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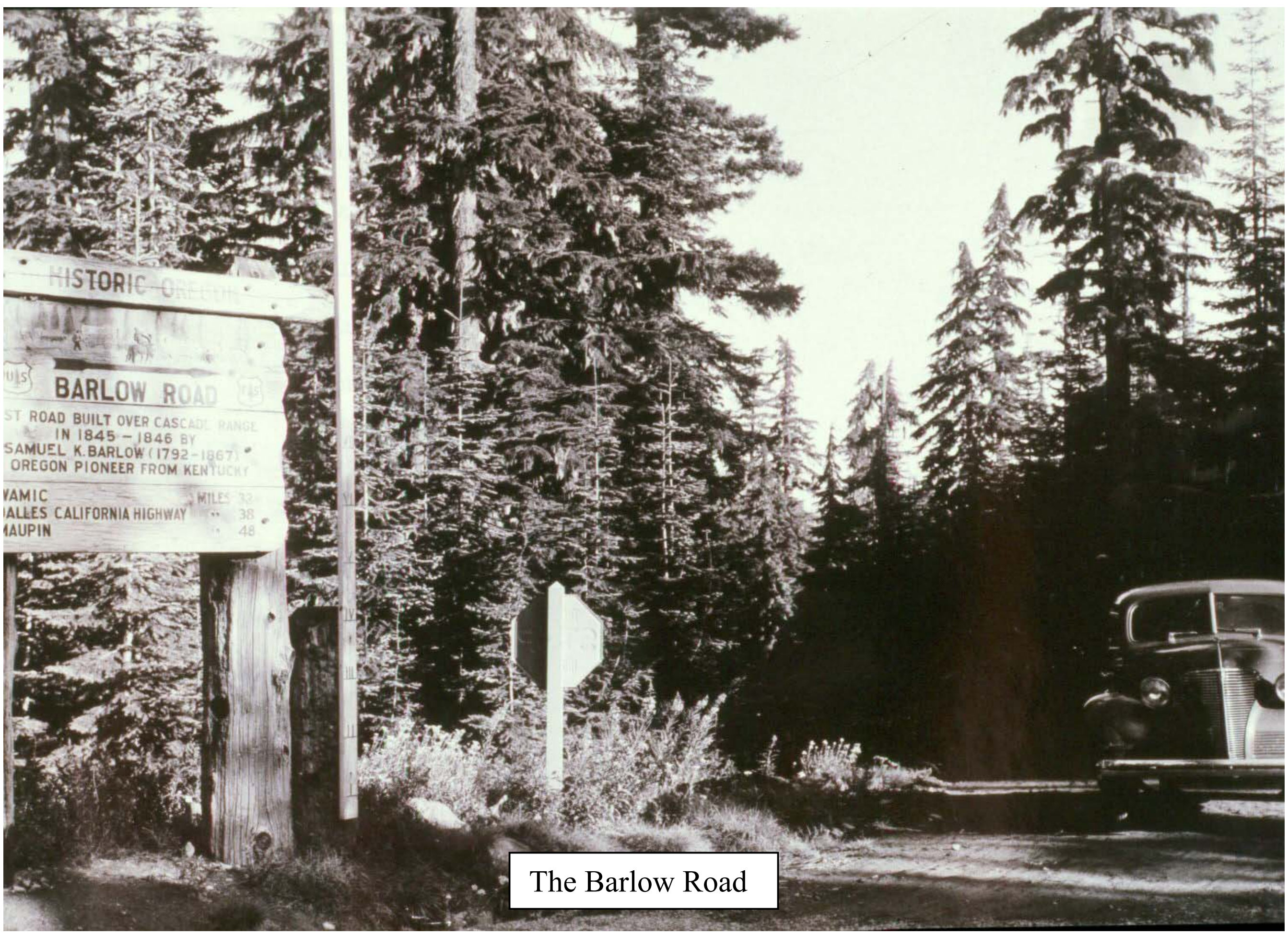
Roads Analysis

Mt. Hood National Forest

For Information Contact: Dick Yoder
16400 Champion Way
Sandy, OR 97055
503.668.1773
http://www.fs.fed.us/r6/mthood

LIST OF PREPARERS

Jaimie Bradbury	Geographic Information Systems
Tom Deroo	Geologist
Alan Dyck	Wildlife Biologist
Sue Helgeson	Fisheries Biologist
Gale Masters	Botanist
Jim Roden	Writer/Editor
Ivars Steinblums	Hydrologist
Dick Yoder	Team Leader



The Barlow Road

EXECUTIVE SUMMARY

This document and associated maps are prepared in response to a document titled, "Roads Analysis: Informing Decisions about Managing the National Forest Transportation System," August 1999. The process of Roads Analysis has actually been evolving on the Mt. Hood National Forest (Forest) for many years. The process began with Watershed Analysis in the mid 90s and it was further developed by the Forest-level Access and Travel Management Plan (ATM) that was completed in 1999. This document is a synthesis of new analysis and existing data and analysis that have already been completed. This analysis covers the entire Mt. Hood National Forest road system.

The Forest currently manages approximately 3450 miles of roads. Not included in this total are the 410 miles of roads that have been decommissioned in the past decade.

Forest Service budgets during the last decade have not kept pace with what it costs to maintain all the roads so that they are safe and functioning properly. The trend of declining budgets is expected to continue. Meanwhile, the public that uses the road network expect the Forest Service to keep roads open and free of safety hazards. There is also an expectation among segments of the public that roads be closed or decommissioned where they put resources at risk.

The opportunities to manage the current road system to better address future needs, budgets, and environmental concerns include: decommissioning, closing to vehicles, reconstructing, changing maintenance levels or continuing current management.

As outlined in the USDA Roads Analysis Guide, the costs in terms of environmental risk and damage of roads are compared, integrated and balanced against the uses and benefits of roads. This is done to develop a set of prioritized opportunities for managing the road system to meet Forest Plan objectives. Roads Analysis is not a decision making process, however the opportunities identified with the analysis may lead to proposals that initiate the Federal decision making process under the National Environmental Policy Act (NEPA).

The Roads Analysis data is available for making decisions about roads. There are summaries for 6^{th} and 7^{th} field watersheds, as well as road-by-road risk ratings for aquatic resources, wildlife and botany. In terms of aquatic resources, the 6^{th} field watersheds with the greatest road related impact are: Lower Collawash Tributaries, Lower Oak Grove, Middle Clackamas River Tributaries, Lower Bull Run, Nohorn-Hughes and Lower Upper Clackamas. The 6^{th} field watersheds with the greatest road related impacts to wildlife are: Middle Clackamas River Tributaries, Gate Creek, Upper White River, Clear Creek-East, Lower Collawash Tributaries and Middle Upper Clackamas. The 6^{th} field watersheds with the greatest road related impacts to botany are: Rock Creek, Upper Fifteenmile Creek and Wapinitia Creek.

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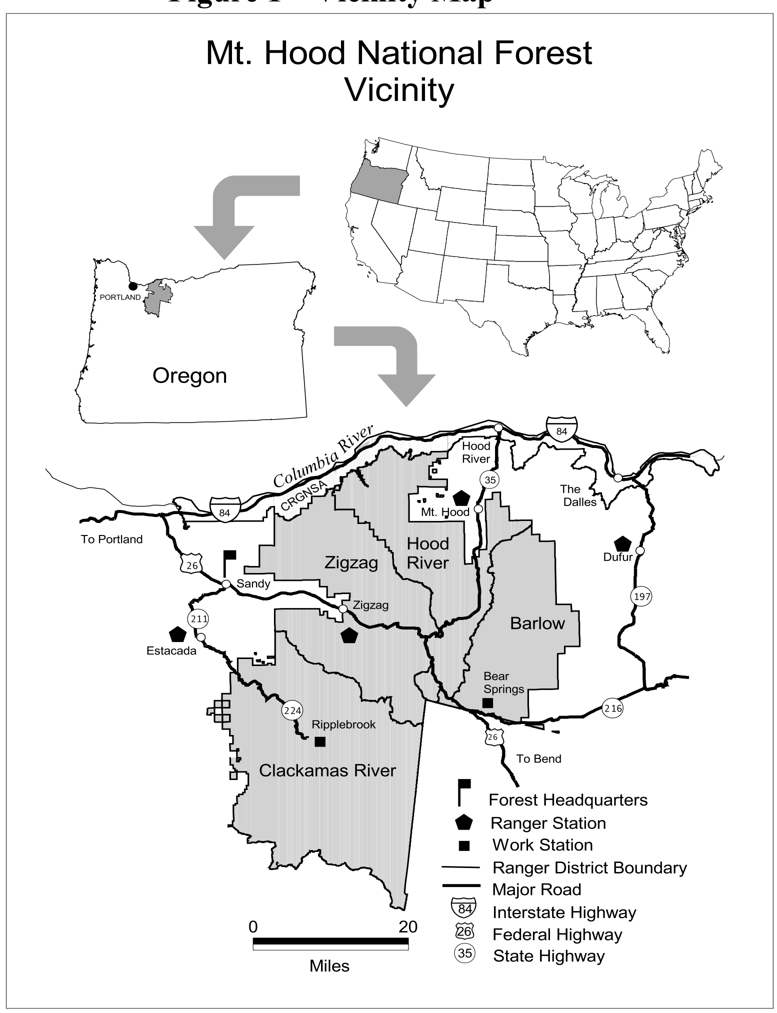
HISTORICAL CONTEXT

During the early expansion of Euro-Americans to this region, the rugged Cascade Mountains were a major obstacle to westward travel, which strongly influenced the role of transportation in the Forest's history.

Since the earliest days, the Columbia Gorge has been the primary east/west travel route in the Northwest. Wagons traversing the Oregon Trail had to be loaded onto rafts at The Dalles and floated down dangerous sections of the Columbia River.

The Barlow Road is the most important historical access road on the Forest. Constructed in 1845 and 1846 as an extension of the Oregon Trail from The Dalles to Oregon City, it was used by thousands of settlers. It was operated as a toll road until 1914. By 1914, it had become an important scenic route for pleasure travel between Portland and the resorts and camping areas around Mt.

Figure 1 – Vicinity Map



Hood. In 1915, it was deeded to the State of Oregon.

In 1924 the scenic highway loop around Mt. Hood was finished. The route evolved from a primitive wagon road to the current route of U.S. Highway 26, a piece of Highway 35 and Forest Road 3530. It has been relocated and reconstructed numerous times: therefore, traces representing different time periods exist side by side or are superimposed.

General Henry Larcom Abbott traversed the route of the Abbott Road in 1855. He was exploring feasible railroad routes connecting the Columbia River with the Sacramento River. Abbott's original east-west route through the Forest has been replaced, first by a CCC road and then reconstructed by the Forest Service.

Other early notable routes are the Cloud Cap Road built in 1889, Lost Lake road in the early1900's and what is known as the Skyline Road (presently Forest Roads 42, 4240110 and 4220) was constructed into Olallie Lake in the late 1920's.

Some sawmills were operated near or within the Forest. These are apparent on 1915 and 1916 maps of the Forest and include Keep's Mill and Tucker's Mill. Before World War I, the Forest Service began planning for "truck roads" into the more gentle terrain to access the sawmills and remote ranger stations such as Roaring River and Clackamas Lake Ranger Stations. Between 1918 and 1935, logging railroads had penetrated to private and Forest lands in the West Fork of Hood River and to the Badger/Jordan area. On the west side, Larch Mountain and Ladee Flat were also logged by rail.

By the 1930's, the Clackamas drainage and Bull Run Reserve were the only large sections of the Forest without roads. Development in the Clackamas drainage began in 1923 when rail lines were constructed to the Oak Grove power plant. A truck trail soon followed which eventually became what is now State Highway 224.

President Franklin D. Roosevelt's administration brought an infusion of road-building funds. The Civilian Conservation Corps (CCC) built many miles of Forest Service roads. After World War II, road building financed by congressional appropriations and timber sales took place throughout the Forest. The Clackamas drainage became the focus of development during the period, due to its highly valued timber. In the 1960's the Clackamas River road system was connected to the Breintenbush system on the Willamette National Forest.

Most of the major roads were constructed in the Bull Run drainage during the late 1950's and 1960's with most of the road system we have today completed by the late 1980's.

The Forest's road system grew from approximately 1000 miles in the 50's to 3,850 miles by 1990.

Road construction techniques evolved over this period. Early roads used sidecast construction with stumps and logs being buried on the outside of the road prism. After 1970, road construction specifications did not allow sidecast construction or burying of stumps and logs. In recent years the older roads have experienced settling in the outer half of the road prism due to the rotting of buried stumps and logs. As a result, reconstruction costs have risen.

In recent years many roads have been decommissioned, reducing total road mileage from 3850 to approximately 3450.

CURRENT SITUATION

Management Direction

Current direction for road management is found in the 1990 Mt. Hood National Forest Land and Resource Management Plan (Forest Plan) as amended. The Forest Plan provides general Forest guidelines for preparation and implementation of travel management plans for the purpose of assigning specific access management goals and objectives to individual routes, trails and land areas (Access and Travel Management Appendix C-1). The Forest Plan includes standards for road density to minimize impacts to wildlife.

The Forest Plan directed each District to complete an Access and Travel Management (ATM) Plan that identified the minimum Transportation System to meet public and administrative access needs while minimizing effects on Forest resources.

The 1994 Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (Northwest Forest Plan) amended the Mt. Hood Forest Plan. The Northwest Forest Plan added standards that relate to roads. For example, it includes direction for no net gain in miles of road in Key Watersheds. It also gave direction to complete watershed analysis.

The watershed analysis process developed watershed ATM guidelines. These were created with public involvement, and identified the desired future condition of each road (including closure and obliteration). The watershed analyses are not decision documents. They do however, highlight access needs, resource concerns such as impacts of roads on wildlife, and identify roads with the potential to cause resource damage.

In February 1998, the Forest Service Chief at that time laid out an agenda for a Forest Service Natural Resource Policy, which has a focus on road issues:

- Watershed health and restoration
- Sustainable forest ecosystem management
- Forest roads
- Recreation

The Chief proposed a new long-term forest road policy. The proposal has four primary objectives:

- More carefully consider decisions to build new roads.
- Eliminate unneeded roads.
- Upgrade and maintain the roads important to public access.
- Develop new and dependable funding for forest road management.

With the above guidelines and direction, the Forest developed an Access & Travel Management Plan to address minimum access needs, reduce road maintenance costs and minimize the effects of roads on the environment. The first plan was completed in 1999.

In 2000 the Forest conducted a Forest-wide update and synthesis of the many watershed analyses that were completed. The purpose was to develop a Forest-wide prioritization model for restoration projects. The model incorporates watershed sensitivity, management intensity and biological factors.

