Second Nature

Improving Transportation Without Putting Nature Second

Patricia A. White and Michelle Ernst

surface transportation
policy project

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FOREWORD

Transportation agencies have come a long way toward addressing environmental issues. In my 25 years with the Florida Department of Transportation, I witnessed a paradigm shift from reluctance to acceptance and finally, active stewardship.

Research continues to help transportation agencies better understand the environmental impacts of transportation networks. The relationship of transportation corridors to land use is becoming more evident. Now that we have a better understanding of the potential consequences of transportation activities, we examine them in greater detail throughout the planning, design and construction process.

With better scientific understanding of the impacts on the environment of transportation and related development, there is an increasing urgency to get the answers right when planning and developing transportation facilities. This is a "quality of life" issue because the very resources that support life, air, water and the land are at risk. Not only is it a quality of life issue for the human species, but also for all of the other species with which we share this planet.

For new transportation facilities, the responsibility to avoid environmental impacts has never been greater because of diminishing natural resources. For existing roadways, we can use our newfound knowledge to not only improve the facility, but also to improve the environment. With the right information, tools, policies and spirit, we have a chance to build a "second" nature, where the first has been adversely impacted. This will only happen if all of the interests involved in transportation planning and development work together toward this common goal.

Cooperation and education are essential for better decision making. *Second Nature: Improving Transportation Without Putting Nature Second* is a collaborative effort between two organizations; one transportation and one conservation. The authors have identified conflicts and provided solutions that advance and even improve both transportation and conservation. Hopefully, this information will inspire readers to develop a more environmentally sound transportation system.

Gary Evink
Florida DOT Ecologist (retired)

EXECUTIVE SUMMARY

The United States is approaching a crossroads — unimpeded urbanization may soon collide with the limits of our country's natural resources. The rate of this urbanization surpasses population growth, and threatens to overwhelm previous victories in environmental protection. Biological diversity — the rich variety of natural species that forms our natural life support system — is in jeopardy. The most significant threat to America's biodiversity is habitat loss, and one of the greatest consumers of habitat is poorly planned, sprawling development.

Over the next few decades, America can avert this collision between growth and biodiversity. Because transportation infrastructure necessarily precedes development, current transportation planning will shape future urban growth. State transportation agencies and planners can steer investment *toward* greater mobility for better communities and *away* from impacting our remaining natural areas.

Some state and local agencies are virtual laboratories for progress; going above and beyond regulatory requirements and paving the way for others to follow. Federal policy can either help or hinder this leadership. Reauthorization of the Transportation Equity Act for the 21st Century (TEA-21) provides a great opportunity for Congress to enable and encourage stewardship and innovation at the state and local levels.

Mobility does not have to come at the expense of biodiversity. *Second Nature: Improving Transportation Without Putting Nature Second* profiles innovative programs that seek to improve transportation infrastructure while protecting biodiversity. Because this concept is relatively new, many of the case studies are still in the early stages. While outcomes are uncertain, each of the programs exemplifies the creative cooperation necessary to affect change. With support, these innovative practices can become "second nature" to transportation and resource professionals across the nation.

IMPACTS

Because both mobility and biodiversity are national priorities, it is necessary to understand how they interact. Until recently, our understanding of how nature degrades roads far outweighed our understanding of how roads degrade nature. For example, road salt protects drivers from ice, but damages waterways. Similarly, fencing controls access to highways, with little regard for the effect that such barriers have on wildlife.

Road ecology, a new field of study, seeks to explain the complex relationship between roads and the natural environment. A road's environmental footprint extends far beyond the edge of its pavement. In fact, nationwide

PATRICIA WHITE, DEFENDERS OF WILDLIFE

the "road-effect zone" is estimated to be 15 to 20 times as large as the actual paved right of way.

Transportation infrastructure has significant direct and indirect effects on the natural environment. Roads directly affect wildlife habitat, ecosystems, and water quality through land consumption, roadkill, habitat fragmentation, and replacement of natural cover with impervious surfaces and invasive species. Poorly planned roads and highways open up vast areas of wilderness and farmland to sprawling residential and commercial development.

INTEGRATED PLANNING

State and federal agencies spend considerable time and capital both protecting natural areas and building transportation infrastructure. Unfortunately, conservation and growth efforts often happen independently and then come into conflict during the permitting and construction phases of a transportation project. But, if conservation efforts are taken into account at the earliest stages of transportation planning, both priorities can be realized, in less time and at less cost.

Florida's Efficient Transportation Decision Making Process (ETDM) overlays maps of strategic habitats with transportation plans, identifying potential environmental concerns at the earliest stage of planning. In Arizona, local officials are using the Sonoran Desert Conservation Plan to "broaden the vocabulary of the growth debate to include biological and scientific concepts, and reframe the elements of regional planning to encompass the relation that the land has to natural and cultural resources." Across the U.S., states are developing comprehensive wildlife conservation plans under the Department of Interior's State Wildlife Grants Program. In addition, Heritage Programs and The Nature Conservancy identify and map areas that need to be protected to ensure the survival of each ecoregion's biological diversity.

CONSERVATION BANKING

Transportation projects are required to compensate for adverse environmental impacts in a process known as mitigation. Traditional compensatory mitigation is conducted on-site, on a project-by-project basis. Because such small-scale mitigation is expensive and rarely ecologically sound, mitigation banking is often used

to compensate for wetland loss. Large, contiguous wetlands are created or restored to earn advance mitigation credits for future impacts elsewhere.

Although wetland mitigation banking has been heavily criticized, the practice is now being applied to other ecosystems. Much like wetland banking, conservation banking proactively preserves large tracts of habitat to offset the adverse impacts of future development projects. For a variety of reasons, banking may be a more appropriate tool for non-wetland habitat conservation. Through a combination of comprehensive large-scale planning and a coordinated mitigation strategy, states and communities can reduce the conflict between development and conservation aims.

In a handful of states, transportation agencies are developing conservation banks to more effectively mitigate impacts, while also controlling costs and improving project delivery. Colorado Department of Transportation is protecting shortgrass prairie and North Carolina DOT has banked habitat for the endangered red-cockaded woodpecker. And in California, where some state laws are stricter than federal, conservation banking is widely used to compensate for the impacts of road projects.

INTERAGENCY COORDINATION

Lack of coordination among federal, state and local agencies can delay transportation projects and cause unnecessary loss of wildlife habitat. Early involvement allows natural resource agencies to identify potential conflicts and helps planners develop projects with minimal environmental impact.

In response to guidelines set forth in TEA-21, several state transportation agencies initiated formal or informal partnerships with resource agencies. Oregon's Collaborative Environmental and Transportation Agreement for Streamlining (CETAS) program establishes a working relationship between ODOT and ten state and federal transportation, natural resource, cultural resource, and land-use planning agencies. California's Tri-Agency Partnership Agreement was born out of the recognition that transportation projects, especially those that promote environmental objectives, need to be delivered in a timely fashion, and that improved collaboration among the three agencies is central to achieving that goal.

WILDLIFE CROSSINGS

Because roads are such prominent — and permanent — parts of the landscape, expanded methods are needed to reduce their effects on surrounding ecosystems and make them more permeable for wildlife on the move. Solutions range from reducing speed limits and adding cautionary signage to building passages. Wildlife crossings are not a panacea, but they can go a long way toward reconnecting fragmented habitat.

Several European countries and Canada have built wildlife passages to reestablish habitat connectivity across existing roadways. In

PATRICIA WHITE, DEFENDERS OF WILDLIFE

the U.S., Florida is leading the way with wildlife passages throughout the state for species such as the endangered Florida panther and the Florida black bear. Currently, Montana DOT is incorporating 42 wildlife passages, from small fish culverts to an open-span overpass, in the reconstruction of US 93.

PUBLIC LANDS

Federal lands, including national parks, forests, wildlife refuges and monuments constitute one quarter of the United States and provide habitat for nearly two-thirds of all threatened or endangered species. Publicly owned lands are critical for biodiversity conservation, but also support local economies through travel and tourism.

Federal Lands Highway Program (FLHP) maintains 90,000 miles of roads on public lands. Because FLHP has been largely devoted to building roads instead of providing access and mobility, vehicle overcrowding, traffic and air pollution continue to degrade the visitor experience and drive away wildlife.

To maintain both mobility and biodiversity, roads on public lands must be maintained in a manner consistent with surrounding resources and visitors must be given environmentally sensible transportation options. Some national parks now provide visitor friendly and environmentally sensible transportation options such as shuttle buses, ferries and bicycle and pedestrian trails. The Santa Ana National Wildlife Refuge in Texas utilizes a public-private partnership to provide wildlife-friendly transportation in the refuge and revenue to the local economy.

NATIVE VEGETATION

After loss of habitat, invasive species represent the greatest cause of species endangerment and decline in the U.S. Invasive species are responsible for at least $137 billion a year in economic losses. Nearly 50 percent of species on the endangered or threatened species lists are at risk because of non-native species.

Because they disturb natural habitats, transportation systems facilitate the spread of plant and animal species outside their natural range. With 12 million acres of land contained within public rights-of-way, transportation agencies are also land managers on a grand scale. Too often, the objective of roadside vegetation management has been to establish an inexpensive, attractive and fast-growing slope stabilizer. Where native flora was too costly, grew too

slowly, or was deemed unattractive, non-native species were often planted.

Given the widespread threat of invasive species, resource managers and transportation agencies have a responsibility to first stop adding to the problem. Second, they must attempt to repair the damage that has already been done. Finally, where possible, roadsides should be enhanced to restore the ecological value they once had. Public rights-of-way must be managed as a valuable resource with the most positive impact on the environment and the economy.

Many states have made great strides in native roadside vegetation management. Through Iowa's Living Roadway Program, roadside vegetation is maintained so that roadways are safe, visually interesting, ecologically integrated and useful for many purposes.

RECOMMENDATIONS

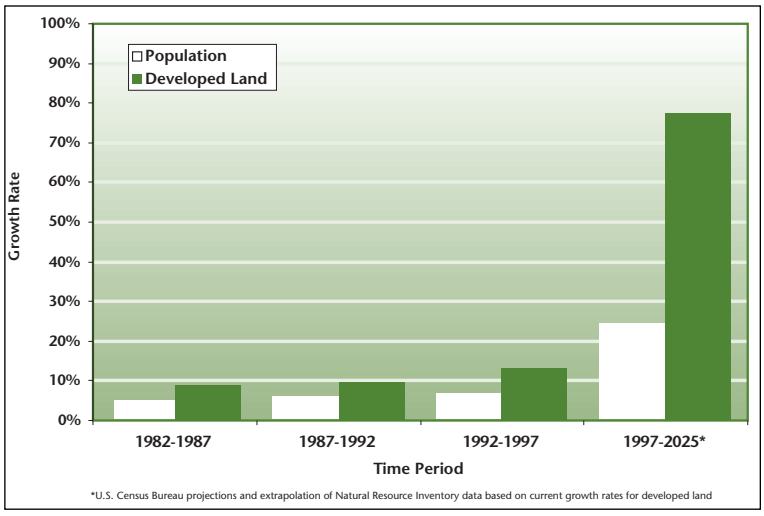
1. Integrate conservation planning into transportation planning.
2. Use conservation banking in concert with large-scale conservation plans to mitigate unavoidable impacts of transportation.
3. Coordinate with resource agencies early, substantively and continuously throughout transportation planning and project development.
4. Build wildlife crossings where necessary to repair ecological damage and restore habitat connectivity.
5. Provide alternative transportation and maintain roads on public lands in a manner consistent with surrounding natural resources.
6. Use only native species in roadside vegetation management.

1 INTRODUCTION

The U.S. is outgrowing the American dream. Between 1950 and 1990, urban land area increased more than twice as fast as population. Development sprawls into rural and natural areas, consuming over two million acres of farmland, open space and wildlife habitat per year. While largely influenced by demographic and socio-economic factors, public policies on transportation and land use have played an important role in shaping development patterns. If the rate of development continues at its current pace and follows today's sprawling model, the amount of land developed in the next 25 years will equal the total amount developed since the country's founding.[1]

As of January 2003, more than 1,300 species of plants and animals had been listed as threatened or endangered by the federal government. The continued existence of many of these species, and of many others that are not on the list, will depend on the availability of quality habitat. Unfortunately, that habitat is being rapidly lost to sprawling development largely ushered in by transportation policies that are focused on building roads without sufficient efforts to minimize environmental impacts. Even species not threatened by the loss of habitat may be vulnerable to another ill brought on by transportation projects — the introduction of foreign species, which can harm native species through displacement or predation. Together, the loss, degradation or fragmentation of habitat and the spread of invasive species are the greatest threats to biodiversity.[2] These dual forces are responsible for what conservation biologists now predict will be the "sixth great extinction" — the loss of a third of the world's plant and animal species within the next 50 years.[3]

Road and highway construction is one of the chief culprits responsible for the loss of biodiversity. Roads harm the natural environment in many ways: they pollute streams and wetlands, they cause roadkill, and they promote land development that consumes natural habitat. The emergence of a new field of study, road ecology, underscores the importance of trans-



COALITION FOR SONORAN DESERT PROTECTION

portation's impact on biodiversity. Road ecology "uses the science of ecology and landscape ecology to explore, understand, and address the interactions of roads and vehicles with their surrounding environment."[4]

Transportation agencies have long-recognized the impact that their projects have on biodiversity. Since the early 1970's agencies have been assessing the environmental impacts of federally-funded projects through Environmental Impact Statements required under the National Environmental Policy Act (NEPA). But recently, some agencies have sought better approaches to addressing environmental impacts and thereby improving transportation project delivery.

This report showcases innovative programs and partnerships pioneered by state and local agencies across the nation to more effectively coordinate transportation, land use, and resource planning and investments. These case studies demonstrate how transportation agencies can both improve project delivery and better protect environmental and cultural resources. These goals can be achieved by planning early in the process for biodiversity conservation, by integrating environmental knowledge into transportation plans, and through better coordination among agencies. This report will examine some innovative programs that already incorporate these ideas, and that may serve as models for the rest of the nation. But first, it will examine how roads and highways and the development they facilitate threaten the country's natural heritage.

1. National Resources Inventory. Natural Resources Conservation Service. U.S. Department of Agriculture, Washington, DC. 2001.
2. G. Ohland and H. Dittmar. Biodiversity and Smart Growth: Sprawl Threatens Our Natural Heritage. Funders' Network for Smart Growth and Livable Communities. Translation Paper Number 10, October 2002.
3. Center for Biodiversity and Conservation, American Museum of Natural History. Humans and Other Catastrophes: Perspectives on Extinction. A summary of the April 1997 symposium of the same name.
4. Richard T. T. Forman, Daniel Sperling, et al. Road Ecology: Science and Solutions. (Washington, DC: Island Press, 2003) xiv.

2 IMPACTS

After more than 100 years of road and highway building, the United States is now criss-crossed by nearly four million miles of roadways.[1] That translates to nearly 19,000 square miles of asphalt, an area greater than the states of New Hampshire and Vermont combined, greater even than the country of Switzerland.[2] Add in all the parking lots, private roads, driveways and road shoulders, and the total amount of paved land comes to approximately one percent of the total area of the contiguous United States.[3]

The construction of roads and highways opens up vast areas of wilderness and farmland to residential and commercial development. The sprawl that occurred after World War II continues to spread, particularly in the South and West. Data from the U.S. Census shows that from 1990 to 2000, the population of central cities within metropolitan areas grew by eight percent. But during that same period, the population of the suburbs and exurbs (the most far-flung suburban developments) of those areas skyrocketed by nearly 18 percent.[4]

Roads and highways and the development they foster have severe impacts on habitat, wildlife and plants. These include roadkill; habitat loss, degradation and fragmentation; air, water, soil, and noise pollution; and invasive species. As noted in the recently published book by Richard Forman, Daniel Sperling and other notable authors, *Road Ecology: Science and Solutions,* "The end result of a highly connected road system is a decrease in both the number and the abundance of the species that once inhabited the landscape."[5]

Roadkill

A four-million-mile network of roads and highways has led to unprecedented mobility for Americans. But that network also shatters natural habitat into many fragments, forcing animals to venture across the pavement in search of food, shelter or a mate. The result is an efficient death-trap for wildlife.[6]

Every day, one million vertebrates are killed on America's roadways, according to the Humane Society of the United States and the

USDA

Urban Wildlife Research Center.[7] This is an astonishing figure, but less so perhaps when one considers the sheer numbers of dead deer, squirrels, raccoons, and opossum passed by on the daily commute. Indeed, Americans kill more wildlife through collisions with vehicles than in any other way. In some locations, for particular species, the roadkill rate may exceed natural causes of death due to disease and predation.[8]

For some species, collisions with vehicles threaten their very existence. The state of Florida, which is largely characterized by low-density, auto-oriented development, has become well-known for conflicts between wildlife and vehicles. In that state, the remaining populations of endangered or threatened species and subspecies such as the Florida black bear, the Key deer, and the Florida panther, are seriously jeopardized by collisions with vehicles. Roadkills of the Florida black bear have grown 29-fold, from just two or three during the 1970s to 90 in 1998. Roadkill is the leading known cause of death for the endangered Key deer. From 1970 to 1992, more than 1,000 Key

WHAT'S NATURE LIKE NEAR A BUSY HIGHWAY?

Consider taking a leisurely stroll or nature walk in the edge of woods by a busy two-lane highway. The sense of leisure quickly evaporates in the face of traffic noise. Speeding vehicles evoke a sense of danger. You may be confronted underfoot with society's refuse. Busy roads and a bucolic outdoors seem incompatible.

So you move back into the wooded edge to look more closely. Many of the native forest birds seem to be missing – even for quite a distance into the forest; apparently it is too noisy. Indeed, few other forest vertebrates – mammals, frogs, turtles, snakes – are seen; it must be a road-avoidance zone for them, too. If you had ventured to walk along the roadside, you might have seen road-killed animals, though carcasses disappear quickly where road-kill scavengers hunt. The combination of road-avoidance zone and road-kill strip makes you realize what a barrier the busy highway is, dividing large natural populations into small ones that may be prone to local extinction. Also, wildlife movement corridors that connect distant patches across the landscape may be severed. You wonder whether this is an inadvertent collective assault on biodiversity.

Unlike the adjoining forest interior, the forest edge seems to be full of generalist "weedy" plants, some of them non-native exotics, all persisting next to the open environment of a frequently mowed roadside. The roadside vegetation growing on earth that was homogenized and smoothed during road construction seems monotonous, largely devoid of its natural heterogeneity and richness. A few grasses, plus some non-native plants, tend to dominate at the expense of a diversity of native wildflowers. Open straight roadside ditches carry warmed water, alternating with pulses of rainwater, into a narrow, wooded stream that lost its valuable curves during road construction. A specific set of invisible chemicals has reached the roadside and perhaps the forest – nitrogen oxides, hydrocarbons, herbicides, roadsalt, and heavy metals such as zinc and cadmiums are typical. Entering the streams, wetlands, and groundwater around you, they inhabit all kinds of natural processes and are toxic to some of the species.

What is it like next to a busy road? No place for a neighborhood walk. Or a path in a park. Or even a nature reserve. Here nature is both severed and impoverished. Road ecology is needed.

