors believe that a private forestry program can serve dual goals of environmental conservation (protection of native forests) and economic development in the area.

Reference: *Environmental Conservation* 21(4):297-307, 1994.

Forest Birds in The Netherlands

Researchers Marc-Andre Villard and Philip Taylor, working in The Netherlands, recently studied how forest bird tolerance to habitat fragmentation influences the colonization of new habitat. They present evidence that species tolerant to habitat fragmentation (like the fieldfare and nightingale) detect and colonize new habitat faster than species intolerant to habitat fragmentation (like the tree pipit and wood warbler). Such results have important implications for the conservation of forest birds. Reserve networks for species intolerant to habitat fragmentation need to maintain some degree of connectivity (e.g., by use of corridors), otherwise these species are likely to be lost from the bird community.

Reference: *Oecologia* 98(3/4):393-401, 1994.

Butterflies in Urban Forest Fragments

What effect does urbanization have on populations and communities of neotropical forest butterflies? This question was of interest to Brazilian university researchers Jaqueline Rodrigues, Keith Brown, Jr., and Alexandre Ruszczyk. They studied butterfly communities and larval and adult food plants in three isolated remnants of native forest in Campinas, Brazil. The two smallest woodlots, 1.4 ha and 2.1 ha in size, were completely surrounded by housing. The largest forest fragment, 12 ha, was located on the urban-rural fringe.

The two small woodlots possessed relatively rich butterfly faunas, 46 species and 47 species for the 1.4-ha and 2.1-ha sites, respectively. However, only 16 species had larval food plants in the small woodlots, so obviously many species were produced elsewhere and were using the small sites as adults for food and shelter. The source of many of the adults observed in the small woodlots was larger woodlots, like the 12-ha fragment, where 78 species of butterflies were recorded. These data show the value of maintaining larger sites for conservation purposes.

In conclusion, these authors stated that "...promotion of physical and vegetational diversity should be an important part of the management plans of urban woods, if the aim is to maintain a greater part of the butterfly diversity of the region..." They further recommended that "...the protection and diversification of even very small urban forest fragments in the tropics could enhance the survival of vagile invertebrates within the highly disturbed urban habitat."

Reference: *Biological Conservation* 64:3-9, 1993.

Urban Wetlands

In the not too distant past, wetlands were viewed simply as wastelands, with little or no practical value. Standard practice was to drain them and perhaps add fill dirt to keep them from reforming. More recently, there has been greater recognition and appreciation for the multiple benefits wetlands provide, including their role in the recharge of groundwater supplies, control of erosion, purification of water, and provision of fish and wildlife habitat.

Author Donald L. Tilton, in a recent issue of *Landscape and Urban Planning* argues for integrating wetlands into communities and planned landscapes. He recommends the following design elements and management efforts for effecting such practice.

"(1) Provide suitable hydrologic sources to the wetland after development. Manage the amount of water entering the wetland to approximate predevelopment levels. Protect the wetland from contaminated runoff that may be generated in the watershed.

"(2) Preserve or enhance native vegetation. Eliminate non-native plant species and restore the understory, forest cover and species diversity in preserved wetlands.

"(3) Provide upland buffer areas adjacent to wetlands of varying widths to provide nesting and feeding habitat for species that use the upland fringe surrounding wetlands.

"(4) Interconnect wetlands with corridors of wetlands, watercourses or upland habitat that allow wildlife to migrate among wetland habitats.

"(5) Control human disturbance by establishing walkways in tolerant natural areas, thus avoiding disturbance of wildlife by human activity."

Meeting stormwater management requirements perhaps offers the best opportunity to integrate wetlands into communities and planned landscapes.

Reference: *Landscape and Urban Planning* 32:205-209, 1995.

Greenways and Wildlife in the Urban Environment

There is much current interest in greenways. Can such areas in the urban environment be managed to enhance wildlife habitat? If so, how? These were central questions of interest to Zolna Russell, a landscape architect pursuing a masters degree at Towson State University in Maryland. Zolna recognized that management for wildlife habitat enhancement would require the approval and support of local people. Therefore, her study objective was to determine landscape preferences of local residents, businesses, government officials, and greenway trail users and their attitudes about wildlife. Her study site was the York County Heritage Rail Trail in southern York County, Pennsylvania, which was under construction at the time of the study in spring, 1995. She conducted a landscape preference questionnaire survey in New Freedom and Glen Rock, two communities in the county through which the greenway trail passed.