Roads Analysis

The Roads Analysis process was initiated in 2001. The objective is to manage the Forest transportation system to provide user safety, convenience, and efficiency of operations in an environmentally responsible manner and to achieve road related ecosystem restoration with the limits of current or likely funding levels. It will address both the access benefits and ecological costs of road-associated effects, give priority to reconstructing and maintaining needed roads and decommissioning unneeded roads, or, where appropriate, converting them to less costly and more environmentally beneficial other uses. This process is outlined in Forest Service Manual 7700. Responsible officials are directed to use a Roads Analysis process to ensure that road management decisions are based on identification and consideration of social and ecological effects. The publication Roads Analysis: Informing Decisions About Managing the National Forest Transportation System (FS-643) has been provided as guidance for conducting a science based roads analysis.

Many phases of Roads Analysis have been evolving for many years. This document is a synthesis of new analysis and existing data and analyses that have already been completed.

Roadless Plan

On January 12, 2001, the Department of Agriculture published a final rule entitled 36 CFR part 294, Special Areas; Roadless Area Conservation (66 FR 3244). Originally scheduled to take effect on March 12, 2001, the Secretary of Agriculture extended the effective date until May 12, 2001, to permit the new Administration to review the rule (66 FR 8899; February 5, 2001).

Over the same period, eight lawsuits, involving seven states in six judicial districts and four federal circuits were filed against the January 12, 2001, rule. On May 10, 2001, the Idaho District Court granted the preliminary injunction requested in Kootenai Tribe of Idaho v. Veneman and State of Idaho v. U.S. Forest Service. The court enjoined the Forest Service from implementing “all aspects of the Roadless Area Conservation Rule” as well as a section of the November 2000, forest planning rule that addresses the inventory and evaluation of roadless areas during the forest plan revision process. The Idaho District Court's decision to grant a preliminary injunction has been appealed and is now pending before the Ninth Circuit Court of Appeals.

Road Statistics

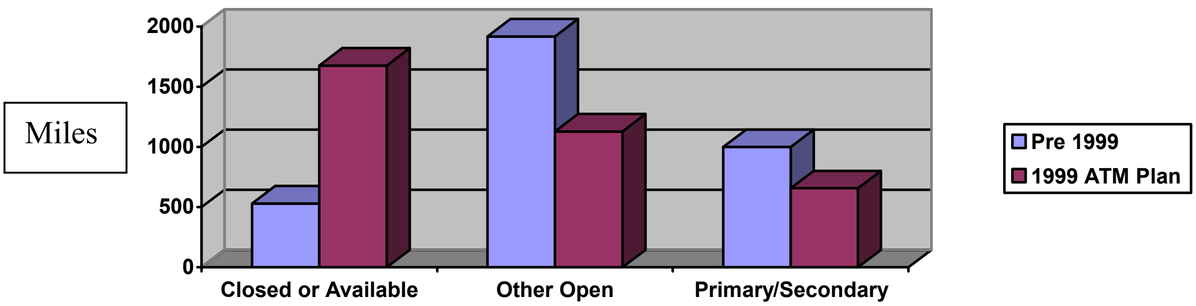
The Forest has jurisdiction over many roads. The term “system road” is used to refer to the network of roads maintained by the Forest. The following discussion related to statistics and maintenance costs refer to system roads even those that are off-Forest if the Forest Service has jurisdiction. It does not include roads that are on-Forest that are managed by other entities such as the State of Oregon, Counties, Federal Highways Administration, Bureau of Land Management or private timber companies. It also does not include approximately 410 miles that have been decommissioned.

The 1999 ATM Plan shows 3,464 miles of Forest Service Classified roads in the Forest transportation system. Of these roads, 51% are designated to stay open to traffic, 49 % are closed now or could be closed or decommissioned in the future.

The Forest consists of 1,024,000 acres (Forest Service jurisdiction, excludes private land). Of this total, 297,500 acres have no roads. This includes 279,100 acres of wilderness or other inventoried roadless areas. The remaining 726,500 acres are roaded.

The Following Chart shows the Forest Road Classification before the 1999 ATM plan and after.

Figure 2 – Forest Road Classification



As part of this Roads Analysis Process, the 1999 ATM plan was reviewed for verification, corrections, additions and deletions. For the results of the ATM review, see section on Road Access.

Key Watersheds

Northwest Forest Plan standards (page C-7) indicate that key watersheds are a high priority for watershed restoration and that there should be no net increase in the amount of roads. The following table lists the gross road mileage at the time of the Northwest Forest Plan (prior to any decommissioning) and the current mileage. All of the watersheds either went down or stayed the same. The Fish Creek watershed changed the most with over 100 miles of road decommissioned.

Figure 3 – Key Watersheds

Key Watershed Name	Gross Mileage	Current Mileage
Bull Run	204	174
Little Sandy	69	64
West Fork Hood	147	118
Mill	179	154
Fifteenmile	61	57
White	671	628
Salmon	120	119
Roaring	29	29
Eagle	31	29
Fish	153	35
Collawash	365	297
Clackamas *	141	120
Oak Grove Fork*	30	29

* Key watershed is designated on a narrow corridor along the river and not the entire watershed.

ISSUES AND KEY QUESTIONS

Step three in the Roads Analysis process is identifying issues and key questions. Roads have many uses and also affect many resources. This section will focus on the key problems associated with aquatics, wildlife, plants and the economics of maintaining the road system while providing safe public and administrative access.

The Roads Analysis team identified the following key questions:

1. Where do roads affect riparian areas and flood plains?
2. Where do roads impede fish passage?
3. Where do roads affect slope stability?
4. Where do roads generate excessive surface erosion?
5. Where do roads create more rapid runoff and sediment delivery?
6. Where do roads affect the quality of municipal water supplies?
7. Where do roads affect wetlands?
8. Where do roads affect wolverine?
9. Where do roads affect northern spotted owls?
10. Where do roads affect bald eagles?
11. Where do roads affect deer and elk winter range?
12. Where do roads affect special habitats?
13. What are the effects of road use and maintenance on the spread of noxious weeds?
14. Where do roads affect key botanical species?
15. Will current and projected road budgets sustain the Open Road System?
16. When is it prudent to obliterate or close a road?

ROAD USES

Recreational Road Use

Driving for pleasure is the most common recreational activity on the Forest. When this is combined with driving to access campgrounds, fishing streams, hunting camps, ski areas, wilderness trailheads and many other recreational facilities, it is clear that road access to the Forest is key to the recreation experience.

Scenic Routes - Highways 26 and 35 make a very popular year-round loop route when connected with Interstate Highway 84 through the Columbia River Gorge. This route is designated as a State Scenic Loop. Highway 224 and road 46 are part of a 75 mile National Scenic Byway that runs through Mt. Hood and Willamette Forests.

Off-Highway Vehicles – Many people enjoy recreating with motorized Off-Highway vehicles (OHV). These vehicles operate on designated trails but they also use roads. The Forest's road system provides an OHV recreation opportunity but there are inevitable conflicts when these vehicles mix with passenger cars, trucks and commercial traffic. OHV use on the Forest has increased in the last few years.

While certain roads are closed to all motorized use, there are many miles of road on the Forest that are open to multiple uses. This multiple use includes OHV use when it is in accordance with state law and the Forest Plan.

At the present time there is only one designated off-road area on the Forest, McCubbins Gulch on the Barlow Ranger District. There are many other motorized trails that are used with the adjacent road system to provide loop opportunities. The majority of these loop opportunities using motorized trails are on the Eastside of the Forest.

In the past, OHV use was allowed on all gravel and dirt roads that were open to motorized use. They were not allowed on paved roads. Recently new guidance has been developed for access and travel management decisions related to OHV use. See glossary for definitions of various maintenance levels.

- Maintenance Level 1 roads would be considered open to OHV use, unless closed by an order. These roads may also be designated and managed as OHV trails.
- Maintenance Level 2 roads would be considered open to OHV use, unless closed by an order. Reasons to discourage or prohibit OHV use may include conflicts with commercial traffic, protection of investments or natural resources, floods or safety concerns.
- On maintenance Level 3-5 (non – paved roads), OHV use would be prohibited. OHV use may be accepted only after completing, documenting and approving an appropriate safety analysis.
- OHV use on paved roads would be prohibited.

Hunting Access - Roads can be an integral part of the hunting experience for many hunters. Roads provide access to favorite or traditional hunting sites and for many it is important to be able to get as close as possible with their vehicle to haul out the animal they have harvested. Some hunters seek areas of relative solitude to hunt.

Fishing Access - Roads provide access to favorite or traditional fishing sites. For many, such as disabled or physically challenged individuals, it is important to be able to get as close as possible with their vehicle.

Forest Products

One of the goals of the Forest is to provide wood fiber and other forest products to meet the needs of society for those products and to provide employment in local communities. Roads are used to access forest stands for these resource extraction activities. The Forest provides approximately 25 million board feet of timber annually. Other forest products sold to commercial gatherers include firewood, boughs, beargrass, mushrooms and landscaping plants. Rock is also sold from quarries and other sources. There are many personal use and subsistence uses as well including firewood, Christmas trees, huckleberries, mushrooms, medicinal plants, rocks and cones.

Special Uses

Roads are used to access private lands and for other uses under special use permit. Activities include:

- Driveways and roads to residences
- Access to private timber lands
- Access to improvements such as dams, ditches, pipelines and power lines
- Access to privately managed lodges and camps
- Access for sporting events
- Historic reenactments
- Filming

Administrative Uses of Roads

Roads are used by Forest Service employees and contractors to manage the Forest. Activities include:

- Monitoring forest and aquatic conditions
- Planning future management actions

- Administering contracts and permits
- Maintaining campgrounds and trails
- Law enforcement
- Search and rescue
- Fire patrols
- Fire fighting
- Fuels reduction and prescribed fire
- Precommercial thinning
- Research
- Public education events
- Access to residences, ranger stations, guard stations, and Timber Lake Job Corps
- Access to mountain top communications sites
- Access to fire lookout towers
- Access to seed orchards
- Access to improvements such as dams, ditches, pipelines and power lines
- Fish stocking
- Noxious weed control
- Fence maintenance and livestock monitoring

Illegal or Unauthorized Uses of Roads

- Dumping trash
- Illicit drug production or growing
- Road damage or blockade by protesters
- Access to unauthorized off-highway vehicle use
- Unauthorized and destructive target shooting
- Poaching wildlife

Road Access Needs

Access needs were grouped into three broad categories and several subcategories as follows:

- Public Access
  - Developed Recreation
  - Dispersed Recreation
  - General Public
  - Private access

- Commercial Access
  - Timber haul
  - All other commercial uses such as rock haul, special forest products, etc.

- Administrative Access
  - All or General Forest administrative
  - Vegetative management
  - Fire suppression or detection
  - Other agency access
  - Administrative site access

Categories in the 1999 ATM Plan have been slightly modified as follows:

1999 Category	Roads Analysis
Primary	Primary Low Clearance (PLC)
Secondary	Secondary Low Clearance (SLC)
	Secondary High Clearance (SHC)
Other Open	Other Open (O)
All Other	All Other (X)

The "Other Open" category includes mostly roads open to high clearance vehicles and interior campground roads or roads that directly access developed campgrounds.
The "All Other" category includes roads that are currently closed, planned to be closed or roads that need a decision as whether to close, decommission or to leave open.

Figure 4 –Road Mileage by ATM Category

ATM Category	Miles	% of Total
Primary Low Clearance	172.4	5%
Secondary Low Clearance	356.3	10%
Secondary High Clearance	90.8	3%
Other Open	990.3	29%
All Other (Closed, planned to close, decision roads)	1532.0 308 in Bull Run	44% 9%

These categories include a few road segments that are in other agency jurisdiction but are an integral part of the Forest Road System.

Click here to view a map of Forest roads by ATM Category.

Maintenance Levels

See glossary for definitions of the various maintenance levels. The higher levels are paved and the lower levels are increasingly more primitive.

Figure 5 – Current Road Mileage by Maintenance Level

Maintenance Level		Miles	% of Total
Level 5		11.8	0.4%
Level 4		170.8	5%
Level 3		429.4	14%
	Bull Run**	32.3	
Level 2		992	32%
	Bull Run**	157.8	
Level 1 *		1531.4	49%
	Bull Run**	117.9	

* Level 1 includes closed roads, planned closures, planned to decommission and other roads that need a decision to whether to close or keep open.
** The roads in the Bull Run watershed are kept separate since the public is not allowed access to the watershed other than guided bus tours.

Roads Analysis Access Rating

For comparison of access needs to effects of roads on the environment, ratings were assigned to each category of access need as follows:

Rating	Access Type
10	General Public
6	Developed Recreation
6	Administrative site access
4	Private access
4	All or General Forest administrative
4	Other agency access
3	Dispersed Recreation
2	All commercial types
1	Timber haul
1	Vegetative management
1	Fire suppression or detection

Each road segment might have multiple access needs or types. The ratings for each relevant access type were summed for every road segment to produce a combined access score for each road segment. The total scores were then assigned high, medium high, medium, medium low and low as follows:

>14	High
11-14	Medium High
6 – 10	Medium
2 – 5	Medium Low
0 – 1	Low

Figure 6 - Photographs showing samples of road maintenance levels

Figure 7– Access Needs Summary

Category	Miles	% of Total
High	306.6	9%
Medium High	144.1	4%
Medium	587.8	17%
Medium Low	676.8	20%
Low	1717.8	50%

Roads in the Low category include all roads that are currently closed and roads that are open but not maintained to a maintenance level 2 standard. These roads could be considered for closure or decommissioned if the environmental score/rating is high or to reduce road maintenance costs.

Road Cost Rating

Roads were also ranked as to the cost of repairing the deferred maintenance items that were identified in the 1999 condition surveys conducted on all Maintenance level 3-5 roads. This does not include routine maintenance, which is discussed in the Economics section.

For Roads Analysis these costs were grouped into four cost categories as follows:

1. Surfacing Costs – this includes all costs associated with repairing the road surface.

2. Road Prism Costs – this includes all costs associated with repairing damage such as slides, slumps and shoulder cracking.

3. Safety Costs – this includes items such as sign repair, brushing, improving turnouts and road widening.

4. Drainage Costs – this includes repairing or adding culverts, cleaning plugged culverts and cleaning plugged ditches.

These costs were ranked by a calculated cost/mile into four broad categories (High, Medium High, Medium, Medium/Low and Low). Each road segment received a ranking for each of the 5 cost categories. The two categories that have the most effect on the environment are Road Prism Cost and Drainage Cost.

