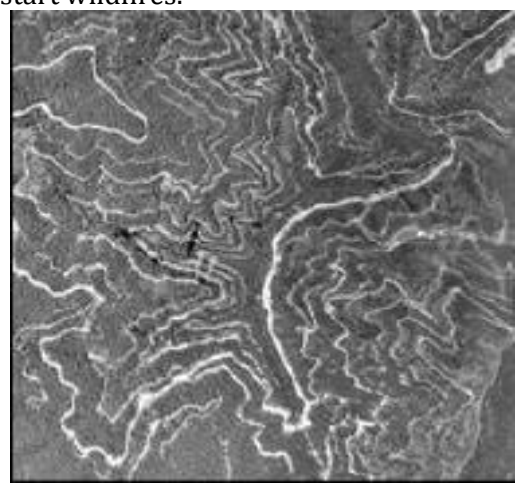
ROADRIGHT: A DECISION SUPPORT TOOL FOR RIGHTSIZING THE NATIONAL FOREST ROAD SYSTEM

The Benefits and Costs of Forest Roads

Roads link people to America's public lands. They provide access for recreation, resource use, and land management. They play a central role in the economic and social development of rural and urban communities.

Yet the road system on national forest lands is arguably one of the largest sources, direct and indirect, of environmental damage. Thousands of birds, mammals, amphibians, reptiles, and insects are road-killed each year. Road traffic causes noise and visual disturbance to humans and wildlife. Roads fragment habitat and create barriers for sensitive animal species. They disrupt water flows, block fish passage, and lead to increased runoff and sedimentation in streams. Roads can bring invasive plant and animal species to formerly pristine areas, and they sometimes bring irresponsible people who litter, poach wildlife, and start wildfires.



The U.S. Forest Service manages 380,000 miles of roads (enough to circle the equator 15 times) that were largely built to extract natural resources. Yet the agency is able to maintain only 20% of its road system to safety and environmental standards; nationwide there is an estimated backlog of $8 billion in deferred road maintenance. Poorly maintained roads cause additional damage as culverts fail and roads collapse into streams. Sixty-six million Americans in 3,400 communities rely on clean drinking water flowing from national forests, and many rural communities have economic ties to high-quality hunting, fishing, and recreation that healthy forest watersheds provide. An oversized and decaying road system degrades these ecosystem services.

Road reclamation may be the most important step in restoring national forests. In addition, getting the road system to the right size means more money for maintaining the roads that are needed for recreation and proper forest management. Because of its limited maintenance funding, the agency has been forced to systematically downgrade roads from passenger to high-clearance vehicle status, thus reducing recreational access to many people. Currently only 17% (about 66,000 miles) of the national forest road system is open to passenger cars, while the remainder is either closed to the public or accessible only by high-clearance vehicles.

The challenge is to reconcile the opportunities for people that forest roads provide with the threats to the environment—and the economy—that they pose.

The Opportunity to "Rightsize" the National Forest Road System

In January of 2001, the U.S. Forest Service adopted a new road management policy—the "Roads Rule"—to maintain a safe, environmentally sound road network that meets public needs and is affordable to manage. The environmental analysis for the 2001 Roads Rule envisioned a road system that is between 260,000 and 300,000 miles, meaning that between 80,000 and 120,000 miles of roads nationwide would need to be reclaimed. As part of the Roads Rule the Forest Service was supposed to conduct analyses of the entire road system to determine which roads should be reclaimed, but for the most part—possibly in response to a change in administration and a change in priorities—the agency only completed the analyses of maintenance level 3-5 (low-clearance passenger vehicle) roads, the roads least likely to be decommissioned.

In November of 2005, the Forest Service merged the Roads Rule with the newly-adopted Travel Management Rule, which ends cross-country driving in national forests and designates roads for motor vehicle use. Unfortunately, most national forests decided to complete the designation of a motor vehicle route system and end cross-country driving before conducting travel analyses to determine the minimum road system and identify roads to be decommissioned.