Zolna found that 83% of respondents favored the planting of trees, shrubs, and wildflowers and that there was generally a high level of support for the trail. Naturalized landscapes ranked highest in photo evaluation of different scenes and support was expressed for providing wildlife habitat. Seventy percent of respondents disapproved of maintaining trail right-of-way as closely mowed grass. Zolna recommended that trees, shrubs, and wildflowers be planted to create varying heights to support a diversity of wildlife species. Both evergreen and deciduous plants should be included and native species should be selected over exotic ones because native plants support native wildlife and are adapted to local climate and growing conditions.

Planting should be done with human safety in mind. Of most importance in this regard is design to minimize potential hiding places for muggers and rapists. Plantings likely would have little impact on regional biological diversity; their main benefit would be to increase human awareness and understanding of wildlife-habitat associations. To assist this effort, educational programs should be instituted. Several potential locations in the area could accommodate nature displays and other environmental programs. Local schools could use the trail in environmental education programs. Hopefully, management plans developed for the two towns will incorporate Zolna's findings. [Editor's Note: A special issue of *Landscape and Urban Planning* (Volume 33, 1995) was devoted entirely to greenways.]

Reference: *Public Attitudes and Landscape Preferences Towards Managing Greenways for Urban Wildlife*, by Zolna Russell. M.A. Thesis, Towson State University, Towson, Md., 104pp. + app., 1995.

Importance of Wildlife to Urban Park Visitors

What value does wildlife hold for visitors to urban-suburban parks? Do visitors enjoy seeing or hearing wildlife as part of the park visit? If not seen or heard, do they gain satisfaction in knowing that wildlife exists in the park? These were questions posed by Norma Kawecki for her graduate research at the University of Maryland. She was interested in evaluating the importance of wildlife to park visitors' overall satisfaction with the park experience.

Ms. Kawecki's study was conducted in Wheaton Regional Park, Montgomery County, Maryland, which borders Washington, D.C. The park encompasses more than 200 hectares and much of it is wooded. As a regional park, county policy calls for two-thirds to be maintained as nature-conservation areas. Up to one-third can be developed for active-use recreation.

An on-site questionnaire was distributed to weekend visitors during June 1993. Two hundred twenty-five useable responses were obtained. Overall satisfaction with the park visit was high. Seventy-five percent of respondents felt that the trip to the park was worthwhile and 67% said they would visit the park again.

There was a significant linear relationship between overall satisfaction with the park experience and satisfaction with the diversity and existence of wildlife. Sixty-nine percent of respondents said that just knowing wildlife existed in the park satisfied them and 58% agreed that the visit would not be as satisfying if they knew there was no wildlife there. However, there was no significant relationship between seeing or hearing wildlife and overall satisfaction. The majority of visitors did not visit the park specifically with wildlife in mind. The most common reason for visiting the park, cited by 44% of respondents, was walking-hiking. Eight percent visited specifically to view wildlife.

The value of the habitat for wildlife was not directly measured, but most probably was highly linked to other "aesthetic" values (for example, presence of trees). Sixty-seven percent of respondents said they would be

willing to pay more in taxes to assure wildlife in the park for future generations. It seems to this editor that park users, with high overall satisfaction, gave indirect approval to the conservation-nature/active use policy of the county.

Reference: *The Importance of Wildlife to the Park Visitors' Overall Satisfaction with the Park Experience*, by Norma J. Kawecki. M.A. Thesis, University of Maryland, College Park, 88pp., 1993.

Rabies Control in Urban Foxes

Red foxes inhabit many British cities in moderate to high densities and considerable knowledge is being gained from research on such populations. Primary interest in urban fox population biology and ecology in England stems from concern about the spread of rabies. The disease is not present in the British Isles but is widespread on the European mainland. British authorities are striving to learn all they can about urban foxes in hopes that such knowledge will offer high probability of containing and eliminating the disease if an outbreak does occur.

The rate of spread of rabies is determined by the frequency of contacts between susceptible and infectious individuals. Fox contact behavior is difficult to measure in the wild and remains the single most important unknown parameter in spread of the disease. Biologists do know that there is some overlap between home ranges of adjacent foxes (which increases with fox density) and home range overlap is greater in winter than in spring through autumn. The heterogeneous nature of the urban landscape results in sharply defined home range boundaries with less overlap than in the countryside; this probably results in lower frequency of contacts in the urban environment than between foxes at the same density in rural areas. Limited research on rabid foxes indicates that they generally remain in their home range but spend more time resting on the periphery of the range.