There were two road segments on the Forest that have very high Road Prism cost/mile. These are Road 45 M.P. 4.4 – 14.5 at $734,000/mile and Road 63 M.P. 6.02 – 12.58 at $506,000/mile. Ranking of the road system will help prioritize spending of appropriated funds for road repair and deferred maintenance projects.

Economics

Road Maintenance

Road maintenance is defined as "maintaining or keeping an existing constructed road in an acceptable condition so as to continue to provide acceptable service and achieve its expected life." Road maintenance excludes activities that would increase its capacity or upgrading it to serve a different purpose from originally intended. Maintenance includes work needed to meet laws, regulations, codes and other legal policies as long as the original intent or purpose of the road is not changed.

Road maintenance condition surveys are now conducted on a 4-year cycle for maintenance level 3-5 roads and a sampling of maintenance level 1 and 2 roads. The annual maintenance needs will vary somewhat depending on soil type, surface type, topography, weather conditions and road gradient.

A road is considered to be fully maintained, when the maintenance activities are completed that leave the road in a condition that meets the criteria as stated by its Road Management Objectives (RMO).

Historical Effects on Road Maintenance Funding

The total miles of roads peaked between 1988 and 1991 at a high of 3850 (rounded) miles. A special emphasis program of road decommissioning that began in the 1990s reduced the total miles to the current inventory of 3450 miles.

Forest roads were primarily constructed to access timber production lands and were paid for largely through timber sale receipts. Capital Investment funds were used to construct roads into developed campgrounds. Road maintenance was funded largely by timber sales and congressional appropriations. However, since 1990, timber harvest has gone from an average of 369 million board feet (MMBF) to approximately 25 MMBF. This has drastically reduced the road maintenance accomplished by the timber purchasers and the deposits they made for road maintenance. Because of the reduced timber traffic, the maintenance needs associated with traffic have been reduced. However, maintenance needs associated with weather has not reduced causing the general deterioration of the Forest's transportation system.

Maintenance Costs

Maintenance costs vary according to factors such as maintenance level, surface type, weather conditions, road gradient and topography. See glossary for definitions of maintenance levels and surface types.

Figure 8 – Cost of Road Maintenance by Maintenance Level and Surface Type

Maintenance Level	Surface Type	Annual Cost/Mile
1	All Surfaces	50
2	Native & Aggregate	380
2	*Asphalt or Paved	410
3	Native & Aggregate	2100
3	Asphalt or Paved	2000
4	Aggregate	3980
4/5	Asphalt or Paved	3530

* This includes all Asphalt Concrete and Bituminous Surface Treatment or more commonly known as "paved roads".

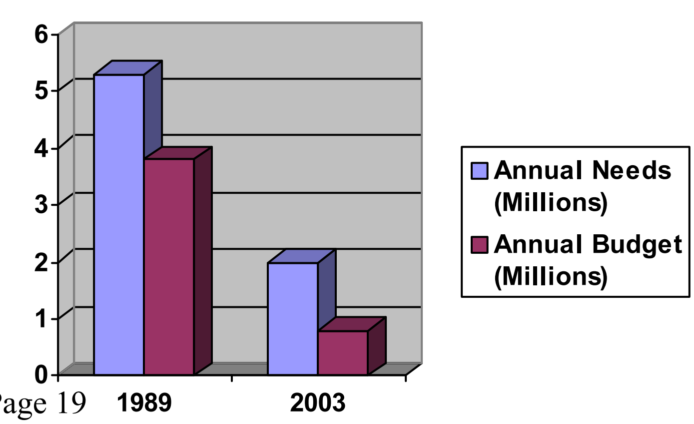
Figure 9 - Miles by Maintenance Level and Surface Type

Maintenance Level	Surface Type	Miles
1	All Surfaces	1613
2	Native & Aggregate	886
2	Asphalt or Paved	204
3	Native & Aggregate	175
3	Asphalt or Paved	260
4	Aggregate	8
4/5	Asphalt or Paved	175

The following table shows the miles of road by surface type and objective or recommended maintenance level for roads that are maintained by the Forest Service. It does not include the roads maintained by others on the Forest such as the City of Portland in the Bull Run watershed nor does it include State or County highways or private roads within the Forest.

The following graph shows the current road maintenance budget compared to the estimated total costs for maintaining the road system. The road maintenance budget includes appropriated funds as well as COOP deposit funds contributed by timber sales. The current budget used the average of the last three years.

Figure 10 - Road Maintenance Needs vs. Budget (Constant 2003 Dollars)



Since 1989, the annual needs have been reduced by changing the maintenance levels and by decommissioning and closing roads. However the available road maintenance budget has also declined. Appropriated funds have dropped, due to inflation, over the last 10 years. The biggest difference has been a drop in COOP Deposits from timber sales. COOP Deposits have dropped from approximately $1.8 million per year to $100,000.

Preliminary estimates indicate that the Forest is underfunded by more than 50% ($2 million in needs vs. $800,000 budget) to maintain the current road network to full objective maintenance-level standard.

Environmental Justice – Civil Rights

Executive Order 12898 directs agencies to identify and address disproportionately high and adverse human health or environmental effects of projects on certain populations. This includes Asian Americans, African Americans, Hispanics, American Indians, low-income populations and subsistence uses. The Civil Rights Act of 1964 prohibits discrimination in program delivery and employment.

Since the roads analysis covers the entire Forest it may affect many disconnected communities on the north, south, east and west sides of the Forest.

Potentially Affected Communities

There are communities with minorities and low-income populations that may be affected by road management. West side communities include the Highway 26 corridor between Sandy and Government Camp, Estacada, and the Highway 22 corridor between Mill City and Idanha. More distant west side communities that have an interest in the Forest would include the Molalla area, the Woodburn area, and the Portland metropolitan area. North side communities in the Columbia River Gorge include Corbett, Bonneville, and Cascade Locks. Hood River Valley contains many communities including Hood River, Odel and Parkdale. The east side of the Forest has communities such as The Dalles, Dufur, Tygh Valley, Maupin and Warm Springs. Individuals from these communities may work, recreate or have other interests in the Forest that relate to roads.

Census data confirm that all of these communities contain minority and low-income populations. Poverty status ranges from 4 to 25 percent and minority populations range from 9 to 25 percent. In the rural communities and small towns, income is lower than the state and national averages and unemployment is higher than state and national averages. In recent decades, some rural areas have experienced an influx of high-income families that have moved to the country and commute to work in the Portland metropolitan area or other cities and towns. However there is still a small town and rural population that relies more on earning their living or supplementing their income on the Forest. Some of these rural communities have experienced downturns in their economies due to reductions in timber harvest and closure of sawmills and other associated facilities. Communities that are oriented around agriculture and livestock have also experienced downturns in economies.

The American Indian communities of Warm Springs and Grande Ronde may be affected by road management. There are areas of religious significance and areas where products are gathered on the Forest. Issues of access to these sites would be addressed during project level planning when decisions are made about potential decommissioning or road closure.

Potentially Affected Workers

Many people work in the Forest. Employment opportunities include logging and other work associated with timber sales such as tree planting. There are recreational employment opportunities at ski areas, lodges and as river guides. And finally there are Forest Service employees, volunteers and contractors. In recent years, the percentage of minorities, particularly Hispanics, working on the Forest has increased. Roads provide access to the Forest enabling this employment.

Some minorities and low-income people work in the forest gathering products. The primary products would include firewood, boughs, beargrass, mushrooms, huckleberries, Christmas trees and landscaping plants. Some of this gathering is for resale to generate income and some is for personal use or subsistence use. Permits are issued for most gathering but some minor uses occur without need for a permit. A large percentage of product gathering is by minority and low-income individuals to supplement their income or as a primary job. Asian Americans and Hispanics are frequent product gatherers. Roads provide access to the Forest for product gathering. Deducing road density would reduce forest product availability on a landscape level.

Potential Affect to Recreation

Minorities and low-income people recreate on the Forest. There are many campgrounds, lakes, trails, ski areas and other destination recreation features. Low-income recreators would more likely participate in lower cost recreation such as dispersed camping, fishing and hunting. Reducing road density would reduce opportunities for dispersed recreation.

Potential Affect to Health

Roads represent a potential source of pollution in the form of fine sediment that may move downstream to the intake of municipal water providers. The proposed action does not involve the use of herbicides or pesticides.

Potential Affect to Environment

The following resources may be of particular value to minority and low-income communities: Rare plants and animals, fish, water quality, wildlife, old growth, soils, scenery, air quality and heritage resources.

No adverse impacts were identified that would have a disproportionate affect on minority or low-income communities. No adverse civil rights impacts were identified.

ENVIRONMENTAL RISKS

The following analyses use the entire road network within the Forest regardless of ownership or jurisdiction. This facilitates cumulative effects analysis. Most of the analysis that follows categorizes data by 6th field watersheds.

Click here to view a map of 6th field watersheds.

Aquatic Risk Factors

Fisheries

Over 1,500 miles of streams on the Forest provide important habitat for native populations of fish. Approximately 300 miles of these streams support anadromous fish populations. Past land management activities have had impacts on watersheds throughout the Forest, but natural conditions and processes, such as erodibility of soils, floods, fire and windstorms also contribute to current conditions. Management activities that have had negative impacts on fish include road building, timber harvest, water diversions, hydroelectric development, grazing and recreation.

Figure 11 - Fish Stocks of Concern on the Forest

Species	**Evolutionary Significant Unit**	**Status**	**Watershed**
Steelhead (*Oncorhynchus mykiss)*	Lower Columbia River	Threatened 3/98	Sandy River, Clackamas River, Hood River
Steelhead (*Oncorhynchus mykiss)*	Middle Columbia River	Threatened 3/99	Fifteenmile Creek, Mill Creek
Chinook *(Oncorhynchus tshawytscha)*	Lower Columbia River	Threatened 3/99	Sandy River, Hood River
Chinook *(Oncorhynchus tshawytscha)*	Upper Willamette River	Threatened 3/99	Clackamas River
Coho *(Oncorhynchus kisutch)*	Lower Columbia River/Southwest WA	Candidate 7/95	Clackamas River, Sandy River
Bull Trout *(Salvelinus confluentus*)	Columbia River District Population Segment	Threatened 5/98	Hood River
Redband trout *(Oncorhynchus mykiss gairdneri)*	N/A	Sensitive	Miles Creeks, Hood River, White River
Cutthroat Trout (*Oncorhynchus clarki)*	N/A	Sensitive	Clackamas, Sandy, Hood River, Miles Creeks

Riparian Areas and Floodplains

Roads located near streams have the potential to affect stream processes. Streams naturally migrate by eroding banks in one location and aggrading them in another. Streams can transport and deposit large woody debris that help establish and maintain stream channel complexity. When roads encroach directly on stream channels, these processes can be modified. The road corridor itself reduces the amount (acres) of potential large woody debris recruitment and can reduce stream shading. The road prism and its alignment can isolate floodplains, constrict the channel, constrain channel migration and simplify riparian and aquatic habitat. Sediment delivery to streams can be affected by roads based on landform type, slope gradient, vegetation cover and physical distance from fish bearing portions of the stream network. These impacts are minimal for those roads located over 200 feet from a stream.

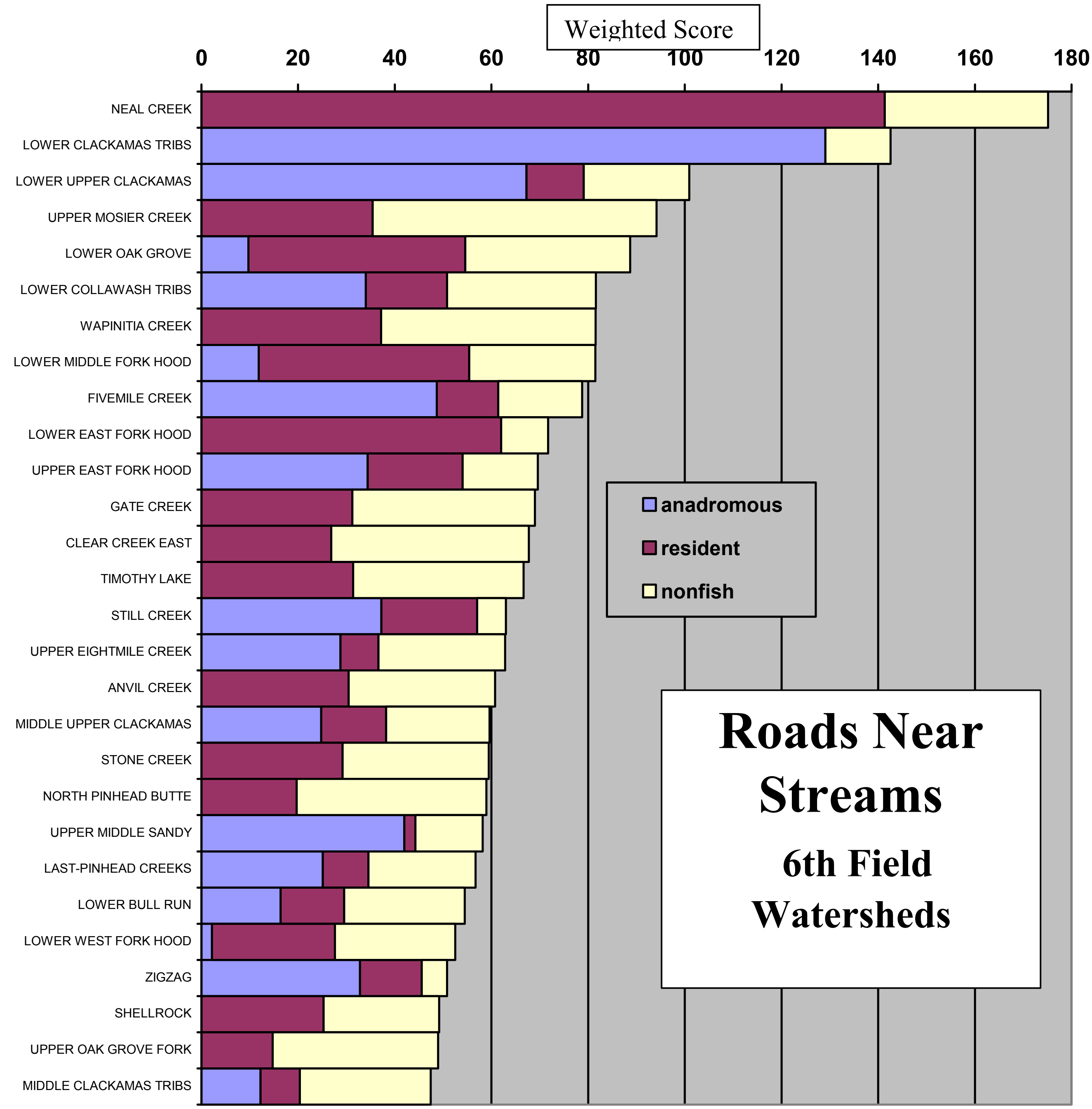
Analysis - To determine the influence that valley bottom roads and/or roads located within riparian areas can have on fish and other aquatic organisms, a GIS map was created of all road segments within 200 feet of a stream. Each road segment was assigned to one of three categories of stream utilization: anadromous, resident or non-fish bearing. Road segments within 200 feet of anadromous streams were rated high because of their possible negative effect on Threatened, Endangered and Sensitive (TES) species. For this category, anadromous refers to all TES salmonids on the Forest including bull trout. Each stream utilization category was then assigned a numeric value based on the team’s judgment as to its relative importance.