Republished from Richard T. T. Forman, Daniel Sperling, et al. *Road Ecology: Science and Solutions.* (Washington, DC: Island Press, 2003) 4.

deer were killed in collisions with vehicles, averaging 45 killed per year; since 1992 the number of individuals killed by cars each year has remained well above 30. The endangered Florida panther is also threatened by conflicts with vehicles. Only about 80 Florida panthers remain in the wild today, and as many as seven are killed each year by cars. In the spring of 2001, seven panthers were killed in just three months, breaking the previous record. Scientists fear that the population will be unable to sustain itself, given this mortality rate.[9]

Other threatened and endangered species throughout the rest of the country that are particularly at risk because of wildlife-vehicle collisions include the ocelot, the Canada lynx, the grizzly bear, desert tortoise, the San Joaquin kit fox, and the Houston toad.[10]

People are also victims. Collisions between larger wildlife species and vehicles often result in vehicle damage and injury or death to their human occupants. A study of accidents in Vermont between 1981 and 1991 found property damage in 94 percent of collisions between vehicles and deer. Nationwide, in 2001 vehicle-wildlife collisions were responsible for an estimated 29,000 human injuries and 177 human fatalities.[11]

Habitat Loss

Habitat loss is the most significant threat to endangered species, 85 percent of which are imperiled in this way.[12] A 1976 study by the Council on Environmental Quality reported that up to 48 acres of habitat is lost with the construction of one mile of Interstate highway.[13]

For many species, the very presence of a roadway can represent an impassable barrier, either psychologically or physically. For these species, roadways fragment existing habitat and isolate populations into smaller groups. This can be devastating to wide-ranging animals that need large areas of contiguous habitat to survive. Young animals may be so confined by habitat fragmentation that they are unable to establish their own territories. A host of related issues can arise, including genetic problems from inbreeding, which can result in weak or sterile offspring.[14] Research in Germany on how road barriers affected small local populations of the common frog found significant alterations in their genetic structure, including lower genetic variability among individuals.[15] Animal populations that are isolated are also more vulnerable to natural catastrophes such as flooding or drought because they are unable to move to other areas. Habitat fragmentation may also make it impossible for species to adapt to climate change, making

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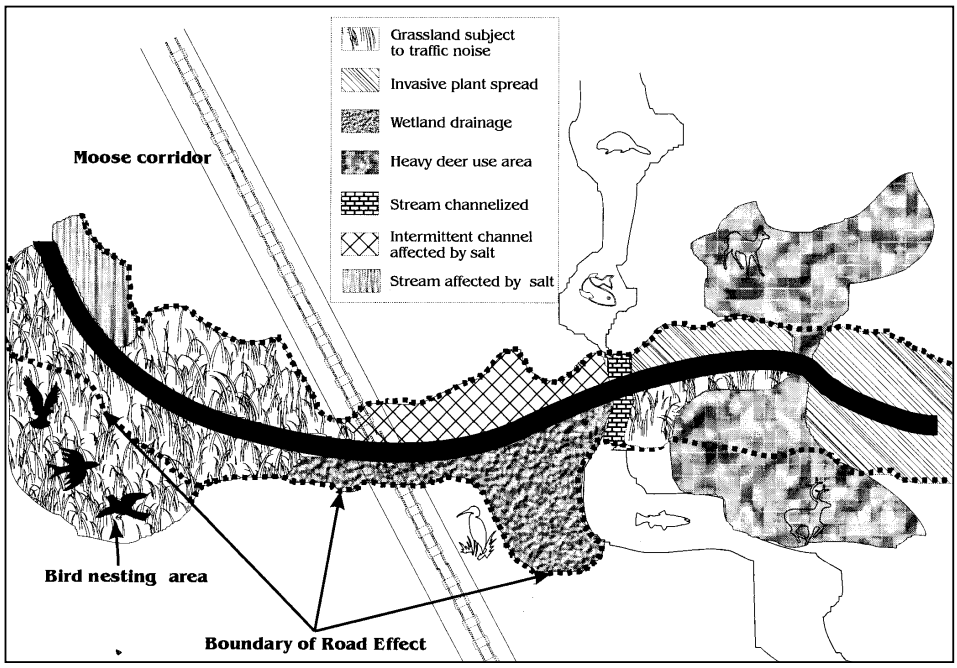

The road-effect zone *

extinction much more likely.[16]

Even large, adult animals such as bobcats, wolves, and grizzly bears, have been found to avoid roads, so that while the roads may not present a physical barrier to movement, they still restrict movement and therefore fragment habitat.[17] Elk in western Montana have been found to avoid areas within one-quarter to one-half mile of roads, depending on the type of road and the amount of traffic it supports. A study of grizzly bears in British Columbia found that the bears would avoid areas within one-half mile of roads. Experts in the ecological impacts of roads have stated that the "impact of road avoidance must well exceed the impact of either roadkills or [direct] habitat loss in road corridors."[18]

The effect of habitat fragmentation is devastating to populations of wide-ranging animals. In addition to direct loss and fragmentation, much additional habitat is degraded by such factors as noise, air and water pollution, and by the creation of new microclimates that border roadways. Such microclimates often have more sunshine and wind, lower humidity and different patterns of rainfall, snowfall and snowmelt than adjacent areas.[19] These edge habitats are often unsuitable for native species, but attractive to invasive, non-native species.[20]

Though the extent of habitat degradation varies depending on the type of roadway and its subsequent use, the effect can be felt as much as 3,000 feet beyond the edge of the pavement. Scientists estimate that this road-effect zone currently impacts as much as 15 to 20 percent of the land surface of the U.S.[21] These individual factors are discussed below.

Pollution

Roads, highways, and the development they facilitate cause air, soil, water and noise pollution. One study of 23 important pollutants found along roads determined that 83 percent came from vehicles.[22] Driving is one of the

largest contributors to air pollution — motor vehicles are responsible for more than two-thirds of the carbon monoxide in the atmosphere, a third of the nitrogen oxides (which react to form ozone or smog and also form acid rain), and a quarter of the hydrocarbons (which also contribute to ozone).

Almost every plant type — conifers, broad-leafed trees, shrubs, herbs, and grasses — includes one or more species that are especially susceptible to ozone. For all types of vegetation, ozone interferes to some extent with the production and storage of starches, reducing growth rates and weakening plants. This makes plants more vulnerable to disease, insect attacks, and other environmental stresses.[23]

Cars and trucks also emit pollutants that form acid rain. Acid rain is a serious problem for aquatic ecosystems and has wide-ranging effects on the many species that depend on them, including insects, amphibians, fish, birds, and mammals. Spikes in acidity caused by spring snowmelt in New England have killed brook and rainbow trout, as well as Atlantic salmon. Amphibians are particularly susceptible to acid rain, which reduces their reproductive success. While acidification does not typically harm mammals and birds directly, it may harm them indirectly by reducing their food supply. In fact, acid rain has been linked to declines in songbirds such as the wood thrush because it reduces the supply of the calcium-rich foods the birds depend on.[24]

Motor vehicles also emit a variety of heavy metals: motor oil and tires contain zinc and cadmium; gasoline contains nickel; and diesel fuel contains lead. These heavy metals have been found in greater concentrations closer to roads and in areas with higher traffic volumes. Research on earthworms has found concentrations of heavy metal high enough to kill earthworm-eating animals.[25] A study of little brown bats, short-tailed shrews, and meadow voles along the Baltimore-Washington Parkway found lead at or above levels known to cause death or reproductive impairment in domestic animals.[26]

Chemicals used in the maintenance of roadways also contaminate roadside ecosystems. While many state departments of transportation have begun to reduce the use of herbicides and other chemicals, the use of herbicides continues to damage roadside ecosystems.[27] Those chemicals may promote the invasion of weedy and exotic species, which are resistant to herbicides. Even more worrisome, herbicides can be transported from treated roadsides into aquatic environments. If large amounts of these herbicides find their way into lakes or streams, biological communities could be seriously jeopardized.[28]

A one-acre parking lot produces about 16 times as much runoff as a one-acre meadow.

According to the U.S. Environmental Protection Agency, approximately 10 million tons of rock salt were used on the nation's roads between the mid-1980s and the mid-1990s. That usage was found to have caused at

least 11 percent of the impaired stream miles reported nationally.[29] The most commonly used road salt is known to contaminate drinking water supplies, and to be toxic to many species of plants, fish, and other aquatic organisms.[30] Road salt used in the Rochester, New York area caused a ten-fold increase in the chloride concentration in Irondequoit Bay of Lake Ontario.[31] Finally, wildlife may be attracted to road salt as an easily accessible salt lick and may then end up as roadkill.[32]

Water Pollution

Roads, highways and parking lots are what hydrologists call impervious surfaces. Those impervious surfaces cause runoff to flow more quickly into open bodies of water, rather than allowing it to seep naturally into the ground to recharge aquifers. A one-acre parking lot produces about 16 times as much runoff as a one-acre meadow. Numerous studies have found that when impervious surfaces cover more than ten percent of a watershed, the rivers, creeks, and estuaries they surround become biologically degraded.[33]

Runoff flowing into streams, rivers, or creeks leads to erosion and sedimentation, thereby degrading aquatic habitat. As runoff flows over pavement, its temperature rises. Because warmer water has less dissolved oxygen, it can make the affected body of water unsuitable for certain plants, invertebrates, and fish.[34]

Runoff also carries with it numerous pollutants, including sediment, nutrients, trace metals, pesticides and petroleum hydrocarbons. The addition of nutrients can lead to algal blooms, which can diminish clarity and, when the algae decays, reduce dissolved oxygen levels below the threshold requirement of some fish and invertebrates. In many aquatic environments, excess nitrogen leads to algal growth. Nitrogen comes from many sources. But as much as 25 percent of the additional nitrogen that finds its way into coastal estuaries comes from atmospheric deposition, much of which originates from motor vehicles. (Cars and trucks are responsible for one-third of atmospheric nitrogen oxides.)[35]

Trace, or heavy metals from cars and trucks may also poison aquatic environments.[36] One study of heavy metals found that even though parking lots and major streets covered just six percent of the watershed, they contributed a quarter of the metals, and 64 percent of the petroleum hydrocarbons in the watershed.[37]

Noise Pollution

Noise pollution from roads and highways, initially during construction and later from heavy traffic, can degrade wildlife habitat and impair biodiversity. Most frequently, noise pollution leads wildlife to avoid roads, but it has also been shown to change reproductive behavior and other patterns of activity. Often, noise pollution causes an increase in the heart rate and in the production of stress hormones in animals. Birds and other wildlife that commu-

nicate by auditory signals are especially vulnerable to noise pollution. Territory establishment and defense may also be disrupted by noise from roadways.[38] Research on toads and tree frogs found that highway noise resulted in abnormal reproductive behavior in the vicinity of major roads.[39] The presence of songbirds has been shown to decline even at low noise levels, and sharply drops near roads.[40]

Invasive Species

Non-native or invasive species pose a significant threat to our nation's biological diversity, and are causing substantial economic burdens. Each year, approximately $137 billion nationwide is lost to the effects of invasive plants on agriculture, industry, recreation, and the environment. An estimated 4,600 acres of land are invaded daily by invasive plants.[41] Invasive species impact nearly half the species currently listed as threatened or endangered under the federal Endangered Species Act.[42]

Roads and highways can encourage the entry of invasive species in four ways: 1) road medians and corridors have often been planted with exotic plant species; 2) techniques used to maintain roadways may encourage the growth of invasive or exotic plant species; 3) roads may facilitate the spread of invasive plant and animal species; and 4) degradation of habitat caused by roadways may usher in exotic and invasive plants and animals.

Many state and local departments of transportation have landscaped roadsides with non-native plant species. Invasive woody plant species, in particular, have been planted along some roadsides to reduce erosion, control snow accumulation, reduce headlight glare, or enhance aesthetics.[43] Unfortunately, the planting of invasives may have unexpected negative consequences for wildlife habitat. Research of Massachusetts roadsides found that in half of the locations where non-native woody species were planted, the species had spread into the adjacent woods.[44] It was not until the 1987 Surface Transportation and Uniform Relocation Assistance Act (SUTRAA) that the federal government require states to plant native wildflower seeds or seedlings as part of landscaping projects undertaken on highway projects that receive federal assistance.[45]

Road or highway maintenance may also encourage the spread of invasive species. Roadside mowing tends to reduce the richness of plant species and favor exotic plants.[46] Mowers and other maintenance equipment that is not thoroughly washed may also inadvertently spread invasive species by carrying seeds from one site to another.[47] Fertilization or soil transfer in roadside management is also known to alter roadside vegetation significantly, typically in favor of invasive species.[48]

Invasive species may take advantage of roads and highways to spread to other areas. Research in New York State found that purple loosestrife, a common invasive species that crowds out native wetland vegetation, was able to spread via roadside ditches, culverts connecting opposite sides of a highway, and median strip vegetation.[49]

Finally, habitat degradation caused by roadway construction and on-going use may create favorable environments for invasive species. Indeed, many plant species thrive along roadsides, but most of these are weedy. Examples include rabbit brush in the Great Basin and creosote bush in the Mojave Desert. These species take advantage of increased light along cleared roadsides and runoff water channeled to road shoulders.[50] Invasive animals are also known to exploit degraded habitat. Perhaps the best

CLAIRE DOBERT, USFWS

known is the brown-headed cowbird, which has spread from the Great Basin to most of North America largely because of forest fragmentation. The cowbird, a brood parasite, lays its eggs in the nests of other bird species, thereby forcing the host birds to adopt the baby cowbirds, usually resulting in the death of their own offspring. Native forest birds show serious declines in areas where cowbirds have invaded.[51]

Sprawl

Roads and highways indirectly impact wildlife by facilitating residential and commercial development. While transportation planners may shy away from taking responsibility for land development, there can be no doubt that in many cases new roadways have ushered in building booms along their corridors. A recent study of sprawl in Maryland found that 93 percent of developed properties within five miles of a major Interstate highway (I-270) were built after the adjacent section of the highway was built; further, the study found that highway corridors were much more developed than more distant areas.[52]

Highway-related development tends to be auto-oriented and low-density. This type of development is particularly destructive to habitat because its footprint tends to be large and because it precipitates further road development. Recent data provides evidence of this trend: from 1992 to 1997, the rate of development doubled compared to the previous ten years.[53] If the rate of development continues at that pace, the amount of land developed in the next 25 years will equal the total amount developed since the country's founding.[54]

In the 45 years since President Dwight D. Eisenhower created the Interstate highway system, the number of miles driven by every man, woman and child, has grown two and a half times to nearly 10,000 miles per year.[55] While it may seem intuitive, recent research supports the claim that sprawling development leads to

increased driving. In one of the most comprehensive analyses of sprawl to date published by Smart Growth America, researchers found an indisputable relationship between sprawl and driving. The study found that for every one standard deviation decline in the Sprawl Index, there is a 2-mile increase in miles driven per person. In other words, the more sprawling a metro area is, the more driving there is. The results are even more compelling at the extremes of the scale. In the 10 most sprawling metro areas, residents drove an average of 27 miles per day. This compares to 21 miles per day in the 10 least sprawling metro areas.[56]

Because sprawl requires people to drive more to meet daily needs, such development results in increased emissions of pollutants that can degrade air and water quality and threaten biodiversity.[57] Further, sprawling development may kick off a vicious cycle of more driving leading to more traffic congestion, leading to pressure for more roads, leading to road construction, leading to more development. In the end, farmlands, forests, grasslands, and all other open space are paved over to make way for more roads.

PRESERVING NATURE THROUGH A SMART GROWTH APPROACH TO TRANSPORTATION

Sprawling development is one of the most serious threats to wildlife and biodiversity because it results in fragmentation, degradation and loss of natural habitat across the country. Smart growth is well-planned development that protects open space and farmland, revitalizes communities, keeps housing affordable and provides more transportation choices. Combined with smart conservation, smart growth can provide for both more development and more habitat protection by charting out where growth should and should not occur. The following are five transportation solutions to ameliorating sprawl's impacts on nature:

1. Integrate transportation planning and land use planning. Citizens, land use planners, natural resource managers and transportation agencies should work together toward common goals
2. Ensure that transportation planning is compatible with water quality goals. Sprawling growth and the associated increase in impervious surfaces contribute to rapid stormwater runoff and drought.
3. Encourage mass transit. Providing Americans with additional transportation options will reduce the need for additional roads, hence protecting more habitat for wildlife.
4. Encourage transit-oriented development. By concentrating development around public transit stations and stops, communities can support economic development, offer residents more convenient places to live, and keep development out of wildlife habitat.
5. Preserve roadway capacity by preserving open space. New and expanded roads often get immediately clogged with traffic because commercial and residential development along the roads creates local traffic. Limiting road access and using transportation funds for open space conservation adjacent to highways preserves the intended mobility and scenic views.

Don Chen, Executive Director
Smart Growth America

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3
INTEGRATED PLANNING

The most significant threat to America's biodiversity is habitat loss, and the greatest consumer of habitat is poorly planned, sprawling development. Low density, automobile-dependent development that spreads beyond the edges of existing communities and alongside highways devours and degrades the habitat that wildlife relies upon for its existence. The Natural Resources Inventory estimates that 2.2 million acres are lost to development each year.[1] In a recent study of listings under the Endangered Species Act, researchers found that urbanization endangers more listed species than any other cause.[2]

Roads and highways enable the mobility necessary for development, hence the transportation planning decisions that are made today will determine the location, direction and shape of the urbanization that happens tomorrow.

In order to stem the tide of sprawl, many local and state governments have undertaken land conservation efforts. State biodiversity plans, regional conservation plans, greenways and open space plans are becoming increasingly commonplace. "Smart growth" has become a priority in local governance. Between 1998 and 2002, voters in 39 states approved ballot initiatives that call for total expenditures of $23 billion to protect natural areas.[3]

These communities also want economic growth and improved road networks. Unfortunately, conservation and growth efforts often happen in isolation and can then confound one another. For example, transportation projects are often planned without detailed information on core conservation areas, sensitive resources or important habitat that might lie within the selected corridor. These conflicts do not come to light until the environmental review process, which then becomes more expensive and time-consuming as transportation and resource officials attempt to reconcile infrastructure and conservation activities.

If conservation efforts are taken into account at the earliest stages of transportation planning, both priorities can be realized, and at less expense of time and money.

STATE BIODIVERSITY PLANNING

Each state has jurisdiction over the wildlife that resides within its borders. However, when a species is officially listed as either threatened or endangered, it then becomes the responsibility of the federal government. To help avoid the listing of species, the federal government provides funding to states for conservation efforts.

In 2001, Congress created a new State Wildlife Grants Program that requires each

state to develop by 2005 a **Comprehensive Wildlife Conservation Plan (CWCP)**, which is intended to identify threats to wildlife and natural habitats and the measures that will be used to address these threats. The plans are expected to identify and map those habitats that are essential to the long-term conservation of a state's at-risk plant and animal species and natural communities. (See Appendix B for guidance on developing Comprehensive Wildlife Conservation Plans.)