Researchers Piran White, Stephen Harris, and Graham Smith recently measured contacts between foxes in the city of Bristol, England, and found them to be higher in winter than in spring through autumn (matching the degree of home range overlap). Thus, for a winter outbreak of rabies, the disease would spread relatively rapidly the first few months but the number of infected foxes would be relatively low. On arrival of spring, when contact probabilities drop, the rate of spread of the disease also would decrease. For a spring outbreak, the initial spread would be slow but three subsequent seasons of high contact probabilities would increase the rate of spread of the disease.

Based on their latest work, these investigators revised an earlier rabies model that has been the basis for control policy of the disease in urban areas should an outbreak occur. The revised model predicts lower intergroup contact than originally thought, but the seasonality of measured contact probabilities are far greater than assumed under the original model. Thus, the rate of spread will be slower than originally predicted with the old model and consequently there will be a greater chance of containment and elimination of the disease within a specified control area. With the revised model, the highest chance of successful control is obtained for a winter outbreak.

British rabies control strategy is one of containment and elimination. Current policy calls for culling of foxes within a control area of 19-km radius using poison baits. Researchers and government officials know, however, that such policy is not fool proof. One study found that baits only reach one-third of adult foxes and less than one-fourth of younger animals. Fox vaccination is not considered an appropriate means of control at present. There is fear that attenuated vaccines may regain virulence or induce rabies in susceptible species.

Reference: *Journal of Applied Ecology* 32:693-706, 1995.

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Human Impact on Small Suburban Woodlots

What effects do people have on small urban-suburban woodlands? Can such woodlands retain conservation value while also serving human outdoor recreation needs? These questions were of interest to Glenn Matlack of Harvard University. In a paper published in *Environmental Management*, he describes the spatial distribution of human impact relative to paths, roads, houses, and the forest edge in 40 suburban forest "fragments" on the Piedmont and Coastal Plain of New Castle County, Delaware. Sites ranged from 0.7 to about 20 ha in size. Human access and activity were not limited or directed by artificial or natural barriers.

Matlack noted that human activity in these woodlands was not randomly distributed and that understanding patterns of use may allow better protection of biological diversity. Foot traffic can have significant impact by compacting soil, reducing or eliminating leaf litter and humus, and altering forest floor vegetation. Root and bark damage to trees, and suppression of seedlings are other human impacts. There is need to better understand human traffic patterns and other impacts in order to better manage such areas.

On his study sites, Matlack found that 95% of human-related damage occurred within 82 m of the forest edge (most within 30 m). He noted two groups of impacts relative to distance to forest edge. Group 1 consisted of lawn-related impacts like leaf piles, grass clippings, and woodpiles. These tended to be close to the edge. Ninety-five percent of grass clippings and woodpiles were within 19 m of edge. Group 2 impacts were recreation related and more dispersed. Noted here were things like treehouses, campsites, and firewood gathering. Other types of impacts included huts, lawn extension, dumps, and rubble. Impacts occurred at greater distances into a forest when a road was present. Also, human impact was often clustered around footpaths.

Human activity was generally related to the forest edge and thus considered an "edge effect." The severity of impact appeared linked to access. To ensure protection of forest habitat, Matlack recommends restricting road access and avoiding the creation of forest fragments with diameters less than about 150 m. Impacts like campsites and dumping could be reduced by closing internal roads to vehicles. Limiting paths is not as critical as limiting road access. In fact, carefully managed paths can help to direct traffic flow away from sensitive areas.

The author recognizes that small suburban woodlots, in addition to their conservation value, typically serve human recreation needs. He concludes that "...recreational, aesthetic, and conservation needs can be reconciled in stands of moderate size through intelligent land-use planning and careful management. This can only be achieved, however, if the surrounding community recognizes the broad social and biological value of these small woodlands."

Reference: *Environmental Management* 17(6):829-835, 1993.

Stormwater Management and Urban Greenways

Researchers Christopher McGuckin and Robert Brown, of the University of Guelph, Ontario, Canada, are interested in the concept of integrating municipal stormwater management facilities into urban greenways. Their view is that this can be done in a manner to enhance both wildlife habitat and human outdoor recreation. The basic philosophy is to integrate stormwater management facilities with a regional network of greenways--to connect them with parks, cemeteries, woodlots, conservation areas, school grounds, and stream corridors, and to larger, undisturbed conservation or environmentally significant areas.