There is new momentum, however, in the Department of Agriculture to "rightsize" the road system on national forest lands. The Secretary of Agriculture, Tom Vilsack, has repeatedly called for greater focus on restoration of watersheds, which are heavily impacted by roads. The House and Senate Appropriations Committees of the U.S. Congress have both stressed, through "report language," the importance of determining the minimum necessary road system on forest lands and assessing which roads are unneeded and should be decommissioned. In fiscal years 2008 through 2011, Congress appropriated $180 million for emergency road maintenance and reclamation.

On November 10, 2010, U.S. Forest Service Chief Tidwell distributed a memorandum to all line officers and program directors instructing all national forests to identify, through a science-based analysis, an ecologically and fiscally sustainable minimum road system by 2015. This guidance directs regional foresters and forest supervisors to complete all of the components of Travel Management Regulations 36 CFR Part 212, Subpart A (formerly known as the Roads Rule). What follows are the regulations that guide the process:

Travel Management Regulations

Part 212 – Travel Management, Subpart A -Administration of the Forest Transportation System†

36 CFR 212.5 (b) (1). *Identification of road system*. For each national forest, national grassland, experimental forest, and any other units of the National Forest System, the responsible official must **identify the minimum road system needed for safe and efficient travel and for administration, utilization, and protection of National Forest System lands.** In determining the minimum road system, the responsible official must incorporate a science-based roads analysis at the appropriate scale and, to the degree practicable, involve a broad spectrum of interested and affected citizens, other state and federal agencies, and tribal governments. The minimum system is the road system determined to be needed to meet resource and other management objectives adopted in the relevant land and resource management plan, to meet applicable statutory and regulatory requirements, to reflect long-term funding expectations, to ensure that the identified system minimizes adverse environmental impacts associated with road construction, reconstruction, decommissioning, and maintenance.

36 CFR 212.5 (b) (2). *Identification of unneeded roads*. Responsible officials must review the road system on each National Forest and Grassland and identify the roads on lands under Forest Service jurisdiction that are no longer needed to meet forest resource management objectives and that, therefore, **should be decommissioned or considered for other uses such as trails.** Decommissioning roads involves restoring roads to a more natural state. Activities used to decommission a road include, but are not limited to, the following: reestablishing former drainage patterns, stabilizing slopes, restoring vegetation, blocking the entrance to the road, installing water bars, removing culverts, reestablishing drainage-ways, removing unstable fills, pulling back road shoulders, scattering slash on the roadbed, completely eliminating the road bed by restoring natural contours and slopes, or other methods designed to meet the specific conditions associated with the unneeded road. Forest officials should give priority to decommissioning those unneeded roads that pose the greatest risk to public safety or to environmental degradation.

†These regulations are further defined in Forest Service Manual Chapters 7700 - 7719 and Forest Service Handbook 7709.55, Chapter 20.

According to Washington Office direction, each forest will designate an interdisciplinary team to use the science-based Travel Analysis Process (TAP) to identify—for all maintenance level (1-5) roads—the minimum road system and roads that are no longer needed. These teams will establish a complete and accurate inventory of roads and trails managed for motor vehicle use; summarize current land management and travel management direction; identify important economic, ecological, and social issues; assess costs, benefits, problems, and risks associated with the road system; produce a map displaying the minimum necessary road system; and publish a prioritized list of unneeded roads and a list of proposed changes to the current travel management direction, including proposed additions to or deletions from the transportation system.

Although the agency did not provide new funding to the field to conduct the TAP analysis, they did provide some significant motivation. The directive memorandum explains that "(b)eyond FY 2016, no Capital Improvement and

Maintenance funds may be expended on NFS roads (maintenance level 1-5) that have not been included in a TAP or RAP (Roads Analysis Process)."

