



Importance of Roadless Areas in Biodiversity Conservation: A Scientific Perspective

Executive Summary

For the past 3 years, the World Wildlife Fund together with the Conservation Biology Institute (Corvallis, OR) have conducted one of the most comprehensive assessments of our nation's protected areas, including the ecological importance of roadless areas to national conservation efforts. The purpose of the assessments was to: (1) determine how much and how representative our nation's protected areas are of important wildlife habitat; (2) provide scientific documentation of the ecological importance of roadless areas; and (3) determine the extent of habitat fragmentation from road building and other disturbances in forested ecoregions where biodiversity is considered "globally outstanding." These studies are available in published reports and CD-ROM formats from WWF and CBI.

Nation's first comprehensive protected areas assessment - Since the designation of the nation's first national park, Yellowstone, in 1872, the United States has set aside more than 100 million acres in wilderness and national parks. However, most scientists agree that it will take far more land in protection to save what remains of nature's legacy from an increasing amount of road building, logging, urban development, and other disturbances. While the nation has some of the best examples of protected areas around the world, the current network of parks, wilderness, and wildlife refuges is not sufficient to insulate biodiversity from projected increases in human population, natural resource consumption, and global climate change extending into the next century. The main findings of this study are as follows:

- The nation has set aside only 5% of its land in "strict" protection (national parks and monuments) and another 5% in more "relaxed" protection categories (state parks and national wildlife refuges where more human activity occurs but not logging or mining).
- The vast majority (83% or 160 million acres) of our national forest lands are open to multiple-use management, including logging, mining, and livestock grazing – only about 17% or nearly 33 million acres are in protected status.

- Protection across the nation varied widely from state to state with most states east of the Mississippi protecting less than 1% of their land area.
- Southern and mid-western states had the lowest levels of protection with only 0.2-0.4% protected.
- Most protected areas were concentrated in the western United States with Alaska (35%) and California (19%) having the highest levels of protection for the nation - Oregon has protected just 5.3% of its lands.
- Most protected areas (even those in Alaska) are at high elevation (rock and ice), missing key low-elevation areas of high conservation value where most wildlife and fish species occur.
- Nation-wide, protected areas averaged less than 25,000 acres, considered too small to insulate wildlife from development in the surroundings.

Ecological Importance of Roadless Areas - the importance of roadless areas was documented for both small (1,000-5,000 acres) and large (>5,000 acres) roadless areas under consideration in the Clinton roadless area environmental impact statement and for three case study regions (Klamath-Siskiyou, Appalachia/Blue Ridge, and Tongass National Forest) recognized by WWF for global biodiversity importance. The Klamath-Siskiyou region of northwest California and southwest Oregon has some of the highest diversity of conifers, endemic plants, and mollusks (terrestrial and freshwater snails and mussels) of any conifer forest in the world. Appalachia/Blue Ridge Forests of the southeastern US are among the world's most diverse deciduous forests in terms of plant richness, amphibians, butterflies, and tree species. The Tongass National Forest in southeast Alaska contains some of the largest, intact blocks of forest in North America and nearly ¼ of the world's temperate rainforest.

In general, large (>5,000 acres) roadless areas in these exceptionally diverse regions provide many ecological benefits that excel in comparison to roaded landscapes, including:

- Relative high levels of intact late-seral/old-growth forests
- Essential habitat for many species of conservation concern (including threatened ones)
- Broad array of habitat types and elevation bands
- "Buffer areas" from exotic species invasions and edge effects
- Critical winter range for ungulates
- Landscape and regional connectivity
- Aquatic strongholds for salmonids
- Areas most likely to have fire regimes operating within natural bounds

Small roadless areas share many of attributes in common with larger ones, including:

- Essential habitat for species key to the recovery of forests following disturbance such as herbaceous plants, lichens, and mycorrhizal fungi
- Habitat refugia for threatened species and those with restricted distributions (endemics)
- Aquatic strongholds for salmonids
- Undisturbed habitats for mollusks and amphibians
- Remaining pockets of old-growth forests
- Overwintering habitat for resident birds and ungulates
- Dispersal “stepping stones” for wildlife movement across fragmented landscapes

In the eastern United States most of the remaining intact forests and roadless areas are smaller than the 5,000-acre RARE II designations. Small roadless areas, however, are key to ecological restoration in these otherwise highly fragmented landscapes and when combined with strategic closure of roads (near roadless areas) the size and functionality of many small roadless areas could be restored.

