APPENDIX B

Minimum Road System
Assessment Criteria
Public Uses

A recreation site is a discrete area on a Forest that provides recreation opportunities, receives recreational use, and requires a management investment to operate and/or maintain to standard under the direction of an administrative unit in the National Forest System.
Recreation sites range in development from relatively undeveloped areas, with little to no improvements (Development Scale 0 and 1), to concentrations of facilities and services evidencing a range of amenities and investment (Development Scale 2 through 5).

RECREATION SITE DEVELOPMENT SCALE DEFINITIONS	
Scale #	**Definition**
0	**No site modification** • No constructed improvements evident at the site • Little to no controls or regimentation • Primary access usually over primitive roads • Spacing informal and often established by user
1	**Almost no site modification**. • Rustic or rudimentary improvements designed for protection of the site rather than comfort of the users. • Use of synthetic materials excluded. • Minimum controls are subtle. • No obvious regimentation. • Primary access usually over primitive roads • Spacing informal and extended to minimize contacts between users.
2	**Minimal site modification**. • Rustic or rudimentary improvements designed primarily for protection of the site rather than the comfort of the users. • Use of synthetic materials avoided. • Minimum controls are subtle. • Little obvious regimentation. • Spacing informal and extended to minimize contacts between users. • Primary access usually over primitive roads. • Interpretive services informal, almost subliminal.
3	**Moderate site modification**. • Facilities about equal for protection of natural site and comfort of users. • Contemporary/rustic design of improvements is usually based on use of native materials. Inconspicuous vehicular traffic controls usually provided. • Roads may be hard surfaced and trails formalized. • Development density about 3 family units per acre. • Primary access may be over high standard roads. • Interpretive services informal if offered, but generally direct.

Scale #	Definition
4	**Heavy site modification**. • Some facilities designed strictly for comfort and convenience of users. • Luxury facilities not provided. • Facility design may incorporate synthetic materials. • Extensive use of artificial surfacing of roads and trails. • Vehicular traffic control usually obvious. • Primary access usually over paved roads. • Development density 3-5 family units per acre. • Plant materials usually native. • Interpretive services, if offered, often formal or structured.
5	**Extensive site modification**. • Facilities mostly designed for comfort and convenience of users and usually include flush toilets; may include showers, bathhouses, laundry facilities, and electrical hookups. • Synthetic materials commonly used. • Formal walks or surfaced trails. • Regimentation of users is obvious. • Access usually by high-speed highways. • Development density 5 or more family units per acre. • Plant materials may be non-native. • Formal interpretive services usually available. Designs formalized and architecture may be contemporary. • Mowed lawns and clipped shrubs not unusual.

Recreation Sites are further defined by specific "Site Types". The following are the specific Site Types and their definitions:

RECREATION SITE TYPE DEFINITIONS	
Site Type	**Definition**
Boating Site	Site managed primarily to facilitate access to water for boating activities.
Camping Area	Area managed for recreational overnight use; minimal or no improvements; Development Scale -0- or 1.
Campground	Site with camp units managed to accommodate overnight use by individuals and families; Development Scale 2-5.
Climbing Area	Site managed primarily for rock climbing and rock climbing staging.
Day Use Area	Site managed for primitive day use recreation activities where there is no dominant use or activity; minimal or no improvements; Development Scale -0- or 1.
Documentary Site	Historic sites, buildings, districts, or other features primarily managed and preserved for their cultural or historic values. Include only sites that have, or are eligible for, State and/or National register status.
Dump Site	Site managed to provide facilities for recreation vehicles to empty gray and black water holding tanks.
Fire Lookouts/Cabins Overnight	Look-out towers, cabins, guard station, or other administrative accommodations designated for overnight public use.
Fish Viewing Site	Site managed primarily to provide the opportunity to view fish.

Site Type	Definition
Fishing Site	Site managed primarily to accommodate fishing and other related day use activities from dock or shore.
Group Campground	Site with camp units managed to accommodate overnight use by groups; Development Scale 2-5.
Group Picnic Site	Site managed for picnicking and other related day-use activities by groups.
Horse Camp	Site with camp units managed primarily to accommodate pack and riding stock and overnight use; Development Scale 2-5.
Hotel, Lodge, Resort	Hotels, lodges, motels, or similar structures managed primarily to accommodate overnight use.
Info Site/Fee Station	Site managed primarily to provide recreation information including maps, general orientation, directions, and regulations. Site can also be managed as a contact point for collecting fees.
Interpretive Site (Major)	Site managed to provide a broad range of interpretive programs, services, and facilities. Usually includes a major visitor center building and annual operations/maintenance exceeds $100,000.00.
Interpretive Site (Minor)	Site primarily managed to offer a smaller scale and range of interpretive opportunities than a major interpretive site. Annual operations/maintenance is less than $100,000.00.
Observation Site	Site managed primarily to accommodate visitors viewing scenery or viewing specific forest-related activities.
Organization Site	Site managed primarily for structured recreation use by organized groups. Structures
Picnic Site	Site managed for picnicking and other related day-use activities by individuals or families.
Ski Area Alpine	Site managed primarily to accommodate downhill skiing. Sites are typically operated under special-use permit and usually include groomed ski runs, uphill transfer devices, sanitary facilities and provisions for public safety.
Ski Area Nordic	Site managed primarily to accommodate Nordic skiing. Sites are typically operated under special-use permit and usually include groomed ski trails, sanitary facilities and provisions for public safety.
Sno-park	Site managed to provide staging for winter recreation activities including cross-country skiing, snowmobiling, and other winter modes of recreation transportation.
Sno-play Area	Site managed primarily as a play area for winter activities such as sledding and tubing.
Trailhead	Site managed to provide staging for trail use.
Wildlife Viewing Site	An observation site managed primarily to provide the opportunity to view wildlife. May include parking lot, toilet, and trails and interpretive displays.

Questions to be addressed to adequately assess the benefits a road provides for Public Access include:

- Is there adequate access to existing and planned developed recreation sites (dev scale 2-5)?
- Is there adequate access to existing dispersed recreations sites (dev scale 0 & 1)?
- Are access roads maintenance levels commensurate with the type (campground, trailhead, boat launch, observation point, etc.) and amount of use (capacity and occupancy)?
- Are there adequate amounts of roads available for driving for pleasure, hunting, fishing, sightseeing, collecting forest products, and other dispersed recreation activities?

Public Access benefits will be assessed using a High, Moderate, and Low value. The following is the definition of factors considered when assessing values for Developed recreation Sites, Dispersed Recreation Sites, and Dispersed Recreation Uses:

Developed Recreation Sites:

High:

- Road leads to 1 or more high use developed sites:
  - Dev scale 4 or 5; or
  - >30% seasonal occupancy; or
  - >100 PAOT
- Road leads to 1 or more high use trailheads
  - Dev scale 4 or 5; or
  - >15 people average per day; or
  - >30 PAOT

Moderate:

- Road leads to 1 or more low/moderate use developed sites:
  - Dev scale 3; or
  - 5% to 30% seasonal occupancy; or
  - 25 to 100 PAOT
- Road leads to 1 or more moderate use trailheads
  - Dev scale 3; or
  - 5 to15 people average per day; or
  - 6 to 30 PAOT

Low:

- Road does not lead to any planned or existing developed recreations sites or very low use developed sites:
  - Dev scale 2; or
  - <5% seasonal occupancy; or
  - <25 PAOT
- Road does not lead to any planned or existing trailheads or very low use trailheads:
  - Dev scale 2; or
  - <5 people average per day; or
  - <6 PAOT