For people interested in large landscape connectivity for wildlife, this initiative presents an opportunity to reduce road densities, create larger roadless areas, and restore linkages between core habitats. For people interested in clean water and fisheries, it is an opportunity to improve water quality and aquatic habitats. And for people interested in fiscal responsibility, it is an opportunity to identify a road system that the Forest Service can afford to maintain.

Decision Support Tool for Rightsizing

The first steps in rightsizing the road system are to identify the minimum road system and identify high-priority roads for decommissioning and reclamation. Success will hinge on the quality of these analyses.

"RoadRight"—a decision support tool that is science-based, simple, transparent, flexible, and scalable—has been developed to use social and ecological criteria to prioritize opportunities for road maintenance, decommissioning, and reclamation. A decision support tool is, as its name indicates, simply a tool to support good decision-making. It provides a means of compiling and measuring information that stakeholders supply. It does not make decisions.

Part I: Identify roads that are unlikely candidates for reclamation (with all others being candidates)

A) Define the scale of analysis: The first step in setting up the decision support tool is determining the scale of the analysis. Minimum road system determinations will likely be made at a large landscape scale. Analyses should be done at the Forest level because that is the scale most appropriate for considering processes such as fire, predation, migration, dispersal, and hydrologic function. The Forest Service Handbook (7709.55, Chapter 20: Travel Analysis) states that "broad-scale analysis can establish greater context; provide more comprehensive support for decisions; serve as a basis for allocations of budgets and expertise in establishing schedules and accountability; and address issues that cross administrative boundaries."

B) Identify non-USFS roads: The scope of road decommissioning under the Travel Management Rule is only roads that are

maintained and administered by the U.S. Forest Service—not U.S. interstate highways, state roads, county roads, or private roads. In addition, while unauthorized or "user-created" routes may be causing environmental damage, they are not expressly referenced in the rules for decommissioning analysis under Subpart A of the Travel Management Rule. These routes are typically unconstructed, ungraded, and lack culverts. Therefore, more intense restoration treatment will be less crucial (compared to the treatment needed for constructed system roads), and benign neglect or less intense treatment will often be sufficient. The analysis, therefore, should be conducted only on *system roads* under Forest Service jurisdiction.

C) Identify USFS ML 3-5 roads: Reclamation priority should be given to native surface, high-clearance roads (maintenance levels 1 and 2). Maintenance level 3-5 roads should for the most part remain in the system, but be evaluated for potential environmental damage and prioritized for emergency maintenance. Maintenance level 3-5 roads are suitable for low-clearance passenger vehicles and are generally paved, graveled, or improved with non-native material. These roads are generally lowest priority for decommissioning because they are well-used arterial routes, convenient, have a large political constituency, and are typically more