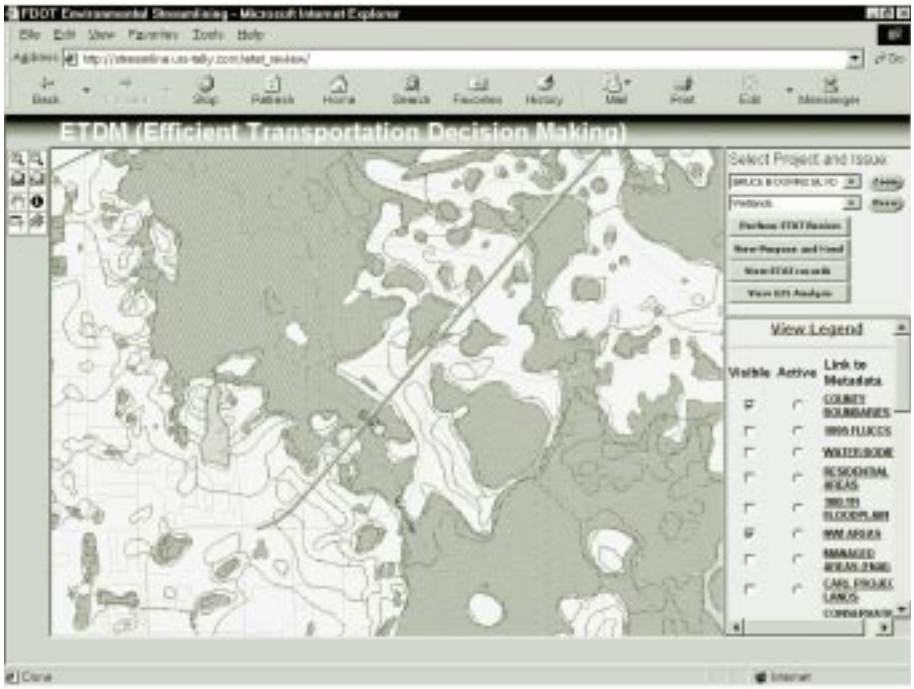
At present, few states have such general habitat conservation strategies, and those that do have little direct control over federally-funded road projects that might work against their conservation efforts. That problem could be addressed through early and informed coordination of federal expenditures on roadways with the Comprehensive Wildlife Conservation Plans. Utilization of the habitat mapping data included in those plans can serve as an effective early warning system to identify transportation projects that will have a major impact on wildlife. Planners can overlay conservation maps with anticipated transportation projects to discover potential conflicts before considerable resources are invested. Efforts to avoid sensitive areas are easier and less expensive during the planning phase than during permitting and construction.

FLORIDA'S PLANNING PROCESS

A decade ago, the state of Florida compiled a statewide plan which identified lands that must be conserved in order to sustain declining wildlife species and natural communities.

The report, *Closing the Gaps in Florida's Wildlife Habitat Conservation System*, assessed the status of species and habitat that encompass Florida's biodiversity. The project mapped two categories of strategic land: areas that were already under some form of conservation protection (20 percent of the state's area), and areas that needed additional protection (an additional 13 percent). *Closing the Gaps* was the first statewide conservation program of its kind, built upon a sophisticated process with a strong scientific approach. Notably, it included the assembly and analysis of numerous data sets and assessments of focal species and population viability. The project has played a key role in guiding land acquisition decisions. Since publication in 1994, the state has acquired 20 percent of the previously-unprotected strategic habitat areas.

Following the 1998 adoption of TEA-21, the Florida Department of Transportation (FDOT) began efforts to expedite projects without sacrificing environmental concerns. Building upon directives in TEA-21, FDOT teamed up with the Federal Highway Administration (FHWA) and other government agencies to develop a refined and improved methodology for making transportation decisions while complying with all federal and state environmental regulations. The result — **FDOT's Efficient Transportation Decision Making Process (ETDM)** — redefines how the state plans and builds transportation projects while protecting Florida's natural assets.



Each of the seven FDOT regions has an Environmental Technical Advisory Team (ETAT) composed of representatives from the relevant planning, consultation, and regulatory agencies. Proposed road projects are screened by the ETAT, based upon a checklist of criteria, including social and environmental impacts. Data from Geographic Information Systems (GIS) are used to perform evaluations, and are accessible to all agencies, as well as to the public through the Florida Geographic Data Library (FGDL).

One point of analysis is the compatibility of the proposed project with the state habitat plan. By overlaying maps of strategic habitats with FDOT's short- and long-range transportation plans, the ETAT can easily identify potential environmental concerns at the earliest stage of planning (see graphic). At that time, options for avoiding or minimizing environmental impacts are greatest and the costs of addressing conflicts are nominal.

As of early 2003, four other states had completed statewide biodiversity plans: Oregon, Maryland, Massachusetts and New Jersey. (See Appendix A for summaries.) However, those plans had not yet been incorporated into statewide transportation planning.

In 2002, the International Association of Fish and Wildlife Agencies (IAFWA) teamed up with the U.S. Fish and Wildlife Service, Defenders of Wildlife and several other organizations to develop flexible guidance for states to complete their Comprehensive Wildlife Conservation Plans.[4] Remaining states are expected to complete their plans by 2005, or risk losing eligibility for federal funding under the State Wildlife Grants Program.

While states are in the process of developing their conservation plans, transportation officials can look to other large-scale planning endeavors for information on ecologically valuable areas to be avoided. Due to development pressures and a need to address conservation issues, many localities have undertaken efforts to develop regional biodiversity plans.

SONORAN DESERT CONSERVATION PLAN

Pima County, Arizona, occupies six million acres of the Sonoran Desert; one of the largest stretches of protected arid ecosystems in the world. This unique and delicate ecosystem supports more than 2,500 pollinators, including invertebrates, birds, bats, and bees. The region also supports thousands of plant species in about 80 plant communities, such as ironwood-paloverde woodlands, saguaro cactus-mesquite scrublands, cottonwood and willow riparian forests, and California fan palm oases.[5] Pima County is also home to diverse cultures and interests, including the Tohono O'odham Native American Nation and an eclectic mix of urban and ranch communities that are growing at the rate of 20,000 residents per year. Residential growth in Pima County consumes seven to 10 square miles of the Sonoran Desert each year. This combination of unbridled development and sensitive environment set Pima County on a course for disaster.

In 1997, biologists found 12 Cactus ferruginous pygmy owls *(Glaucidium brasilianum cactorum)* in Pima County and soon thereafter, the owl was added to the endangered species list. Faced with a listing that would greatly affect development, Pima County could no longer ignore its growth problems. The county used the listing as an opportunity to establish a regional planning tool — the Sonoran Desert Conservation Plan (SDCP). The purpose of the current plan is "to ensure the long-term survival of plants, animals and biological communities that are indigenous to this county." The SDCP contains six areas of focus: Habitat, Corridors, Cultural, Mountain Parks, Ranch Lands, and Riparian. The Pima County Board of Supervisors is leading the SDCP effort in coordination with 12 major government land managers and a 74-person public steering committee that includes conservationists, developers, neighborhood groups, ranchers, and private landowners.

"We broadened the vocabulary of the growth debate to include biological and scientific concepts, and reframed the elements of regional planning to encompass the relation that the land has to natural and cultural resources. Our method assumes that urbanizing areas are endowed with certain natural, cultural and historical resources that should receive protection."

In developing the SDCP, Pima County used the concept of "bio-planning," or natural resource assessment and planning, as a necessary first step in determining urban form. "We broadened the vocabulary of the growth debate to include biological and scientific concepts, and reframed the elements of regional planning to encompass the relation that the land has to natural and cultural resources," said County

COALITION FOR SONORAN DESERT PROTECTION

Administrator Chuck Huckelberry. "Our method assumes that urbanizing areas are endowed with certain natural, cultural and historical resources that should receive protection."

Based on the amount of acreage needed to stabilize and recover endangered, threatened and imperiled species, the plan outlines a conceptual biological reserve, which is combined with historic and cultural reserves. Areas identified as unique and ecologically or culturally sensitive are designated Environmentally Sensitive Lands (ESL).

In response to community concerns about potential conflicts between preserving ESLs and future roadbuilding, Pima County formed a panel of experts from multiple disciplines (roadway engineers, wildlife biologists, cultural resources experts, and a landscape architect) to develop guidelines that allow planners and designers to better account for biological, cultural and historic resources in the roadway corridor. Transportation projects occurring within designated areas are defined as Environmentally Sensitive Roadways (ESR), and are to be designed and constructed to minimize disturbances to natural resources.*

NATURESERVE AND HERITAGE PROGRAMS

NatureServe is a non-profit, non-advocacy organization that provides scientific information and tools to guide effective decisions in land use and conservation. NatureServe and its network of state biological inventories known as natural heritage programs are the trusted source for information about rare and endangered species and threatened ecosystems.

State DOTs routinely ask for information from over 90 percent of state natural heritage programs. Maine DOT employs information from the Maine Natural Areas Program (MNAP) to screen projects prior to implementation. Potential conflicts are identified and averted early. "When there is an overlap of our information with their plans, our ecologists travel to the site with their planners and engineers," says MNAP's Molly Docherty.

THE NATURE CONSERVANCY — ECOREGIONAL PLANS

Using a comprehensive and science-based approach to conservation, The Nature

Conservancy (TNC) has identified areas that need to be protected to ensure the survival of each ecoregion's biological diversity. Ecoregions are defined by their distinct climate, geology and native species. Conservation goals are set for each of the sites, and priorities are established for conservation action. The planning teams rely heavily on data on the location and status of species and natural communities and on local expertise for site selection. Eighty such plans are scheduled for completion by 2003, and are primarily intended to guide the land acquisition activities of TNC.

In addition to acquisition, TNC will join with communities, businesses, governments and other organizations to preserve identified conservation lands. Transportation agencies can contact TNC in their state for more information on incorporating ecoregional plans into local and statewide transportation planning.

KEY DEER HABITAT CONSERVATION PLAN

Long before the Florida Keys became a popular vacation destination and retirement haven, it was home to Key deer, the diminutive and endangered cousin of the Virginia white-tailed deer. Development has consumed all but six square miles of Key deer habitat, forcing many to cross US-1, a major highway that connects the Keys to the mainland. From 1970 to 1992, a total of 1,023 Key deer were killed on roads, with 526 occurring along US-1 on Big Pine Key.

Citizens of the Keys face growth-management issues, resource managers face endangered-species issues, and Florida DOT is in the middle, trying to provide adequate transportation facilities to the people of Florida, while reducing threats to the Key deer.

To address these issues, FDOT, Monroe County, the Florida Department of Community Affairs and the U.S. Fish and Wildlife Service are developing a Habitat Conservation Plan (HCP) for the Key deer which takes into account the impact of potential development over a 20-year period. The HCP will cover residential and commercial development, as well as transportation improvements to meet the community needs of Big Pine and No Name Keys. Concurrently, Monroe County is carrying out a "Livable CommuniKeys Program" (LCP)

USFWS/NATIONAL KEY DEER REFUGE

to determine the type, location, and amount of development that the community would prefer to see in the project area. The LCP and HCP will ultimately provide the basis of a Master Plan for future development and community facilities within the project area.*

* As of early 2003, the SDCP and Key deer HCP had not been finalized, and stakeholders had serious concerns about whether the final plans would have adequate habitat protections. Nevertheless, the processes are instructive for other state DOTs, because they included a regional conservation plan, extensive scientific studies and models, community involvement, and an important role for the state DOT.

Transportation planning that integrates existing conservation efforts will save money, protect resources and expedite project delivery.

CONCLUSION

Approximately 1,300 species are on the endangered species list and more than five times that number are considered vulnerable to extinction.[6] Many of these species are endangered because of the alarming rate at which wildlife habitat is being converted to suburban sprawl. Over the next few decades, decisions regarding further development will determine the fate of these species and America's biodiversity.

Since the enactment of the ESA in 1973, we have been able to stave off the extinction of the bald eagle and the whooping crane. We have preserved thousands of acres of designated critical habitat.[7] However, we have also witnessed the extinction of the dusky seaside sparrow[8] and hundreds more species have been added to the endangered list. In the past decade, at least 34 species of unique populations of plants and vertebrates have become extinct in the United States while awaiting federal protection.[9] Most important, we have learned that a species-by-species approach to conservation is costly, time-consuming and rarely successful.

Biodiversity conservation efforts will be more successful and less expensive if they protect adequate habitat before species become threatened or endangered. If this is done on a biologically comprehensive basis (all natural community types and all at-risk species), and in accord with emerging principles for the long-term viability of such systems, it is possible to avoid the future endangerment of thousands of species.[10] Designing and implementing such systems of habitat conservation would also provide opportunities for better addressing the habitat needs of currently listed species and would provide a common framework for recovery efforts on their behalf.

While maintaining a strong ESA is essential as a fail-safe mechanism, there are sensible ways to empower the states to play a greater leadership role in biodiversity conservation that, over time, could lessen the need for feder-

al regulation. Moreover, the traditional role of states with regard to wildlife and other public resources, and their role in land-use issues mean the states are essential players in habitat conservation efforts.

State and federal agencies spend considerable time and capital both protecting natural areas and building transportation infrastructure. While these sometimes conflict, they need not be antagonistic. Transportation planning that integrates existing conservation efforts will save money, protect resources and expedite project delivery.

Existing large-scale conservation plans should be used to guide long-term transportation planning. All levels of government — local, county, MPO, regional and state — can benefit from incorporating conservation planning into infrastructure planning.

RECOMMENDATIONS

- Transportation planners, at the state and MPO level, should locate and utilize existing landscape-level conservation plans in their own planning efforts.
- In those states that have yet to adopt a Comprehensive Wildlife Conservation Plan, individuals should contact the state fish and game agency and state environmental protection agency to offer support for such a plan. Using conservation plan mapping, transportation officials and MPOs can plan future road and highway projects that avoid sensitive and protected areas.
- Use conservation plans to identify mitigation sites or banks in advance of project impacts.
- Provide adequate training on the incorporation of conservation planning to field and administrative staff, as well as transportation planners.
- Sponsor pre- and post-planning monitoring to determine the effectiveness of planning initiatives.
- Inform and involve the public through communication and outreach tools.

CORBIS

RESOURCES

The Biodiversity Partnership http://www.biodiversitypartners.org/

National Wildlife Federation: Smart Growth and Wildlife http://www.nwf.org/smartgrowth/

Closing the Gaps report http://www.floridaconservation.org/oes/habitat_sec/Closing_Gaps.pdf

Florida Environmental Streamlining home page
http://fdotenvironmentalstreamlining.urs-tally.com/

Florida Geographic Data Library http://www.fgdl.org/

Sonoran Desert Conservation Plan http://www.co.pima.az.us/cmo/sdcp/

Pima County Environmentally Sensitive Roadway Guidelines:
http://www.dot.co.pima.az.us/docreview/envsens/

NatureServe on Biodiversity and Smart Growth
http://www.natureserve.org/conservation/smartGrowth.jsp

TNC Ecoregional Plans http://nature.org/aboutus/howwework

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INTEGRATED PLANNING AND TEA-21

Under TEA-21, metropolitan and statewide transportation planning emphasizes the role of state and local officials in tailoring the planning process to meet local and state needs. Plans are fiscally restrained, with long-term planning horizons and provisions for public involvement. At both the metropolitan and state level, plans must consider the following seven objectives:

1. Support economic vitality, especially by enabling global competitiveness, productivity, and efficiency;
2. Increase the safety and security of the transportation system for motorized and nonmotorized users;
3. Increase the accessibility and mobility options available to people and for freight;
4. Protect and enhance the environment, promote energy conservation, and improve quality of life;
5. Enhance the integration and connectivity of the transportation system, across and between modes, for people and freight;
6. Promote efficient system management and operation; and
7. Emphasize the preservation of the existing transportation system.

OPPORTUNITIES FOR REAUTHORIZATION

- Add a planning objective for wildlife conservation that encourages transportation plans to identify and avoid impacts to natural areas in the earliest stages of planning.
- Provide support for state transportation agencies to acquire and utilize state and regional biodiversity plans.
- Incentivize the incorporation of conservation plans in transportation planning by rewarding states that improve project delivery and demonstrate ecological stewardship.
- Provide funding for scenario-planning technology to improve communities' ability to assess future transportation and land-development options and their impacts on natural areas.

4
CONSERVATION BANKING

In the U.S., a variety of laws require that any transportation projects that receive federal money compensate in some way for their adverse environmental impacts, in a process known as mitigation.

- Under the Clean Water Act of 1972, agencies that wish to dredge and fill a wetland area must obtain a permit from the Army Corps of Engineers (USACE). After demonstrating avoidance and minimization of impacts, the Corps may also require permittees to engage in compensatory mitigation efforts.
- Under the Endangered Species Act of 1973, the "taking" of endangered species is prohibited. Federal actions that impact a listed species or its habitat require a consultation and permit from the U.S. Fish and Wildlife Service (USFWS). Often, compensatory mitigation is required in order for a permit to be issued.

USFWS

The traditional form of compensatory mitigation is conducted on a project-by-project basis. First, a project is planned and designed. Then, during the subsequent environmental review and permit phase, regulatory agencies determine the amount of environmental damage that can be expected and suggest actions that can be taken to mitigate that damage. Often, this mitigation is conducted on-site, by setting aside a portion of the land in the project area. For example, if a new highway project fills 25 acres of wetland, the project sponsor might be required to create an additional 25 acres of wetland. Mitigation areas are chosen ad-hoc, rather than as part of a large-scale planning effort. This is not only expensive and time-consuming for the project sponsor; it is rarely effective for the environment.

Transportation officials often divide one large project into many smaller, more manageable phases. While this might make sense from an operational and administrative standpoint, it creates additional problems for mitigation. Applicants conducting mitigation projects often seek the most inexpensive solution that meets the minimum acceptable standards.

However, mitigation on several small projects can be very expensive. When small mitigation sites are used to compensate for small development phases, economies of scale are lost. The cost per acre will increase as size of the mitigation site decreases.

Not only is small-scale mitigation expensive, it is rarely ecologically sound. Small, isolated patches of natural area are vulnerable to stochastic events and can be degraded over time by such things as off-road vehicle traffic, invasion of non-native species and illegal dumping. Numerous small areas are also costly to monitor, which is imperative to successful mitigation.

The shortcomings of traditional, on-site mitigation have led to the concept of mitigation banking, defined in 1995 as "the restoration, creation, enhancement or preservation of wetlands and other aquatic resources for purposes of providing compensatory mitigation in advance of authorized impacts to similar resources at another site."[1] Under this concept, the mitigation banker assembles a large, contiguous area where new wetlands can be created or degraded ones restored. As the bank creates or restores the wetlands, it earns mitigation credits from the relevant regulatory agencies. Those credits can then be sold at market rates to either public or private developers that face mitigation requirements for their projects. Buying the credits would then relieve the developer of the need to conduct mitigation efforts as a direct part of the project. Banks can be established by private investors who seek to profit from conserving land, public agencies or non-profits.

The practice of banking, then, is both anticipatory and aggregative. Banks are established in anticipation of future demands for compensatory mitigation, and are designed to consolidate at one site the mitigation for activities that may be widely dispersed.[2]

GARY ZAHM, USFWS

Mitigation banking places a dollar value on wetlands — which had long been considered worthless — and thus brings a market approach to conservation. This reverses the phenomenon of property losing its value once designated as conservation land.

Mitigation banks have existed for more than 20 years, and policies within the FHWA have promoted wetland mitigation banking for more than a decade. The majority of early mitigation banks were single-user banks established by state DOTs. In 1992, nearly half of all banks were state highway banks.[3]

Wetland mitigation banking has not been

without its critics. In both the conservation and scientific communities, opinions range from reserved support to strong opposition. Among the many concerns:

- Federal law requires that project builders follow a particular sequence with regard to environmental damage. First, they must avoid as much damage as possible. Next, they must minimize the damage that can't be avoided. Last, they must mitigate the remaining damage. The establishment of mitigation banks can compromise this process by leading developers and regulators immediately to mitigation, thus avoiding the requirements to first avoid or minimize damage.
- Regulators find it difficult to deny a permit to projects which otherwise pose unacceptable impacts, because they provide existing mitigation.
- Sites are often selected based upon availability and price, rather than appropriate features and a strong probability of success. Mitigation lands should be chosen from identified conservation priority areas, established under a large-scale planning effort.
- By mitigating off-site, the impacted area loses the biological values and hydrologic functions that wetlands provide, and created wetlands cannot replace the equivalent attributes of natural wetlands.[4]

Despite these concerns, the concept of mitigation banking is now being applied to other types of habitat and ecosystems. Much like wetland banking, conservation banking is the practice of proactively preserving large, contiguous and viable tracts of habitat for the purpose of offsetting the adverse impacts of future development projects. Wetlands are but one of several imperiled ecosystems in the U.S. Rates of conversion for coastal areas, grasslands, forests and croplands rival those for wetlands. Without protection, many of our landscapes will be severely degraded within the next century. For example, if today's land consumption trends continue, more than one quarter of the country's coastal acreage will be developed by 2025 — up from 14 percent in 1997.[5]

Currently, the Endangered Species Act provides one of the few federal regulatory protections for non-wetland habitat. The ESA prohibits the "taking" of endangered animals, a prohibition that has been interpreted under some circumstances to include the destruction of habitat.[6] The FWS can issue permits for limited take, as long as it is incidental to the carrying out of otherwise lawful activities. The permit is conditional upon the permittee mitigating the impacts of the project or the "take."