Dispersed Recreation Sites:

High:

- Road provides access to a high number of dispersed sites:
  - > 5 sites
  - >40% occupancy

Moderate:

- Road provides access to a moderate number of dispersed sites:
    - 3 to 5 sites
    - 20% to 40% occupancy

Low:

- Road provides access to a moderate number of dispersed sites:
    - <3 sites
    - <20% occupancy

Dispersed Use:

High:

- Road provides access to high levels of use; or
- Road provides access to a high number of types of dispersed opportunities; and
- Primary use is in the summer and fall; or
- Roads with moderate level of use but also provide access to winter dispersed opportunities

Moderate:

- Road provides access to moderate levels of use; or
- Road provides access to a moderate number of types of dispersed opportunities; and
- Primary use is in the summer and fall

Low:

- Road leads to no dispersed recreation opportunities; or
- Road provides access to low levels of use; or
- Road provides access to a low number of types of dispersed opportunities; or
- Primary use is in only during big game hunting season

WILDLIFE RISK ASSESSMENT

Risk Assessment Process:

Roads or road segments will be given a specific score based on a set of evaluation criteria. Road scoring efforts were designed to provide a relative ranking of road segments based on their impact to habitat or populations. Local knowledge and professional judgment should be used to determine the score where GIS analysis and data does not exist. The evaluation criteria will be used place roads in categories of low, moderate, and high.

Deschutes and Ochoco NF. Issue Associated Questions:

Critical Wildlife Habitats – Reproduction Areas, Winter Habitats, Unique Habitats, etc. –

Does the road system allow public access to areas used by wildlife during critical periods (reproduction, rearing, wintering, etc.) or are rare or unique (caves, wetlands, etc)?

High – 3: Road segment is affecting one or more critical habitats within the watershed to a point where species use may be limited due to road influence at a level that may impact local populations.

Medium – 2: Road segment has potential to be limiting use of critical habitat areas.

Low – 1: Road segment does not affect critical habitats.

Does the road influence habitats within the minimum buffer for nest stands or reproductive areas?

Most wildlife species are extremely sensitive to human disturbance during the reproductive season. The level of disturbance varies based on the type and distance of the disturbance. Traffic associated with roads and the associated human use has the potential to disrupt reproductive activities. Roads that enter identified minimum human activity restriction buffers or known reproductive areas have greater potential for disrupting reproduction than those that don't.

Yes – 3
No – 0

Does the road intersect TE&S habitat (primary and secondary reproductive habitat)?

Yes – 3
No – 0

Is the road within or provide access to wildlife related LMRP management allocations (winter range, BEMAs, LSR, etc.)?

Assess if seasonal closures are effective in reducing the disturbance and use your professional judgement to assign a score.

Yes – 2
No – 0

Is the road within a priority watershed identified in theTerrestrial Restoration and Conservation Strategy?

TRACS identifies the greatest impact to wildlife species and habitat comes from roads and the FS has moderate to high control over this threat. Road closures generally benefit priority species and

habitats. Road closures can also reduce other threats like loss of dead wood habitat and a reduction fire risk due to lessening the risk for human starts.

Yes – 2
No – 0

Does the road provide access to priority habitats identified in the Terrestrial Restoration and Conservation Strategy?

Yes – 2
No – 0

Is the road within a riparian reserve or RHCA?

Roads reduce habitat security, remove habitat, and introduce habitat factors like noxious weeds, non-native species, dust, etc. These effects vary by species and type.

Yes – 3
No – 0

Snags and Down Wood –

Is the road system contributing to the reduction of habitat for species dependent upon snags and down logs (*where snags and down logs are limited*)?

High – 3: Road provides access to the forest types and topography that are conducive to firewood removal. Road segments that are on relatively mild slopes in areas where off road travel is permitted present or has a history of or high potential for illegal wood cutting are the greatest risk for snag and down log reductions extended distances from the road. This road may also provide access to numerous subsequent roads that increase the potential for reducing snag numbers.

Medium – 2: Road is in the forest types and topography that have moderate potential to move levels below desired levels. This road segment may be located where there are moderate or steep slopes and firewood removal is somewhat difficult due to slope and topography; or in forest types that do not typically provide firewood.

Low – 1: Road segment has limited potential to have a large impact on snag and down log levels with the watershed due to location, vegetation types and/or topography. Illegal firewood harvest would be too difficult.

Core Habitats and Fragmentation –

Does this road access an unroaded area or unfragmented block of habitat (core habitat)?

Areas with no roads or low road densities provide unique habitats. Roads that allow access to human activities to these areas can reduce the quality of these habitats.

Identify blocks of core habitat using the buffer analysis completed on forest (need location). Areas outside of the buffers equate to core habitat. However, most of this will be small in size. Look at opportunities to make larger blocks by closing roads.

High – 3: Road provides direct access to a core area or unfragmented block of core habitat. Road segment is contributing to fragmentation directly by impacting large amounts of core habitat and/or subsequently facilitating traffic to secondary roads and human associated activities within core habitats.

Medium – 2: Road is not the primary access route to core area or unfragmented habitat but facilitates access to these areas. Road segment is contributing to the fragmentation of some habitats.

Low – 1: Road does not provide access to core areas and does not affect core habitats.

Wildlife Movement – Migration, Dispersal, Connective Habitat –

Does the road system intersect areas important to wildlife movement (dispersal, migration, etc.) thus precluding or altering wildlife movement and increasing the chance of mortality due to collision?

Recognize natural movement corridors (ridgelines, saddles, riparian, edges of lava, etc.) where information on migration corridors is limited or unknown. It is also understood that maintenance level roads 4 and 5 (larger, high speed roads) are where most mortality (collisions) are likely to occur. It is possible to identify areas where we would want to down-grade the maintenance level for some of these roads. However, collisions and mortality can also occur on lesser used roads as well.

High – 3: Road segment is contributing to changing direction and ease of flow, concentration of flow, and/or increasing the potential for mortality for animals migrating or dispersing due to road interactions or increased exposure to predation. This road segment may also have high secondary effects by facilitating human use in the area.

Medium – 2: Road has moderate effects to wildlife movement and chance of mortality due to collision.

Low – 1: Road segment is having minimal impact on migration or dispersal.

Are there physical barriers associated with the roads?

Physical barriers limit the ability of some animals such as amphibians to cross roads. Barriers also increase the time or difficulty of crossing a road which can preclude animals from utilizing adjacent habitats or possibly resulting in them being killed. Physical barriers include cement median dividers, guard rails, fences, powerline corridors, train tracks, etc.

Yes – 2
No – 0

What is the <u>operational</u> maintenance level and average traffic volume of the road?

Higher maintenance levels are indicative of higher traffic volumes, increased speeds, and larger areas required to cross. Higher traffic volumes and wider roads limit the ability of wildlife to cross the road and increase the potential they will be killed or injured in the process.

Maintenance level information can be gathered from the engineers or road manager.

High – 3: Maintenance level 4 with locally known high volume or maintenance level 5

Medium – 2: Maintenance level 3 or maintenance level 4 with locally known low volume.

Low – 1: Maintenance level 2 or below unless local knowledge warrants medium.

Other Wildlife Related Questions –

Is the road within 5 miles of a city or subdivision?
Human activity centers have increased vehicle traffic and a much greater potential for human wildlife interactions. These areas may have other influences like dogs and habitat removal. Human activity centers combined with other factors reducing migration habitat effectiveness can cause pinch points which increase the potential conflict with a road segment and in some cases multiple factors can reduce or eliminate the potential for wildlife to utilize the corridor. Legal and illegal wood cutting activities that reduce snag and down log levels are typically greater closer to population centers. The more remote and inaccessible the road is the less traffic it typically receives, and thus has lower potential for impacts to snag and down log levels.