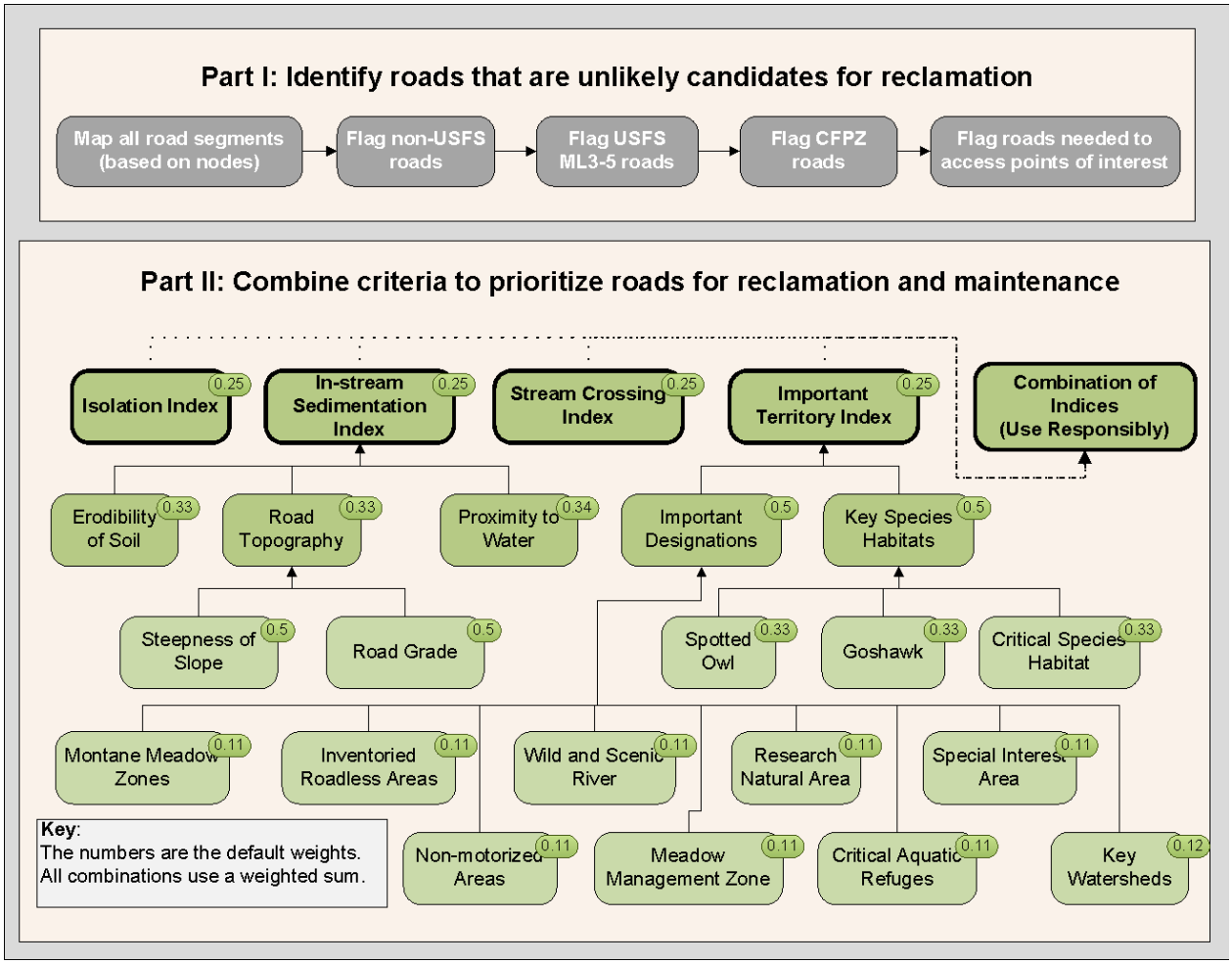


Figure 1. Road Decommissioning Decision Support Tool

expensive to remove. Conversely, many high-clearance roads were built for resource extraction, such as logging or hardrock mining. Today, only a small minority of them are used for their original purpose and maintained to standard. By separating high-clearance, native surface roads from low-clearance, improved roads, the ecological analysis can be used to set priorities for decommissioning the former and maintaining the latter.

D) Identify roads in the community fire planning zone (CFPZ): Roads that are needed to protect human life and property from fire should remain in the transportation system. The Travel Management Rule requires that roads remain on the ground "to meet resource and other management objectives adopted in the relevant land and resource management plan," and most forests have guidelines that require fires to be extinguished in the CFPZ.[1] By retaining roads that are near structures and developed sites, access is ensured for firefighters. The decision support tool will, however, include these roads in the ecological analysis to determine which roads in the CFPZ are highest priority for maintenance work.

E) Identify roads providing access to developed sites and private lands: The public should be able to access by motor vehicle, at a minimum, developed sites and private land on the forest. The Forest Service Handbook requires consideration of "transportation investments necessary to meet land management plan objectives, and ability to meet user needs and desires." There are a number of developed sites on national forests that would be inaccessible or underused if the roads to them were closed or decommissioned. Developed sites include: boat launches; hiking, biking, cross-country skiing, and equestrian trailheads; research stations; developed campgrounds; ranger stations; interpretive trails and kiosks; developed fishing access sites; downhill ski resorts; snowmobile and ORV staging areas; fire lookouts; private in-holdings; recreation sites; historic buildings; picnic areas; parking lots; active mines or quarries; and developed scenic viewpoints. *At least one* road leading to each site should remain in the transportation system. Again, these roads will be included in the ecological analysis to determine their priority for maintenance work.