Wetlands and endangered-species habitat are alike in that both are federally protected. However, the differences between wetlands and other habitat make banking a generally more appropriate tool for habitat conservation.

First, existing wetlands can be protected and remain in their natural state without active management. By contrast, endangered species often need both protected status and active management in order to survive. Without protection and management, the habitat may degrade, the species can be displaced, and the

protection they both enjoyed under the ESA will disappear. Conservation banks are required to remain under active management in perpetuity.

Second, small isolated wetlands can remain functional and continue to provide hydrologic values within watersheds. Traditional on-site wetland mitigation may be preferred to off-site banking if the bank is located outside the watershed where the damage from a road project takes place. In contrast, small, isolated patches of land quickly cease to provide viable habitat for endangered species and thus are poor choices for mitigation.

Finally, wetland policy is based upon a "no net loss" goal. Wetlands are measured by acreage, not function, so it is possible to avoid losses through preservation. Endangered species policy is based upon a more ambitious goal of reducing the likelihood of extinction. Instead of simply maintaining the status quo, recovery requires actively reducing threats and increasing probability of survival.[7] Success is not measured by saving individuals, but by securing viable populations with adequate habitat and appropriate distribution. If conservation banking is guided by policies that recognize these differences, it may prove to be more successful than wetland banking.[8] And if conducted in the framework of large-scale conservation plans, banking has the potential to make great strides in protecting our biodiversity.

Just as wetland mitigation banking was pioneered and widely used by transportation agencies, conservation banking could be an especially helpful tool for reducing delay in transportation projects and increasing environmental benefits. Road building has significant impacts on natural resources, wetlands and wildlife habitat. While the facilities are linear, the impacts are farther reaching. Here are some examples of state DOTs use of conservation banking to mitigate the impacts of road projects:

CORBIS

COLORADO'S SHORTGRASS PRAIRIE INITIATIVE

America's grasslands and shrublands are best known in the sagebrush steppes of the Rockies and in the prairies of the Midwest and Great Plains. However, the full system stretches from Florida's scrubs to Alaska's tundra. At 683 million acres, grasslands and shrublands comprise

the largest ecosystem type in the U.S., and the most mistreated. At least one-third of the country's rangelands have been converted to urban or agricultural uses since European settlement; 11 million acres between 1982 and 1997 alone.[9] This reduction in habitat has led to a decline in many species, including grassland

RON SINGER, USFWS

birds, the prairie dog, burrowing owl, swift fox, and ferruginous hawk.

In order to preserve large tracts of prairie, the Colorado Department of Transportation (CDOT), Federal Highway Administration, U.S. Fish and Wildlife Service (USFWS), Colorado Division of Wildlife (DOW), and The Nature Conservancy of Colorado (TNC) developed the Shortgrass Prairie Initiative. Anticipating further impacts caused by the 20-year state transportation plan, the initiative seeks to mitigate in advance of expected impacts and protect a highly vulnerable system. Rather than mitigating for each CDOT project in a piecemeal fashion, this initiative takes a large-scale and more ecologically meaningful approach. CDOT and FHWA will develop land-management plans that meet mitigation requirements, as well as incorporate the support and concerns of private landowners, who are integral to making the effort succeed.

Partners signed a memorandum of agreement which outlines the project's objectives. The Nature Conservancy will acquire some of the targeted lands in order to ensure proper management and oversight and CDOT will seek other bankers to host selected land and easements. In order to receive mitigation credits, the project partners must develop management plans that will benefit the species that are included in the planning efforts.

This mitigation approach serves as a model for addressing environmental concerns well in advance of adverse impacts. Conservation banking can save time and money for the transportation agency, encourage better habitat management and habitat connectivity, and provide an economic incentive to private landowners.

NCDOT'S RED-COCKADED WOODPECKER HABITAT BANK

Old-growth pine forests of the southeast United States are home to hundreds of species specialized to this unique ecosystem, including the red-cockaded woodpecker (RCW). The RCW (*Picoides borealis*) hunts insects on tree trunks

and creates nests within living pines. These nests are occupied for several generations and are used by many other wild creatures, such as chickadees, flying squirrels, and raccoons.

The RCW, however, has had to compete for these same century-old trees with timber and paper-pulp industries, which have clearcut the forests and decimated the species. As a result, the RCW was added to the endangered species list in 1970.[10] Protection of the scarce remaining habitat is essential to the existence of this and many other species.

The Palmetto Pear Tree Preserve was established in a partnership between the North Carolina Department of Transportation (NCDOT), the U.S. Fish and Wildlife Service (USFWS), and The Conservation Fund (TCF). The preserve encompasses some 9,732 acres of the Coastal Plain of North Carolina and is managed to provide suitable habitat for the RCW.

Pru Timber had intended to use the land for commercial logging, which would have jeopardized the clusters of RCW observed within its boundaries. USFWS was concerned not only about the possible effects of logging, but of the possibility that without active management, the property would become inhospitable to the woodpecker, and would soon lose protection under the ESA.

Under advisement of USFWS, NCDOT purchased the land from Pru Timber for approximately $16.3 million. The Conservation Fund, a non-profit group, will manage the site as a conservation bank. Credits may be used only when a state highway project has an unavoidable impact on the woodpecker and the NCDOT can demonstrate to the USFWS that there are no alternatives for avoiding or minimizing that impact. The credit ratio will range between 1:1 and 3:1 and will be decided on a case-by-case basis. For any given project, the USFWS can suggest that mitigation via the

IN LIEU FEE MITIGATION

"In lieu fee" (ILF) mitigation is another mechanism for securing compensation for impacts to wetlands under the Clean Water Act (CWA) Section 404 permit program. This arrangement allows for a developer to pay a fee to a natural resource agency or private conservation organization to implement the mitigation that the developer would otherwise be required to carry out itself. Fees are pooled from multiple permit recipients and are used to implement consolidated mitigation projects conducted away from the areas of the permitted impacts.

To date, the Corps has established 72 in-lieu-fee arrangements in 19 Corps districts across the U.S.[12] However, concerns have been raised about whether fees are being spent in a timely manner and whether the Corps is providing adequate monitoring and oversight of the mitigation projects. Reviews have found that ILF arrangements inadequately mitigate adverse impacts to wetlands. In response, federal agencies in October, 2000, issued guidelines for the use of ILF mitigation. In some cases, in lieu fees have the potential to be an effective mitigation tool that benefits the environment and provides developers flexibility.

bank is not the best means of mitigation. Although the agreement does not exclude the sale of credits to third parties, all or most of the credits will be used by NCDOT.

CALIFORNIA

Many states have enacted laws or stated policies for wetland mitigation banking, but only California has done so for conservation banking. In April, 1995, then-governor Pete Wilson established California's Official Policy on Conservation Banks. Taking the many environmental laws in California that require mitigation, including the California Environmental Quality Act, the California Coastal Act and the California Endangered Species Act, the policy provides guidance on banking for wetlands, endangered species habitat, and "environmentally sensitive habitat areas" such as mudflats and sub-tidal areas. (See Appendix C for California's Conservation Banking policy.)

California also employs a system of establishing expected management costs and the size of endowments needed to meet them that is widely used by both public agencies and nonprofit land trusts. Developed by the Center for Natural Lands Management, the system is known as the Property Analysis Record (PAR). The PAR is a computerized database methodology that helps land managers calculate the costs of management for a specific site. The PAR generates a concise report that serves as a well-substantiated basis for long-term funding, including endowments.[11]

CONCLUSION

If current trends in land conversion and road building continue, conflict between roads and wildlife will continue to increase. The need to mitigate the impacts of roads will increase exponentially as the amount of suitable habitat is further fragmented and degraded. The price of mitigation will increase accordingly as natural areas become scarcer and more expensive. State and local governments will need to make wise use of remaining conservation areas as well as mitigation dollars.

While growth may be inevitable, loss of biodiversity is not. When considered simultaneously, both growth and biodiversity can be accommodated. Through a combination of comprehensive large-scale planning and a coordinated mitigation strategy, states and communities can reduce the amount of conflict between development and conservation aims.

Conservation banking can be used to solve problems with conventional mitigation, making it more cost effective by reducing the cost and increasing the ecological effectiveness. If guided by well-conceived policies, conservation banking also has the potential to address concerns with wetland mitigation banking and to contribute to endangered species conservation efforts. Using conservation banking, the transportation sector can make great strides in improving project delivery and controlling costs, while increasing the effectiveness of mitigation.

RECOMMENDATIONS

- Use conservation banking when avoiding and minimizing impacts is impossible and when consolidating mitigation is biologically preferable to onsite mitigation.
- Create a revolving fund from which transportation officials can make interest-free withdrawals to acquire land that can be banked for mitigation purposes. Money would be reimbursed to the fund from project funding.
- Use existing conservation plans to determine the most valuable lands for banking. These include statewide comprehensive wildlife conservation plans, regional conservation plans, endangered species recovery plans and critical habitat designations.
- Site conservation banks strategically, with a particular conservation objective in mind.
- When establishing conservation banking in your state, develop a statewide MOU among all resource and action agencies involved.

RESOURCES

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California's Policy on Mitigation Banking http://ceres.ca.gov/wetlands/policies/mitbank.html

Corps Guidelines: Habitat Mitigation and Monitoring Proposal Guidelines http://www.spk.usace.army.mil/cespk-co/regulatory/habmitmon.html

Sacramento Fish and Wildlife Office: Guide to Conservation Banks http://sacramento.fws.gov/es/cons_bank.htm

CONSERVATION BANKING AND TEA-21

TEA-21 contains a preference clause for banking over all other forms of mitigation. Under §103 Federal-Aid Systems, "With respect to participation in a natural habitat or wetland mitigation effort related to a project funded under this title that has an impact that occurs within the service area of a mitigation bank, preference shall be given, to the maximum extent practicable, to the use of the mitigation bank if the bank contains sufficient available credits to offset the impact and the bank is approved in accordance with the Federal Guidance for the Establishment, Use and Operation of Mitigation Banks (60 Fed. Reg. 58605 (November 28, 1995)) or other applicable Federal law (including regulations)." The final rule made mitigation for wetlands and natural habitat eligible for Federal-aid transportation funding, to include both current **and past** highway projects.[13]

OPPORTUNITIES FOR REAUTHORIZATION

- Create a federal revolving fund from which state DOTs can make interest-free withdrawals to acquire mitigation lands in anticipation of future project impacts. The fund would be reimbursed from project funding.
- Encourage states to use comprehensive wildlife conservation plans to identify mitigation opportunities for long-range transportation plans.
- Establish a small business loan program to encourage entrepreneurs in conservation banking.
- Amend the banking preference to allow maximum flexibility for the most effective mitigation.

1. Federal Register: November 28, 1995 (Volume 60, Number 228). Page 58605-58614.
2. Bean, Michael and Dwyer, Lynn. 2000. Mitigation Banking as an Endangered Species Conservation Tool. Environmental Law Reporter 30: 10537-10556.
3. Zinn, Jeffrey. Wetland Mitigation Banking: Status and Prospects. Washington, DC. Congressional Research Service, 1997
4. The National Academies, 2001. Reforms needed in wetlands regulatory programs, June 26, 2001.
5. Dana Beach. Coastal Sprawl: The Effects of Urban Design on Aquatic Ecosystems in the United States. Pew Oceans Commission. 2002
6. Babbitt v. Sweet Home Chapter of Communities for a Great Oregon, 515 U.S. 687 (1995)
7. Section 7 (a)(1) of the ESA requires all federal agencies to do their part and "utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species listed pursuant to section 4 of this Act."
8. At publication, USFWS had drafted guidance on Conservation Banking.
9. The State of the Nation's Ecosystems. The Heinz Center. Cambridge University Press. 2002
10. http://endangered.fws.gov/wildlife.html#Species
11. Bean, Michael and Dwyer, Lynn. 2000. Mitigation Banking as an Endangered Species Conservation Tool. Environmental Law Reporter 30: 10537-10556.
12. Environmental Law Institute. 2002. Banks and Fees: The Status of Off-Site Wetland Mitigation in the United States: Washington, D.C.
13. Federal Register, Volume 65, No. 251. December 29, 2000. Page 82913. The final rule established the preference for wetland mitigation banking, broadened the eligibility for Federal highway funds to include mitigation for current **or past** highway projects, and to mitigate impacts to natural habitat.

5
INTERAGENCY COORDINATION

Lack of coordination among federal, state and local agencies can delay transportation projects and cause unnecessary loss or degradation of wildlife habitat. Indeed, the transportation, natural resource and cultural resource agencies that work on transportation projects often seem to be working at cross-purposes, rather than in collaboration. A recent study by the Federal Highway Administration found that only eight percent of delayed transportation projects were delayed by resource agency review.[1] Nevertheless, these delays can be reduced by coordinated planning between transportation and resource agencies.

Typically, these delays occur because transportation agencies are late to consult resource agencies about the environmental impact of a proposed project. Congress, in the most recent federal surface transportation funding bill (TEA-21), required improved coordination among agencies. Guidelines issued by the FHWA state:

"Section 1309 of the Transportation Equity Act for the 21st Century (TEA-21) calls for a coordinated environmental review process to expedite Federal highway and transit projects. Accomplishing this requires better and earlier coordination among Federal, state, and local agencies. To avoid delays and costly duplication of effort in reviewing and approving transportation projects, agencies must:

"Establish an integrated review and permitting process that identifies key decision points and potential conflicts as early as possible;

"Integrate the National Environmental Policy Act (NEPA) process and other environmental review and approvals as early as possible in the scoping and transportation planning processes;

"Encourage full and early participation by all Federal, state, and local agencies that must review a transportation construction project or issue a permit, license, approval, or opinion relating to the project; and

"Establish a dispute resolution mechanism to address unresolved issues."[2]

In response to these guidelines, several state departments of transportation have initiated formal or informal partnerships with resource agencies. The following case studies look at how the Oregon Department of Transportation and the California Department of Transportation have sought to improve project delivery and environmental protection through better coordination.

Oregon's Collaborative Environmental and Transportation Agreement for Streamlining (CETAS) Program

In response to directives in TEA-21, the Oregon Department of Transportation (ODOT)

has implemented a coordinated review process for highway construction projects. The process, the Collaborative Environmental and Transportation Agreement on Streamlining (CETAS), establishes a working relationship between ODOT and ten state and federal transportation, natural resource, cultural resource, and land-use planning agencies. The agencies include Oregon's Department of Land Conservation and Development (DLCD), EPA, FHWA, National Marine Fisheries Service (NMFS), Oregon Department of Environmental Quality (ODEQ), Oregon Department of Fish and Wildlife (ODFW), Oregon State Historic Preservation Office, Oregon Division of State Lands (ODSL), Army Corps of Engineers, and U.S. Fish and Wildlife Service (USFWS). ODOT intends to use the CETAS process for all environmental impact statements and environmental assessments that are prepared for projects that impact natural resources.[3] The ultimate goal of CETAS, according to ODOT Environmental Services Manager Lori Sundstrom, is to "produce transportation projects that are as environmentally benign as possible."

CETAS identifies six "pillars" that support efficient project delivery without sacrificing environmental quality:

1. **Environmental Management System (EMS).** Not yet established within ODOT, EMS is intended to address the life cycle impacts of ODOT's activities, products, and services on the environment. In addition to ensuring that ODOT meets its environmental stewardship obligations in the most efficient manner possible an EMS would provide ODOT with routine feedback on its environmental performance.

2. **Habitat Mitigation Program.** This program, initiated by ODOT but open to participation by other state, regional, and local governments, was established to purchase or create wildlife habitat in anticipation of impacts from future transportation projects. ODOT plans to develop its own wetland mitigation bank under the initiative.

3. **Natural and Cultural Resource Mapping Program.** Once fully implemented, this program will use a geographic information system (GIS) to map sensitive natural and cultural resources. It will also gather data from a variety of agencies and relate it to the state highway system. This will provide comprehensive views of resources in or near planned project areas, and support collective decision making regarding the actions necessary to sustain and improve critical habitat. The goal is to develop future transportation projects in such a way that whenever possible they *avoid* impacts to critical natural and cultural resources.

4. **Expanded Programmatic Approvals.** This element seeks to increase the kinds of construction and maintenance activi-

ties covered by programmatic agreements or permits and includes joint or parallel programmatic biological opinions from National Marine Fisheries Services/NOAA Fisheries and the U.S. Fish and Wildlife Service, developing regional general permits with the U.S. Army Corps of Engineers as well as maximizing use of Nationwide Permits, and highway-specific General Authorization permit from the Oregon Division of State Lands. ODOT and its CETAS partners are exploring a permitting approach founded on desired environmental outcomes that consider the temporary disruption from construction as well as the on-going impacts of the finished project.

5. **Seamless Performance by Local Governments and Contractors.** Under this element, ODOT will improve its training of consultants, contractors and the local governments that receive federal funds that pass through ODOT to ensure the quality of their environmental management practices.

6. **Expanding CETAS Partnerships.** The final pillar involves extending an invitation to federal land managers, such as the U.S. Forest Service and the Bureau of Land Management, and other local, regional, state or federal governments or agencies to join CETAS on either a permanent or ad hoc basis.[4]

Before ODOT established CETAS, the first opportunity for natural and cultural resource agencies to provide input on an ODOT project was during the project development and final design stage. Such a process, common to most states, means that critical input from resource agencies is unavailable at key decision points in the project development and design process. This often leads to conflicts between resource and transportation agencies and to delays during environmental review while resource agency concerns are addressed and the project is potentially redesigned. Worse, by not providing opportunity for involvement early in the design process, transportation agencies may lose the opportunity to avoid environmental impacts, and instead may be forced to undertake costly and less environmentally beneficial mitigation measures.

Under CETAS, resource agencies are involved in the early planning stage of major projects, and that involvement continues throughout project development. ODOT seeks concurrence from the agencies at four key decision points in project development: purpose and need, range of alternatives to be studied, criteria for selection of a preferred alternative, and selection of the preferred alternative. Concurrence does not replace or supplant official agency actions or approvals required by law, but it is intended to represent a good faith indication of each agency's acceptance of the project at those points in time. CETAS meets monthly to accomplish project reviews and to work on the various improvement initiatives described

above. This also serves to keep all parties informed of potential future conflicts. By tapping into the expertise of natural and cultural resource agencies, ODOT is better able to avoid environmental impacts, assess how to minimize those impacts, and receive valuable advice on selecting optimal mitigation strategies. CETAS members believe that because potential environmental or cultural impacts should be kept to a minimum, the environmental review process, while still exhaustive, should be less controversial, less costly, and less time consuming, and therefore proceed more quickly.