Landscape ecology provides a theoretical base on which to implement such a concept. These investigators were particularly interested in "habitat connectivity," "porosity," and "patch size." The basic ecological premise under which they were working is that it's better to integrate and connect habitats regionally than to provide isolated habitats. They developed a computer model for predicting the spatial distribution of stormwater management facilities in developing urban

areas and applied it to a developing area of Guelph. The model can differentiate between a "scattered patch landscape" and a "network landscape" of intersecting corridors. It can be used to simulate future landscape change under various development scenarios. "...the simulation results clearly demonstrated the regional landscape ecological benefits to the study area of integrating planned new stormwater management facilities into an enhanced urban landscape network of corridors and patches, by increasing landscape connectivity and decreasing landscape porosity." The model can be used to assist municipal decision-makers in planning and implementing stormwater management programs that better maintain the ecological integrity of an area.

Reference: *Landscape and Urban Planning* 33:227-246, 1995.

More on Stormwater Management

The practice of urban stormwater management is still evolving and considerable opportunity exists for input from biologists and ecologists with regard to minimizing detrimental impacts of stormwater discharge on plant and animal communities as well as opportunity for enhancing wildlife habitat.

Recently, Laurance S. Torok studied plant community changes brought about by stormwater discharge to a wetland complex in New Jersey following construction of a housing development. Little alteration in vegetation was noted above the discharge outfall. However, in the vicinity of the outfall and downstream from it, significant changes were noted in hydrology and vegetation. As a result of outfall discharge design, erosion was accelerated and a channel was carved in the wetland. Because of more rapid loss of water from the area following development, loss of many spring-fed seeps occurred. Changes in the vegetation community included loss of sedges and rushes and an increase in woody species. Torok pointed out that the extent of impacts could have been reduced by use of a rip-rap channel between the outfall and wetland to reduce water velocity below erosion standards for the site soils. Also, use of a detention basin or recharge basin would have reduced water flow and velocity, helped to retain sediment, and recharge groundwater, which would have helped to maintain seeps.

Changes in the vegetation community noted in this case were particularly detrimental because the site constituted habitat for the bog turtle, a species either threatened, endangered, or extirpated throughout much of its range or former range in the eastern United States. Specific habitat features used by the bog turtle, and which were lost, included spring-fed pockets of shallow water, soft mud or rock bottoms, and sedges and grasses.

Reference: *Bulletin of the Maryland Herpetological Society* 30(2):51-61, 1994.

Habitat for Hawks and Owls

Urbanization is generally thought to be detrimental to raptor populations because the process reduces habitat needed by prey populations as well as nesting habitat needed by hawks and owls. Little actual research has been conducted on raptors in urban areas, however.

Researchers William and Maureen Minor and Michael Ingraldi (*J. Field Ornithol.*) studied red-tailed hawks and great horned owls in an urban-suburban complex with scattered patches of greenspace in central New York for 10 years (1980-1989). They found productivity in the metropolitan area to be 1.10 fledglings/nest, which was not significantly different from 1.27 fledglings/nest reported from the literature for non-urban habitat. The authors stated "It appears that with adequate nest sites Red-tailed Hawks can propagate under these human-made habitat conditions just as well as in non-urban habitats." A real key appears to be providing adequate nesting conditions because overall density of nesting pairs was three times lower in urban (0.08 nesting pairs/km^2) compared to non-urban (0.274 pairs/km^2) areas. Great horned owls produced 1.63 young/nest and averaged 0.02 nesting pairs/km^2. The authors concluded that "Today the populations of Red-tailed Hawks and Great Horned Owls in this urban/suburban ecosystem appear to be relatively stable. We believe from their presence as successful breeding populations in and around Syracuse that with proper maintenance of undisturbed nesting areas and adequate open space for foraging, they will persist as top predators."

The small screech owl is widespread in North America and may be the most abundant of all raptors in suburban areas. Dr. Fred Gehlbach has studied the bird in Texas for many years (*Nat. History, Proc. Intl. Ornithol. Congress*) and, in addition to research papers, has written a book on the subject (*The Eastern Screech Owl: Life History, Ecology, and Behavior in the Suburbs and Countryside*, Texas A & M Univ. Press, College Station, 1994). Gehlbach notes that nesting suburban owls are similar to their rural counterparts with

regard to clutch size (about 4 eggs) and incubation period (about 30 days). However, suburban owls lay eggs earlier and fledge faster-growing, larger offspring, and density of the suburban owls may be more than three times that of rural birds. Nest predation in Texas is lower in suburbia but mortality of adult birds is higher than in rural areas.