Rating - Road segments within 200 feet of streams

Score	Classification
10	Anadromous (TES species including bull trout)
5	Resident fish
2	Non-fish bearing

Results – The following chart compares the 6th field watersheds that have the greatest percentage of roads within 200 feet of streams weighted by the scores for anadromous, resident and non-fish.

Figure 12 – Sixth Field Watersheds with Roads near Streams



Fish Passage

Some culverts at road/stream intersections restrict the passage of fish. Surveys were conducted from 1999 to 2001 visiting road crossings that were suspected of having problems with fish passage. 300 culverts were actually surveyed using Region 6 protocol including all of the highest priority anadromous culverts.

Eighty-five percent of the surveyed culverts were rated “red” (likely impassible), 12 percent were rated “gray” (possible barrier, needs additional survey), and 3 percent were rated “green” (not a barrier). Estimated blocked habitat above “red” and “gray” culverts totaled 175.2 miles of stream. Cutthroat trout are most affected by culvert barriers (61 percent of the habitat blocked), followed by redband trout, resident coastal rainbow trout, and Lower Columbia River steelhead. The miles of anadromous fish habitat blocked is a relatively small amount – only 7 percent of the total. For resident trout, the range of habitat blocked by culverts is approximately 0.1 to 9.5 miles and for anadromous fish is 0.5 to 2.50 miles. It is likely that not every culvert rated “red” or “gray” is a complete passage barrier for all salmonids because the rating criteria was based on the weakest known salmonid – juvenile coho salmon. Other fish species and /or life stages may be able to ascend through some culverts that were rated “red” or “gray,” at least at certain flows.

The main criteria for rating and/or prioritizing the culvert barriers are 1) the presence or absence of TES fish stocks and 2) the amount of available habitat upstream of each barrier. Each “red” culvert barrier was assigned to an adjacent road segment. The numeric values or scores for each culvert barrier are based on the team’s judgment and reflect the importance of replacing fish passage barriers.

Rating -

Score	Classification
10	Anadromous fish culverts
5	Resident fish (unique populations) culverts a) Redband trout – White River, Miles Creeks b) Cutthroat trout– Oak Grove Fork Clackamas River between Harriet Lake and Timothy Lake c) Cutthroat trout – Bull Run River d) Bull trout – Hood River
2	Resident fish (Other) culverts

Click here to view a map of roads within 200 feet of streams.

Landslide Hazard

Roads can be a source of sediment that may eventually affect water quality or fish habitat. Road-related sediment is produced through two erosional processes: landslides and surface erosion.

There are many types of landslides and all can be triggered, accelerated, or diverted by roads. Roads alter local slope geometry, surface water flow, groundwater flow, and vegetative root strength, all of which can contribute to landslides. On the Forest, road-related landslides are typically debris slides, debris flows, slumps, earthflows, and rockfall. These landslides may occur above or below the road, on the cut-slope or on the fill-slope, and usually within the road prism. Roads can redirect water that may result in a landslide that is outside the road prism.

Analysis - A Forest-wide map of landslide risk had been compiled in 2000 from the geomorphic mapping completed during watershed analysis. Each watershed, and eventually the entire Forest, had been divided into geomorphic map units, primarily based on geologic unit and slope angle. Each geomorphic map unit had then been assigned a qualitative descriptor of its propensity for landslides (high, medium, or low). The assignment of this adjective was based on landslide inventories. The map lumps all landslide types together.

Click here to view a map of landslide hazards.

Road segments located in high landslide-risk polygons tend to have many more times the frequency of landslides than do road segments located in other landforms.

Rating -

10	High road related landslide risk
4	Medium road related landslide risk
1	Low road related landslide risk

The number is an index that reflects the relative risk or hazard of road-related landslides for a particular road segment.

Surface Erosion Hazard

The second type of erosion process that produces road-related sediment is surface erosion. Flowing water carries or pushes soil particles down slope, sometimes reaching a channel and potentially affecting water quality and fish habitat. The ability of water to erode soil is a function of the soil type, vegetative cover, slope angle, and volume of water or precipitation present. A road's cut-slope, ditch, fill-slope, and road surface itself can all produce sediment from surface erosion. Most roads have vegetated cut and fill-slopes where erosion is minimal, but there are occasionally "hot spots" where erosion is chronic.

Analysis - A Soil Resource Inventory (SRI) was completed for the Forest in 1978. The SRI mapped the main soil types within the Forest boundary and designated over one hundred different soil types. Management interpretations were made for all soil types, based on the soil texture, slope angle, and climate typical for that soil type. One of the management interpretations included in the SRI is "cut-slope and fill-slope erosion potential." This was selected as the most appropriate management interpretation to use for Roads Analysis to approximate the surface erosion hazard of roads. The SRI divides soil types into five categories of cut-slope and fill-slope erosion potential. Each road segment was assigned one of the five categories of cut-slope and fill-slope erosion potential based on the management interpretation for the soil type polygon containing that road segment.

Click here to view a map of surface erosion hazards.

Rating -

10	High road-related surface erosion potential
8	Medium-high road-related surface erosion potential
6	Medium road-related surface erosion potential
4	Low-medium road-related surface erosion potential
2	Low road-related surface erosion potential

The number is an index that reflects the relative risk or hazard of road-related surface erosion for a particular road segment.

Hydrologic Hazard

Rain-on-snow events can occur in the transient snow zone, which is defined as the elevation band at which snow accumulation and melt may occur several times over the course of a winter. This elevation zone differs from area to area depending on a variety of physical factors. The transient snow zone is important in that it represents an area that has a higher probability of having rain-on-snow events which may lead to increased flooding and landslide potential.

Roads located on landforms with a moderate or high landslide risk have a greater potential for failing during a rain-on-snow event. In addition, more erosion could be expected to occur on roads built on soils with moderate to high cut-slope and ditch erosion potential. In the transient snow zone, roads have a higher risk of failing if debris flows occur, or if higher stream flows mobilize trees and large woody debris that can plug drainage structures.

Analysis - A digital elevation model (DEM) was used to map the areas of the Forest that are within the transient snow zone of 1200 to 3600 feet elevation. Roads above and below this elevation band would also be rated since there are unusual storms that occur such as a warm front during an extreme storm event that melts snow well above 3600 feet. There is also the possibility of an unusual cold front that deposits snow at low elevations followed by a warm rain that melts it.

Click here to view a map of hydrologic hazards.

Rating –

10	Road segment is within the transient snow zone
2	Road segment is located above the transient snow zone
5	Road segment is below the transient snow zone

The number is an index that reflects the relative risk of rain-on-snow events that may lead to increased flooding and landslide potential.

High Risk Stream Crossings

There are several risk factors that could contribute to the failure of a road at a stream crossing. There is the potential for culvert blowouts, dam-break floods, debris flows, diversions and cascading failures. Contributing factors would include geologic hazards (landslides, debris flows, etc.) and hydrologic hazards (peak flow events). Hydrologic hazard has been evaluated separately.

Analysis – Intermittent and perennial stream crossings located on high landslide-risk terrain were mapped using GIS. Since some impacts to both roads and aquatic systems can occur downstream, intermittent and perennial stream crossings located downstream of stream crossings on high landslide risk-terrain were mapped manually.

Click here to view a map of high-risk stream crossings.

Roads having a high score with this factor are often those with the highest frequency of storm damage.

Rating - A numerical rating for upslope hazard is assigned to each road segment using the following criteria:

10	Perennial stream crossing located on high landslide-risk terrain
8	Perennial stream crossing located downstream of a stream crossing on high landslide-risk terrain
7	Perennial stream crossing not located on high landslide-risk terrain
7	Intermittent stream crossing located on high landslide-risk terrain
6	Intermittent stream crossing located downstream of a stream crossing on high landslide-risk terrain
5	Intermittent stream crossing not located on high landslide-risk terrain
0	No stream crossing

Stream Crossing Density

Where roads cross streams, there is the potential to affect fisheries and watershed values. Many factors have already been discussed.

Stream channel expansion: Many roads have ditches that flow directly into streams at a culvert or bridge. This is sometimes referred to as an expansion of the stream channel network since road ditches act as human made streams. Rainfall and snowmelt help move sediment from road ditches, cut-slopes and road surfaces rapidly to streams. If there were no road, rainfall and snowmelt would be more likely to percolate into the ground with minimal erosion reaching streams.

Stream crossing failure: There is the potential for failure of the stream crossing due to plugging or because it is in the path of a debris flow. If a catastrophic failure occurs, sediment and woody material can scour a stream channel to bedrock. In other cases, very little downstream damage would occur if a plugged culvert overflows in a controlled fashion.

Analysis – Density numbers were generated from GIS based on the number of times roads intersected streams within each 7th field watershed, divided by watershed area in square miles.

Click here to view a map of stream crossing density.

Rating - The stream crossing density per square mile in each 7th field watershed was then assigned to one of five risk classes using natural data breaks. The risk classes were assigned an index to weight the roads.

Risk Class	Number of Stream Crossings Per Square Mile	Index
Very High	13-21	10
High	8-12	8
Moderate	5-7	6
Low	2-4	4
Very Low	0-1	2

Wetlands

Roads in close proximity to wetlands have the potential to adversely affect these sensitive areas. Roads could alter surface and subsurface movement of water, introduce sediment into wetlands or provide access for vehicles leaving the roadway and traveling onto wetlands.

Rating - Roads within 200 feet of a wetland were mapped. A numerical rating for wetlands is assigned to each road segment using the following criteria:

10	Road segment is within 200 feet of a wetland
0	Road segment is not within 200 feet of a wetland

Water Uses

Many people use water from the Forest for various purposes including irrigation and drinking. Municipal water providers supply high quality drinking water to their customers. Without high quality water at intakes, water treatment costs can become very expensive for water suppliers and ratepayers. Road management can affect water quality. Water quality issues have been addressed in the previous sections, but roads were not ranked according to their effect on municipal water.

The presence of municipal water withdrawal has affected land allocations in the Forest Plan. The Bull Run Watershed and "buffers" outside the watershed (D allocation) are managed primarily to produce clean water for the city of Portland. Special Emphasis Watersheds (B6 allocation) were delineated for the municipal watersheds of the cities of Sandy, The Dalles, Dufur and Corbett. Water quality issues for these cities also contributed toward Tier 2 Key Watershed designation in the Northwest Forest Plan.

The 1996 amendments to the *Safe Drinking Water Act* (Section 1453) require States to develop and implement source water assessment (SWA) plans which will delineate the boundaries of the surface and groundwater source areas that supply drinking water to public systems. The SWA assessment plans for the various public water systems receiving water from the Forest are available on the Drinking Water page of the Oregon Department of Environmental Quality's website: www.deq.state.or.us/wq/dwp/SWACompleteSW.asp. SWA plans are available for the following public water systems on the Forest:

Clackamas River: Clackamas River Water, Lake Oswego, North Clackamas County Water Commission, Oregon City, City of Estacada and the Forest Service Timber Lake Job Corps Center.

Sandy River: City of Sandy (Alder Creek), City of Corbett (Gordon Creek), and the City of Portland (Bull Run River).

SWA plans for the City of the Dalles (Dog River, Mill Creek), and the Rhododendron Summer Home (Henry Creek, tributary to Zigzag River) have not yet been completed. As an example of the extent of a SWA, the SWA for the City of Estacada (PWS # 4100279) totals about 673 square miles, and extends approximately 33 miles up the Clackamas River into the Collawash watershed.

Aquatic Risk Factor Composite Rating

Each aquatic risk factor was weighted based on the estimated relative importance of a particular risk factor, as shown below.

Risk Factor	Weighting Factor
Riparian Areas/Floodplains	1
Fish Passage	3
Landslide Hazard	2
Surface Erosion Hazard	1
Hydrologic Hazard	2
High Risk Stream Crossings	2
Stream Crossing Density	2
Wetlands	1

Click here to view a map of composite aquatic risk factors.

A composite rating was assigned to each road segment based on combining values of the individual aquatic risk factors. The lowest possible score for a road segment is 6 and the highest is 140. The actual scores varied from 6 to 126, with a range of scores of 120. The higher scores indicate higher potential adverse impact to aquatic systems. Risk ratings were summarized into categories from very low to very high using five natural breaks in the data. The risk classes were then assigned an index ranging from 2 to 10 to weight the scores.

Risk Class	Range of combined aquatic factor scores per road segment	Index
Very high	69 to 126	10
High	53 to 68	8
Moderate	42 to 52	6
Low	29 to 41	4
Very Low	6 to 28	2

Click here to view a map of Forest roads and their assigned composite aquatic risk factors.

A road segment that scores in the "mid-range" of each of the eight aquatic risk factors would have a composite score of 65 (high risk class). This theoretical road segment has no culvert fish passage barrier, crosses a perennial non-fish bearing stream in an area downslope from a high landslide risk zone, is within a medium landslide hazard zone, has cutbanks and fillslopes with moderate surface erosion hazard, is within the transient snow zone, is within a watershed with a moderate number of stream crossings per square mile, and does not impact a wetland. Even though no single aquatic risk factor in this example has a high potential adverse impact to aquatic systems, the cumulative potential adverse impact is high.

The below are several examples of theoretical road segments that have composite aquatic scores in the "very high" risk class. Example A is a road segment with no stream crossing and is not near a stream or wetland. It is within the transient snow zone in a high landslide hazard area with high surface erosion hazard and within a watershed with a very high number of stream crossings per square mile. Example B is a road segment with a culvert fish barrier on nearly flat ground, below the transient snow zone. Example C is a road segment with a perennial stream crossing with anadromous fish, medium landslide hazard, within the transient snow zone, moderate stream crossing density and moderate surface erosion hazard. Example D is a road segment that crosses a wetland on high landslide hazard ground, with no stream crossing but within a watershed with a very high stream crossing density, within the transient snow zone, and with moderate surface erosion hazard.