Many of the roads identified above will need to be repaired or maintained to a higher standard than present condition. When the road system is rightsized, more money will be available for maintenance of these roads.

<u>Part II: Conduct ecological analysis to prioritize road reclamation and maintenance</u>

After separating roads into two categories—those that are necessary in a minimum road system and those that are candidates for decommissioning—an analysis is conducted to identify potential ecological risks to determine which roads are highest priority for decommissioning and which roads are highest priority for maintenance work. The Travel Management Rule directs the agency to "ensure that the identified system minimizes adverse environmental impacts" and "should give priority to decommissioning those unneeded roads that pose the greatest risk to public safety or environmental degradation." The

[1] The Community Fire Planning Zone can be determined and mapped by the protocols in *Wilmer, B. and G. H. Aplet. 2005. Targeting the Community Fire Planning Zone. The Wilderness Society, Washington, D.C.* and *Aplet, G. H. and B. Wilmer. 2006. Managing the Landscape for Fire: A Three-Zone, Landscape-Scale Fire Management Strategy. The Wilderness Society, Washington, D. C.*

Forest Service Handbook directs the agency to consider "environmental issues, such as soil and water resources, invasive species, and biological communities." This part of the decision support tool considers the potential environmental impact of each road segment. Note that the spatial data is not meant to describe or predict the actual condition of the road. The purpose of the decision support tool is to rank roads on their *potential* to cause environmental damage.

The ecological analysis is divided into four categories with the goals of 1) improving the configuration of the road system for wildlife and people; 2) reducing soil erosion and in-stream sedimentation; 3) increasing stream connectivity; and 4) reducing impacts to important conservation areas and wildlife habitat (see Fig. 1). Through these four paths one can prioritize road reclamation and maintenance to accomplish a large number of ecological goals: creating more and larger roadless areas for wide-ranging, area-sensitive species; creating larger natural-sound areas for people and wildlife; zoning the forest to ease conflict between primitive and motorized recreation; creating more barrier-free corridors for terrestrial wildlife to migrate, disperse, or move in response to climate change; reducing fragmentation of wildlife habitat; decreasing in-stream sedimentation to improve water quality and aquatic species' habitat; decreasing barriers to fish passage; and achieving target road densities for a given area or species.

A) Improving the road configuration: According to the theory of reserve design that applies to reserve size in the absence of detailed autecological information, 1) large blocks of habitat containing large populations of a target species are superior to small blocks of habitat containing small populations and 2) blocks of habitat that are roadless or otherwise inaccessible to humans are better than roaded and accessible habitat blocks. In addition, creating larger patches of roadless land effectively "zones" the forest to prevent conflict between primitive and motorized users and increases the amount of noise-free areas in the forest. Larger roadless patches are also easier to manage for natural disturbances and may be more likely candidates for protective designations, such as Wilderness.

An isolation index was created to assess the impact of individual road segments on the roadless quality of the landscape. It measures (at 30 m intervals along each road segment) the proximity of all neighboring roads at 90 m-radius, 990 m-radius, and 3 km-radius scales. Road segments are assigned a score between zero and one that reflects the degree of isolation from other roads.

B) Reducing soil erosion and in-stream sedimentation: Contribution to the sediment load in rivers and streams is one of the most significant negative effects of forest roads. Roads built on steep slopes are more likely to fail, and sediment from roads on steep slopes will travel farther than sediment on gentle slopes. Roads that have steep grades are more likely to collect runoff and channel it in the roadbed, causing rill erosion and the formation of sediment-moving gullies. Roads that traverse highly-erodible soils are more likely to cause migration of soil and eventual sedimentation in streams. And, all else being equal, roads that are near streams are more likely to deposit sediment therein than roads farther away. Therefore, an in-stream sedimentation index was created which measures (at 30 m intervals along each road segment) the potential for roads to cause in-stream sedimentation in four ways: 1) the slope of the landscape, 2) the grade of the road, 3) the erodibility of adjacent soils, and 4) the proximity to the nearest stream. Road

segments are assigned a score between zero and one that reflects the potential for erosion and in-stream sedimentation.