Yes – 3
No – 0

Is the road within 1 mile of dwellings, campgrounds, etc.?
Dwellings may include private homes, guard stations, resorts, ect.

Yes – 2
No – 0

Road Density –

Does the road density in the watershed (subwatershed?) or allocation (winter range, key elk etc.) exceed LRMP standards?

Yes – 10
No - 0

Final Road Score –

Assign a score based on the operational maintenance level of the road. It's likely that many roads will be in watersheds/allocations that exceed standards so doubling wouldn't really separate roads by score. It might in a few watersheds but probably not many. The operational maintenance level and ability we have to close them does though. See table below.

Operational Maintenance Level	Score	Rationale for scoring
1	Sum of all values above.	Road is closed. While the road may still be having effects to wildlife there is very little, or no opportunity to further mitigate road effects.
2	Triple all values	Objective maintenance level 2 roads provide the greatest opportunity to reduce/mitigate wildlife effects and are therefore given the highest score.
3	Double all values	Operational maintenance level 3 roads provide moderate opportunity to reduce/mitigate

		wildlife effects.
4	Sum of all values above.	While the road is open and may be having significant effects to wildlife there is little, or no opportunity to mitigate road effects.
5	Sum of all values above.	While the road is open and may be having significant effects to wildlife there is little, or no opportunity to mitigate road effects.

Benefit and Risk Rating

For Heritage Resources

Archeological Resources

- Archaeological resources that have been developed as interpretive sites depend on access being opened. These types of sites have a High need for access. The risk to the resource is Low.
- Archaeological resources that are of National Register of Historic Places (NRHP) quality that are currently bisected by a road do not have need for access. These types of sites have a Low need for access. The risk to the resource is High.
- Archaeological sites that are NRHP quality and located directly adjacent to roads, or are located within 1/8 of a mile from the road, do not need access and therefore are valued as a Low access need; however, the risk to the resources is Moderate.
- Archaeological resources (often historic) that are susceptible to fire damage require access to accommodate fire suppression equipment, in the event of a wildfire. These types of sites have a High need for access. The risk to the resource is Moderate.

Tribal Resources

- Traditional food gathering and hunting areas require access. The need for access to these areas is High. The risk to the resources is Low.
- Places of worship. The need for access to this area is High. The risk to the resource can range from Low to High depending upon the type and sensitivity of the resource and the setting.

BOTANY RISK ASSESSMENT

For Minimum Roads Analysis

The objective of the Botany Assessment is to assess benefits, problems, and risks to botanical resources that are associated with the transportation system. The following risk factors are used to evaluate and compare different road segments and how they may be influencing native plant species and habitats.

These ranking criteria and analysis procedures have been used in the forests-wide Roads Analysis and in project-level analysis.

KEY ISSUE A: Effects on Plant Habitats. The presence, type, and location of roads may affect special plant habitats.

To address Key Issue A, the following question was analyzed:

Key Question A1: How and where do roads affect special habitats?

Examples of potential impacts

Impact to plant species within special habitats and the overall condition of the plant communities that occur in special habitats is often directly related to many of the same physical attributes that will be evaluated in the aquatic risk rating. For example, wetland habitats may be impacted by increased sedimentation and changes in hydrologic function and water quality. A road may alter the function of a stream's floodplain and/or off-channel habitat by changing drainage patterns. Roads may intercept runoff, which can accelerate erosion and lower water tables, increase sediment loading and delivery of toxic pollutants, change plant species composition by introducing invasive plants, and degrade water quality. A culvert that is not functioning properly (for e.g., the culvert is under-sized and the hydraulic capacity is exceeded) may increase sediment into wetlands and streams. In some areas, productive wetlands have been converted to compacted road surfaces. Many of these habitats have had fill placed on top of existing habitat as roads are built through them. Road failures in landslide terrain can impact special habitats. The resulting changes in drainage patterns, soil composition, and introduction of invasive plants from roadside shoulders may cumulatively result in significant alteration of the existing plant communities. Of these effects, those that affect the areas ability to receive, store and move water will likely have the greatest impact on a wetland's condition and function.

As with special habitats, the impacts to riparian plant communities often tie directly to the criteria that are used in the aquatic risk ratings. If the road segment has a high aquatic risk rating, the riparian plant community is likely to be impacted by the same factors, resulting in a high botany risk rating. Roads often intersect riparian areas and can cause changes in hydrologic function and water quality. Roads intercept runoff that can accelerate erosion and lower water tables. Bank erosion can cause an associated loss of bank vegetation. A road segment may alter the function of a stream's floodplain and/or off-channel habitat, therefore impacting riparian and floodplain-related plant communities. Roads may constrain and divert both surface and subsurface flows that support the water table, potentially causing changes in species composition or altered vigor of riparian plants. Roads facilitate the establishment and spread of invasive plants, resulting in changes in plant species composition.

Other impacts could occur due to increased public access. There may be increased collecting of unique plant species that occur within special habitats. Roads may facilitate the use of off-

highway vehicles into adjacent special habitats. High-use recreation areas, both dispersed and developed sites, may impact special habitats, such as wetlands and riparian areas. Recreation use also affects riparian plant communities. Therefore, the Recreation Risk Rating might also be used to evaluate potential impacts to riparian habitats. Roads may provide access for off-highway vehicles into riparian habitats. Dispersed and develop recreation can impact the health and vigor of riparian plants, depending on the level of reaction use.

Roads facilitate the establishment and spread of invasive plants, which impact native plant communities. Areas scheduled for road reconstruction, as well as on-going maintenance activities, have a high risk of introducing and spreading invasive plants, which can alter species composition and associated wildlife use within habitats such as meadows.

Analysis Procedure

Special habitats to consider in this analysis are defined as **wetlands** (i.e., ponds, bogs, swamps), **wet, moist and dry meadows, aspen stands, cottonwood bottomlands, and scablands**.

Review plant associations for both the Deschutes and Ochoco National Forests; select those plant associations that fit the above definition of special habitats. (The Ochoco NF has many acres of scablands and these areas are included because they are extremely fragile, with shallow clay soils, and have extremely diverse vegetation. Any road built in these areas becomes a permanent road due to impacts. The scablands also are very important because roads built across these areas can cause sediment loading into riparian areas.)

Query plant association GIS layers and associated data tables for the analysis area. The Deschutes NF has a wetland GIS layer; query this layer also. Identify any of the desired plant associations that occur within 200 feet of roads within the analysis area; buffer by 200 feet to determine relative miles of road that intersect special habitats. The resulting data table will provide information on the number of miles of special habitat that the road segment passes through. Unfortunately, many special habitats are not mapped and the analysis must rely heavily upon knowledge of district botanists and ecologists.

Assumptions

- Many small special habitats are not mapped and information will be lacking for these areas.

Risk Factors to Evaluate Issue A1

0 = NO RISK -- There are no special habitats found along the road segment.
1-3 = LOW RISK -- One or more special habitats occur(s) along the road segment, but it occupies a relatively small area along the road and/or the special habitat is not considered at risk because of one or a combination of the following factors:

- The special habitat is unique **but relatively common** in the watershed so that concern about road effects is reduced.
- **Invasiveplants** are currently not present; therefore, risk to the special habitat is low. The road segment is far enough away from high density weed infestations to reduce the risk of invasive plant spread and establishment.