Aquatic Factor	**Example A**	**Example B**	**Example C**	**Example D**
Riparian Area/Floodplains	0	10	10	0
Fish Passage	0	30	0	0
Landslide Hazard	20	2	8	20
Surface Erosion Hazard	10	2	6	6
Hydrologic Hazard	20	10	20	20
High Risk Stream Crossings	0	16	16	0
Stream Crossing Density	20	12	12	20
Wetlands	0	0	0	10
Total composite score	**70**	**82**	**72**	**76**
Risk class	**Very high**	**Very high**	**Very high**	**Very high**

Obviously, a wide variety of situations can lead to a composite aquatic score in the "very high" risk class. Users of the road analysis data will need to examine the individual aquatic risk factor scores for a particular road segment to better understand the composite aquatic score for that road segment.

Road segments that have composite aquatic scores in the "low" or "moderate" risk class might still have one or more individual aquatic risk factors that are high. Several theoretical road segments are shown below. Example E is a road segment with no stream or wetland crossing, high landslide hazard, high surface erosion hazard, above the transient snow zone, and within a watershed with very low stream crossing density. Example F is a road segment with no stream crossing, low landslide hazard, high surface erosion hazard, within the transient snow zone, within a watershed with very low stream crossing density, and crosses a wetland. Example G is a road segment that is near but does not cross a non-fish bearing stream, high landslide hazard, low surface erosion hazard, below the transient snow zone, and within a watershed with very low stream crossing density. Example H is a road segment that crosses an intermittent stream, with low landslide hazard, high surface erosion hazard, above the transient snow zone, and within a watershed with a low stream crossing density.

Aquatic Factor	Example E	Example F	Example G	Example H
Riparian Area/Floodplains	0	0	5	5
Fish Passage	0	0	0	0
Landslide Hazard	20	2	20	2
Surface Erosion Hazard	10	10	2	10
Hydrologic Hazard	4	20	10	4
High Risk Stream Crossings	0	0	0	10
Stream Crossing Density	4	4	4	8
Wetlands	0	10	0	0
Total composite score	**40**	**46**	**41**	**39**
Risk class	**Low**	**Moderate**	**Low**	**Low**

Composite Aquatic Score-Watersheds (5th, 6th, and 7th field)

A weighted, composite aquatic score was calculated for each 5th, 6th, and 7th field watershed by multiplying the weight for each risk index class (2 thru 10) by the road density (miles/square mile) for the roads falling in that risk index class in each watershed. For example, if a 6th field watershed with 50 square miles has 10 miles of road with a risk index of 10, the road density would be 0.2 mile/square mile. The road density is then multiplied by the risk score (0.2 x 10) to give a weighted score of 2 for that risk class. The same calculation is done for the remaining risk scores of 8, 6, 4, and 2. The sum of the weighted scores for the five risk classes is the weighted aquatic score for the watershed. Using road density (rather than miles of road) normalizes the data and allows direct meaningful comparison of weighted aquatic scores from watershed to watershed. Fifth field watersheds range in size from 34,200 (Upper Sandy River) to 176,271 acres (White River); Sixth field watersheds range in size from 10,063 (S.F. Bull Run River) to 31,686 acres (Middle Clackamas River tributaries); and Seventh field watersheds range in size from 480 (Five Mile Creek) to 15,418 acres (Upper White River).

Results - The weighted aquatic risk score for the 5th field watersheds ranges from 0.4 for the Middle Columbia/Eagle Creek to 15.7 for the White River. For the 6th field watersheds the weighted aquatic risk score ranges from 0.5 for the Middle Salmon watershed to 25.4 for the Lower Collawash tributaries. For the 7th field watersheds the aquatic risk score ranges from 0.001 for Chenney Creek (Lower Salmon River) to 45.3 for Fan Creek (Lower Collawash River tributaries). Other 7th field watersheds with high weighted aquatic risk scores include the Lower Clackamas River-Wards Reach, Lower Nohorn Creek, Big Creek, Fall Creek, Tag Creek, Skin Creek, Upper Clear Creek, and Lower Oak Grove. All of these 7th field watersheds are in the Clackamas River Drainage.

Larger scores indicate a greater risk to aquatic resources from the existing roads in the watershed. The weighted composite scores for the highest ranked 6th and 7th field watersheds are displayed in bar chart format below.

Figure 13 – Aquatic Composite Score by Sixth Field Watersheds

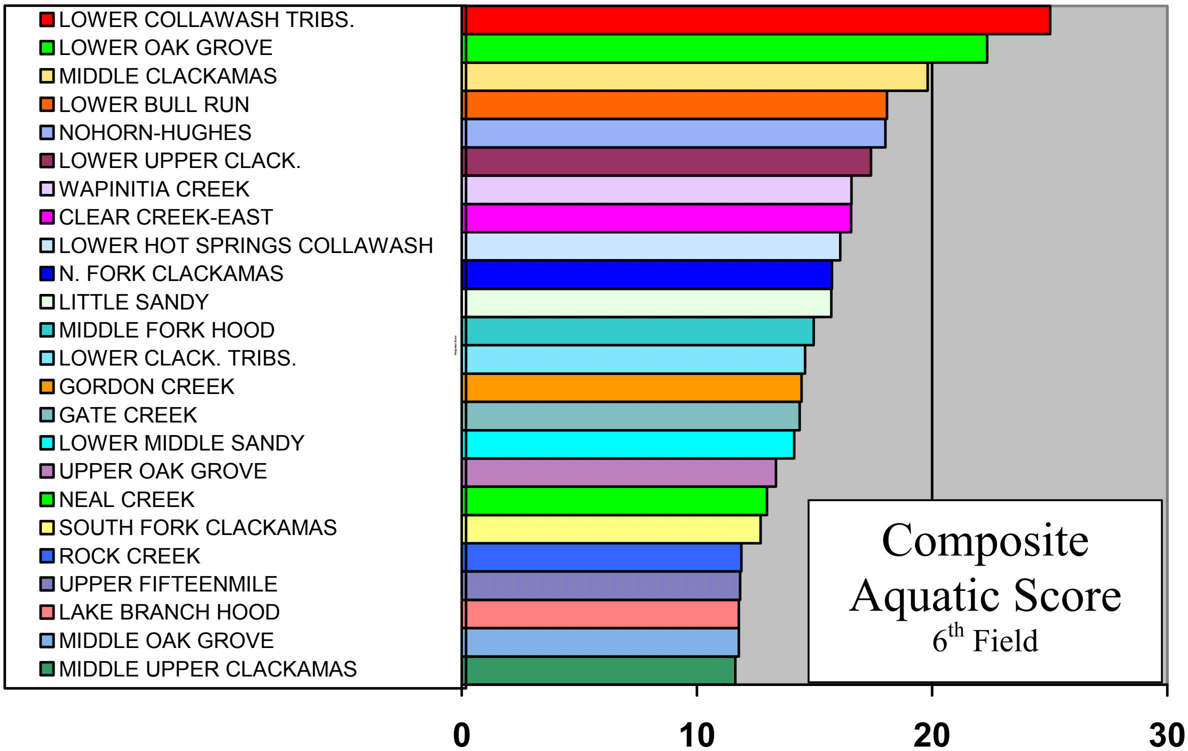
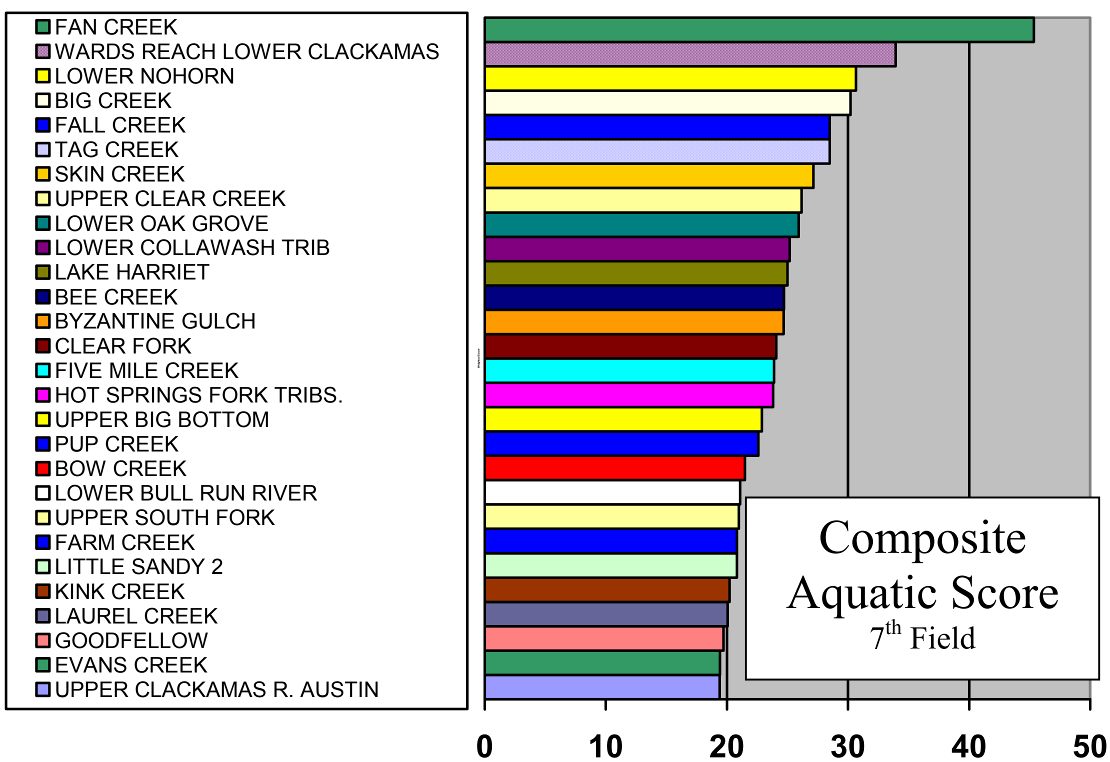


Figure 14 – Aquatic Composite Score by Seventh Field Watersheds



Terrestrial Wildlife

Introduction

The Forest is considered an urban Forest due to its location in relation to the Portland metropolitan area. This location results in a high level of interaction between people and wildlife. Highway 26 is heavily traveled at all times of the year. In addition, a large number of recreation sites including five ski areas, numerous lakes, the Pacific Crest Trail, and Mt. Hood itself draw of people from the local area as well as out of state visitors. This level of use by people results in a variety of impacts on wildlife populations and behavior.

Roads are one of the primary points of wildlife interactions with humans. Some animals are hit by vehicles and some species avoid using suitable habitat due to the disturbance by visitors. Animals may abandon young or a nest resulting in a reduction of reproductive capacity. Roads also provide access to remote areas for both legal hunters and poachers.

The Forest has implemented many strategies to reduce the impact of roads on wildlife. Some of those strategies include road gating, berming, water barring and decommissioning.

The purpose of the wildlife portion of the Roads Analysis is to examine each road on the Forest and compare it to wildlife values.

Rating System

One way to define the importance of the area bisected by a road is to develop a rating system that would numerically assign a value to the habitat based on the status of the species or how important this habitat is. The ratings for all of the wildlife species will be totaled to determine relative importance of the habitat.

This information can be used later for planning purpose when looking at road maintenance dollars or determining whether to close a road and possibly even how to close the road.

A ten point ranking system will be used for each species of concern.

Point Values	Ranking
10	High
8	Moderate High
6	Moderate
4	Moderate Low
2	Low

Wolverine Denning

Wolverine prefer solitude and have a strong affinity to denning in large boulder fields at the base of cirque basins typically above 4,000 feet in this part of the Cascades.

The wolverine is a solitary animal and will abandon a den site and move the young if disturbed by human presence. Any road that comes within hiking, snow shoeing or skiing distance of the den would make that habitat unusable by wolverines for denning purposes. In addition, snowmobile access can be a major impact on denning by this species. Wolverine will not travel through areas where they perceive that people will be present. Roads can be a major barrier to movement of these animals as well as transporting people into its habitat.

Rating –

10	Road goes through mapped potential wolverine habitat
8	Road is within one mile of mapped potential wolverine habitat
6	Road is above 4,000 feet in elevation but was more than one mile from mapped potential wolverine denning habitat
2	Road is below 4,000 feet in elevation

Spotted Owls

The analysis will rank the importance of habitat to spotted owls and the amount of ambient noise the owls are currently exposed to. Near mainline roads, spotted owls have become acclimated to the sound of car and truck traffic. Elsewhere, traffic and management activities can disturb spotted owls. There is greater concern for disturbance in Late Successional Reserves (LSRs) than for disturbance in nesting, roosting and foraging habitat, sometimes referred to as suitable habitat. There is little concern about disturbance in dispersal habitat since it is assumed that the birds will only use this habitat for short periods of time. Road maintenance activities such as brushing and snow plowing would have no effect but more intense road construction and maintenance would have an effect to spotted owls.

Rating -

10	Road goes through mapped Late Successional Reserve habitat
8	Road is within 0.25 mile of mapped Late Successional Reserve habitat
6	Road goes through mapped Nesting, Roosting, and Foraging habitat
4	Road is within 0.25 mile of mapped Nesting, Roosting, and Foraging habitat

Bald Eagles

Currently there is only one known bald eagle nesting on the Forest. But during the Forest Planning stage additional habitat was identified as potential nesting areas for Bald Eagles. Bald Eagles are sensitive to disturbance. A one-mile distance will be used to rate potential Bald Eagle disturbance.

Rating -

10	Road goes within one mile a current Bald Eagle nest
8	Road goes through mapped Bald Eagle habitat
6	Road is within one mile of mapped Bald Eagle habitat

Road Density in relation to Deer and Elk Winter Range

The effect of roads on deer and elk use of habitat is well documented. Numerous studies have shown that elk will avoid using an area where vehicle traffic is present. Deer are less sensitive. Even on low use roads, once an animal has been disturbed at that location they will avoid using that area. The effect is that for about 300 feet on either side of the road there is a large reduction in use of that habitat. During the summer this can reduce the area that animals use but it is not as critical as during the winter when the only available forage that is not under snow is concentrated into narrow bands at the lower elevations. Deer and elk typically spend most of their time within a 1-2 square mile area during any one season so limiting the forage can be a serious detriment to the nutrition of the herd.

The Forest Plan has standards that limit road density. The maximum is 2.0 miles per square mile within inventoried deer and elk winter range. Since winter range is the limiting factor it will be the focus of the analysis.

Rating -

8	Road is within inventoried winter range and the road density is above 2.0
4	Road is within inventoried winter range and the density is below 2.0

Click here to view a map of winter range road density.

Other Wildlife Considerations

Unique Habitats-Meadows, Talus, and Caves

Meadows, Talus, and Caves are unique wildlife habitats that are limited in area and distribution. These terrain features are often important habitat for unique species and are important to the lifecycle for some species. Some species of bats may only use caves and mines for roosting and maternity colonies. Some species of frogs may only use particular meadows with unique micro characteristics. Talus is the only place where pika can live and the rare Larch Mountain Salamander is closely associated with talus slopes.