What factors are responsible for these observed differences between rural and suburban screech owls? Weather in suburbia is typically less variable than in the surrounding countryside and winter temperatures are generally warmer, both of which may benefit the owl. In Texas, the food supply, including moths, katydids, June bugs, crickets, and earthworms, is estimated to be 2-8 times more concentrated in suburbia. Unfortunately, a contributing factor to higher mortality of adult birds is collisions with vehicles as the owls prey on earthworms on wet road pavements.

References: *J. Field Ornithology* 64(4):433-439, 1993; *Natural History* 95:56-66, 1986; *Proceedings of the International Ornithological Congress* 19:1809-1813, 1988.

Bald Eagles and Development

What kind of open space is needed to retain bald eagles in the face of increasing human development? This question was of interest to researchers Sheri Chandler, James Fraser, David Buehler, and Janis Seegar working in the northern Chesapeake Bay region of Maryland, 1984-1992. They captured and marked with radio transmitters 110 eagles, and kept track of the birds' movements during the study period. In addition, they observed 2,962 eagles from aircraft surveys during the study and measured several habitat features.

Eagle use was positively correlated with number of perch trees (both living and dead) and amount of forest cover, and negatively correlated with building density. Ninety percent of perched eagles observed were located in trees and conserving perch trees near the shoreline is important because birds prefer to perch close to the shoreline. These researchers concluded that, in order to maintain eagles in the face of increasing development in the area, it is necessary to maintain perch trees and forest cover within 20-50 m of the shoreline. Shoreline trees greater than 20 cm in dbh (diameter breast high) should be protected and dead trees should be allowed to stand.

Reference: *Journal of Wildlife Management* 59(2):325-332, 1995.

Conservation Planning

With an interest in conserving wildlife when planning for the future, how does one decide which areas should be protected for conservation purposes? Most biologists would agree that species diversity is an important factor to consider--perhaps the most important factor. How can one realistically compare different sites with regard to species diversity or other factors of interest? Do data exist for valid comparisons? In many cases, data do not exist.

Researchers James Harrison and Peter Martinez, of the University of Cape Town, South Africa, in a paper published in *Ibis*, point out that "bird atlas" data sets, which are being completed worldwide, may be useful in this regard. Bird atlases are not yet fully utilized in conservation planning.

Harrison and Martinez, working in southern Africa, used data from the Southern African Bird Atlas Project, which consist of lists of species in quarter-degree grids. A problem for comparative purposes is the fact that some grids were sampled more frequently than others. Unequal sampling is common with such atlases and it presents a problem because greater sampling effort results in more species being recorded. So, obviously it is not a good idea to compare an area sampled heavily (most likely with a long checklist) with one sampled lightly (most likely with a shorter checklist). In reality, the latter may be more diverse than the former. Thus, the problem.

In order to use bird atlas data for conservation planning purposes, one needs to be able to compare the various grids. Thus, the focus of this research was "to produce a measure of species diversity which can be used to rank sample sites independently of the sampling effort at these sites." Harrison and Martinez did this by adapting the widely used Shannon diversity index to overcome the sampling problem and to allow reliable ranking of grid blocks according to species diversity. They found that the modified diversity index produced a measure that stabilized rapidly with modest sampling effort. The calculated diversity indices were allocated to quantiles and mapped in different shades for easy visual comparison.

Distribution patterns differed for the five groups of birds included in the study (waterbirds, terrestrial birds, grassland birds, South African endemics, and subcontinental endemics). This would be expected based on different habitat preferences and distribution

of habitats. Using the grassland biome as an example, another indication that results are biologically meaningful is the fact that, for all terrestrial species, diversity was greatest at the edge of the biome (where it graded into another type). However, for all grassland species, diversity was greatest in the center core of the biome. For conservation planning purposes, one must decide which patterns are more important and why.

Harrison and Martinez subscribe to the principle of complementarity in targeting sites for protection for conservation purposes. Thus, new sites slated for protection would complement existing sites in terms of representing the entire regional biota.

A two-step process is presented: (1) select an appropriate geographical area that is defined in environmental and/or biological terms (e.g., biome, ecosystem, landscape type, watershed); and (2) select a group of species ecologically dependent on the area. The authors term this process the "Compatible Sets Approach."