- The **special habitat occupies a small area** relative to overall road length. The habitat may have some impacts, but these impacts are relatively localized and small in scope.
- The **road segment crosses through or near a very small portion** of the special habitat.
- **The risk rating for aquatics is low.** For wetland habitats, road design characteristics are providing for the uninterrupted movement of surface and groundwater necessary to support the wetland's vegetation and soil characteristics. Potential landslides and road failures, which can greatly increase sediment loading into adjacent habitats, are not expected to occur.
- **The risk rating for recreation is low.** Dispersed and developed recreation use is low or non-existent.

4-6 = <u>MODERATE RISK</u> -- One or more special habitats occur along the road segment and there is a slightly elevated concern about the future of this (these) habitats because of a combination of factors:

- **Invasive plants** are not known to occur within the special habitat, but occur either along the road segment OR occur along roads feeding into this road. Therefore, there is an elevated concern that the special habitat may be at risk from invasive plants.
- **The risk rating for aquatics is moderate.** For wetland habitats, there is increased sediment loading, which is likely decreasing the saturation of wetlands and moist meadows. Delivery of fine sediment from natural landslides is considered moderate within a few hundred feet of perennial streams. Slope failure has a moderate probability of occurrence (25-50%) with normal (proper) road design.
- **The risk rating for recreation is moderate.** Dispersed and developed recreation use is occurring, and it is of some concern. However, it is rated moderate relative to other areas where concerns are greater.
- The **special habitat occupies a relatively large area** along the road segment.
- The road segment contains a **diversity of special habitats** (e.g., moist meadow, aspen, and scablands). The concern is elevated due to this increased diversity.
- Road segment travels through a **relatively significant portion** of the special habitat.

7-9 = <u>HIGH RISK</u> -- One or more special habitats occur along the road segment and there is a elevated concern about the future of this (these) habitats because of one or a combination of the following factors:

- The **special habitat is rare** (i.e., rarely occurs in central Oregon); and, therefore, should be maintained for overall biodiversity and ecosystem health.
- **Invasive plants** are present along the road segment that crosses or parallels the special habitat. Invasive plants are known to exist within the special habitat and are considered "high risk" species (therefore, the Invasive Plant Risk Rating is High).
- **The risk rating for aquatics is high.** For wetland habitats, the road impacts the movement of surface and groundwater necessary to support the wetland's vegetation and soil characteristics. The road's location and design have displaced or degraded the wetland's size and function. Runoff is being delivered directly to the wetland, increasing sediment and contaminant loadings. Crossings of surface and near surface water paths have severely limited the volume, timing and distribution of water necessary to saturate the landform and support the wetland's vegetation and soil characteristics. Potential landslides and road failures, which can greatly increase sediment loading into adjacent habitats, are at high risk.

- **The risk rating for recreation is high.** The area receives an abundance of dispersed and/or developed recreation use to the point at which habitat degradation is likely to be occurring or is known to occur. Dispersed and developed recreational use of the special habitat is high and causing habitat degradation, such as soil compaction and vegetation trampling.
- The road segment travels through a **relatively significant portion** of the special habitat. The road may parallel the special habitat or travel through it to the point where it is likely that road impacts may be occurring.
- There are or may be **cumulative impacts** to the special habitat due to a variety of different recreational uses (e.g., the area is used by bicyclists, off-highway vehicles, horses, hikers, campers, etc.).

Key ISSUE B. TES Plant Species: The presence, type, and location of roads may affect threatened, endangered, or sensitive plant species and other plant species of concern.

Key Question B1: How and where do roads affect TES plant species

Examples of potential impacts

Threatened, Endangered, and Sensitive plant habitats often occur in special habitats, such as moist or wet meadows, wetlands, or riparian habitats. Roads can impact these types of habitats by the same factors discussed above (see Examples of potential impacts for Special Habitats).

Other impacts could occur due to increased public access and recreational use. There may be increased collecting of sensitive plant species that occur within sensitive plant habitats (e.g., flower picking is a threat for the Newberry gentian, *Gentiana newberryi*, in popular campsites). Roads may facilitate the use of off-highway vehicles into sensitive plant habitats. High-use recreation areas, both dispersed and developed sites, may impact sensitive plant habitats, by trampling vegetation, compacting soils, and introducing invasive plants. Some sensitive plant species, such as the green-tinged paintbrush (*Castilleja chlorotica*) depend on a host plant; if high recreation use impacts the host plant, then indirect impacts can occur to the sensitive plant.

Analysis Procedure

Overlay the sensitive plant GIS layer with the roads evaluated in this analysis. Buffer sensitive plant populations by 200 feet; identify any roads that intersect with the resulting polygons. If a sensitive plant occurs within a special habitat (e.g., wetland), then the Aquatic Risk Rating for wetlands would also be considered in the analysis. Potential habitat is not addressed in this analysis because it is not mapped.

Assumptions

- TES plant populations are not always in the exact same locations. Individuals increase, decrease, and colonize new areas. Therefore, locations of TES plants in this analysis may change in the future.

Risk Factors to Evaluate Issue B

0 = <u>NO RISK</u> -- There are no TES plant populations along the road segment.
1-3 = <u>LOW RISK</u> -- One or more TES plant populations occurs along the road segment, but there is a low concern for the population because of one or a combination of the following factors:

- The **population occupies a relatively small area** along the road and individuals and their associated habitat are considered to be in good condition and not at risk
- The **majority of known populations in other locations are protected** and, therefore, there are no long-term viability concerns for the species.
- The **TES plant habitat is not being degraded or directly impacted by the road** and its associated use and maintenance (i.e., the Aquatic Risk Rating for wetlands is Low).
- **Low recreation use** occurs along the road segment.
- The area has not been surveyed for TES plants and there is some possibility and low-level concern that **TES plant populations may occur** along the road segment.
- **Invasive plants** either do not occur along the road or low-risk species (e.g. bull thistle) occur; therefore, there is a low risk to the TES plant population(s) from invasive plants.

4-6 = <u>MODERATE RISK</u> -- One or more TES plant populations occurs along the road segment and there is a slightly elevated concern about the future of the population(s) because of a one or a combination of following factors:

- **The TES plant population occurs in a wetland habitat and the Aquatic Risk Rating is moderate**. For example, The Aquatic Risk Rating for the road segment indicates that fine sediment loading may be occurring or the floodplain is not functioning properly.
- The **TES plant population is a "protected" population** in a Conservation Strategy and/or the population is considered important genetically for maintaining long-term viability of the species. However, the road is not necessarily degrading the habitat. There is a higher concern than low because it is an important population, but not enough to warrant a high risk rating.
- The TES plant population occurs in a **special habitat that received a moderate Aquatic Risk Rating**. For example, there may be a TES plant population in a riparian area below a road, but the design of the road is such that a timbered buffer exists between the road and the riparian area that filters sediments and reduces the risk.
- The **Recreation Risk Rating is Low or Moderate**. There is a slightly elevated concern about an existing TES plant population, but either the design of the road limits recreation use (e.g., steep slope between the road and creek where TES plants occur) so that the risk rating is not high **<u>OR</u>** the road is allowing access to the plant population or it's habitat only to a moderate degree.
- **Invasive Plant Risk Rating is Moderate**.
- Some level of **habitat degradation** is occurring that can be attributed to the road, but not enough to be considered at high risk.