Roads in these habitats can alter the hydrology, and bring predators or harassment to the creatures using these habitats. A road to a mine or cave may provide access to exploration that may disturb bats roosting there. Disturbance of bats at critical parts of their life can cause them to expend energy and die.

Rating-

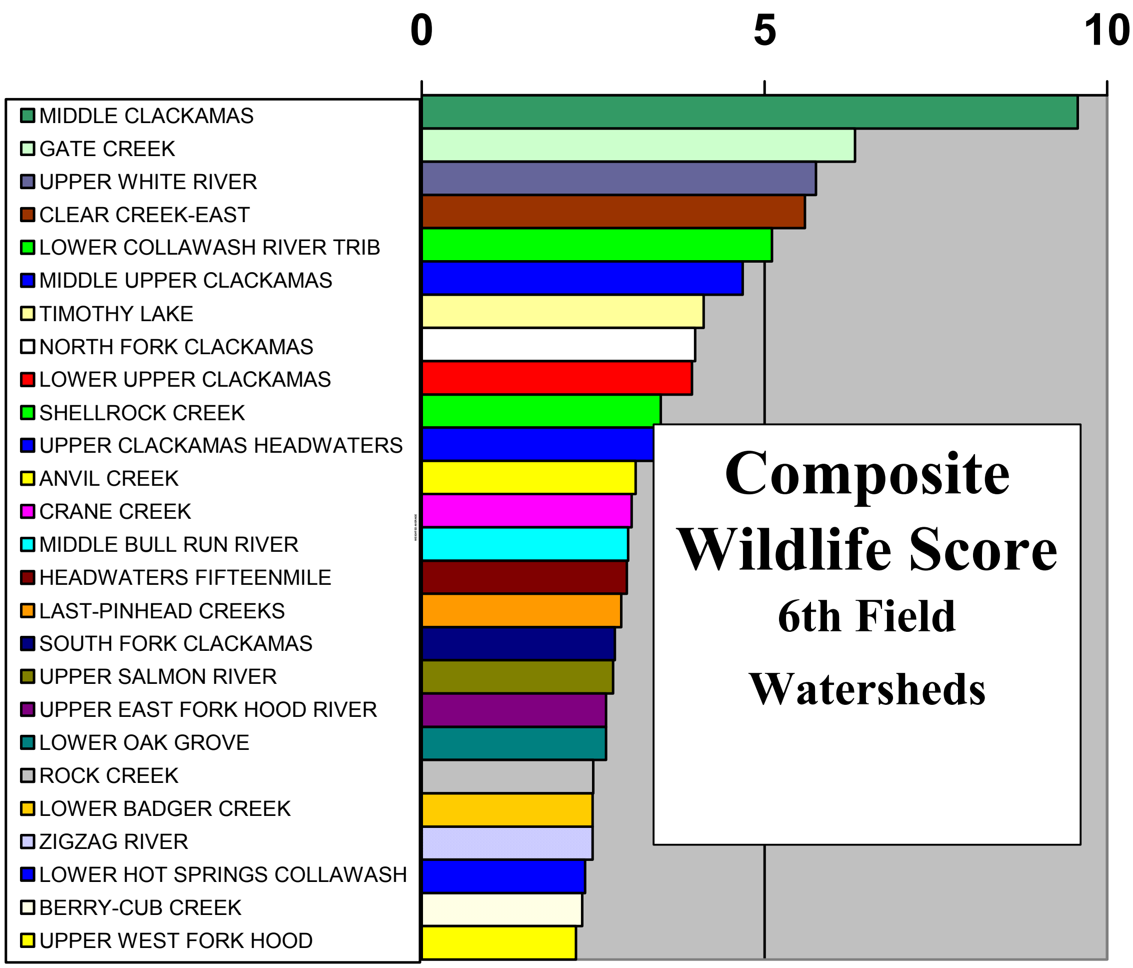
10	Road goes through a unique habitat or to a cave or mine
8	Road is on the edge of a unique habitat

Results for Terrestrial Wildlife –

Click here to view a map of composite wildlife risk factors.

Click here to view a map of Forest roads with their assigned composite wildlife risk factors.

Figure 15 – Wildlife Composite Score by Sixth Field Watersheds



Botany

Noxious Weeds

One of the Forest's objectives is preventing the introduction and establishment of noxious weed infestations. For management activities including road management, the Forest would (1) determine the factors that favor establishment and spread of noxious weeds, (2) analyze weed risks in resource management projects, and (3) design management practices to reduce these risks. The Forest's Noxious Weed Strategy identifies development of practices for prevention and mitigation during ground - disturbing activities as a long-term emphasis item. The February 1999 Executive Order 13112 on Invasive Species requires Federal agencies to use relevant programs and authorities to prevent the introduction of invasive species. Other relevant documents that guide Noxious Weed management include Guide to Noxious Weed Prevention Practices, USDA July 2001, and the 1988 FEIS for Managing Competing and Unwanted Vegetation.

Site-specific analysis and surveys would be conducted during project level planning.

Noxious weeds can displace native plant species reducing terrestrial and aquatic diversity. A weed infestation can result in costs associated with manual, biological, or chemical control. Noxious weeds are targeted for control by the Oregon Department of Agriculture.

The introduction or spread of noxious weeds into an area can occur through ground disturbance. Some weed species have the potential to be introduced to areas via seed transport by uncleaned machinery and equipment used during project implementation such as road construction and reconstruction and road maintenance and operations. Any vehicle can spread noxious weeds from established plants. Timing of road maintenance activities can also play a role in dispersal, if for example the brushing of a road prism occurs during noxious weed seedset.

Movement of established weed plants and residual seedbanks can occur with the transport of sand, gravel, rock, and excavated road waste materials associated with ditch cleaning, from an infested location to a non-infested site. Some weeds can be spread from sand and gravel stockpiles that are privately owned or are managed by other agencies such as Oregon Department of Transportation (ODOT).

A strategy of prevention should be used to minimize the risk of introducing new noxious weeds to project areas and/or spreading existing weeds throughout the road corridors and adjacent Forest. Suggested implementation guidelines and mitigations to be included in any roads projects are found in the General Weed Prevention Practices for Site-disturbing Projects and Maintenance Programs (Guide To Noxious Weed Prevention Practices, USDA Forest Service, July 2001). The general goals stated in this guide include weed prevention in all aspects of the project (layout, design, alternative evaluation, project decisions), removal of sources of weed seed and propagules (equipment cleaning, weed-free staging areas, manual removal), restriction of movement of infested materials (inspection and documentation of sand, gravel, borrow, fill sources), and minimization of soil disturbance and retention of native vegetation and canopy to the extent practical (native revegetation, certified or weed/seed-free hay and straw mulch). Road management goals in the guide also address new and reconstructed roads and road maintenance and decommissioning. Included in these goals are also prevention during all aspects of the project, minimization of roadside sources of weed seed, equipment cleaning in contract provisions, and treatment of known sites before blading roadsides or ditches or prior to the decommissioning of roads.

The Forest-wide Noxious Weed map layer (and annual updates to it) should be used in consultation with the District or Zone Botanist and the Forest-wide Range Conservationist during project planning. The Forest Noxious Weed Map layer represents all known noxious weed sites in previously surveyed project areas. Surveys are conducted in and adjacent to proposed project areas by the District Botanists and the Forest Range Conservationist. Additional surveys are conducted annually through a Memorandum of Understanding with the Oregon Department of Agriculture Noxious Weed Control Program along various roads in the forest. The forest-wide road system and adjacent road prism has not been completely surveyed.

On the east side of the Forest, the noxious weed species of concern include *Centaurea maculosa* (spotted knapwed), *Centaurea diffusa* (diffuse knapweed), *Centaurea pratense* (meadow knapweed), *Centaurea repens* (Russian knapweed), *Hieracium aurantiacum* (orange hawkweed), *Hieracium pratense* (meadow hawkweed), *Senecio jacobaea* (tansy ragwort), *Cyanoglossum officinale* (houndstongue), and *Linaria vulgaris* (yellow toadflax).

On the Barlow and Hood River Ranger Districts, many arterial and collector roads have large noxious weed infestations, as do some of the spurs leading into these roads. Noxious weeds adjacent to wilderness areas are of particular concern. The following roads on the Barlow Ranger District have populations of noxious weeds of concern: 17 (Barlow R.D. side), 1720, 1722, 44, 4420, 4421, 4430, 4440, 4450, 4460, 27, 2710, 2711, 2720, 48, 4810, 4811, 4814, 4820, 4830, 4840, 4850, 4860, 4880, 4881, 4890, 4891, 3530, 43 (Barlow R.D. side), 4310, 4330, 2110, 2120, 2130, 2131, 42-220, and Highway 216. The following roads on the Hood River Ranger District have populations of noxious weeds of concern: Highway 35, 18 (Hood River R. D. side), 1810 (at Lolo Pass), 17 (Hood River R.D. side), and 2630.

On the west side of the Forest the noxious weed species of concern include *Centaurea maculosa* (spotted knapweed), *Centaurea diffusa* (diffuse knapweed), *Hieracium aurantiacum* (orange hawkweed), *Hieracium pratense* (meadow hawkweed), and *Polygonum cuspidatum, P. polystachyum, P. sachalinense* (knotweed). The following are some of the roads on the ZigZag Ranger District that have noxious weeds of concern: Highway 26, 18 (ZigZag R.D. side), 1828, 10 (closest to 18), 2656, and 2612. Other areas with infestations also include the Laurel Hill Pit off of Highway 26 and the private driveways to summer homes along 2612. The following are some of the roads on the Clackamas River Ranger District that have noxious weeds of concern: Highway 224, 45, 4510-130, 46, 4635, 46-330, 4661-026, 4670, 4600 at junction with 4220 (Squirrel Quarry), 57, 5730-160/170, 5732, 58, 58-034, 42, 6350-210, 6330-200, and 7010.

Analysis – Roads within 100 feet of noxious weed of concern.

Rating -

10	Presence of noxious weeds within 100 feet of road
0	Absence of noxious weeds within 100 feet of road

Botanical Species

Threatened, endangered, and sensitive (TES) and Survey and Manage (S&M) vascular plants, lichens, bryophytes, and/or fungi species

There are no threatened or endangered plant species on the Forest but there are documented sites and habitat for sensitive plants and Survey and Manage species.

Surveys are conducted in and adjacent to proposed project areas by the District Botanists and the Forest Ecologists but the Forest-wide road system and adjacent road prism has not been completely surveyed.

Road projects and maintenance activities have the potential to cause adverse effects to Sensitive plant species and habitat through the alteration of habitat or immediate impacts to the plant individuals during the implementation of ground disturbing activities. Some of these concerns may include the removal of trees adjacent to the road that might provide canopy or microsite habitat for plants, road maintenance activities that might include equipment use within the plant habitat, the loading of excavated road waste material on the plant site, the destruction of rocky habitat during blasting for rock pits, the loss of stream connectivity where culverts have rerouted streams and altered hydrology, and the accidental introduction of noxious weeds to the habitat via equipment use and soil exposure.

Road management activities that could be a concern for Survey and Manage plant species include the removal of trees adjacent to the road that might provide habitat for lichens, removal or disturbance of adjacent downed wood in the road prism that might provide bryophyte or fungi habitat, and the removal of or maintenance activities associated with culverts in riparian and aquatic habitat inhabited by Survey & Manage vascular plant, lichen, and bryophyte species.

Future road management will continue to require site-specific analysis with regard to these species. For the purpose of this analysis, only sensitive plants are used because data for Survey and Manage species is incomplete.

Analysis – Roads within 100 feet of sensitive plants.

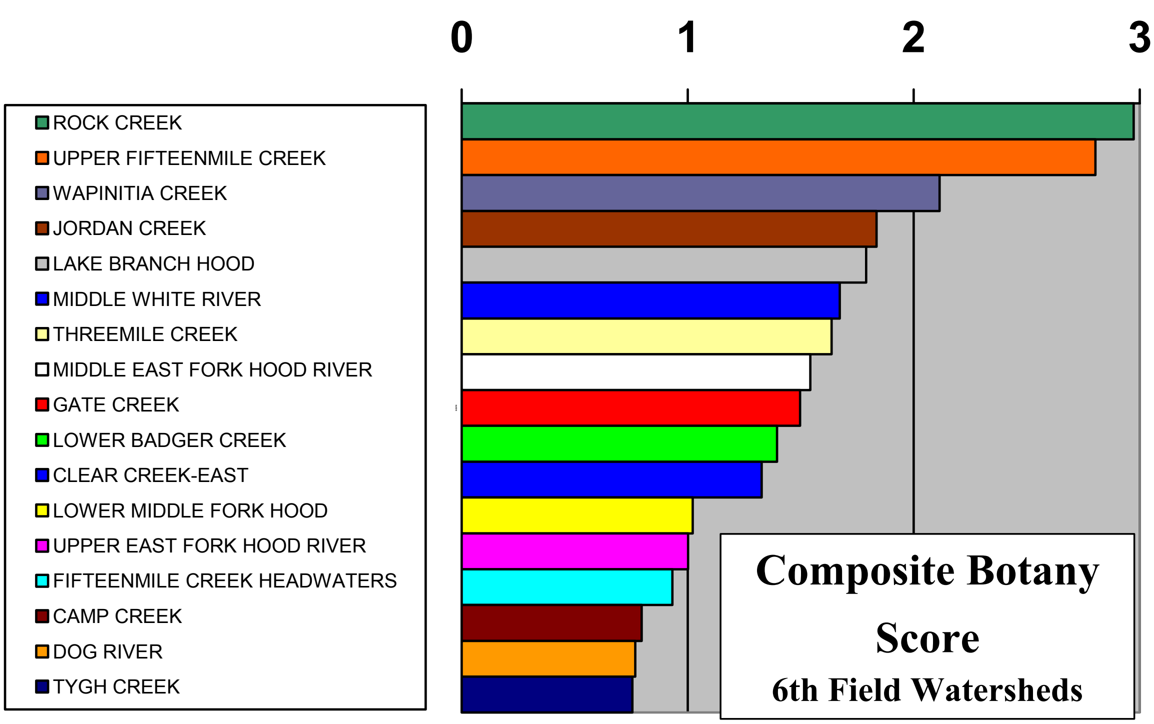
Rating -

10	Presence of sensitive plants within 100 feet of road
0	Absence of sensitive plants within 100 feet of road

Results - The following chart shows the 6th field watersheds with the highest composite botanical score. Click here to view a map of composite botany score.