Impacts of Roads on Biodiversity and Ecosystem Processes - roads are often the first major human disturbance into a forest, which is then followed by land clearing and other disturbances. Excessive road building may act directly or indirectly on wildlife population viability and/or ecosystem process as follows:

- dispersal bottlenecks for propagules of sensitive species, thereby fragmenting populations
- dispersal conduits for invasive species (e.g., roads and associated vehicular traffic are a major contributor to the spread of root rot fungus *Phytophthora lateralis* that is decimating Port Orford cedar forests in Oregon and California)
- impediments to hydrological properties and processes, particularly changes in drainage patterns and stream morphology
- degradation of fish habitat
- mass wasting events and slope instability (particularly road building on steep slopes)
- poaching, over-hunting, and trapping of wildlife
- collisions with wildlife - one study estimates more than 1 million vertebrates nation-wide are killed each day by collisions with vehicles -- roadkill is the leading cause of death of the endangered Florida panther and key deer
- alteration of fire patterns (e.g., increased risk of arson due to human access exacerbated by roads)
- soil and water pollution, air pollution, particularly a build up of nitrous oxides in soils and streams that has been associated with the spread of exotics

- erosion, stream sedimentation, edge effects, over collecting of rare plants and animals (e.g., cacti and reptiles), and elimination of snags for firewood or road safety.

In forested ecosystems, roads result in cumulative impacts, which when combined with other disturbances, can reduce habitat suitability for many species. This is well documented across a range of taxa from small mammals, amphibians, and carabid beetles to ungulates, large carnivores, and neotropical migratory songbirds. Large carnivores like grizzly bears and wolves typically drop out of an area when the density of roads increases beyond certain thresholds (usually >0.5 mi of roads/square mile of forest), salmon spawning habitat can be degraded by sediment from roads, and deer and elk lose important hiding and thermal cover when forests are fragmented by road building and clearcutting.

Roadless Areas and Fire Management/Access Issues - while roads are important to land managers concerned about access into the forest for fire control or pest management, not every acre of forest landscapes needs to be managed in order to ensure healthy forests. Many species cannot tolerate multiple use management or road building on every acre of the land and thus the presence of roads has been associated with loss of biodiversity and disruption of ecosystem processes. Too many roads in an area can elevate fire risks due to arson and accidental fires associated with greater access (more than 90% of all forest fires are arson or accidental related). Given the remoteness of most roadless areas and terrain and safety considerations, fire control in roadless areas is best carried out by helicopters and fixed wing aircraft than by vehicles. Observations of fire behavior indicate that when fires reach plantations they often spread rapidly (i.e., “blow up”) due to contact with fine fuels produced by logging slash. This pattern suggests that plantations may, in fact, be more vulnerable to fires than roadless areas and that most fire management should be directed at managed landscapes. In comparison, many roadless areas, because of access problems, have not been subjected to fire suppression and thus fuel levels are typically within historic bounds. Roads are also a significant conduit for the transmission and spread of numerous invasive exotic species that contribute to forest health problems, including the extensive decline of Port-Orford cedar. Finally, given the preponderance of roads in most forested landscapes (more than 378,000 miles on federal lands alone) the cumulative forest health problems and fire risks of additional access will more than offset any benefits provided by access into roadless areas. Satellite images of forest regions throughout the US reveal an extensive network of roads crisscrossing and fragmenting most forested landscapes. Thus, roadless areas provide some of the last remaining intact forest key to the functionality and health of entire ecosystems.

Conclusions – the studies conclude that a responsible roads policy is one that is grounded in sound science, recognizing the importance of roadless protection, road repair, road maintenance, and the closing and decommissioning of unstable and high risk roads. Existing roads will continue to provide for local forest management and access but roadless areas need to be protected for their unique benefits. Roadless areas are the “pearls” in a string of regional connectivity holding the many components of ecosystems

together and are the underlining fabric for biodiversity and ecosystem services that healthy forests provide. Protecting all roadless areas of 1,000 acres or greater on federal lands from logging, mining, grazing, and motorized access is key to ensuring that forests remain viable and that ecosystem management practices are scientifically sound. This level of protection should become the basis for the environmental impact statement on roadless areas currently in preparation by the Forest Service.

For more information on these studies contact:

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