7-9 = <u>HIGH RISK</u> -- One or more TES plant populations occurs within 200 feet of the road segment and there is an elevated concern about the future of the population(s) because of one or a combination of the following factors:

- **Each TES plant population is considered important** to maintain the long-term viability of the species. There may be several factors that contribute to this determination. For example, there may be a low number of known populations for the species, or the majority of known sites are at risk.

- The TES plant population occurs in a special habitat, such as a wetland, that is at high risk due to the road (i.e., the **Risk Rating for Aquatics is High**).
- The **Recreation Risk Rating is High**. High recreation use occurs. There are or may be **cumulative impacts** to the TES plant habitat due to a variety of different recreational uses (e.g., the area is used by bicyclists, off-highway vehicles, horses, hikers, campers, etc.)
- The TES plant population is a "**protected" population** in a Conservation Strategy and/or the population is considered important genetically for maintaining long-term viability of the species, and there are impacts occurring or likely to occur due to the road.
- **High risk invasive plant species** exist along the road segment or close enough to be of high concern.
- The **TES plant populations are small, fragmented, and vulnerable to habitat loss** that may be occurring due to a combination of factors that can be linked to roads, such as invasive plants, high recreation use, high road density, etc**.**

KEY ISSUE C. Invasive Plants: Roads facilitate the establishment and spread of invasive plants.

To address Key Issue C, the following question is analyzed:

1. **Key Question C1: How and where do roads and their use contribute to the spread of invasive plants?**

Examples of potential impacts

Invasive plants can reduce ecological values by displacing native vegetation, increasing soil erosion, reducing forage for wildlife and livestock, and degrading recreational values. Road maintenance has the ability to increase the establishment and spread of invasive plants by moving the seed and/or propagules along the road prism, introducing infected aggregate or providing a vector for infected vehicles/equipment to transport seed.

- Roads directly encourage and cause the establishment and spread of invasive plants.
- Effects may be measured as a relative comparison of risk of introducing or spreading weeds; risk it to the native plant communities adjacent to the road segment.
- Weed Prevention Practices (BMP's) can reduce the risk.
- All road segments are at risk of being invaded by invasive plants, particularly spotted and diffuse knapweeds and St. Johnswort.
- Doesn't matter if it's 1 or 2 miles from a weed population – seeds can be spread even by low or intermittent use of a road.
- The risk is alleviated by annual inventories (sophisticated search & destroy), and BMP's.
- describe prevention measures (BMP's, annual inventory & treatment, etc.) in this section and refer below simply as "prevention measures".
- **Volume of traffic and proximity to large weed population centers can elevate the risk.**

Analysis Procedure

Overlay the invasive plant GIS layer with the roads evaluated in this analysis. Buffer invasive plant mapped sites by 200 feet; identify any roads that intersect the resulting polygons.

Assumptions

- All roads have a high risk of facilitating the spread and establishment of invasive plant.
- Due to limited budgets, inventory and mapping of invasive plants is limited and not keeping up with the rapid rate of spread of invasive plants. As a result, existing invasive plant sites might be missed in the electronic analysis; therefore, the invasive plant analysis needs to rely heavily upon the knowledge of district botanists and ecologists.
- Invasive Plant Risk can be reduced by:
    - Annual inventory and treatment (i.e., early detection and treatment).
    - Following Best Management Practices for road maintenance and projects that occur along or near roads.

Risk Factors to Evaluate Issue C

0 = NO RISK -- All roads in this scale/level of analysis are at risk of being invaded by invasive plants. Therefore, there is never a "no risk" situation.
1-3 = LOW RISK -- The risk is determined relatively low due to one or a combination of the following factors:

- The road segment is **relatively far away from large infestation areas** (e.g., cities of Bend, Sisters, Redmond, LaPine; Highway 97, etc.).
- The **species** along the road segment or closest to the road segment is of relatively **low risk** (e.g., bull thistle).
- **Recreation use and overall traffic is low or limited seasonally** (e.g. spring chanterelle mushroom hunting) such that there is a relatively lower risk of weeds spreading and becoming established.
- A **relatively small invasive plant infestation** occurs along the road and it is **fairly stable and contained**, and not expected to spread (assuming that yearly treatment continues).
- There exists l**ow or limited potential habitat** for the invasive plant species; therefore the population is not expected to expand its size and range along the road segment.

4-6 = MODERATE RISK -- The risk is determined to be moderate due to one or a combination of the following factors:

- Invasive plants occur along the road segment, but the **population is reduced and considered contained** due to years of treatment. (However, this road segment could become a high risk if a year of treatment is skipped due to lack of funding and personnel).
- **Medium traffic flow** occurs along the road segment.
- **Invasive plants do not occur along the road segment, but high risk species** are established on road(s) feeding into this road.
- The area has not been surveyed and the risk is not known. However, the area has received a **high amount of ground disturbance** and contains private lands which have not been surveyed and are assumed to be uncontrolled or it is known that the **private land invasive plant populations are not being treated**. There is moderate concern that invasive plants exist in the area and will spread along the road system.

7-9 = HIGH RISK -- The risk is determined to be high due to one or a combination of the following factors:

- **High risk invasive plant species** occur along the road segment. Examples include spotted and diffuse knapweeds, Canada thistle, leafy spurge, yellow star thistle, medusahead, and houndstongue.

- Road segment may not have invasive plants, but is located **relatively close to high infestation** areas; therefore it is likely that invasive plants will spread into this road segment.
- **Recreation use is high**.
- **High traffic flow**. The road is a major arterial road that has a higher risk of spreading weeds.
- The road segment travels through an area that has a **high fire risk in combination with a high risk invasive plant problem**. If the area does burn, invasive plants will spread rapidly along the roads.
- **Existing populations, use, and previous disturbance.**
- The area has not been surveyed and the risk is not known. However, the area has received a **high amount of ground disturbance** and contains private lands which have not been surveyed and are assumed to be uncontrolled or it is known that the **private land invasive plant populations are not being treated,** and contains **high risk invasive plant species**. There is high concern that invasive plants exist in the area and will spread along the road system.

Timber (T):

How does the road system affect access needed for administrative use?
How does the road system affect managing the timber base and other lands?

Rating System (T) Will the segment of road be needed for access for administrative use (timber sales), and managing the timber base (Silviculture)? Does the road segment provide primary (main route) or secondary (more than one access route) for timber management.

0 = Road segment does not affect access needs for timber management and administration.

(1-3) Road segment will not be needed for 10 or more years for timber management and administration.

(4-6) Road segment is the secondary route and will be used in the next 5 years, or road will not be needed for 5 to 10 years for timber management and administration.

(7-9) Road segment is the primary route and will be used in next 5 years for timber management and administration.