Click here to view a map of Forest roads with their assigned composite botany score.

Figure 16 – Botany Composite Score by Sixth Field Watersheds



Composite Scores

Click here to view a composite map of all resource risk factors.

Click here to view a map of Forest roads by composite of all resource risk factors.

OPPORTUNITIES AND RECOMMENDATIONS

The results, recommendations and data files are an ideal starting point for project level planning. The Roads Analysis results will provide a good broad perspective of the physical setting and potential resource impacts of any road segment. Although the data used was the best available, it is not a substitute for a field examination.

Options for Reducing Road Maintenance Costs

Preliminary estimates indicate that the Forest is underfunded by more than 50% ($2 million in needs vs. $800,000 budget) to maintain the current road network to full objective maintenance-level standard.

Maintenance level 1 and 2 roads are the logical place to look for road maintenance savings. Three options have been explored for these roads. (Maintenance level 2 roads are used in the following examples because they make up the bulk of the roads under consideration.)

1) No change – continue to maintain road at current level.
2) Decommission road so that no repairs or maintenance are needed.
3) Close road and reduce maintenance and repairs to minimum level.

Under these three scenarios, the following assumptions were made:

1) Under the no change scenario, maintenance costs would be $250/mile/year, repair costs expected to be $1,600/mile every 10 years.
2) To decommission the same mile of road would cost $10,000 of initial investment and no additional expenses incurred.
3) To close the same road would cost $500 for blocking the entrance and $1,000/mile for stormproofing, $60/mile/year in minimal maintenance and $1,600/mile repair costs every 10 years.

Using a discount rate of 4% and a time period of 20 years, the following costs for each scenario were derived.

Alternative #	**Discounted Costs**
Option #1	$5459
Option #2	$10,000
Option #3	$4067

Below is a summary of some details and break-even points:

Option 1 - Under the no change scenario, if maintenance costs were greater than $600/mile/year, then decommissioning the road may make sense. However costs that high are unlikely. Current experience is that the high end would be about $400/mile/year. If repair costs exceed $5000/mile/decade then decommissioning may make sense. This cost is also unlikely. Current experience is that the average road repair is 1/3 that level.

Option 2 - Decommissioning costs vary depending on the characteristics of the road and its surrounding topography.

Figure 17 – Costs of Road Decommissioning

Environmental Risk	**Decommission Type**	Cost per Mile
Low	ML 1 or 2 roads, flat slope, no live stream culvert removal, no large fills	$2,000 - $5,000/mile
Moderate	Removal of some small culverts, minor to modeate live stream channel restoration, some fill pullback	$5,000 - $15,000/ mile
High	Large fills, large culvert removal, sidecast pullback, major stream channel restoration	$15,000 - $30,000/mile

Assuming an average cost for decommissioning of $10,000/mile, the total cost to decommission 2500 miles could be in the range of $25 million.

If decommissioning costs were reduced to $5,500 or less per mile, then decommissioning may be a viable option. Costs for decommissioning presume that the road would not be needed again for timber harvest or other uses. If the road were needed again, it would have to be reconstructed at additional cost that would be born by the timber purchaser.

Option 3 - If the cost of closing the road increased to $2,500 or more or if annual maintenance costs increased to $125/mile or if repair costs increased to more than $1,800/mile/decade then it may not make sense to close the road.

Conclusions

Under these scenarios, a typical road not posing a high risk to the environment or safety would not make economic sense to decommission. Decommissioning roads with an objective to bring the road maintenance costs in alignment with the budget is not recommended. Closing roads is a much better choice given the above assumptions; however, the difference between closing a road and maintaining to the current level is close, so a careful analysis of costs is important.

This assessment presents a dilemma of the current road system and the maintenance budget. To continue to maintain the road as efficiently as possible with the current budget will eventually result in roads not maintained to a safe level for users and managers nor would they be environmentally sound. Currently, a one-time investment of funding to decommission roads strictly to bring the maintenance needs in line with the current budget levels is also not fiscally responsible unless costs change significantly as presented above. There will, however, be roads that need to be decommissioned because they pose a high risk of causing significant environmental damage that make them worthy of decommissioning.

Recommendations:

- ❖ Decommission roads that pose high environmental risks and/or safety hazard.
- ❖ Look for opportunities to decommission those roads that have a low cost to decommission and that will not contribute to future timber commodities, recreation or other uses on the Forest.
- ❖ Close roads, stormproof and maintain at a maintenance level of 1.
- ❖ Look for opportunities to allow a road to close naturally after careful analysis to determine its not causing any environmental risk.

Road Management Recommendations

The following road management recommendations used a combination of the total composite environmental risk factors, road access ratings and road costs. For discussion of these individual factors, see individual sections.

One use of this analysis is to help prioritize Capital Investments funds and other funding not associated with routine maintenance funding. Roads categorized with a higher road repair cost coupled with a high access need and a high environmental risk factor should receive a higher priority for road repair funds than a road that has a low cost to repair, a low access need and a low environmental risk factor. The following table consists of road segments with a high road prism cost along with higher environmental risk factors and higher access needs. The road segments that have a Road Prism cost of 10 have major road repair problems that entail the use of retaining walls, major geogrid repairs or similar costly repairs. Roads with a rating of 8 have similar problems – just not as many. The following tables show summary information for road segments or whole roads. The raw data contain more specific information about where the actual road problems occur. For example Road 13 M.P. 3.60 – 11.6. The severe section is located between M.P. 7.5 – 11.6 and would cost $350,000/mile to repair.

Figure 18 – Roads with Greatest Repair Cost

Road #	Begin and End Mile Post	Environmental Risk Factor	Access Rating	Length	Drainage Cost	Safety Cost	Road Prism Cost	Surface Cost
1300000	**3.60 - 11.76**	**6.82**	**8**	**8.237**	**10**	**4**	**10**	**10**
6300000	**6.00 - 12.58**	**7.08**	**8**	**6.408**	**2**	**4**	**10**	**6**
6350000	**0.00 - 3.25**	**5.77**	**8**	**3.183**	**8**	**4**	**10**	**4**
4500000	**4.70 - 14.86**	**5.49**	**6**	**9.96**	**6**	**2**	**10**	**10**
6300000	**0.00 - 6.00**	**7.90**	**10**	**5.805**	**8**	**4**	**8**	**4**
1700000	**8.65 - 14.10**	**5.18**	**10**	**5.39**	**8**	**4**	**8**	**4**
2618000	**5.12 - 6.93**	**5.28**	**6**	**1.865**	**8**	**6**	**8**	**6**
1800000	9.88 - 16.31	6.78	10	6.579	8	8	6	6
4800000	0.00 - 16.43	6.78	10	16.176	2	6	6	8
4400000	0.00 - 5.14	6.39	10	5.473	8	6	6	10
4600000	0.00 - 28.46	6.24	10	27.968	8	6	6	8
7000000	0.00 - 6.16	6.19	10	0.189	4	4	6	4
1800000	16.31 - 19.92	5.75	10	4.102	8	4	6	6
2840000	0.00 - 3.52	5.53	10	3.358	6	4	6	6
1300000	11.76 - 15.63	5.53	10	3.909	8	6	6	2
1800000	2.37 - 6.21	5.15	10	3.951	6	4	6	4
7000000	6.16 - 7.41	5.52	8	1.251	4	4	6	4
7000000	7.41 - 8.690	6.85	6	1.277	4	4	6	4
6380000	0.00 - 2.920	5.75	6	2.776	4	4	6	2
6340000	0.00 - 7.810	5.71	6	7.582	6	4	6	2
7000000	8.69 - 9.010	5.35	6	0.321	4	4	6	4
4500000	**19.20 - 30.23**	**4.99**	**6**	**9.643**	**4**	**2**	**8**	**10**
2618000	**2.06 - 5.12**	**4.91**	**8**	**3.147**	**8**	**6**	**8**	**6**
5700000	0.00 - 7.500	4.85	10	7.403	4	6	6	6
4690000	0.00 - 3.420	4.62	8	3.371	4	6	6	6
4500000	0.00 - 4.700	4.33	6	4.603	6	4	8	10
4670000	0.00 - 6.62	4.32	6	6.492	6	4	8	4
5810000	0.00 - 5.11	4.29	8	5.139	4	6	6	6
1310000	0.24 - 5.913	4.27	8	5.405	6	4	10	2
1828000	0.00 - 8.610	4.25	10	8.574	6	4	6	4
1800000	0.00 - 2.370	4.21	10	0.446	6	4	6	4
4200000	22.29 - 26.58	4.17	10	4.219	4	6	6	4
1600000	0.70 - 18.90	4.14	10	17.747	6	4	10	10
5800000	19.10 - 19.60	4.00	10	0.45	2	4	6	6
3531000	0.00 - 2.57	3.69	8	2.697	4	4	6	6
4690000	3.42 - 6.24	3.67	8	2.762	4	6	6	6
4220000	0.00 - 2.72	3.34	8	2.679	4	4	8	4
5800000	6.90 - 19.10	3.23	10	11.879	2	4	6	6
6341000	0.00 - 3.48	3.02	6	3.595	4	4	10	10
2820000	0.00 - 6.47	2.79	6	4.337	6	4	6	4
4430000	0.00 - 4.33	2.71	10	4.33	6	4	6	10
2820000	6.47 - 11.98	2.70	6	5.261	6	4	6	4
1310000	0.00 - 0.24	2.00	8	0.235	6	4	10	2

Some of these road segments deserve special mention.

Road 13 segment 3.6 – 11.6

The worst section occurs between M.P. 7.5 and M.P. 11.6. This section is beyond all the major intersections and exists as a tie through for a loop route providing a secondary access to the Lost Lake recreation area. It is used primarily by a few recreationists who like the "back door" approach to Lost Lake. However, this segment has one of the highest resource ratings along with being one of the most expensive segments to repair. It is recommended that the Asphalt surfacing be ground up and returned to an aggregate surface. Decommissioning of this section should also be considered. A transportation analysis of this road was completed a year ago, which recommended decommissioning based on resource concerns and economic costs. This option may receive negative public comment.

Road 45 M.P. 4.5 – 14.9 and 19.2 – 30.2
These two segments have the highest cost per mile for road prism costs on the Forest. The total resource rating is in the high range. These segments are both asphalt surfaced. It is recommended that the asphalt surfacing be ground up and returned to an aggregate surface. By doing this only the most severe sites will need to be repaired.

Road 63 - M.P. 6.00 – 12.6 and Road 6350 M.P. 0.00 – 3.25
It is recommended that the asphalt surfacing be ground up and returned to an aggregate surface.

Road Decommissioning

The analysis is useful to help identify road segments that should be considered to decommission or close and stormproof. These roads would be categorized by having high environment risk factors coupled with a low access need. In some situations a road with a high environmental risk factor, medium access need and high road prism cost should be considered for decommissioning. The following table consists of roads or road segments that have a low access need and a relatively high environmental risk factor of 8 –10. This list should be used during project planning. All the roads listed are roads that were identified during the Forest ATM review as X or decision roads.

Figure 19 – Roads with Low Access Needs and High Environmental Risk

Road #	Begin and End Mile Post	Environmental Risk Factor	Access Rating	Length
4620150	0.00 - 0.88	10.00	2	0.812
4630120	0.00 - 0.55	10.00	2	0.518
4621160	0.00 - 0.47	10.00	2	0.433
4621162	0.00 - 0.40	10.00	2	0.334
4600032	0.00 - 0.20	10.00	2	0.197
4631120	0.00 -0.26	10.00	2	0.188
4620160	0.00 - 0.16	10.00	2	0.154
4600031	0.00 - 0.25	10.00	2	0.14
7010025	0.00 - 0.13	10.00	2	0.097
4600028	0.00 - 0.20	10.00	2	0.085
4600265	0.00 - 0.05	10.00	2	0.073
4620013	0.00 - 0.23	9.92	2	0.282
4600267	0.00 - 0.14	9.53	2	0.136
4621150	0.00 - 1.49	9.46	2	1.397
4600038	0.00 - 0.30	9.44	2	0.174
4621017	0.00 - 0.13	9.37	2	0.423
4600030	0.00 - 0.66	9.33	2	0.83
4640011	0.00 - 0.68	9.24	2	0.623
4620014	0.00 - 0.20	9.18	2	0.213
4621015	0.00 - 0.20	8.99	2	0.18
4640120	0.00 - 1.02	8.94	2	1.104
4630140	0.00 - 0.15	8.94	2	0.432
4621014	0.00 - 0.22	8.56	2	0.207
4600242	0.00 - 0.32	8.53	2	0.179
6340120	0.00 - 0.36	8.49	2	0.329
4600037	0.00 - 0.16	8.47	2	0.339
4630031	0.00 - 0.50	8.39	2	0.438
4810140	2.33 - 2.93	8.31	2	0.521
6311140	0.00 - 1.12	8.15	2	1.053