Using the grassland biome as an example in the present study, all grassland bird species of the region were found in only 6.8% of the top-ranked grid blocks. This illustrates the value of the approach in providing information useful for decision making. In summary, the overall process ranks areas according to diversity (standardized for comparative purposes) applied to compatible sets of species and geographical areas.

The authors suggest the following procedural steps for conservation-related use of bird atlas data in southern Africa:

"(1) Identify an ecological integrated geographical area, e.g. a biome.

"(2) Identify the species which are an integral part of the biotic community of that area.

"(3) Calculate an index of diversity for the selected species, for each grid block, using the best measures of relative or absolute abundance available.

"(4) Rank the grid blocks according to their diversity indices.

"(5) Survey an appropriate number of grid blocks, prioritized according to rank, for existing and potential reserve sites.

"(6) Survey each of these sites to produce species lists which should include only those species which could be meaningfully conserved at each site.

"(7) Apply an iterative site-selection procedure to the surveyed sites, using the principle of complementarity.

"(8) If the full range of relevant species is not included in the available sites, go back to step 5 and include a larger number of grid blocks."

This procedure should prove useful in other geographical areas where the data consist of checklists.

Reference: *Ibis* 137:410-417, 1995.

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Urban Land Use and Bird Diversity

Robert Blair, of Miami University, Ohio (formerly of Stanford University), recently studied bird community changes across an urban gradient in Santa Clara County, California. During 1992 and 1993, he censused summer resident birds in six types of habitat. Representing increasing urbanization, these were a biological preserve, recreational area, golf course, residential neighborhood, office park, and business district. The original habitat at all sites before development was oak woodland.

Forty species of birds were recorded in the study. Blair catalogued seven as "urban avoiders," including the Blue-gray Gnatcatcher, Western Wood-Pewee, and Ash-throated Flycatcher. Maximum densities for these were noted in the biological preserve. Thirty species were classified as "suburban adaptable." Included in this group were the Plain Titmouse, Western Bluebird, Rufous-sided Towhee, American Robin, Mourning Dove, and Northern Mockingbird. Three species were classified as "urban exploiters," the Rock Dove, White-throated Swift, and House Sparrow. Blair found that the most effective environmental variables for differentiating sites and their bird communities were 1) amount of cover in buildings, 2) lawns, and 3) trees-shrubs.

The bird community changed from mostly native species in the biological preserve to mostly invasive and exotic species in the business district. Blair concluded that "If planners wish to maintain predevelopment levels of biodiversity, then development should be spatially concentrated." Further, "...in order to maximize native biodiversity, it would be advisable to concentrate business endeavors in as small an area as possible to maximize the amount of undeveloped land. This study also indicates that golf courses are not as benign a land use as some people assume...leading to a loss of >40% of the species found in the predevelopment community."

Reference: *Ecological Applications* 6(2):506-519, 1996.

Breeding Birds in and Around Torun, Poland

Researcher Andrzej Zalewski, of the Polish Academy of Sciences, recently studied the distribution and abundance of breeding birds in forests subjected to varying degrees of urbanization in and around Torun, Poland. Study sites consisted of 1) urban forest (two squares and a cemetery within the city), 2) suburban forest (on the outskirts of the city), and 3) exurban forest. Birds were censused by a modified territorial mapping method between 1985 and 1990.

Similar to other research studies, the number of breeding species decreased with degree of urbanization and a calculated diversity index also was lower in the city. Forty-five species were recorded outside the city, 37 in the suburban forest, and 28 in the highly manicured urban sites. However, unlike many other studies, bird density was lower in Torun than in the surrounding forest. This was attributed to the low proportion of shrub-nesting birds in the city.

Species composition of the bird community differed for urban and exurban sites. Insectivores decreased from 173.4 pairs per 10 ha outside the city to 22.2 pairs per 10 ha in the city and omnivores increased from 0.6 pairs per 10 ha outside the city to 38.2 pairs per 10 ha within. Shrub-nesters also were heavily impacted by urbanization; density outside the city was 65.5 pairs per 10 ha but within the city, only 1.8 pairs per 10 ha. Birds found almost exclusively in the surrounding forest included the Wood Warbler, Robin, and Wren. Some birds were recorded in all habitats. Included here were the Chaffinch, Spotted Flycatcher, Great Tit, and Blue Tit. Four species, the Song Thrush, Blackbird, Chiffchaff, and Blackcap, were found in higher densities in the suburban forest than in either the city or surrounding forest. Zalewski postulates that these birds seem to have begun to colonize towns. Finally, four species, the House Sparrow, Magpie, Collared Dove, and Greenfinch, were found only in the city.