Code Definitions

(Aquatic Assessment Table)

Field Heading

ROAD - Road Number

BMP – Beginning mile point for a segment of road

EMP – Ending mile point for a segment of road

WATERSHED – 5th field watershed

Rating Factors

GEO – Geologic Hazard (landslide potential)
FINE SED – Fine Sediment (surface erosion)
FLOOD PLANE – Flood Plane (function)
FLOW – Flow (intercepts surface runoff)
FISH – Fish Populations (listed species)
WET LAND – Wetlands (presence along roads)

SUM – Total numerical sum of all rating factors for a given road segment

SUM RATING – Summary Rating - (L) Low, (M) Moderate, (H) High

AQUATIC RISK ASSESSMENT

The objective of the Aquatic Assessment is to characterize how the transportation system may be influencing watershed processes and aquatic habitat at the subbasin (5th level HUC) and subwatershed (6th level HUC) scale. The assessment at the subbasin and subwatershed scale is basically the same, the primary difference being the scale of watershed and road segment to be analyzed. The basic units of assessment at the subbasin scale are the watersheds within the subbasin and road segments of arterial and collector roads within the watersheds. The basic units of assessment at the subwatershed scale are subwatersheds within the watershed and road segments of local roads. The subbasin scale analysis will help prioritize watersheds for further analysis based upon aquatic resources and potential restoration needs, identify issues within watersheds, establish context for the subwatershed or project scale analysis and identify potential management of the arterials and collectors. Analysis of local roads at the subwatershed or project level is essentially the same, but the segment scale will be different and watershed conditions are based upon the condition of the subwatershed. The watershed and subwatershed condition ratings are based upon the watershed BAs with further information provided by completed watershed analysis and existing GIS layers. The watershed condition ratings establish a context for the road segment ratings. The segment ratings are based upon stream survey data, road logs, culvert surveys, and local knowledge.

Road Segments – Roads will be divided into segments. The segments can be delineated in a manner analogous to a stream reach. When the character of a road changes then there will be a new segment. Segments should be delineated as long as possible without losing the characteristics of the road. Road segments in the subbasin analysis will be divided into individual lengths for that subbasin (i.e. a road segment in a 5th level HUC will start as the road passes into the HUC and end as it passes out). Road segments on the 6th field HUC level are first defined as valley bottom road mid-slope road or ridge top road. The segments are then further delineated based upon the risk factors, or changes in a physical characteristic recognized as affecting resources, such as frequency of stream crossings. A road segment would change when the segment changed from a valley bottom to mid-slope, mid-slope to ridge top, or if the definition remains the same (valley bottom, mid-slope, ridge top), a new road segment would be delineated when one of the risk factors (below) changes. For example, a new road segment should be delineated when the road goes from a high risk geologic hazard to a low risk, the impact on floodplain function changes, the road goes from a significant subwatershed to a subwatershed that is not felt to be significant, etc. Road maintenance level may also need to be included.

Development of the Aquatic Impact/Risk Factors

Aquatic factors were developed to capture key processes associated with roads as they link to aquatic environments. The list of factors includes: geologic hazard; road related

sediment; floodplain off-channel habitat riparian reserve function; flow effects; at risk fish populations; and wetlands. The term "at risk fish" in this document refers to fish listed as Threatened or Endangered or Sensitive. **Numbers following each section are associated with the Key Questions associated with the INA for the Aquatics section.**

Geologic hazard (AQ-2, 9, 10, 11): This factor was developed to incorporate the natural risk of mass wasting as an effect on roads or potential for roads to accelerate mass movement events. Three forms of mass movement were identified: debris flows (shallow rapid landslides); earth slumps (fairly deep land slides); and deep-seated landslides.

The interpretation of mass wasting was taken from the Oregon State Geology Map and 1985 resource photo interpretation. These interpretations were based upon observations of landslide features, the Ochoco Soil Resource Inventory (SRI), literature references, geomorphic mapping, bedrock weathering properties, geologic structural features, slope gradient, drainage characteristics and patterns, and regolith features.

On the Ochoco National Forest, the higher risk terrain is located at the intersection of any combination of the dormant and active landslide terrain with Quaternary landslide debris, Clarno-Formation and John Day Formation, L soil mapping units of the Ochoco SRI or the Piture Gorge basalt/John Day/Clarno interface.

On the Deschutes national Forest, debris flows are associated with extreme rain-on-snow weather events in the Metolius River drainage. They are most likely to occur on steep slopes of glacial valleys and on the steeper slopes of Green Ridge.

Geologic hazard was considered a highly important factor relating to aquatic conditions. Each road segment will receive a rating for Geologic Hazard. Listed below is a summary of hazard rating:

- **0 = NO RISK –** There is no risk of landslides along the road.
- **1-3 = LOW RISK –** The terrain that the road corridor crosses has 1 to 2 of the site features associated with landslide probability. Little evidence of natural landslides have been observed and if present are localized and small. Delivery of fine sediment from natural landslides is considered low. Risk assessment indicates slope stability has a low probability of occurrence (<25%) with normal (proper) road design measures. Normally the degree of site limitation is minor and can be overcome. Generally, off-site sediment generation from road caused failures is low.
- **4-6 = MODERATE RISK–** The terrain that the road corridor crosses has 2 or more site features associated with landslide probability. Evidence of natural landslides has been observed locally but the landslide risk is not common throughout the area. Delivery of fine sediment from natural landsides is considered moderate within a few hundred feet of perennial streams. Risk assessment indicates that slope failure has a moderate probability of occurrence (25-50%) with normal (proper) road design. Special planning, design, or maintenance can usually overcome the degree of limitation. However,

occasionally landslides have been triggered within the road corridor delivering moderate levels off-site sediment.

- **7-9 = HIGH TO VERY HIGH RISK –** The terrain that the road corridor crosses has most or all of the site features associated with landslide probability. Natural landslides have been observed and occur over much to most of the area. Delivery of fine sediment from natural landslides is considered high to very high. Risk assessment indicates that significant slope failure has a high to very high probability of occurrence (50-75% or >75%) with normal (proper) road design measures. The degree of limitation may not be completely overcome with special design or maintenance measures. Large and/or small scale landslides have been triggered within road corridors delivering high levels of off-site sediment.

Road Related Fine Sediment (AQ-1, 2, 5, 8, 10, 15, 18) Surface erosion occurs on wildland roads due to erosion of the road surface, cutslopes and fillslopes and accelerated mass failures. Surface erosion of the road is sensitive to road design, road maintenance and geologic hazard. Road surface, design and maintenance of drainage structures can influence the amount of road surface erosion. Insufficient drainage structures, culverts, including ditch-relief culverts can also be sources of sediment. Roads crossing areas of high geologic hazard or with unstable fill slopes may contribute to accelerated mass wasting initiated by the failure of the fill slope. Culverts at stream crossings can be a sediment source if the culvert is under-sized and the hydraulic capacity is exceeded, or the culvert inlet is plugged causing streamflow to overtop the road. Large amounts of sediment or mass wasting can also be generated if the plugged culvert results in failure of the crossing resulting in a debris flow, or if the culvert is overrun resulting in the stream flowing down the road surface eroding the surface and fill. Ditch relief culverts that erode fill material directly into streams are another sediment source. The increase in sediments can cause streams that do not meet water quality standards to be listed as impaired under section 303(d) of the Clean Water Act.

Fine Sediment – (AQ-1, 2, 5, 8, 10, 15, 17, 18) –

- **0 = NO RISK** - Road segment has a paved surface, crossings are bridged or sufficient to pass the 100 year flood and associated debris. Cut and fill slopes are vegetated and are not eroding. Crossings are not impacting channel morphology downstream.
- **1-3 = LOW RISK** - Road segment is native surfaced, or graveled but has no visible erosion. Ditch relief culverts are not causing erosion of fill into streams, crossings are perpendicular to the stream and sufficient to pass the 100 year flood, or designed so that if failure occurs, only the prism at the crossing fails. Crossings are not impacting channel morphology downstream or causing downstream bank erosion. There is no evidence of accelerated mass wasting due to the road segment. The stream is on the 303d list for sediments.
- **4-6 = MODERATE RISK** - Road segment is not meeting above criteria to some degree. Potential impacts to at risk fish habitat appear to be minor due to amount of erosion. Potential for sediment delivery if a crossing failure or fill slope failure

were to occur is minor. Change to channel morphology due to a crossing is confined to the site or does not alter the channel type. The stream is on the 303d list for sediments.