To further improve the environmental review process, ODOT is funding several positions at resource agencies. Using federally-reimbursable funds, ODOT is funding one position at the U.S. Fish and Wildlife Service (FWS), two positions at the Oregon Division of State Lands (ODSL), and three positions at the Oregon Fish and Wildlife Department. ODOT has detailed three ODOT biologists to NMFS/NOAA Fisheries to supplement their staff because of a staffing cap at that agency. ODOT is also evaluating the benefits of funding one position at the State Historic Preservation Office (SHPO). These employees work exclusively to evaluate the environmental impact of ODOT projects, and provide technical assistance to ODOT staff, and so are not forced to choose between their regular work obligations and requests for assistance with environment reviews.[6]

While it's still too early to formally evaluate CETAS's effectiveness, (ODOT has begun, but not yet completed, a thorough review process), participants in the program are optimistic about its potential to simultaneously expedite project delivery and improve environmental protection.[7] An early review of the first three major transportation projects to utilize the CETAS process found concurrence on each aspect of the projects for all participating resource agencies.[8] (See Appendix D for the CETAS memorandum of understanding.)

California's Tri-Agency Partnership Agreement

In February 2001, California's three major transportation and resource agencies — the California Environmental Protection Agency (Cal/EPA), the Resources Agency (RA), and the Business, Transportation and Housing Agency (BT&H) — established a Tri-Agency Partnership to speed transportation planning without compromising on environmental protection. The partnership was born out of the recognition that transportation projects, especially those that promote environmental objectives, need to be delivered in a timely fashion, and that improved collaboration among the three agencies was central to achieving that goal.[10]

The agreement identifies two purposes for the partnership. The first is to encourage its three member agencies to work collaboratively and cooperatively. The second is to ensure the timely planning and implementation of transportation projects that protect or restore the state's environment.[11] Among such projects would be those that promote walkable, livable communities,

environmental justice, regional planning, and cultural and environmental conservation.[12]

The partnership agreement further establishes nine goals for the future. At the most basic level, the three member agencies will identify and share information on transportation and environmental priorities and develop transportation and environmental performance criteria by which the agencies can evaluate and improve transportation projects.

Perhaps most important, the Tri-Agency Partnership encourages the "early and continuous participation of affected state, federal and local agencies, public interest groups, and the public" throughout the planning and approval process. The partnership also establishes as a goal that member agencies work together to determine the nature and scope of environmental studies, and to develop baseline environmental resource information.[13]

The partnership will also look for ways to conduct concurrent environmental and permitting processes, and to develop a process for interagency issue resolution with appropriate timelines for completion.[14]

Since its establishment, the Tri-Agency Partnership has formed three sub-teams to work on the various goals. The first sub-team will focus on encouraging collaborative planning early in the project development process. The sub-team sponsored a workshop in November, 2002, with the University of California at Davis to identify regions where conflicts are developing between growth and environmental concerns and initiate efforts to resolve them. The sub-team is working with regional agencies to coordinate habitat conservation planning with long-range transportation and land-use plans (as has been done in Riverside and Merced Counties, California), in an attempt to avoid or mitigate environmental impacts.[15]

The second sub-team is examining opportunities to align data and information requirements of federal and state permits in an effort to lessen environmental review burdens. The third sub-team is evaluating information tools such as Geographic Information Systems (GIS) that might help improve decision-making, and in particular, identify opportunities to avoid sensitive habitat or other natural resources.[16]

The Tri-Agency Partnership is less formal than ODOT's CETAS program. However, the two approaches share a common goal — early and continuous collaboration between transportation and resource agencies. The Tri-Agency Partnership has helped instill in all the departments under the three agencies a much greater awareness of opportunities to incorporate environmental enhancements in transportation projects. While administrators of the partnership have yet to complete a formal review of its effectiveness, there continues to be a strong commitment from high-level officials, and participants are optimistic about the partnership's potential.[17]

Some results from the Tri-Agency Partnership include:

- A revived effort between the state Department of Fish and Game and CALTRANS to align various state and federal

requirements related to the aquatic environment, endangered species, and streambed alteration. (CALTRANS is the California Department of Transportation, a constituent agency of BT&H).

- A project in which CALTRANS and the California Department of Parks and Recreation worked together to connect two important habitat areas in Orange and Riverside counties by removing highway off ramps that were no longer needed and in their place created a wildlife underpass in Coal Canyon.

CONCLUSION

Though an FHWA study found that the most significant sources of transportation project delay were lack of funding, low priority, local controversy, or the inherent complexity of the project, resource agency review may in some cases slow project delivery. Recognizing this, TEA-21 establishes "full and early participation by all relevant agencies..."[18] as a key objective of environmental streamlining efforts. Further, Section 1309 permits state DOTs to provide Title I (highway program) funding to natural resource agencies to help expedite the review process while ensuring that environmental concerns are fully considered.

To date, however, few states have embraced the idea of interagency coordination. The two exceptions profiled above provide strong evidence of the merits of involving all relevant agencies early and substantively. Early involvement of natural resource agencies helps transportation project planners develop projects with minimal environmental impact.

Early involvement gives resource agencies an opportunity to work with transportation planners to identify potential conflicts between road projects and environmental and cultural resources and make appropriate adjustments. In some cases, the process is so successful that the transportation agencies are able to avoid a full Environmental Impact Statement review. Regardless of the level of project review that is required, the early involvement of resource agencies ensures that there won't be any surprises when the agency is asked to comment on the environmental or cultural impacts of a proposed project. This alone has the potential to greatly expedite project delivery, and make for better projects.

RECOMMENDATIONS

- Fund full-time employees at relevant agencies to work exclusively on environmental and cultural resource reviews for transportation projects.
- Establish Environmental Review Committees composed of high-level representatives from each of the relevant federal and state agencies.
- Hold regular meetings of the Environmental Review Committees to discuss upcoming projects and identify potential conflicts and impacts.

RESOURCES

FHWA Streamlining Initiatives http://www.fhwa.dot.gov/environment/strmlng/prodlist.htm

CalTrans Tri-Agency Partnership http://www.dot.ca.gov/hq/transprog/ctcbooks/1201/4_9.pdf

INTERAGENCY COORDINATION AND TEA-21

In an effort to improve project delivery, TEA-21 required improved coordination among all involved agencies. Section 1309 calls for a coordinated environmental review process to expedite Federal highway and transit projects. Accomplishing this requires better and earlier coordination among Federal, state and local agencies. To avoid delays and costly duplication of effort in reviewing and approving transportation projects, agencies must:

- Establish an integrated review and permitting process that identifies key decision points and potential conflicts as early as possible;
- Integrate the National Environmental Policy Act (NEPA) process and other environmental review and approvals as early as possible in transportation planning;
- Encourage full and early participation by all Federal, state, and local agencies that must review a transportation construction project or issue a permit, license, approval, or opinion relating to the project; and
- Establish a dispute resolution mechanism to address unresolved issues.

OPPORTUNITIES FOR REAUTHORIZATION

- Retain Section 1309 and allow states to continue making progress in improving project delivery through interagency coordination.
- Provide financial incentives for states to adopt coordination agreements with participating agencies.
- Reward states that show progress in project delivery by working in coordination with participating agencies and the public.
- Allow resource agencies to apply directly to DOT for eligible reimbursement funding.

1. FHWA. Reasons for EIS Project Delays. September 2000.

2. FHWA. Interagency Guidance: Transportation Funding for Federal Agency Coordination Associated with Environmental Streamlining Activities. 2002.

3. Oregon Dept. of Transportation. CETAS: A Vision for Joint Environmental and Transportation System Stewardship in Oregon.

4. Oregon Dept. of Transportation. CETAS: A Vision for Joint Environmental and Transportation System Stewardship in Oregon.

5. Northwest Environmental Streamlining and Transportation Forum. Meeting Minutes. May 10, 2001.

6. Personal communication. Lori Sundstrom, Environmental Services Manager, ODOT, December 16, 2002.

7. Personal communication. Lori Sundstrom, Environmental Services Manager, ODOT, December 16, 2002.

8. Oregon Dept. of Transportation. CETAS: A Vision for Joint Environmental and Transportation System Stewardship in Oregon.

9. Personal communication. Lori Sundstrom, Environmental Services Manager, ODOT, December 16, 2002.

10. Partnership Agreement Among Resources Agency, California Environmental Protection Agency, and Business, Transportation and Housing Agency. February 21, 2001. California Transportation Commission. Executive Guide: Issues for 2002. From 2001 Annual Report to the California Legislature. Adopted December 13, 2001.

11. Partnership Agreement Among Resources Agency, California Environmental Protection Agency, and Business, Transportation and Housing Agency. February 21, 2001.

12. Partnership Agreement Among Resources Agency, California Environmental Protection Agency, and Business, Transportation and Housing Agency. February 21, 2001.

13. Partnership Agreement Among Resources Agency, California Environmental Protection Agency, and Business, Transportation and Housing Agency. February 21, 2001.

14. Partnership Agreement Among Resources Agency, California Environmental Protection Agency, and Business, Transportation and Housing Agency. February 21, 2001.

15. Personal communication — Denise O'Connor, Caltrans. December 16, 2002.

16. Personal communication — Denise O'Connor, Caltrans. December 16, 2002.

17. Personal communication — Denise O'Connor, Caltrans. December 16, 2002.

18. FHWA. "Environmental Streamlining Overview." <http://www.fhwa.dot.gov/environment/strmlng/overview.htm>

CORBIS

6
WILDLIFE CROSSINGS

Roads constitute the largest human artifact on earth.[1] Because they are such prominent — and permanent — parts of our landscape, we need to expand methods of reducing the harm they cause to the surrounding ecosystem and make them more permeable for wildlife on the move. Solutions can range from the simple to the complex. Simple, non-structural solutions include reducing speed limits, adding cautionary signage and otherwise increasing motorist awareness of crossing wildlife. Where these methods are insufficient, a combination of fencing and underpasses or overpasses can be used to move wildlife safely from one side of a roadway to the other.

The practice of building passageways for wildlife began in Europe. In order to protect their limited remaining biodiversity, countries such as France, Germany, Switzerland and the Netherlands have long built underpasses and overpasses. In fact, provisions for habitat connectivity are often included in transportation planning to provide for ecological networks of habitats that address the needs of all species to ensure sustainable population dynamics.[2]

Closer to home, Canada has built 24 wildlife passages in Banff National Park. The Trans-Canada Highway (TCH) brings more than 14,000 vehicles per day through the park, and had earned the nickname, "the Meat-Eater" due to the volume of wildlife killed upon its lanes. As the TCH was being expanded from a 2 to 4-lane highway, 22 underpasses and two overpasses were added to increase habitat connectivity and reduce roadkill. The types of underpasses constructed vary along the 28-mile stretch, ranging from open-span bridges to metal and box culverts. Wildlife exclusion fencing 95 inches in height was added in conjunction with the crossing structures to further reduce wildlife carnage.

The wildlife passageways and fencing have reduced accidents involving wildlife by 80 percent. Systematic monitoring by wildlife researcher, Anthony Clevenger has further demonstrated the success of these crossings. For over six years, year-round monitoring has recorded the following passes: 70 grizzly bear, 637 black bear, 710 cougar, 2,899 wolf, 2,801 coyote, 22,173 elk, 12,156 deer, and 2,107 sheep.

FLORIDA

Florida was one of the first states to recognize and react to the detrimental impact that roads have on wildlife. Florida's human population has increased rapidly, from 9.7 million in 1980, to 12.9 million in 1990 to almost 16 million in 2000.[3] Unfortunately, the human population grows at the expense of wildlife populations. This human increase has led to the development and expansion of roads,

greater traffic density, faster highways, and increased habitat fragmentation. According to the Florida Department of Transportation (FDOT), for the past 50 years, the state has built an average of 4.5 miles of high-speed paved road per day.

Increased traffic and habitat fragmentation has pushed the endangered Florida panther — one of the rarest mammals in the world — ever closer to extinction. With approximately 80 cats in existence, each individual killed on Florida's highways is a devastating loss.

USFWS

Between 1978 and 1994, 20 panther deaths (12 males and 8 females) and six injuries were documented from collisions with cars and trucks. Spring 2001 was especially deadly. Seven cats were killed on Florida highways in three months — as many as in all of 2000.[4]

When Alligator Alley, which crosses South Florida, was converted to I-75, 24 underpasses were installed to aid the crossing of panthers and other wildlife. Roadkill and radio telemetry data were assessed to find the best locations for the new underpasses. In addition to the underpasses, an 11-foot-high chain link fence topped with three strands of outrigger barbed wire was added to prevent panthers and other species from crossing the busy highway. Although primarily constructed for the panther, the crossing structures have benefited a wide range of species such as the bobcat, deer, great blue heron, wild turkey, and alligators.

The Florida black bear is another of the state's imperiled species that has suffered great losses on roads and highways. More than 800 bears were documented to have been killed by vehicles between 1976 and 2002. State wildlife officials said increasing human encroachment on bear habitat resulted in at least 120 black bears killed by motor vehicles in 2002 alone, up from 104 in 2001.

FDOT and the Florida Fish and Wildlife Conservation Commission teamed up to build the state's first underpass for black bear in 1994. The underpass on State Road 46 is a dirt-floor box culvert, 47 feet long by 24 feet wide by 8 feet high. The two-lane road was elevated above the crossing to give skittish animals a clear view across to the other side. The state also planted rows of pines in the open pasture on one side of the road to guide bears to the culvert entrance. To ensure that bears could easily access the underpass from the south, the FWC purchased a 40-acre tract of land in the bears' travel corridor — a private "inholding" within Rock Springs Run State Park.

Post-project research revealed that bears and

at least 12 other species, including bobcats, gray foxes, and whitetail deer had used the culvert. "Underpasses like this one, together with land acquisition and habitat protection, are tools we can use to minimize the impacts of highways on wide-ranging mammals," says Terry Gilbert, an FWC biologist and member of the SR 46 crossing design team.

A SPIRIT OF PLACE

U.S. Highway 93 which crosses the Flathead Indian Reservation in western Montana is poised to become a model in the United States, illustrating how the combined efforts of citizens, local, state, federal and tribal governments can result in an innovative plan to consider wildlife and land ethics while reconstructing highways. Fifty-six miles of the highway from Evaro to Polson is scheduled to be widened over the next decade to improve motorist safety. Thanks to the agreement between the Montana Department of Transportation, the Confederated Salish & Kootenai Tribes, and the Federal Highway Administration, the highway will be reconstructed with "a spirit of place," and context-sensitive solutions.

As part of this goal, the project will include 42 crossing structures for wildlife. Biologists and highway architects have evaluated roadkill data and tracking information in order to determine the best locations for passageways. The structures will range from small fish culverts to an open-span overpass, and most will be built to accommodate multiple species. Fencing will also be added to keep wildlife off the road and to funnel animals to the new structures.

AQUATICS

Roads and highways impact not only the land, but streams, rivers, lakes and oceans, especially when roads are built in a way that blocks the natural flow of water. Often, roads

DAVID PITKIN USFWS

built over streams are at-grade, rather than bridging from one bank to the other. Small culverts are installed to allow water flow, but these often present significant barriers to fish. Culverts may restrict water flow, providing too little water for fish to swim, or channelize water, making it difficult for fish to swim

against the current. Anadromous fish — species that migrate from freshwater to saltwater and back to freshwater — are the most severely impacted by fish passage barriers. Ability to migrate upstream is a critical issue for both anadromous and local fish species. Restrictions are especially troublesome to juveniles, which can't jump as high, sustain a sufficient level of energy, or tolerate the changes in water temperature and turbulence.

With developments in science and technology, biologists and engineers have designed a variety of methods to allow fish passage under roads where they cross streams at grade. Bridges, baffles and culverts can be designed to allow the proper water depth and velocity necessary for fish to pass under roads. Washington DOT and the state Department of Fish and Wildlife have been working together to correct more than 500 problem culverts where the water depth is too shallow, the water velocity too high, or the outfall drop too far. In Oregon, 54 fish passages have been replaced or modified and more than 130 miles of habitat have been restored or enhanced through the state DOT.

A CROSSWALK FOR ELK

There's a place in Washington where "elk call" has taken on a whole new meaning. Residents of Sequim, Washington know the 80-head herd of Roosevelt elk is near not by the haunting sound of their bellows, but by flashing road signs that read "ELK X-ING."

GARY ZAHM, USFWS

In recent years, this once small town has become a popular retirement community and witnessed unprecedented growth. According to the City of Sequim, as many as 10,000 vehicles per day pass through the area during the summer travel season on the Olympic Peninsula. As development has increased, so has traffic and collisions with elk. Drivers had become accustomed to standard elk-crossing signs. Although no drivers were seriously injured, as many as nine elk were killed per year.[5] After improvements to Highway 101, residents feared elk mortality would grow.

Through a partnership among the Department of Fish and Wildlife, the U.S. Forest Service, Washington DOT, local tribes and conservation organizations, an inexpensive yet effective solution was developed in a crosswalk for elk. Biologists equipped several elk with radio-transmitting collars, and Washington DOT installed six radio-activated warning signs along a three-mile stretch of Highway 101 where the herd regularly crosses to reach the northern end of its range. As the herd approaches the highway, the radio collars activate the signs to warn motorists that elk are near. Because the signs light up only when elk are approaching, motorists are less likely to become habituated to their presence.

The project was funded through a $75,000 grant under the Transportation Enhancements Program. Herding and collaring the elk cost $13,000, the signs cost $48,000 and radio telemetry stations cost an additional $12,700.

CONCLUSION

For the last century, automobiles and the roads they require have been the dominant force shaping the modern American landscape. There are more cars per capita in the United States than in any other nation in the world. An unrivaled Interstate highway system connects major metropolitan areas and is the basis of our transportation infrastructure. Unfortunately, many roadways were not planned or designed with wildlife in mind. However, science and engineering have converged with solutions, and several states are retrofitting existing roads to protect biodiversity. While wildlife crossings are not a panacea, they can go a long way toward restoring connectivity where roads have fragmented habitat.

RECOMMENDATIONS

- Conduct habitat connectivity studies to determine where passageways are needed. Locate structures in existing migration routes.
- Retrofit existing roads with wildlife passageways. Consider the full range of options, from at-grade, non-structural approaches to land bridges.
- When planning, designing and building wildlife crossings, ensure the future viability of habitat on either side through land acquisition or easements.
- Conduct post-construction monitoring on the effectiveness of passageways.
- Increase the use of signage to make motorists aware of wildlife in the area.
- Reduce speed limits in wildlife areas.

RESOURCES

Critter Crossings: Linking Habitats and Reducing Roadkill
http://www.fhwa.dot.gov/environment/wildlifecrossings/

Wildlife Habitat Connectivity Across European Highways, FHWA
http://www.international.fhwa.dot.gov/wildlife_web.htm

National Transportation Enhancements Clearinghouse http://www.enhancements.org/

Humane Society of the United States: Safe Passage for Wildlife
http://www.hsus.org/ace/13409

Wildlife Crossings Toolkit http://www.wildlifecrossings.info

WILDLIFE CROSSINGS AND TEA-21

Since 1991, transportation programs that receive federal aid have been required to consider environmental, cultural, economic, and social conditions in an effort to create a more balanced transportation system that provides people with choices and with a richer experience. At the heart of this effort is the Transportation Enhancements (TE) program, which provides federal reimbursement for community-based activities that are "more than asphalt, concrete, and steel." Eligible projects include pedestrian and bicycle facilities, scenic preservation and historic restoration. When ISTEA was reauthorized in 1998, Defenders of Wildlife worked with members of Congress to include "Provision of Wildlife Connectivity" as an eligible Transportation Enhancements activity. Interest groups, local governments and state agencies can now apply for federal funding to retrofit existing roads with crossing structures for wildlife.