C) Increasing stream connectivity: Because road stream crossings often impede fish dispersal, migration, and spawning either by altering the stream profile and streambed composition or due to blocked or failed culverts, a stream crossing index was created to measure the number of road stream crossings per kilometer. Road segments are assigned a score between zero and one that reflects the degree of stream connectivity (i.e. the comparative lack of crossings per kilometer).

D) *Reducing impacts to important conservation areas and wildlife habitat*

Roads may have a negative impact on sensitive and endangered animal species through habitat fragmentation, visual disturbance, associated noise, and by facilitating invasive species. Protected Activity Centers for spotted owls and goshawks and Critical Habitat for species listed under the Endangered Species Act are used as a measure of the importance of wildlife habitat that the road crosses. Road cells (30m) are assigned a score between zero and one that reflects the extent of the road's intersection with important species habitat.

Roads may also affect the quality of important designations such as Wild and Scenic Rivers, Research Natural Areas, Special Interest Areas, Non-motorized Areas, Meadow Management Zones, Critical Aquatic Refuges, and Key Watersheds. Road cells (30m) are assigned a score between zero and one that reflects the extent of the road's intersection with these important management designations.

All of these scores are combined to create an "important territory index."

Optional steps: Managers or stakeholders may want to prioritize road decommissioning within a particular geographic area (e.g., wildlife linkages), habitat type, or focal species range (or combination). In those cases, one may overlay the data layer and remove from analysis roads that do not intersect these areas.

When the ecological analysis is complete and normalized scores for each of the four principle components is determined, weights may be assigned to each based on specific goals and priorities.

Part III: Conduct fiscal analysis

The Forest Service Handbook requires consideration of "economic costs and benefits," and the Travel Management Rule defines the minimum necessary system as one that "reflects long-term funding expectations." Moreover, a road that is not maintained may cause greater ecological damage. Roads that are unmaintained are more costly to maintain later, creating a positive feedback loop. And an excessive road system drains the agency of money that could be spent on ecological restoration or improved visitor services.

The maximum length of the road system that each forest can maintain can be estimated using the average cost per kilometer of maintaining a native surface road to safety and environmental standards and the average road maintenance budget of each forest [this analysis is in development].

Funding Road Decommissioning

The Forest Service Legacy Roads and Trails Remediation Initiative (LRTRI) was passed as part of an appropriation bill in December 2007, spearheaded by Rep. Norm Dicks (D-WA), to provide funding to the Forest Service to decommission

unneeded and environmentally problematic roads and trails, and undertake repairs on needed ones. The purpose of the legislation is to restore the health of public forests and improve water quality and fish and wildlife habitat.

Legacy Roads and Trails Remediation Initiative FY 2010
House Report Language for Appropriations

…$90,000,000 shall be designated for urgently needed road decommissioning, road and trail repair and maintenance and associated activities, and removal of fish passage barriers, especially in areas where Forest Service roads may be contributing to water quality problems in streams and water bodies which support threatened, endangered or sensitive species or community water sources…funds provided herein shall be available for the decommissioning of roads, including unauthorized roads not part of the transportation system, which are no longer needed…the decommissioning of unauthorized roads not part of the official transportation system shall be expedited in response to threats to public safety, water quality, or natural resources.

Since its inception, LRTRI has provided nearly $270 million for crucial road restoration, maintenance, and decommissioning: $40 million in 2008, $50 million in 2009, $90 million in 2010, $45 million in 2011, and $45 million in 2012.