Road #	Begin and End Mile Post	Environmental Risk Factor	Access Rating	Length
4621140	0.00 - 0.56	8.14	2	0.558
4645000	0.00 - 1.13	8.02	2	1.109
6300170	0.00 - 2.70	8.00	2	2.595
4621000	0.45 - 2.46	8.00	2	1.857
4640150	0.00 - 1.85	8.00	2	1.455
4830120	0.00 - 1.50	8.00	2	1.44
4645130	0.00 - 1.10	8.00	2	1.167
6311160	0.00 - 0.96	8.00	2	0.938
6300185	0.00 - 0.96	8.00	2	0.896
4620130	0.3 - 1.20	8.00	2	0.883
4645120	0.00 - 0.86	8.00	2	0.856
6311150	0.00 - 0.83	8.00	2	0.809
6300183	0.00 - 0.20	8.00	2	0.8
4630150	0.00 - 0.46	8.00	2	0.755
2110260	0.00 - 1.03	8.00	2	0.699
4621022	0.00 - 0.54	8.00	2	0.664
6321150	0.00 - 0.66	8.00	2	0.646
1340640	0.00 - 0.23	8.00	2	0.627
4630012	0.00 - 0.82	8.00	2	0.606
4640012	0.00 - 0.45	8.00	2	0.585
4621130	0.00 - 0.62	8.00	2	0.571
4640016	0.00 - 0.35	8.00	2	0.556
4640140	0.00 - 0.565	8.00	2	0.53
4600203	0.00 - 0.66	8.00	2	0.515
6322140	0.00 - 0.33	8.00	2	0.482
1340011	0.00 - 0.81	8.00	2	0.463
4621200	0.33 - 0.80	8.00	2	0.463
4640130	0.00 - 0.49	8.00	2	0.453
4620140	0.00 - 0.43	8.00	2	0.416
4621220	0.00 - 0.57	8.00	2	0.375
1330620	1.70 - 2.10	8.00	2	0.372
4620174	0.00 - 0.37	8.00	2	0.368
4620187	0.00 - 0.33	8.00	2	0.367
4810016	0.00 - 0.61	8.00	2	0.362
4645135	0.00 - 0.57	8.00	2	0.356
6321016	0.00 - 0.40	8.00	2	0.354
4620170	0.00 - 0.35	8.00	2	0.347
4621000	0.00 - 0.35	8.00	2	0.331
4621200	0.00 - 0.33	8.00	2	0.327
6300176	0.00 - 0.25	8.00	2	0.319
4630015	0.00 - 0.18	8.00	2	0.314
6300180	0.00 - 0.31	8.00	2	0.291
4621125	0.00 - 0.27	8.00	2	0.266
6321015	0.00 - 0.26	8.00	2	0.246
6310115	0.00 - 0.27	8.00	2	0.245
4885142	0.00 - 0.30	8.00	2	0.237
2130281	0.00 - 0.23	8.00	2	0.229
4640027	0.00 - 0.22	8.00	2	0.219
4640014	0.00 - 0.22	8.00	2	0.216
4600324	0.00 - 0.26	8.00	2	0.214
4621011	0.00 - 0.20	8.00	2	0.213
4621190	0.00 - 0.46	8.00	2	0.212
4621120	0.00 - 0.16	8.00	2	0.203
6311012	0.00 - 0.20	8.00	2	0.199
4620130	0.10 - 0.30	8.00	2	0.197
6310162	0.00 - 0.20	8.00	2	0.195
6300016	0.00 - 0.18	8.00	2	0.193
6322012	0.00 - 0.20	8.00	2	0.184
1020016	0.00 - 0.10	8.00	2	0.181
4621028	0.00 - 0.18	8.00	2	0.176
4621210	0.00 - 0.17	8.00	2	0.174
6350200	0.00 - 0.27	8.00	2	0.163
6322122	0.00 - 0.17	8.00	2	0.162
4620017	0.00 - 0.05	8.00	2	0.161
4620019	0.00 - 0.15	8.00	2	0.157
7010114	0.00 - 0.20	8.00	2	0.155
4620180	0.50 - 0.64	8.00	2	0.153
6330011	0.00 - 0.10	8.00	2	0.15

Road #	Begin and End Mile Post	Environmental Risk Factor	Access Rating	Length
6321017	0.00 - 0.17	8.00	2	0.149
4645012	0.00 - 0.21	8.00	2	0.148
1020022	0.00 - 0.17	8.00	2	0.143
4640017	0.00 - 0.12	8.00	2	0.136
4621023	0.00 - 0.21	8.00	2	0.135
4620175	0.00 - 0.10	8.00	2	0.133
4620011	0.00 - 0.14	8.00	2	0.131
4885151	0.00 - 0.13	8.00	2	0.126
2130021	0.00 - 0.30	8.00	2	0.124
6321014	0.00 - 0.16	8.00	2	0.123
4621170	0.00 - 0.13	8.00	2	0.122
4620018	0.00 - 0.11	8.00	2	0.121
6300175	0.00 - 0.17	8.00	2	0.12
4640013	0.00 - 0.13	8.00	2	0.116
6321130	0.00 - 0.20	8.00	2	0.116
7010134	0.00 - 0.08	8.00	2	0.115
4640015	0.00 - 0.13	8.00	2	0.106
4620130	0.00 - 0.10	8.00	2	0.099
4645000	1.13 - 1.23	8.00	2	0.099
4631017	0.00 - 0.32	8.00	2	0.098
4621013	0.00 - 0.12	8.00	2	0.097
6320014	0.00 - 0.04	8.00	2	0.094
6300015	0.00 - 0.15	8.00	2	0.087
4620012	0.00 - 0.14	8.00	2	0.086
4630011	0.00 - 0.16	8.00	2	0.086
2630241	0.00 - 0.25	8.00	2	0.084
6300173	0.00 - 0.07	8.00	2	0.084
7010016	0.00 - 0.60	8.00	2	0.077
4600019	0.00 - 0.10	8.00	2	0.076
6300015	0.15 - 0.28	8.00	2	0.075
7000111	0.00 - 0.07	8.00	2	0.07
6322011	0.00 - 0.13	8.00	2	0.065
6311011	0.00 - 0.15	8.00	2	0.063
6350200	0.27 - 0.37	8.00	2	0.058
6300170	2.70 - 2.75	8.00	2	0.047
4621030	0.00 - 0.15	8.00	2	0.039

Road Surface Management

Observations were made of road surface types and how costs differed during the Forest Deferred Maintenance condition surveys of the last three years. After some analysis of the road prism costs by surface type, it was observed that all of the high cost per mile road segments occurred on hard surfaced roads (A/C surface or Bituminous treatments). The same observation was made of flood damage repairs during the 1996 and 1997 flood events. Almost all of the high cost repairs occurred on hard surfaced roads. One reason for this is that during intensive rainfall events water will sheet down or across the asphalt surface and follow any cracks in the pavement and concentrate water into the subgrade and road prism. That portion of the fill will become saturated and cause road failure. A gravel-surfaced road, on the other hand, will dissipate the water and percolate slowly into the subgrade.

Many of our Maintenance Level 2 and 3 paved roads have not been maintained adequately allowing the surface to degrade causing cracking on road shoulders into the center of the travelway.

It is recommended to grind up and return Maintenance Level 2 and 3 paved roads back into gravel surface roads. It is estimated that this will reduce the road prism repair costs by 60 – 80%. This should be prioritized by aquatic environmental risk factors.

Aquatic Recommendations

1) Identify options for possible road realignments adjacent to anadromous streams to restore stream channel functions and floodplain connectivity, by installing culverts or relief culverts along roads.

2) Reconnect floodplains along anadromous streams. An example of this is along Forest Road 46 where road construction in the mid 1940's cut off numerous meander bends along the Clackamas River blocking historic floodplain and side channel areas. To restore floodplain connectivity, numerous side channels were reopened in the 1990's to provide necessary rearing habitat for juvenile salmonids.

3) Identify partnerships to realign priority segments of state highways. An example of this is the joint Highway 35 Feasibility Study with Oregon Dept. of Transportation and the Federal Highway Administration.

4) Replace, repair or remove all high priority anadromous fish culverts according to the priority in the following table.

Figure 20 – Highest Priority Culverts

Forest-wide Priority	Stream Name	Road Number	Miles Blocked	Species/Stock
1	Tag Cr	4600.267	0.75	Clackamas Late run Coho
2	North Fork Mill Cr.	1711.630	1.0	Mile Cr. Steelhead (winter)
3	Red Hill Cr.	1800	0.50	Hood River Steelhead (summer)
4	Marco Cr.	1800	0.6	Hood River Steelhead
5	McGee Cr.	1810	0.4	Hood River Steelhead
6	Mag Cr.	4600	0.7	Clackamas River Late run Coho
7a	Little Zigzag River	2639	0.7	Sandy River Steelhead (winter)
7b	Little Zigzag River	2639	0.2	Sandy River Steelhead (winter)
8	Dutch Cr.	7000	0.5	Clackamas River Steelhead (winter)
9	Whale Cr.	4620	0.3	Clackamas River Early run Coho
10	Tony Cr.	1800	2.50	Hood River Steelhead (winter)
11a	Robinhood Cr.	3520.650	1.0	Hood River Steelhead (winter)
11b	Robinhood Cr.	3520	0.25	Hood River Steelhead (winter)
12	Meadows Cr.	3500.681	0.8	Hood River Steelhead (winter)
13a	Laurel Cr.	1300.620	0.5	Hood River Steelhead (winter)
13b	Laurel Cr.	1350	0.5	Hood River Steelhead (winter)
14	Pocket Cr.	3540	0.5	Hood River Steelhead (winter)

Note: Culverts labeled as Forest-wide fish priority "a" or "b" would be designed and re-constructed together given close proximity on the same stream.

5) Evaluate resident fish culvert barriers to determine which ones are critical enough to replace, repair or remove.

   - Consider unique populations
     a) Redband trout – White River, and Miles Creeks

b) Cutthroat trout – Oak Grove Fork Clackamas River between Harriet Lake and Timothy Lake
c) Cutthroat trout– Bull Run River
d) Bull trout – all known culvert barriers associated with bull trout have been removed or reconstructed, however, there are portions of designated critical habitat for bull trout that may need further investigation such as East Fork Hood River.

- Determine the amount of available habitat upstream of crossings and if there are other barriers, man-made or natural upstream that would downgrade the effectiveness of the culvert replacement.

- Field verify "Red", "Gray", and "Green" culverts for high priority resident trout populations.

- Conduct a cost-benefit assessment to assist in prioritization of resident trout culvert barriers for replacement.

Landslide Hazard

6) Road segments with high landslide hazard scores should receive priority maintenance attention before, during, and after storm events.

Surface Erosion Hazard

7) Ditch maintenance should be a priority for road segments with high surface erosion hazard. The fillslopes and cutslopes of road segments with higher ratings for surface erosion hazard are good candidates for bioengineering projects that seek to stabilize those slopes.
8) Roads with native surfacing and a high surface erosion hazard rating should be considered for temporary closure during the wet season.

Wildlife Recommendations

Wildlife composite scores range from one to nine for 6th field watersheds. A score of nine indicates the highest conflicts of roads and wildlife. Watersheds that have a score of five or more would be high priority for beginning to resolve road and wildlife conflicts. Wildlife scores for individual roads should be examined to assess which roads have the greatest impact.

Winter Range Road Density Recommendations

The roads analysis identified several 6th field watersheds that have road densities in winter range greater than 3.5 miles per square mile. The following watersheds should be the highest priority for reducing open road density.

Figure 21 – Winter Range Areas with High Open Road Density

6th Field Watershed	Open Road Density (miles per square mile)
Still Creek	3.98
Zigzag River	3.91
Nohorn-Hughes Creeks	3.72
Lake Branch Hood River	3.71
Lower Oak Grove	3.7
Wapinitia Creek	3.68
Upper Sandy	3.64
Rock Creek	3.56
Upper Mosier Creek	3.51

Some winter range areas have roads that may not be appropriate to close, making it difficult or impossible to meet Forest Plan open road density standards. For example, some roads are primary highways, or access roads to recreation areas or residences.

It may be more appropriate to examine open road density at a larger scale such as 5th field watersheds or winter range areas as a whole without regard for watershed boundaries.

The following are roads that have unique circumstances.

1) The **Bonnie Butte Hawkwatch Site (Road 4891)** is an important site for tracking raptor migration. The Hawkwatch International organization staffs the site for monitoring migration numbers, banding hawks as they migrate, and educating the public who visit the site. Over a thousand visitors per year come to watch the hawks as they migrate down the ridge. It is recommended that road 4891 be maintained at a higher level to allow low clearance vehicles and possibly even buses to make it to the site so more people can be enjoy and become educated about the hawks and their importance to our ecosystem.

2) **Road 5880** near Frying Pan Lake is crossed by many migrating young amphibians during the spring and summer. Vehicles traveling on this road kill many young creatures. It is recommended that this road be closed.

3) **Wildlife Corridors and Road Crossing Mortality -** It is recommended that the Forest devise a process to identify problem areas on heavily traveled roads and devise a strategy to mitigate wildlife mortality. Currently there are no records kept. In the absence of this data the Forest could use a process involving Oregon Department of Transportation and the U.S. Fish and Wildlife Service to identify important potential crossing areas along Highways 26 and 35. Wolverine and other important species would benefit.

Botanical Recommendations

1) Sand and gravel stockpiles often become seed sources for noxious weeds (This concern includes Forest Service stockpiles and those managed by other agencies). Weeds at these sites should be controlled prior to use. Sand stockpiles maintained by ODOT at Bennet Pass Sand Storage Shed at Hood River Meadows access road 3545, and at ODOT's facilities at Government Camp along Highway 26 near the junction to the Timberline Lodge Road, are of particular concern.

2) Closing or decommissioning roads in or near noxious weed populations would slow the spread of noxious weeds. Eliminating use by vehicles and road maintenance equipment would stop vehicular transport of seed and plant fragments. Weed control should occur prior

to closure or decommissioning and roads should be revegetated with native plant species where feasible. Since the residual seed bank may continue to germinate in former roadbeds, annual monitoring of decommissioned or closed roads would need to occur and weeds controlled where necessary. Gating roads is considered less effective due to administrative traffic that could spread seeds or plant fragments. When evaluating potential road closures, consider that roads provide ease of access for manual, biological or chemical control of weeds along roads or the adjacent land. The timing of road closure and control efforts should be coordinated to minimize cost.

Effectiveness of Road Closure Techniques

When closing a road there are several options that vary in terms of cost and effectiveness. There are several techniques that have been used to close roads. The following list describes the type of closure device.

- Gate – Gates are often used to close a road temporarily, such as a seasonal wildlife closure during the winter months. Sometimes gates are used where administrative access is needed. The road would usually be kept in a maintenance level 2.
- Guardrail – The road is blocked by spanning two or three posts with a guardrail that blocks all traffic yet still allows access for emergencies.

Guard Rail Barrier

- Berm – The road is blocked with a large pile of dirt, boulders, stumps, buried logs, a ditch or a combination of these. Since berms block road maintenance equipment, if there are live water culverts they would likely be removed prior to berm installation.
- Natural Closure – When a road is not used or maintained, vegetation grows up and eventually blocks all vehicle access.
- Decommissioning – The road would be removed from service by scarifying (ripping) the road surface, taking out culverts, recontouring, revegetating and blocking with a berm.

Berm and Decommission

- Stormproofing – Many large water bars are dug across the road to allow storm runoff to cross the road. Low clearance vehicles cannot drive a stormproofed road.

The success of road closures often depends on many factors such as closure type, topography, and whether there are established use patterns on a road. In some areas the barriers are breached or vandalized every year.

The following table shows estimates of the percentage of control and cost for each road access control measure. Any closure structure is more effective where there is a steep side slope at the point of installation. On gentle terrain, vehicles often drive overland around the structure particularly where it looks like the road is drivable beyond.

Figure 22 - Road Access Control Effectiveness

Access Control Measure	Average Control (percent of vehicles stopped)	Approximate Cost to Install
Decommissioning	99	Up to $20,000 per mile
Earthen Berm and a Few Culverts Removed	97	$2000
Guard Rail Barrier combined with Earthen Berms	90	$1500*
Two Earthen Berms	90	$400
Earth Berm with no culvert removal	85	$300
Gates	75	$3000*
Guard Rail Barriers	70	$1100*
Storm Proofing Water Bars	35	$900 per mile

* Gates and guardrail barriers often experience vandalism. There would be additional costs for monitoring, and repair or replacement.