OPPORTUNITIES FOR REAUTHORIZATION

- Continue funding for the Transportation Enhancements Program at current levels or higher. Encourage states to develop fair and accessible procedures for TE program fund distribution.
- Provide research funding for statewide and national habitat connectivity studies.
- Enable states to build necessary crossings even when no additional road improvements are planned in those areas.
- Create a safety grant program to encourage states to install crossings for human safety as well as habitat connectivity. See Title II, § 2003 Occupant protection incentive grant program.

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2. Wildlife Habitat Connectivity Across European Highways, FHWA, 2002.
3. US Census, http://quickfacts.census.gov/qfd/states/12000.html
4. Defenders of Wildlife, Habitat & Highways Campaign http://www.defenders.org/habitat/highways
5. Elk, Drivers Benefit from Crossing Project, Northwest Indian Fisheries Commission Newsletter, Summer 1999.

7 PUBLIC LANDS

Federal lands, including national parks, forests, wildlife refuges and monuments embody one quarter of the United States and provide habitat for nearly two-thirds of all species that are listed as threatened or endangered. Twelve percent of these species are restricted largely to federal public lands, on which they depend for survival.[1] These lands, then, are critical for biodiversity conservation. The visitors they attract are also critical for local and regional economies.

Federal lands are managed primarily by five agencies: the Fish and Wildlife Service (USFWS), which manages the National Wildlife Refuge System; the Bureau of Land Management (BLM), which is responsible for national monuments; the National Park Service (NPS); the Forest Service (USFS); and the Department of Defense (DoD). While these agencies have different missions and are guided by different regulations, all are mandated to conserve and sustain the natural resources found on their lands.

With the exception of military bases, most federal lands are open to the public and to vehicle traffic. More than 300 million people visited national parks in 1999 alone.[2] More than 38.8 million visitors came to national wildlife refuges and hatcheries in 2001. Refuge visitation is expected to increase to more than 61.2 million by 2009.[3]

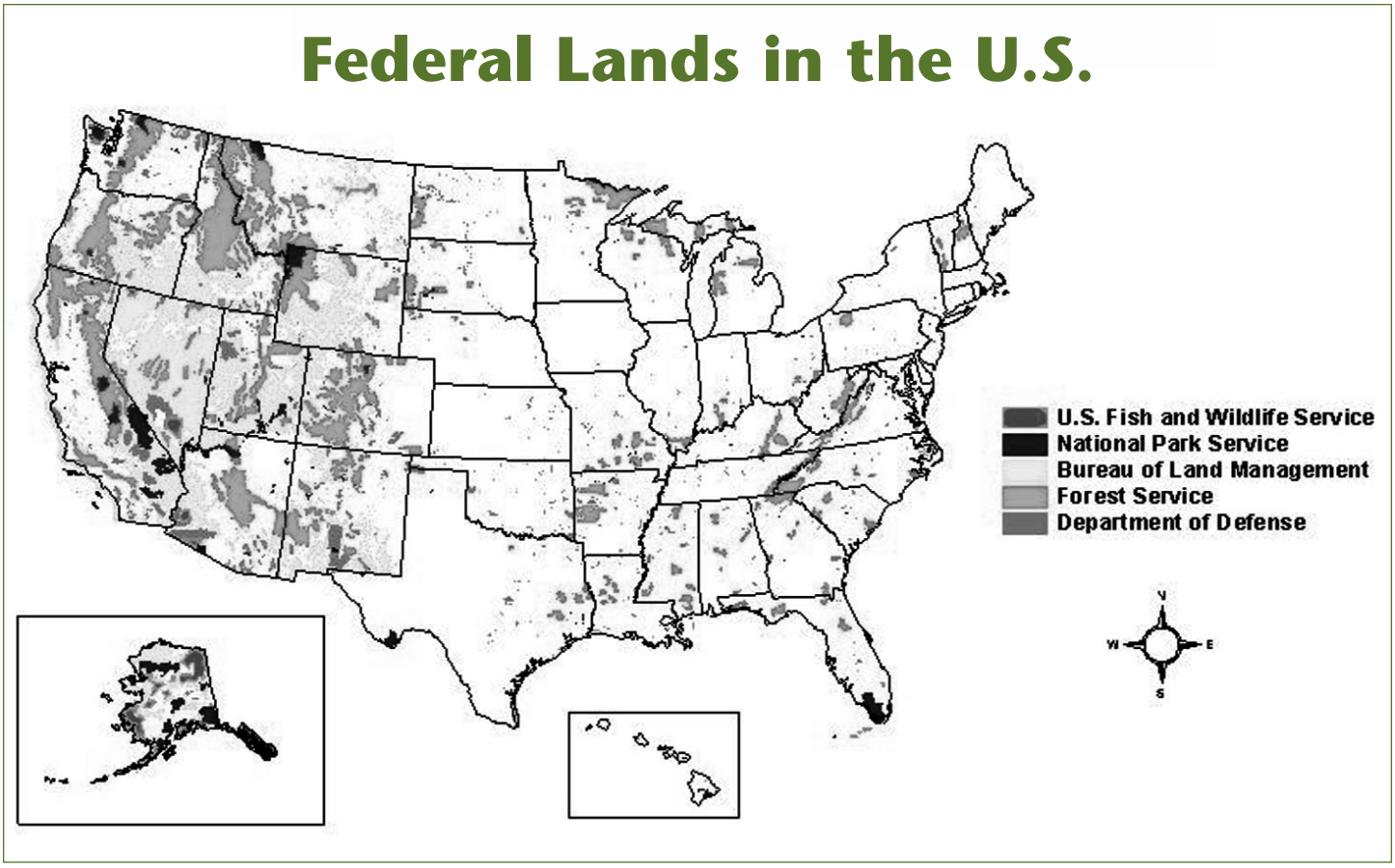
FEDERAL LANDS HIGHWAY PROGRAM

The task of providing safe and adequate access to public lands is shared by the individual agencies and Federal Lands Highway Program (FLHP), which is responsible for some 90,000 miles of roads that are owned by public authorities or the federal government and are not under state or local responsibility. The agency is administered by the FHWA as an adjunct to the Federal-Aid Highway Program. FLHP also provides modest funding for alternative transportation programs in national parks, such as shuttle buses, ferries and bicycle and pedestrian trails.[4]

Because FLHP has been largely devoted to building roads instead of providing access and mobility, America's public lands are increasingly threatened by vehicle overcrowding, traffic congestion and air pollution. As outdoor recreation becomes more popular, millions of Americans flock to public lands every day. However, transportation options within public lands are limited, diminishing the overall visitor experience and environmental quality. Many areas are readily accessible only by personal vehicle, leaving visitors mired in traffic jams, rather than enjoying the activities and scenery. In Great Smoky Mountains National Park, it can take four to six hours to drive an 11-mile loop.[5]

Due to the volume of vehicles, public lands suffer from air quality problems that rival major metropolitan areas. According to the National Parks Conservation Association (NPCA), in 2001 Sequoia and Kings Canyon National Park in the southern Sierra Nevada in California recorded 61 days when the air was unhealthy to breathe because of ground-level ozone.[6]

High road density and traffic volume threaten wildlife on some federal lands, as well as the people who visit. Many species are restricted to public lands because suitable habitat is not available elsewhere. Among these species, the grizzly bear *(Ursus arctos)*, gray wolf *(Canis lupus)*, and caribou *(Rangifer tarandus)* are known to avoid areas adjacent to highways because of the noise and human activity associated with roads. In fact, road density is among the most reliable predictors of wolf habitat. As road density increases within our public lands, habitat quality decreases exponentially. Increased attendance and increased vehicle traffic also increase the number of animals



killed by vehicles. According to a NPS study, 939 large mammals were killed by vehicles within Yellowstone National Park between 1989 and 1996.[7] Eventually, public lands will cease being suitable habitat for some of the most magnificent of wildlife species.

Without wildlife and the high quality habitat they need, public lands will also cease being suitable vacation destinations for tourists. Gateway and surrounding communities rely heavily on adjacent public lands for tourist dollars.[8] Visitors come from across the country and around the globe to enjoy America's natural wonders.

Wildlife associated recreation supports rural economies and added $50 billion to the national economy in 1996 alone, according to a Forest Service report.[9] National Park Service analysts estimated that the 1.4 million visitors to Shenandoah National Park in 1992 spent more than $45 million in surrounding counties. In addition, combined spending by NPS and by the concessionaire operating businesses on Skyline Drive was estimated at $10.2 million.[10]

More than 82 million U.S. residents aged 16 and older fished, hunted, or watched wildlife in 2001, spending $108 billion. This amounted to 1.1 percent of the Gross Domestic Product (GDP). Of the total amount spent, $28 billion was for travel, $64 billion for equipment, and $16 billion for other items. Hunting and fishing drew $70 billion in 2001 — $36 billion on fishing, $21 billion on hunting, and $14 billion on items used for both hunting and fishing. Wildlife watchers spent $38 billion on trips, equipment, and other items.[11]

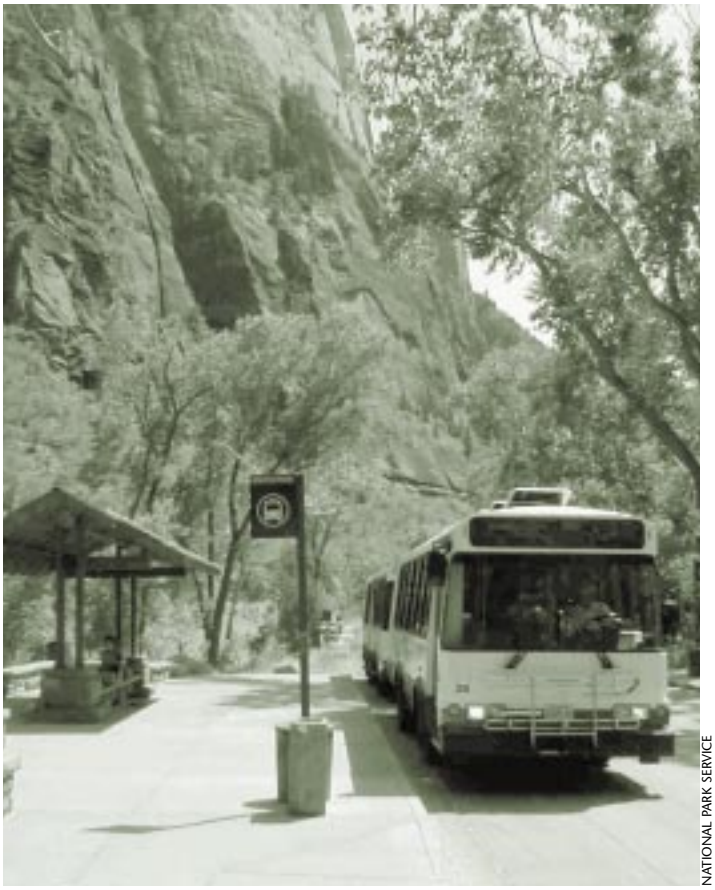
Recreational and educational visits to national wildlife refuges generate substantial economic activity. In fiscal year 1995, there were more than 27.7 million such visits. Visitor spending generated $401.1 million of sales in regional economies. As this spending flowed through the economy, more than 10,000 people were employed and $162.9 million in employment income was generated. In some areas, refuge visitors are major stimuli to the local economy. Visitors to Chincoteague National Wildlife Refuge, for example, generate almost 3 percent of the earned income in Accomack County, Virginia. Within the Chincoteague zip code, more than one-third of the jobs are attributable to refuge visitation.[12]

CORBIS

The reintroduction of wolves to Yellowstone has been a boon to surrounding communities and businesses. The Fish & Wildlife Service projected that wolf watching will continue to attract record numbers of visitors to Yellowstone National Park and add an additional $23 million annually to the local economy.[13]

ALTERNATIVE TRANSPORTATION ON PUBLIC LANDS

The interests of gateway communities, tourism, visitors and wildlife will be best served by improvements that recognize their interdependence. In order to address traffic congestion, air pollution, and continued threats to biodiversity, resource agencies and the FLHP should consider providing more visitor friendly and environmentally sensible transportation options on public lands. Instead of continuing with the roadbuilding agenda that has precipitated these problems, resources would be better spent on a system designed to meet the current and future needs of both human visitors and non-human residents. It is possible to improve mobility and visitor experience, and at the same time mitigate the impacts of existing roads.



NATIONAL PARK SERVICE

Alternatives to the private vehicle are now offered at many public lands. According to the NPCA, more than 90 national parks now offer some form of public transportation for visitors. The Fish and Wildlife Service offers alternative transportation at ten or more national wildlife refuges.[14] Another alternative is improved access for pedestrians and bicyclists. Many visitors may prefer to walk or bike, but find no sidewalks or trails from gateway communities to the facility. This forces many people to drive to and from the facility, adding to traffic tie-ups. With additional support, alternative transportation can reduce the burden of traffic congestion within public lands, improve visitor experience and protect biodiversity.

ZION NATIONAL PARK

Not long ago, Utah's Zion National Park was overwhelmed by cars, RVs, and tour buses.

Traffic congestion, lack of parking, air and noise pollution, and damage to natural resources frustrated managers and visitors alike. The park now offers a free shuttle bus along the Zion Canyon Scenic Drive from early April through the end of October. Private vehicles are not allowed during peak visitation hours. All other parts of the park are open to private vehicles. The shuttles operate in two loops, one making six stops in the town of Springdale and the other making eight stops at points of interest in the park. Each bus is fully accessible and can carry two bicycles. There is room onboard for packs, coolers and strollers. Two trams in the fleet are electric-powered.

"Initially, people [visiting Zion] were a little hesitant and didn't know if they'd like being separated from their cars, but our members have told us it works very well," said Rolayne Fairclough of the Utah office of the American Automobile Association (AAA).[15]

SANTA ANA NATIONAL WILDLIFE REFUGE TRAM

For more than 15 years, an open air, interpretative tram has taken visitors through Texas' Santa Ana National Wildlife Refuge. The tram runs four times daily from Thursday through Monday during peak season, and private vehicles are prohibited on the drive when the tram is in service. The tram holds up to 30 people and makes a tour loop of 7.5 miles. The tram fare is $3 for adults and $1.50 for children, and free for school groups.

The tram service is a cooperative effort with the Valley Nature Center (VNC), a local, nonprofit organization dedicated to environmental education, which supplies a driver and a narrator for each tour. Annual ridership exceeds 6,000 passengers, earning about $18,000 in fares for VNC. The Santa Ana NWR supplies the tram, gasoline, and maintenance for the vehicle, with an annual budget of $5,000.

CONCLUSION

Public lands are the cornerstones of our natural heritage, providing Americans with recreation, food and fiber, watersheds and scenic beauty. These lands hold a wealth of amenities, not the least of which is a repository for our nation's imperiled biodiversity. These lands should not be sequestered, but must remain accessible to Americans who support them. However, attempts to accommodate visitors should not destroy the very amenities that draw them in the first place.

Public lands support local communities, the travel and tourism industries and resident wildlife in a mutually beneficial relationship. That which threatens one, threatens all. Solutions to traffic congestion, polluted air and degraded habitat will not be found in continuing to focus on private vehicles as the only mode to visit public lands. To maintain mobility and environmental quality, resource agencies and the FLHP must provide visitors with environmentally sensible transportation options. Increase mobility, not lane miles. Accommodate visitors, not vehicles.

RECOMMENDATIONS

- Maintain roads on public lands in a manner consistent with the management of surrounding natural resources, including wildlife, both terrestrial and aquatic.
- Practice context-sensitive solutions in roads and highways on public lands. Retrofit existing roads to reduce their intrusion on the landscape and increase habitat connectivity.
- Weigh the need for additional roads against the increased impact on natural resources.
- Increase public awareness of wildlife needs through reduced speed limits, signage and informational pull-outs.
- Reduce the need for individual motorized access to public lands by improving multimodal infrastructure, such as bike paths, hiking trails and trams.
- Use only native species in right-of-way vegetation management on public lands.

RESOURCES

USFWS Refuge Roads http://refuges.fws.gov/roads/index.html

Roads, Parking Lots, Bridges and Trails: Conditions and Future Needs U. S. Fish and Wildlife Service, July 2002 http://refuges.fws.gov/roads/ResourcePaper.pdf

National Parks Conservation Association http://www.npca.org/across_the_nation/visitor_experience/tea21.asp

Federal Lands Highway Program http://www.fhwa.dot.gov/flh/

Alternative Transportation in the National Parks http://www.nps.gov/transportation/alt/index.htm

Federal Lands Alternative Transportation Systems (ATS) Study: Summary of National ATS Needs http://www.fta.dot.gov/library/policy/fedland/v3/asses.pdf

PUBLIC LANDS AND TEA-21

Authorizations for FLHP in TEA-21 totaled $4.1 billion for fiscal years 1998 through 2003. Funding is provided for the three existing categories of Federal Lands highways — Indian Reservation Roads (IRR), Park Roads and Parkways, and Public Lands Highways (discretionary and Forest Highways) — and for a new category; Refuge Roads, which are federally owned public roads that provide access to or within the National Wildlife Refuge System. FLHP funds can be used for alternative transportation facilities within public lands, national parks, and Indian reservations and can also be used as the state or local match for most types of Federal-aid highway projects. Procedures and a fund allocation formula for the IRR program are developed through negotiated rulemaking with Indian tribal governments.

OPPORTUNITIES FOR REAUTHORIZATION

- Reauthorize and fully fund the National Scenic Byways, Emergency Relief for Federally Owned Roads, Recreational Trails and Transportation Enhancements programs, all of which support public lands.
- Increase funding for repair and maintenance of transportation facilities on public lands. Specify that funding is NOT to be used for additional road-building.
- Provide dedicated funding for alternative transportation on public lands.

1. http://www.defenders.org/publiclands/
2. National Parks Conservation Association, http://www.npca.org/about_npca/
3. The number of visitors for FY 2001 was based on information obtained from the Refuge Management Information System. The estimated number of visitors for FY 2002 is based upon the average rate of growth during the 1995-2001 time period. Roads, Parking Lots, Bridges and Trails Conditions and Future Needs U. S. Fish and Wildlife Service, July 2002
4. Federal Lands Highway Program, http://www.fhwa.dot.gov/flh/
5. NPCA, http://www.npca.org/across_the_nation/visitor_experience/tea21.asp
6. Code Red: America's Five Most Polluted National Parks, NPCA
7. Influence of Vehicle Speed and Vegetation Cover-Type on Road-Killed Wildlife in Yellowstone National Park. 2001, Gunther, Kerry A. The Wildlife Society Annual Meeting.
8. Gateway communities are cities and towns that border late public land holdings such as national and state parks, forests, or wildlife refuges.
9. Flather, C.H., S.J. Brady and M.S. Knowles. 2000. Wildlife Resource Trends in the United States.
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11. 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, USFWS
12. Banking on Nature: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation, USFWS, 1997
13. Duffield, J. W. and C.J. Nehu. 1996. Economics of Wolf Recovery in Yellowstone National Park. Transaction of the 61st North American Wildlife and Natural Resources Conference.
14. Personal communication with Sean Furniss, Refuge Roads Coordinator, 2003.
15. At more parks, visitors leave the car behind, By Todd Wilkinson, The Christian Science Monitor

8
NATIVE VEGETATION

The single greatest threat to biodiversity in the United States is loss or degradation of habitat; a contributing factor in the decline of 85 percent of the species currently listed by the Department of the Interior as threatened or endangered.[1] Introduced species are the second greatest cause of species endangerment and decline in the U.S. and also worldwide — far exceeding all forms of harvest. Nearly 50 percent of species on the endangered or threatened species lists are at risk because of non-indigenous species. Invasive species degrade habitats and threaten natives through predation, disease, competition and/or hybridization. At least three of the 24 known extinctions of listed species were wholly or partially caused by hybridization between closely related exotic and native species.[2]

Quietly, insidiously — and often by invitation — the U.S. has been invaded. More than 50,000 species of non-native plants, animals and microbes have taken up home here — most in the past 70 years. Many are valuable crops or useful plants that humans brought from other countries. Others are pests that have overtaken the habitats of native species, pushing many towards extinction, causing extensive crop damage and human and animal disease.[3]

Native species have evolved and adapted within an ecosystem that contains competing species, predators, and diseases, all of which limit their abundance. In other words, they are part of an ecological dynamic that has evolved over thousands of years. In the absence of these checks, many non-natives can spread rapidly and dominate an area, altering habitats and evicting native plants and animals. Species that are not native at a site are variously called non-native, exotic, alien, adventive, or non-indigenous species.[4]

COSTS OF INVASIVES

The ecological cost of invasive species is rivaled only by the economic cost. In a 2000 damage assessment study, *Environmental and*

BENEFITS OF NATIVE SPECIES

1. **Erosion control**
2. **Vegetation management**
3. **Biodiversity**
4. **Wildlife habitat**
5. **Wetland mitigation**
6. **Endangered species**
7. **Water quality**
8. **Hardy vegetation**

Adapted from "Reassessing Beautification: More Than an Aesthetic Goal" by Bonnie L. Harper Lore, FHWA

Economic Costs of Nonindigenous Species in the United States, a team of researchers from Cornell University estimated that invasive species are responsible for at least $137 billion a year in economic losses.