Zalewski concludes that "The results of this study showed that in urban land management and planning

the suburban forests should be saved and protected since they create 'ecological corridors' which enable the birds to colonize the urban habitats and maintain their populations there. 'Ecological corridors' of woody vegetation connecting the suburban forests with the patches of green areas in town should be planned and created."

Reference: *Landscape and Urban Planning* 29:31-41, 1994.

Park Birds in Madrid, Spain

Winter birds were studied in El Retiro Park, a large (200 ha) old-wooded park in Madrid, Spain, by Guillermo Blanco and Thomas Velasco of the University de Alcala de Henares, Madrid. Bird censuses were conducted by point count 15 November - 15 February, 1990-1991.

Thirty-two species of birds were recorded in the park, but 74% of all birds observed were House Sparrow, Pigeon, Blackbird, and Spotless Starling. Other abundant species included Magpie, Robin, Stock Dove, and Blue Tit. Compared to exurban forested habitat in Spain, El Retiro Park birds exhibited high density and low diversity. Habitat generalists tended to do well; specialists did not.

Habitat structure was important in defining bird distribution and diversity. Exhibiting positive influence were number (and species) of deciduous trees, conifers, tree height, and amount of shrubs and herbaceous plants. Negative factors included asphalt, lawn, bare soil, and number of people. These factors accounted for slightly more than 77% of the variation in bird distribution noted in the park. Birds associated with lawn included the Pigeon and White Wagtail. Those associated with mature forest in the park included the Great Tit, Blue Tit, Chaffinch, Blackcap, Blackbird, and Firecrest. Birds associated with intermediate habitat structure included the Chiffchaff, Serin, and Short-toed Treecreeper.

Reference: *Folia Zoologica* 45(1):35-42, 1996.

Urban Open Space Planning and Design

An earlier issue of *The Urban Open Space Manager* (Vol. 2, No. 1, 1997) discussed some work going on in Portland, Oregon with regard to ecological landscape planning and resource conservation. Three other examples are presented below.

Fort Collins, Colorado

The Natural Resources Division of the city of Fort Collins prepared a draft wildlife habitat management plan for the city in 1987 (*Wildlife Habitat Management Plan for the City of Fort Collins*, Nat. Resour. Div., Fort Collins, Colo.). It was designed to give policy makers appropriate tools for making informed decisions concerning the future of wildlife habitat areas within Fort Collins. Land cover types were mapped in the city and in a designated surrounding "Urban Growth Area," and criteria were developed to rate each cover type area with regard to wildlife habitat value.

The wildlife habitat management plan evolved into an expanded "Natural Areas Policy Plan" that was adopted by the city council in 1992 (*City of Fort Collins Natural Areas Policy Plan*, Nat. Resour. Div., Fort Collins, Colo.). The basic purpose of the adopted plan is to identify and evaluate important natural areas and plan for their future protection and management for the benefit of city residents as well as the wildlife resource. Important factors in identifying natural areas include: wildlife habitat quality, presence of significant geologic or archaeological sites, or presence of rare native plant or animal species or communities. Designated natural areas include wetlands, waterways, lakes and ponds, grasslands, shrublands, and forests. About 16% of the Urban Growth Area was mapped as natural areas in 1990, totaling 3,311 ha. Some 965 ha of this total were in public ownership, including 500 ha maintained as city open space and parks. The remaining 2,346 ha were privately owned. A real challenge will be how to acquire or otherwise maintain the value of these natural areas in the face of increasing development.

King County, Washington

In 1993, the King County Council adopted a "wildlife habitat network" scheme in the East Sammamish Community Planning Area. In order to minimize impact of development on wildlife, the plan will attempt to maintain habitat corridors on private land through development restrictions rather than through land purchases. The habitat network also is viewed as part of a system of open space in the East Sammamish community that will have human benefit.

In an effort to influence where future development will occur, habitats were ranked using a value system

based on combined land cover and ownership analysis. Areas with streams or wetlands ranked higher than areas lacking such waters, and undeveloped tracts ranked higher than developed ones. Also, large intact tracts ranked above subdivided parcels retaining single ownership. Lowest ranking was assigned tracts subdivided into many small lots with multiple ownership. Planning tools envisioned to implement the network include buffer requirements, density controls, required setbacks, and clustering (Dr. Kate Stenberg, King County Environ. Div., Personal comm.).