- 7-**9 = HIGH RISK/VERY HIGH RISK -** Road segment has high potential impacts to at risk fish habitat. Road surface and/or fill slopes exhibit erosion into streams, visible ditch erosion, or cut slope erosion into ditches. Sediment directly enters fish-bearing stream from ditch. Fill slopes are beginning to fail, and there is evidence of accelerated mass wasting due to the sediment and/or crossings with high potential for failure where failure of the prism will result in a large amount of sediment delivered into at risk fish habitat. If culverts are over-topped it is probable that the stream will travel down the road and deliver sediment to at risk fish habitat. Crossings are altering stream channel type downstream and/or causing downstream bank erosion. The stream is on the 303d list for sediments.

Floodplain Function, Off-Channel Habitat and Riparian Reserves (AQ-1, 3, 5, 6, 8, 12, 16): This factor addresses how the road segment has altered the function of a stream's floodplain and/or off-channel habitat. Floodplains are important regulators of streamflow and water quality. They absorb overbank floodwaters, allowing water to soak through the vegetation/organic mat and into the ground where it is stored and released more slowly into streams. In doing so, functioning floodplains can provide more water in late summer and reduce peak floods in winter and spring.

Roads can affect floodplains by limiting the frequency of overbank flows thereby concentrating greater volumes of water within stream banks, and by interfering with the ability of the stream to migrate across its floodplain. In addition, roads can prevent hillslope runoff from recharging floodplain aquifers, intercept runoff and flood waters thereby eroding and degrading water quality, and indirectly degrade floodplain function by encouraging off-road motorized access from roads onto floodplains. Indicators of direct and indirect floodplain or riparian reserve degradation include soil compaction, noxious weed introduction, evidence of soil erosion or mass wasting of road fill during peak runoff, water quality changes, artificial confinement of streams, stream bank erosion, interruption of hillslope delivery of water onto floodplain, and loss of downed or standing woody debris which is both an energy dissipater and a habitat component. Similar impacts occur if roads are within or provide vehicle access to the portion of a riparian reserve which affects aquatic habitat; loss of bank vegetation with associated loss in cover and accelerated bank erosion, reduction in large wood from the channel or potential large wood due to wood cutting or hazard tree removal, soil compaction and accelerated surface erosion. Off-road access, provided by roads onto floodplains or riparian reserves, is influenced by factors which include: proximity of road to floodplain, slope of ground leading from road onto floodplain, and desirability of floodplain determined by its width and demands for dispersed use. With more alteration, the likelihood increases that stream systems will not be functioning properly and those road segments within the floodplain will be at higher risk of damage.

Off-channel habitats provide important rearing habitat and refuge habitat during high flows. Roads in the floodplain may isolate these off-channel areas so they are no longer

accessible to fish or completely fill them. A road system may not isolate or fill an off-channel area but by providing access to vehicles result in loss of vegetation, bank stability, large wood input, cover and a loss of overall habitat quality.

Floodplain Function – (AQ-1, 3, 5, 6, 8, 12, 16)

- **0 = NO RISK –** Road segment is not located in valley bottom or is located on toe slope in confined valley bottom outside the 100 year floodplain and not interfering with floodplain functions and does not provide for dispersed recreation access.
- **1-3 = LOW RISK–** Road segment located on slightly confined valley or unconfined bottoms with localized areas of road encroachment on stream channel or off channel habitats. Road location may be providing limited motorized off-road access onto floodplain or within riparian reserves such that floodplain or riparian habitat conditions which affect aquatic habitat could start degrading in localized areas within a few years with continued use (see indicators above).
- **4-6 = MODERATE RISK–** Road segment located on moderately confined valley or unconfined bottoms with localized areas of road encroachment on stream channel. Road location may be providing motorized off-road access onto floodplain or within riparian reserve such that floodplain or riparian habitat conditions which affect aquatic habitat showing signs of degrading in localized areas (see indicators above).
- **7-9 = HIGH RISK/VERY HIGH RISK** = Road segment is located on unconfined valley bottom which frequently or continuously restricts channel migration and off-channel habitat. Road segment is affecting riparian habitat conditions affecting vegetation, altering movement of water, accelerating erosion processes, and interfering with recruitment of large woody debris. Road segment is providing access for motorized off-road dispersed use within the floodplain or riparian reserve to the point riparian habitat conditions affecting riparian habitat are being degraded or channel changes from a class B to a class C type stream, or there is a greater width to depth ratio. Stream is 303(d) listed for temperature, lack of shade contributes to elevated temperatures.

Flow effects (AQ-1, 3, 4, 5, 12, 19): This factor addresses road segments that, 1) intercept surface runoff and near surface ground water along cut slopes and ditchlines, converting subsurface flows to surface flows, and 2) increase delivery efficiency of these flows by diverting them directly to streams. Where these combined flows are continuous between roads and stream systems there is hydrologic connectivity. Hydrologic connectively is defined as any road segment that during runoff has a continuous surface flow between any part of the road prism and a natural stream channel. Water moves from hillslopes to valley bottom via surface and subsurface paths. Roads affect flow when they cut across hillslopes and/or require fill material through depressions that interrupt these natural paths. Road cutslopes or ditches intercept surface runoff and groundwater, accelerating their movement toward stream crossings. This action frequently increases soil erosion risks and routing efficiencies, which deliver road derived sediments and contaminants to streams and can alter peak flows and channel characteristics

downstream. Precipitation/runoff mechanisms including rain-on-snow, spring snowmelt and convectional storms should be considered when evaluating a road segment's hydrologic connectivity. Indicators of these effects include water interception on road surfaces and ditchlines, absences of ditchline relief culverts or crossdrains, or interruption and detention of flows by road fill.

Flow Effects – (AQ- AQ-1, 3, 4, 5, 12, 19)

- **0 = NO RISK –** Road segment is not intercepting concentrating runoff or groundwater in ditchlines. Runoff is cross-drained through a vegetative filter prior to reaching stream channels. Natural flow paths are maintained uninterrupted.
- **1-3= LOW RISK–** Road segment is occasionally intercepting runoff (<25% of length), esp. during peak events but generally not groundwater. Delivery efficiencies are low due to combination of landform slope and weakly developed stream networks (usually greater than 300 feet from the stream. Some additional ditch relief is necessary for routing surface runoff through vegetative filter. Downstream stream reaches may be susceptible to damage from increase peak flows. Road densities are 2-3 miles per square mile (only use during 6th field analysis).
- **4-6= MODERATE RISK–** Road segment frequently intercepts both surface runoff and/or groundwater (25-50% of the length of the segment) in sufficient volumes to influence flow downstream and moderately delivering waters directly to streams. Landform slopes are moderately steep and drainage densities moderate, providing increased delivery efficiency to stream channels (usually 150-300 feet from the stream channel). Downstream stream channels have occasional unstable reaches and are susceptible to damage from increased peak flows. Road prisms may be interrupting and detaining water preventing it from recharging floodplain aquifers. Road has moderately hydrologic connectivity to the stream system. Road densities are 4-5 miles per square mile (only use during 6th field analysis).
- **7-9= HIGH RISK/VERY HIGH RISK -** Road segment frequently intercepts both surface runoff and/or groundwater (>50% of segment length) in sufficient volumes to influence flow downstream and delivers waters directly to streams. Steep slopes and high drainage densities provide increased delivery efficiency to stream channels (usually less than 150 feet from stream channels). Downstream stream channels are unstable and susceptible to damage from increased peak flows. Road prisms may be interrupting and detaining water preventing it from recharging floodplain aquifers. Road has high hydrologic connectivity to the stream system. Road densities are 6 miles per square mile or greater (only use during 6th field analysis).