The losses related to plants alone total $36.6 billion annually, as follows:

- Crop losses cost $23.4 billion a year and an additional $3 billion is spent on herbicides to control them.
- In grazing and pastureland, invasives result in a loss of forage that amounts to $1 billion a year. Ranchers spend about $5 billion each year to control invasive and toxic weeds in pastures and rangelands, but they continue to spread.
- Homeowners spend an estimated $500 million a year and golf courses spend $1 billion a year to control weed invaders.
- An estimated $100 million is also spent to control aquatic weeds that clog waterways and alter natural ecosystems.[5]

Today, as much as 17 percent of North American flora, and up to 33 percent of individual state floras are made up of exotics. Each day, approximately 4,600 acres of land is invaded by invasive plants.[6] Nowhere is this more evident than along the four million miles of roads and highways that crisscross the country. Because they disturb natural habitats, transportation systems can facilitate the spread of plant and animal species outside their natural range. With 12 million acres of land contained within public rights-of-way, transportation agencies are also land managers on a grand scale. Even along some of the most remote roads, evidence abounds of introduced species. Since roadbuilding began, our rights-of-way have been inundated with non-native species — mostly by accident, some times by design, and often in well-intentioned but harmful attempts to "beautify" the roadside.[7]

NORMAN E. REES, USDA ARS, WWW.INVASIVE.ORG

Purple loosestrife, a European native popular as an ornamental plant in the early 1800s, has invaded wetlands in 48 states, and is blamed for crowding out 44 native plants and endangering wildlife that depends on those natives. The economic damage of purple loosestrife is estimated at $45 million a year for control and loss of forage crops.

The management of roadside vegetation has always been a reflection of prevailing attitudes and the current level of understanding of ecology. During the 1930s, roadsides were maintained as if they were the nation's front yard. The labor-intensive planting and mowing that

this required was significantly reduced in the 1950s with the introduction of agricultural herbicides. Beautification became a major objective of state highway agencies in the 1960s. During the 1970s, a growing appreciation for the environment led to a more ecological approach to roadside management. By the 1990s, it was understood that none of these previous aesthetics were mutually exclusive or necessarily incompatible with ecology. The idea grew that the country's roadsides should reflect the natural beauty and biodiversity of each region, and that a new aesthetic could be built through better planning based on an understanding of natural heritage. The benefits of this include roadsides that are more ecologically diverse, that provided suitable habitat for wildlife, that showcase local character, that control erosion, that require reduced use of water, fertilizer and other chemicals, and that also require less maintenance.[8]

> ***"Extinction by habitat destruction is like death in an automobile accident: easy to see and assess. Extinction by the invasion of exotic species is like death by disease: gradual, insidious, requiring scientific methods to diagnose."***
>
> ***E.O. Wilson***
> ***Harvard University***

When highway construction began in the early 20th century, the objective of roadside vegetation management was to establish an inexpensive, attractive and fast-growing slope stabilizer. Depending on the region, native species may or may not have met all of these objectives. Where native flora was too costly, grew too slowly, or was deemed unattractive, non-native species were often planted. As a result, public rights of way became clogged with invasive species such as kudzu and grasses. Some of these invasives spread beyond the right of way, onto adjoining private and public property, further degrading habitat and reducing biodiversity. Decisions based only on cost, ease of use and driver safety fail to consider the negative consequences for the roadside environment and beyond.

Many of these practices and attitudes about roadside vegetation management continue today. Roadsides provide a buffer between the roadway itself and the adjacent commercial, industrial, agricultural or residential lands, protecting the private landowner and the highway user from one another. Roadsides also provide opportunities for the movement of invasive species through the landscape. Invasive plant or animal species can move on vehicles and in the loads they carry. Invasive plants can be moved from site to site during spraying and mowing operations. Weed seed can be inadvertently introduced into the corridor aboard construction and maintenance equipment, through the use of mulch, imported soil or gravel, and sod. Some invasive plant species might be deliberately planted in erosion con-

trol, landscape, or wildflower projects. Very often, such weeds not only threaten the economic activities of adjacent landowners, but also fail to protect the interests of the highway users. Millions of miles of highway rights-of-ways traverse public and private lands. Many of these adjacent lands have weed problems and the highway rights-of-way provide corridors for further spread.

On February 3, 1999, Executive Order 13112 was signed "to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause." The executive order builds on the National Environmental Policy Act (NEPA) of 1969, the Federal Noxious Weed Act of 1974, and the Endangered Species Act of 1973, to prevent the introduction of invasive species, provide for their control and take measures to minimize economic, ecological, and human health effects. The order established an Invasive Species Council, called for an Invasive Species Management Plan and outlined federal agency duties as follows:

- Identify actions which affect invasive species
- Detect and prevent introductions
- Monitor populations and conduct research
- Restore native populations
- Promote public education
- Discontinue authorization, funding and execution of all actions which promote introductions
- Consult with the Invasive Species Council and stakeholders

The executive order reflects great concern about the impacts of invasive species, and also the need for action on a national scale. Shortly after the executive order was signed, then Secretary of Transportation Rodney E. Slater issued a "Policy Statement on Invasive Alien Species," which directed state DOTs to actively implement the order. DOTs were given a new directive to address issues related to roadside vegetation management, from both the construction and maintenance aspects. Guidance developed by the FHWA provided a framework for preventing the introduction of new invasives on rights-of-way and controlling those invasives that already existed. Control can be a complex effort involving various governmental jurisdictions, adjacent landowners, and the general public. The FHWA guidelines were developed with the goal of promoting improved cooperation, communication, and joint eradication efforts with agencies at all levels and with the private sector. To reduce economic and ecological costs and to improve eradication effectiveness, states are encouraged to incorporate elements of this guidance into their planning and implementation of construction, erosion control, landscaping, and maintenance.[9]

IOWA'S LIVING ROADWAY PROGRAM

Beyond the preventative and reactive, there is also great potential for state DOTs to become proactive stewards in roadside management. In many regions, roadsides provide some of the last vestiges of native habitat. Prairies and

grasslands are our most highly imperiled native habitats. Roadsides offer excellent opportunities for restoring some components of the prairie ecosystem. Together, the Iowa Department of Transportation and the Roadside Management Program at the University of Northern Iowa are making strides in restoring roadside prairies. In Iowa alone, where 98 percent of the native prairie habitat has been lost, the 600,000 acres of roadside habitat provide more area than all the state, county, and city parks combined.[10] In 1988, the Living Roadway Trust Fund was established to provide funds for the development and implementation of Integrated Roadside Vegetation Management (IRVM) plans. The purpose of these plans is to preserve, plant, and maintain Iowa's roadside vegetation so that roadways are safe, visually interesting, ecologically integrated, and useful for many purposes. On roadside projects, a minimum of 50 percent by count of newly planted trees and shrubs must be considered native to Iowa or be improved hardy cultivars of a native species. All grasses and forbs (plants and/or seeds) must be considered native to Iowa. Introduced species, other than annual grasses used specifically as cover crops, will not be funded.[11]

CONCLUSION

Twelve million acres of land are contained within our public rights-of-way — an area roughly half the size of Indiana. Given the widespread threat of invasive species, resource managers and transportation agencies have a responsibility to first stop adding to the problem. Second, they must attempt to repair the damage that has already been done. Finally, where possible, roadsides should be enhanced to restore the ecological value they once had. Our nation's rights-of-way must be managed as a valuable resource with the most positive impact on the environment and the economy.

RECOMMENDATIONS

- Develop and adopt integrated roadside vegetation management plans.
- Coordinate and compile vegetation inventories, classification systems, plans and implementation strategies for roadsides.
- Establish a statewide invasives clearinghouse to provide data, information and technical assistance to land and resource managers, action agencies, and developers.
- Provide additional training in removing invasive species and reestablishing native flora on rights-of-way.
- Develop educational programs and provide informational materials for the general public, landowners, government employees, and board members as part of a program for integrated roadside vegetation management. The public does not support what it does not understand. Through public service announcements and instructional materials, state DOTs can shore up the public support necessary to successfully address invasive species issues.

- Sponsor pilot projects on the removal and prevention of roadside invasives, as well as native species restoration.
- Conduct research and monitoring of project sites for invasives.
- Reward managers and communities for exemplary efforts in the eradication of invasives and restoration of native species.

RESOURCES

Roadside Use of Native Plants, by Bonnie Harper-Lore and Maggie Wilson. Island Press, 2000.

Gateway to Federal efforts concerning invasive species http://www.invasivespecies.gov

Federal Highway Administration Guidance on Invasive Species http://www.fhwa.dot.gov/environment/rdsduse/rdus3_13.htm

Iowa's Living Roadway Program http://www.iowalivingroadway.com/ http://www.uni.edu/irvm/web/

Invasive Species in Transportation Rights of Way: "You Wouldn't Plant Kudzu, Would You?"http://itre.ncsu.edu/cte/TC27HANDOUT.pdf

Executive Order http://www.invasivespecies.gov/laws/execorder.shtml#sec2

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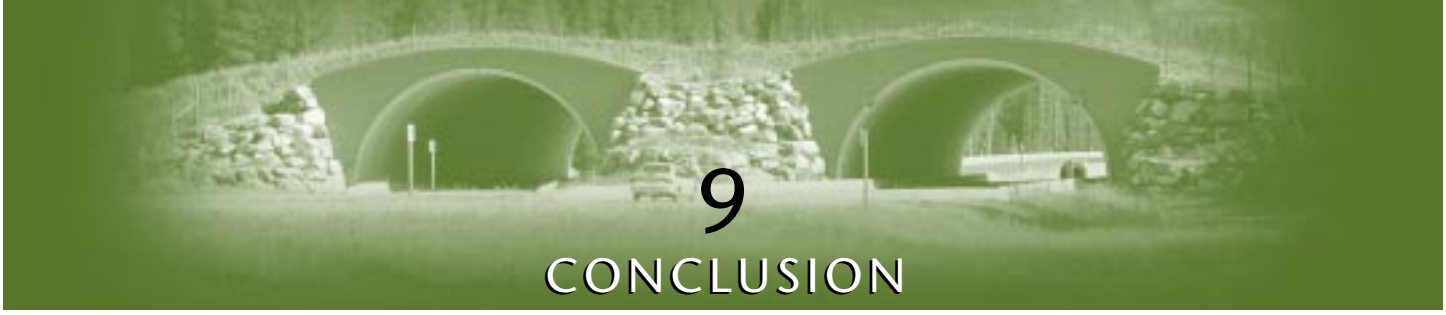
NATIVE VEGETATION AND TEA-21

TEA-21 does not contain any provisions to assist or encourage states to discontinue using invasive species or to establish native roadside vegetation management programs.

OPPORTUNITIES FOR REAUTHORIZATION

- Provide funding for statewide inventories of vegetation in rights-of-way. Statewide inventories will document invasions and aid in statewide planning and management of this issue.
- Require discontinuation of the use of non-natives in roadside vegetation management. Compile state lists of target species and appropriate replacements.
- Support native species restoration. The executive order on invasive species required federally funded projects to not only prevent the spread of invasive species, but also to actively plant and manage native plants. Vegetation managers need incentives to move from current practice to a native vegetation management plan.
- Institute a start-up, small business loan program for growers to establish native seeds and stock for use in roadside vegetation. Businesses would be given a five-year grace period before reimbursement is expected. Reimbursement would be in the form of native seed and stock to be used by state DOTs.
- Provide funding to educate practitioners on native vegetation. State DOTs vary widely in their capacity to make positive changes in vegetation management. Additional training is needed to make these changes the standard, rather than the exception.



9 CONCLUSION

After a century of roadbuilding, the need to address conflicts between transportation and biodiversity has never been greater. Science has revealed the effects of roads on wildlife. Engineering has responded with methods to improve existing roads and ameliorate impacts. Better planning and policy can guide future infrastructure investments away from sensitive natural areas and toward improved mobility and communities.

Many states and agencies are beginning to recognize that there are ways to both meet transportation needs and do a better job of protecting environmental and cultural resources. Current efforts to weaken the environmental review process under the National Environmental Policy Act could seriously jeopardize the country's natural and cultural resources, while doing little to reduce project delays. Indeed, an FHWA study recently found that the most common reason that projects were delayed was because of lack of funding or low priority (32 percent), local controversy (16 percent), or the inherent complexity of the project (13 percent). All of these issues, as well as changing or expanding the scope of the project (8 percent) surpass environmental factors as causes of project delay.[1]

The states and agencies profiled in this report have found that expedited project delivery and improved environmental protection can be achieved by comprehensively planning for biodiversity conservation, proactively mitigating environmental impacts through conservation banking and wildlife crossings, improving coordination among transportation and resource agencies, reducing road impacts and promoting alternative transportation on public lands, and promoting the use of native vegetation in roadway landscaping and maintenance. Rather than being the exception to the rule, these practices can become "second nature" to transportation and resource professionals across the nation.

CORBIS

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10 RECOMMENDATIONS

1. Integrate conservation planning into transportation planning.

- Transportation planners, at the state and MPO level, should locate and utilize existing landscape-level conservation plans in their own planning efforts.
- In those states that have yet to adopt a Comprehensive Wildlife Conservation Plan, individuals should contact the state fish and game agency and state environmental protection agency to offer support for such a plan. Using conservation plan mapping, transportation officials and MPOs can plan future road and highway projects that avoid sensitive and protected areas.
- Use conservation plans to identify mitigation sites or banks in advance of project impacts.
- Provide adequate training on the incorporation of conservation planning to field and administrative staff, as well as transportation planners.
- Sponsor pre- and post-planning monitoring to determine the effectiveness of planning initiatives.
- Inform and involve the public through communication and outreach tools.

2. Use conservation banking in concert with large scale conservation plans to mitigate for unavoidable impacts of transportation.

- Use conservation banking when avoiding and minimizing impacts is impossible and when consolidating mitigation is biologically preferable to onsite mitigation.
- Create a revolving fund from which transportation officials can make interest-free withdrawals to acquire land that can be banked for mitigation purposes. Money would be reimbursed to the fund from project funding.
- Use existing conservation plans to determine the most valuable lands for banking. These include statewide comprehensive wildlife conservation plans, regional conservation plans, endangered species recovery plans and critical habitat designations.
- Site conservation banks strategically, with a particular conservation objective in mind.
- When establishing conservation banking in your state, develop a statewide MOU among all resource and action agencies involved.

3. Coordinate with resource agencies early, substantively and continuously throughout transportation planning and project development.

- Fund full-time employees at relevant agencies to work exclusively on environmental and cultural resource reviews for transportation projects.
- Establish Environmental Review Committees composed of high-level representatives from

each of the relevant federal and state agencies.

- Hold regular meetings of the Environmental Review Committees to discuss upcoming projects and identify potential conflicts and impacts.

4. Build wildlife crossings where necessary to repair ecological damage and restore habitat connectivity.

- Conduct habitat connectivity studies to determine where passageways are needed. Locate structures in existing migration routes.
- Retrofit existing roads with wildlife passageways. Consider the full range of options, from at-grade, non-structural approaches to land bridges.
- When planning, designing and building wildlife crossings, ensure the future viability of habitat on either side through acquisition or easements.
- Conduct post-construction monitoring on the effectiveness of passageways.
- Increase the use of signage to make motorists aware of wildlife in the area.
- Reduce speed limits in wildlife areas.

5. Provide alternative transportation and maintain roads on public lands in a manner consistent with surrounding natural resources.

- Practice context-sensitive solutions in roads and highways on public lands. Retrofit existing roads to reduce their intrusion on the landscape and increase habitat connectivity.
- Weigh the need for additional roads against the increased impact on natural resources.
- Increase public awareness of wildlife needs through reduced speed limits, signage and informational pull-outs.
- Reduce the need for individual motorized access to public lands by improving multimodal infrastructure, such as bike paths, hiking trails and trams.

6. Use only native species in right-of-way vegetation management on public lands.

- Use only native species in roadside vegetation management.
- Develop and adopt integrated roadside vegetation management plans.
- Coordinate and compile vegetation inventories, classification systems, plans and implementation strategies for roadsides.
- Establish a statewide invasives clearinghouse to provide data, information and technical assistance to land and resource managers, action agencies, and developers.
- Provide additional training in removing invasive species and reestablishing native flora on rights-of-way.
- Develop educational programs and provide informational materials for the general public, landowners, government employees, and board members as part of a program for integrated roadside vegetation management.
- Sponsor pilot projects on the removal and prevention of roadside invasives, as well as native species restoration.
- Conduct research and monitoring of project sites for invasives.
- Reward managers and communities for exemplary efforts in the eradication of invasives and restoration of native species.

11 APPENDIX

A. OTHER STATEWIDE CONSERVATION PLANS

Oregon's Living Landscape: The Oregon Biodiversity Project (1993-1999) was a private sector-based collaborative effort that involved a wide range of interests, including federal, state, and local governments, academia, and industry and conservation organizations. Initiated by Defenders of Wildlife in collaboration with The Nature Conservancy of Oregon and the Oregon Natural Heritage Program, the Oregon project produced a statewide biodiversity analysis and outlined a broad conservation strategy to guide future action. The project developed a number of high quality products, including a full-color atlas that outlined major findings and a separate publication on landowner conservation incentives. The Oregon project has been widely recognized as a model for future biodiversity projects in other states.

Massachusetts BioMap Project: Funded by the Massachusetts Executive Office of Environmental Affairs, the BioMap Project was initiated by the Massachusetts Natural Heritage and Endangered Species Program in the spring of 2000. The goal of the project was "to promote strategic land protection by producing a map showing areas that if protected, would provide suitable habitat over the long term for the maximum number of Massachusetts' terrestrial and wetland plant and animal species and natural communities." Using GIS technology and state rare species and exemplary natural communities data, the BioMap identifies 2,130,000 acres (42% of the state) as important for the long-term conservation of species and natural communities, of which 1,160,000 acres are Core Habitat (23% of the state) and 970,000 acres are Supporting Natural Landscape (19% of the state). The BioMap is now being used as a tool to facilitate informed land conservation decisions throughout Massachusetts. It is being used to help set land acquisition priorities, and the Natural Heritage and Endangered Species Program staff is working to encourage towns to use the BioMap to guide land-use planning decisions and to incorporate it into their next update of Open Space and Recreation Plans.