Montgomery County, Maryland

In the mid-1980s, Dr. John Hench was instrumental in establishing a natural resources planning and management program in Montgomery County, Maryland. His aim was to better protect and manage natural resources in the county by elevating ecological concepts and principles within the local government (see paper published in *Integrating Man and Nature in the Metropolitan Environment*, Natl. Inst. for Urban Wildl., Columbia, Md.). Among other things, Dr. Hench is working to link important habitat areas in the county by corridors.

Parklands total some 11,340 ha in Montgomery County. A natural resources concept plan is now integrated into the master planning process, along with the traditional recreation concept plan. Information on geology, soils, slope, aspect, drainage, flora, and fauna are used to delineate natural, conservation, and active-use areas. Trade-offs in natural resource and recreation values are discussed and negotiated. According to Hench, natural areas and conservation areas enhance active-use areas by contributing to the character of the latter, by serving as outdoor classrooms for nature study and outdoor laboratories for scientific research, and by providing the tranquil environment that many park users seek. Carefully designed trails--for walking, jogging, and horseback riding--can penetrate the nature-conservation areas. Observation platforms, study blinds, wildlife food and cover plots, and feeding stations can facilitate a safe and enjoyable interaction between people and wildlife. In turn, active-use areas can positively impact nature-conservation areas by providing a broad constituency of park users who can be called upon to support the department politically when alternative land-use proposals threaten a park's integrity.

Management Approaches

In the United States, more thought and effort have gone toward creating urban open spaces than toward managing these areas. Most sites are still highly manicured, with little consideration given to wildlife in management decisions. But attitudes and practices are slowly changing. One measure of such change is the fact that county and city departments of recreation and parks increasingly are hiring open space personnel with ecological training.

Landscape architect Edmund Hilliard proposed a hypothetical framework for considering wildlife in the management of urban open space. His approach was based on the assumption that space will be a critical limiting factor in the urban environment. Thus, the home range size of animals can be used to help determine species that can be accommodated. Also to be considered is the fact that animals of interest need access to habitat. Species with broad habitat tolerances, high mobility, or small home ranges will be easier to accommodate than species with narrow tolerances, low mobility, or large home ranges. Managers also need a knowledge of the desirable form and structure of vegetation and plant species composition. With this information, a given sized open space area can be managed for species of interest.

Reference: *Wildlife Conservation in Metropolitan Environments*, Natl. Inst. for Urban Wildl., Columbia, Md., 1991.

Managing Urban Natural Areas in South Africa

Geoff Nicols, conservation officer for the Durban City Council, South Africa, offers some practical advice for managing urban natural areas in a paper published in the proceedings of the International Metropolitan Open Space Systems Conference in 1994. He places emphasis on the following.

Plants

Invasive exotic species should be controlled. Early on

a decision must be made as to what plant community is desired. If invasive species are under control and if the planting budget is tight, nature most likely will replant the area satisfactorily if there are appropriate corridor links to other areas allowing seed dispersal. A wild, natural image of the area should be introduced gradually. Entrances to the area should be manicured.

Pollution

The area manager should act as a watchdog and report any law or regulation violations noted. Such deeds should be publicized through the local press and to the local environmental activists community. Natural areas are not "waste" areas, yet this is often the perception of a portion of the public. Some folks, therefore, think it is appropriate to dump their trash in these areas. There is need for continued education and sometimes offenders can be identified from the trash left behind. It is necessary to keep a natural area rubbish and litter free. The cleaner the area is kept, the fewer problems one will have with dumping. In high use areas, like picnic grounds, it is necessary to provide trash cans and to empty them daily.

People

One working for a public agency is obligated to meet the needs of people. Working with the local community will probably be the most challenging part of the area manager's responsibilities. "People have needs; accept those needs and try to serve them...if you are working as a municipal official, you are being paid by those people to manage the resource for them. It is your duty as a manager to work with and within the local community to understand and channel your energies in such a way as to give that community what they require not what you think they need."

Participation

Get the public involved with the area. Conduct environmental education programs and give teachers the resources they need in this regard.

Politics

Local political support is necessary to maintain funding for a natural areas program. Field trips for officials can help to communicate what you are doing and its importance to the community. Also, go outside to the local community for support. For specific projects, target potential sponsors and contact them with a well prepared plan of action. For corporate sponsorship, advertizing spin-offs is often helpful.

Reference: *MOSS (Metropolitan Open Space Systems) International Conference Proceedings*, the Wildlife Society of Southern Africa, 100 Brand Rd., Durban 4001, South Africa, 1994.

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