At Risk Fish Populations (AQ-2, 6, 7, 13, 14): This factor addresses whether fish listed for protection under the Endangered Species Act or on the Regional Foresters Sensitive Species List or Essential Fish Habitat, are present in the watershed and the relative

importance to recovery within the subbasin. The term "significant" here is used to denote important spawning and/or rearing habitat that is key to populations persistence. This factor addresses the relative importance of a subwatershed to the conservation and recovery of at risk fish and to help weight the potential for adverse impacts to at risk fish or their habitat. Besides the potential impacts to aquatic habitat, roads can increase the potential for poaching or introduction of exotic species.

At Risk Fish Populations – (AQ-2, 6, 7, 13, 14)

- **0 = NO RISK –** Road segment with the following set of conditions: road segments located in a watershed with no listed fish species; stream crossings are not migration barriers (any life stage) for other fish species.
- **1-3 = LOW RISK –** Road segment is in a subwatershed with at risk fish but is not a significant subwatershed for At Risk species. Stream crossings are not barriers to at risk fish but may be to other species. Or at risk fish are not present and some stream crossings are barriers to some life stages of other species.
- **4-6 = MODERATE RISK–** Road segment is in a subwatershed with at risk fish but is not a significant subwatershed for an At Risk species. One or more crossings are a barrier to at risk fish at some life stage; or road segment is in a significant subwatershed for an at risk species, no road crossings are barriers to any life stage of an at risk species, poaching is not a major concern.
- **7-9 = HIGH RISK/VERY HIGH RISK -** Road segment is in a significant subwatershed for an at risk species and no road crossings are barriers to any life stage of an at risk species, but poaching due to access from the road segment is a concern though not necessarily documented. The road segment is or has potential, based upon the previous factors, to have serious adverse impacts to at risk fish habitat; and/or there are road crossing barriers to some life stage of an at risk species and/or there is known poaching of at risk fish occurring.

Wetlands and Wet Meadows AQ-3, 5, 6: This factor addresses whether wetlands are present along road systems and do road segments interfere with their condition and function, ground water movement or wetland vegetation. The wetlands also include seeps, springs and sag ponds related to landslide terrain.

A road segment's influence on the condition and function of adjacent wetlands is a result of either a direct impact, such as a road location relative to the wetland, or indirect impacts related to the road's effect on the wetland's supporting hydrology, vegetative community and soil characteristics. The most notable effects include converting productive wetlands to compacted road surfaces, providing motorized off-road access into these areas, constraining and diverting both surface and subsurface flows that support the water table, intercepting runoff which can accelerate erosion and lower water tables, increasing sediment loading and delivery of toxic pollutants, conversion of plant species composition by introducing noxious weeds, reducing baseflows and increasing peak flow and flood frequencies and degrading water quality. Of these effects, those that affect the areas ability to receive, store and move water will likely have the greatest impact on the wetland's condition and function.

Wetlands and Wet Meadows AQ-3, 5, 6:

- **0 = NO RISK –** Road segment is either not near or adjacent to wetlands/wet meadows, or road design characteristics are providing for the uninterrupted movement of surface and groundwater necessary to support the wetland's vegetation and soil characteristics.
- 1-3 = **LOW RISK–** Road segment is adjacent to, or crosses small localized wetlands or wet meadows (<5 acre in size). Road design characteristics, particularly crossings of surface and near surface water paths are limiting the available water necessary to inundate and saturate the landform and support the wetland's vegetation and soil characteristics. Initiation of wetland degradation including noxious weed establishment, increased sediment loading, and decreased area of saturation is occurring.
- 4-6= **MODERATE RISK–** Road segment is adjacent to, or crosses large scale wetlands or wet meadows (6-50 acres in size). The road's location and design have displaced or degraded the wetland's size and function. Runoff is being delivered directly to the wetland during high flow events, increasing sediment and contaminant loadings. Crossings of surface and near surface water paths have somewhat limited the volume, timing and distribution of water necessary to saturate the landform and support the wetland's vegetation and soil characteristics. Road segment could, or is starting to provide motorized off-road vehicles access into the area, further contributing to its degradation**.**
- 7-9 = HIGH **RISK –** Road segment is adjacent to, or crosses landscape scale wetlands or wet meadows (greater than 50 acres). The road's location and design have displaced or degraded the wetland's size and function. Runoff is being delivered directly to the wetland, increasing sediment and contaminant loadings. Crossings of surface and near surface water paths have severely limited the volume, timing and distribution of water necessary to saturate the landform and support the wetland's vegetation and soil characteristics. Road segment is providing motorized off-road vehicles access into the area, further contributing to its degradation**.**

February, 2013
Fire - Minimum Roads Analysis Criteria

Fire Access:

Items to Consider:

- Does the road system provide necessary (based on risk) access for firefighting resources (e.g., to water sources, fire camp locations and other improvements)?
- Does the road system provide necessary access for hazardous fuels treatments including personnel for project work, contract administration, equipment, water sources, etc?
- Is the road in a strategic location which would facilitate fire suppression efforts (e.g., along a ridge top, needed for ingress/egress, escape route)?
- Is the current Maintenance Level of the road essential to meet the needs for fire suppression and the current established primary resource mix (equipment, crews, engines, etc)?

Rating System:

Does the road segment provide primary (main route) or secondary (more than one) access route for fire management (suppression)?

(L) = Road does not provide access to firefighting resources. OR Road segment provides secondary access for fire management to a limited area. It is not needed as an escape route. It is not in a strategic location which would facilitate fire suppression.

(M) = Road segment provides secondary access for fire management and provides access to one fire fighting resource. Access would likely not be compromised if the current maintenance level were reduced.

(H) = Road segment provides primary access for fire management and provides access to firefighting resources. It is in a strategic location which would facilitate fire suppression. The current maintenance level is essential to meet the needs for fire suppression.
Answering "Yes" to any of these questions would categorize the road as high.

Fire Risk

Items to Consider:

- Is the road within the Wildland Urban Interface, CWPP boundary, high recreation use area, or other area commonly visited by humans?
- Is the road commonly used by patrol/prevention resources?
- Is the current Maintenance Level of the road essential to mitigate fire risk?
- Does the road access an area rated as a COFMS, "high-risk/high exposure area"?
- Is the road adjacent to an area or identified as a high priority in the Strategic Fuelbreak Strategy

Rating System

Does the road segment mitigate fire risk?

(L) = Road segment is not within the WUI, high recreation use area, or other area commonly visited by humans and is rarely used by patrol/prevention resources. Road is not within or does not access an area rated as “high-risk/high exposure”.

(M) = Road segment may or may not be within WUI, high recreation use are, or other area commonly visited by humans, but is commonly used by patrol/prevention resources. Road may or may not access an area rated as “high-risk/high exposure”. Fire risk would likely not increase if the current maintenance level were reduced.

(H) = Road segment is within the WUI, high recreation use area, or other area commonly visited by humans and is essential to mitigate fire risk. Road is commonly used by patrol/prevention resources. Road is within an area rated as “high fuel hazard” or “high-risk/high exposure”. The current maintenance level is essential to meet the needs for fire suppression. Road is identified as high priority in the Landscape Fuels Strategy.
Answering “Yes” to any of these questions would categorize the road as high.