Maryland GreenPrint Program and Green Infrastructure Assessment: In 2001, Maryland's GreenPrint Program was initiated to protect the remaining ecologically significant lands that would be important for the long-term survival of the state's native plants and wildlife. The Governor approved $145 million over five years for the program. The purpose of the program is to "identify, using the most up-to-date computer mapping techniques, the most important unprotected natural lands in the state; link, or connect, these lands through a system of corridors or connectors; and save those lands through targeted acquisitions and easements." As a component of the GreenPrint Program, Maryland's Green Infrastructure Assessment provides a scientifically based, landscape approach to identifying and linking ecologically valuable areas in the state. The purpose of the Assessment was to systematically identify and protect ecologically important lands, address problems of forest fragmentation, habitat degradation, and water quality, maximize the influence and effectiveness of public and private conservation investments, promote shared responsibilities for land conservation between public and private sectors, guide and encourage compatible uses and land management practices and provide coordination and targeting of mitigation efforts to enhance urban environments and land conservation goals.

New Jersey Landscape Project: In 1994, the New Jersey Division of Fish and Wildlife's Endangered and Nongame Species Program initiated a statewide landscape approach to conserving biodiversity, called the Landscape Project. The goal of the project was to protect New Jersey's biodiversity by conserving rare wildlife populations and their habitat. Using Geographic Information Systems (GIS), rare wildlife habitats were mapped by overlaying species occurrence locations with land cover classifications. Identified habitat areas were then ranked according to the endangered status of the species found within the parcel to help prioritize conservation and management options. The project was designed to provide maps that can be reproduced at various scales, benefiting agencies, organizations, and landowners at the state, county, and municipal levels. Furthermore, the project maps have been used to guide planning and regulatory decisions, direct proper management of public conservation areas, provide conservation tools to local communities, such as the townships of Chester and Delaware, and prioritize land acquisition decisions, especially through Green Acres-the state open space acquisition program.

B. GUIDING PRINCIPLES FOR STATES TO CONSIDER IN DEVELOPING COMPREHENSIVE WILDLIFE CONSERVATION PLANS FOR THE STATE WILDLIFE GRANT AND WILDLIFE CONSERVATION AND RESTORATION PROGRAMS

FINAL: SEPTEMBER 27, 2002

The International Association of Fish and Wildlife Agencies recommends the following guiding principles for the States, the U.S. Fish and Wildlife Service, and their conservation partners to consider and apply while developing Comprehensive Wildlife Conservation Plans to meet their obligations under the State Wildlife Grant (SWG) and the Wildlife Conservation and Restoration (WCRP) programs.

These Guiding Principles identify goals, objectives, and actions to strive for over time. Few if any will be fully realized in any State under what is hopefully just the first round of conservation program development under SWG and WCRP. Some things must occur from the outset, because they are legally required and/or because they are essential to success. Clearly, broad-scale public participation is an example of one such area. Among the diverse stakeholders in this effort are: private, local, State, and Federal agencies and governments, NGOs, etc.

The Comprehensive Wildlife Conservation Plan provides an opportunity for the State wildlife agency to provide effective and visionary leadership in conservation. The Plan can identify the measures that will be used, the results achieved, and the threats and needs that remain with regard to wildlife and wildlife habitat. It is also an opportunity to address broader issues and programs, including environmental and wildlife-related education, outdoor recreation, and wildlife-related law enforcement. These other areas can constrain, or enhance, wildlife conservation efforts, and funding and public support for wildlife conservation can be increased, or at least stretched, by involving partners that share those interests.

A: PLANNING PROCESS AND PARTNERSHIPS

1. Involve multiple staff levels within each agency, and broad public-private partnerships, to develop and implement the Plan.
2. Involve partners that have the authorities necessary to ensure that the Plan addresses the full range of issues at hand.
3. Build capacity for collaboration among all partners engaged in the effort, and make sure the collaboration is productive, so trust and confidence grow, and organizational and interpersonal relationships become strengths of the Plan.
4. Share responsibility and credit for planning and implementation among all partners, who collectively share responsibility for success of the Plan.
5. Focus on efficiency and effectiveness, so the value added in planning and implementation is commensurate to the funds invested.
6. Ensure that the planning processes and the resultant Plans are dynamic (so they can be improved and updated efficiently as new information is gained.
7. Communicate effectively with stakeholders, other partners, and the public, early and often.
8. The planning processes, and the decisions made during planning, should be obvious to those who read and use the Plan, and repeatable (document the processes and the decisions so the next planning cycle can build on this one.

B. FOCUS AND SCOPE

1. Base the Plan in the principles of (best science,((best management practices,(and (adaptive management,(with measurable goals, objectives, strategies, approaches, and activities that are complete, realistic, feasible, logical, and achievable. Describe these processes and practices sufficiently that partners understand what they entail and how they should function.
2. Address the broad range of wildlife and associated habitats, with appropriate priority placed on those species of greatest conservation need and taking into account the relative level of funding available for conservation of those species.
3. Integrate and address wildlife-related issues statewide, across jurisdictions and interests, and coordinate with parallel efforts in other States and countries.
4. Combine landscape/ecosystem/habitat-based approaches and smaller-scale approaches (e.g. focal, keystone, and/or indicator species; guilds; species of special concern) for planning and implementation.
5. Make the Plan an effective, long-lasting blueprint for conservation that provides a broad vision and priori-

ties, so a broad array of organizations, including other government agencies and NGOs, can help realize the vision. The Plan should have sufficient flexibility to respond to the full spectrum of conditions and circumstances likely to be encountered within the planning area.

C. FORMAT AND CONTENT

1. Make the Plan readable, understandable, and useful, with well-defined issues, short and long-term goals and objectives, strategies, and realistic measures of performance that enable State agencies and their partners to demonstrate accountability.
2. Make full and effective use of relevant existing information; in particular, integrate appropriate elements of other plans and initiatives (such as Partners-in-Flight and the many regional and other plans), databases, GIS layers, records, reports, other information sources, and management information systems that overlap or complement these Plans.
3. Identify knowledge gaps, as well as areas of knowledge, to help focus future efforts to improve understanding and planning, but do not allow a lack of information to inappropriately limit necessary short-term application of the best available science and good judgment in decision-making.
4. Make the Plan spatially explicit, to the extent feasible and appropriate, with a full complement of GIS and other maps, figures, and other graphics, as well as appropriate text to provide sufficient detail and consistency in describing species and habitat conditions, conservation needs, conservation recommendations, and other issues/actions, so it can be used effectively by all partners.
5. Use threats analyses, risk and stressor assessments, and other techniques to help set priorities for goals, objectives, strategies, and activities.
6. In addition to wildlife, address factors that can have substantial impact on wildlife conservation, such as management of invasive species, wildlife-related and conservation-related education, law enforcement, and outdoor recreation.
7. Include a comprehensive glossary, so partners and the public have a shared and common understanding of key terms used in the Plan.
8. Develop an updatable information system to monitor Plan implementation and the status and trends of wildlife and habitat.
9. Consider wildlife conservation-related education and wildlife-associated recreation as tools that can help accomplishing conservation goals.

D. COMPLETION, OUTCOMES, AND AVAILABILITY

1. Provide annual written progress updates on the planning effort and progress to IAFWA(s CARA Implementation Committee each September, in addition to annual performance reports that must be submitted to the U.S. Fish and Wildlife Service pursuant to Federal Aid guidelines.
2. Ensure that the Plan clearly and definitively meets State obligations to Congress under the WCRP and SWG legislation, and to the U.S. Fish and Wildlife Service with regard to Federal Aid administration.
3. Provide sufficient documentation in or with the Plan to facilitate public understanding of the decisions that are made, how and why they were made.
4. Make the Plan a driving force in guiding activities under diverse wildlife and habitat conservation initiatives, and usable for helping to inform land-use decision-making.
5. Make the Plan readily available to the public in variety of media
6. Provide a mechanism for reporting accomplishments and tracking progress so local partners are aware of both.
7. Ensure that the Plan can be implemented, i.e. that it is administratively and politically feasible, and that there are sufficient resources (funding and staff) among the partners to accomplish significant gains at a large scale, and within an appropriate time frame, to preserve our Nation(s wildlife heritage.

C. OFFICIAL POLICY ON CONSERVATION BANKS

Douglas P. Wheeler
The Resources Agency

James M. Strock
California Environmental Protection Agency

April 7, 1995

The executive and legislative branches have endorsed the use of conservation banks as a means to accomplish important resource management goals. This document provides formal policy guidance on how to achieve this directive.

A conservation bank is a single parcel, or a series of contiguous or non-contiguous parcels, of habitat which is managed for its natural resource values. The resource benefits derived from this management regime are sold as "credits" to project proponents who seek mitigation opportunities to compensate for resource impacts elsewhere. Credits may be generated to meet any number of resource conservation needs, including compensation for impacts to wetlands, threatened or endangered species, Environmentally Sensitive Habitat Areas, mudflats, sub-tidal areas, and less sensitive resources.

Conservation banks, if properly established and managed, serve several useful functions. First and foremost, banks provide for the conservation of important habitats and/or habitat linkages. Second, they provide a viable alternative to the current practice of requiring piecemeal mitigation for individual project impacts. Individualized mitigation projects which have little connection with their surrounding ecosystem are often much more prone to failure than a mitigation project which is incorporated into a larger, ecosystem-based conservation bank or regional conservation plan. Third, conservation banks can take advantage of economies of scale that are often not available to individualized mitigation projects. Fourth, conservation banks provide significant incentives for private landowner participation and represent one of the best examples of private/public partnerships in an era of shrinking budget resources. Fifth, conservation banks can be a major funding component for the creation of an ecosystem preserve under a regional conservation plan. Sixth, and finally, conservation banks simplify the regulatory compliance process while achieving greater conservation goals.

CONSERVATION BANKING

For purposes of providing guidance on conservation banking, all Departments shall designate and train personnel to actively work with potential bank developers in accordance with the following precepts:

1. The priority for mitigation should be to accomplish it at a site which provides for the long-term conservation of habitat and species. As such, off-site mitigation is specifically sanctioned in the context of an otherwise permissible conservation bank.
2. A bank may be established pursuant to regulatory permit or contract between the bank developer and the appropriate regulatory agency(s). Where a bank is established pursuant to contract, care must be taken to create a legally enforceable instrument.
3. There is no minimum or maximum size of a conservation bank and it may be divided into clearly defined subareas. However, the bank and each of its subareas (if any) should be large enough to be ecologically self-sustaining or part of a larger conservation strategy that has a reasonable expectation of being accomplished.
4. Upon sale of the first credit in the bank or subarea, the land in the bank or subarea must be permanently protected through fee title or conservation easement. The land-use restrictions should run with the land and be recorded in the appropriate county(s) of jurisdiction.
5. Before selling bank credits, a proposed conservation bank should be approved by the appropriate resource management agency(s). Basic elements in any approvable bank proposal should include, but are not limited to:
    a. identification of a bank manager;
    b. identification of the geographical boundaries of the bank and the service area of the bank;
    c. provision for fundamental property protection measures (e.g., fencing some or all of the bank property if deemed appropriate, control of off-road vehicle use, etc.);
    d. provisions for the resolution of current or prospective land use conflicts involving the bank lands (e.g., rights-of-way issues, existing use issues, adjacent land-use issues);
    e. provisions requiring an annual report by the bank manager to be submitted to the appropriate regulatory agency(s).
6. Prior to the sale of credits, a resource management plan should be approved by the appropriate regulatory agency(s). A sufficient level of funding with acceptable guarantees (e.g., cash, letters of credit,

public charity, public funding mechanism) should be provided to fully ensure the operation and maintenance of the bank as may be required.

7. Provision should be made for long term management of bank lands after all the mitigation credits have been awarded. Generally, land management responsibilities should ultimately vest in a resource management agency or qualified non-profit organization, although a private entity may be an acceptable long-term manager.
8. Provision should be made for ensuring implementation of the resource management plan in event of non-performance by the bank owner and/or operator.
9. Provisions should be made in any bank establishment for the monitoring and reporting of identified species/habitat management objectives.
10. An easement or other agreement should be established at the bank in favor of appropriate resource management agency(s) guaranteeing the agency's right of entry onto bank lands for the following purposes:
    a. Inspections;
    b. Specified resource management responsibilities;
    c. Quality Assurance/Quality Control review with regard to bank management and operation;
    d. Resource management should the bank operator fail to implement prescribed resource management responsibilities.
11. Bank credits should be established by reference to an environmental baseline which may, but need not be, assessed at the time of the bank creation. This baseline will be used to establish credits for a number of categories requiring resource management, including, but not limited to, the following:
    a. Resource Preservation (the preservation of specified resources through acquisition or other appropriate means);
    b. Resource Enhancement (the enhancement of a degraded resource);
    c. Resource Restoration (the restoration of a resource to its historical condition);
    d. Resource Creation (the creation of a specified resource condition where none existed before).
12. The award of bank credits should be negotiated on a case-by-case basis between the project proponent in need of the subject credits, the regulatory agency(s) of jurisdiction, and the bank manager. Generally:
    a. Credits may be negotiated for available or prospective resource value establishment.
    b. Credits may be based on habitat acreage, habitat quality, contribution to a regional conservation strategy that has been approved by the appropriate regulatory agency(s), or any other basis acceptable to the regulatory agency(s).
    c. Actual awards of bank credits need not be withheld pending full realization of the targeted resource value at the bank. Credit availability may vary in accordance with agreed upon performance criteria for the development of the resource value in question.
    d. Awarded bank credits, subject to the approval of the regulatory agency(s), should be made transferrable.
13. Whether out-of-kind mitigation credit will be allowed at a particular bank will require a fact-specific inquiry on a case-by-case basis for the project creating the impacts.
14. The creation of any conservation bank should be listed with the Resources Agency in accordance with forthcoming guidance for purposes of maintaining a statewide bank inventory.

CONCLUSION

Conservation bank agreements developed between the bank developer and the appropriate regulatory agency(s) in accordance with the preceding precepts shall be considered consistent with state policy regarding conservation banks, assuming no violation of federal and state laws. Training manuals on this subject are forthcoming.

http://ceres.ca.gov/wetlands/policies/mitbank.html

D. A VISION FOR JOINT ENVIRONMENTAL AND TRANSPORTATION SYSTEM STEWARDSHIP IN OREGON COLLABORATIVE ENVIRONMENTAL AND TRANSPORTATION AGREEMENT FOR STREAMLINING (CETAS)

Charter Agreement

I. INTRODUCTION

The CETAS Group was formed in June of 2000 in response to several issues: a greater and greater sense of urgency about environmental stresses; the response to TEA-21 streamlining; the complexity of environmental regulation and planning requirements; and the need to update and fully implement the existing NEPA/404 Accord. Old processes were no longer adequate for the tasks at hand. The CETAS group was formed out of desire for a more harmonious and streamlined process for meeting agencies' missions.

II. GOAL

The goal of this Group is to identify and implement collaborative opportunities to help each participating agency realize its mission through sound environmental stewardship, while providing for a safe and efficient transportation system. Our direction for achieving this goal is derived from Table 1, which sets out the Group's vision.

III. BALANCING OF VALUES

In pursuing this goal, the ethic is one of balancing environmental and transportation values. Through earlier and more effective communication, mutual education, and process change, greater environmental benefits can be accomplished, while minimizing costs and delays. The ultimate goal is the improved outcome for each agency's mission.

When making environment-related decisions, CETAS participants share the responsibility to balance competing business needs and requirements with appropriate environmental stewardship. Schedule, cost, safety, quality, public input, regulator input, fish and wildlife habitat and other factors are all top priority, while none have first priority. Under §7(a)(1) of the Endangered Species Act, the Federal Highway Administration and the Oregon Department of Transportation shall use all of their authorities to conserve listed species and the ecosystems upon which they depend. With that vision, transportation planning and programs will use this authority to protect and restore habitat for listed species.

Under the authority of the National Environmental Policy Act, the Fish and Wildlife Coordination Act, the Clean Water Act, and other statutes, typically avoidance of environmental impacts is the highest priority. The best stewardship of the resource is to avoid harm in the first place. If the resource cannot be avoided, then minimize harm to the maximum extent possible and practicable. Where the resource cannot be avoided, and where minimization leaves harm to the resource, mitigate or offset the harm. In addition, sound environmental stewardship requires that, on all projects, decision-makers be mindful of environmental enhancement opportunities, and take advantage of them when appropriate.

IV. MEMBERSHIP AND RESPONSIBILITIES

A. The CETAS is composed of one representative, and one alternate from each of the following agencies: Oregon Department of Transportation, Federal Highway Administration, Oregon Division of State Lands, Oregon Department of Environmental Quality, Oregon Department of Fish and Wildlife, Department of Land Conservation and Development, Environmental Protection Agency, US Fish and Wildlife Service, US Army Corps of Engineers, and National Marine Fisheries Service.

B. CETAS members agree to:

- come to the CETAS meetings to share their individual opinions and knowledge,
- represent their agency's position fully,
- listen respectfully,
- ensure that the CETAS decision reflects agency positions rather than individual opinions, and receives full understanding and full agency ratification, and
- ensure that their agency develops an implementation plan, where relevant, for CETAS work products and the long-term implementation of CETAS agreements.

C. Decision-Making. Subject to statutory and legal constraints the following will occur:

- Decisions will be made by consensus of the partici-

pants. Consensus is defined as the willingness of all the participants to accept the decision and abide by it. It is understood that the decision may not represent the optimal outcome for any one participant, but it is an acceptable outcome to all.

- By agreeing to consensus, each member supports the decision.

D. Attendance

- Members agree to attend regular meetings of the CETAS.
- An alternate will be thoroughly briefed on the issues by their agency's CETAS representative prior to the meetings.
- Seven participants constitute a quorum.

V. MEETINGS

A. Timing of Meetings

- ODOT representative will convene quarterly CETAS meetings for the purpose of information sharing, monitoring of ongoing CETAS work products, and addressing other work issues,
- ODOT may convene additional meetings as the need arises;
- At the request of two or more agencies, or as specified in any of the CETAS work products, ODOT shall convene additional meetings.

B. ODOT will provide for minutes.

C. Annually, ODOT Environmental Services shall prepare and present a report summarizing and evaluating the work of the CETAS, its workgroups, and the implementation of its work products.

VI. TASK OF THE CETAS

It is the task of the CETAS to: provide a forum for exchange of information and perspectives, establish collaborative opportunities for its work groups to resolve, establish work groups, monitor the progress of work groups, approve work group products, implement CETAS agreement, monitor the implementation of CETAS agreements and engage in other activities as the group decides.

VII. WORKGROUPS

A. Workgroups may be used to prepare specific proposals or draft agreements. Workgroups will:

- be subject to the ground rules established by this charter, unless otherwise specifically directed;
- to the extent possible, reflect a balance of interests;
- make regular progress reports to the CETAS Group.

B. The work products should include the following: conditions of the agreement, education plan, implementation plan, monitoring and assessment mechanism, durability of the agreement, conflict resolution process, if appropriate.

C. The Work product shall not be considered final until approved by the CETAS.

VIII. ELEVATION OF CONTESTED ISSUES

Elevation should be used whenever participants feel the decision needs to be made at a higher level, participants feel the agreement is not being upheld, or participants cannot concur with a proposed activity. Elevation is a position step in appropriately resolving issues. The sequence for each of the agencies is identified in Table 2.