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Appendix I

Heritage Resources

Heritage Resources
Jane Agar, Archeologist
1995

With a diversity of resources ranging from abundant fish, small mammals, big game and prolific vegetation the Middle Fork Willamette Downstream Tributaries (MFWDT) and its tributaries have provided choice human habitat for at least 6,000 years. Ethnographic evidence from low elevation sites suitable for year round use, to aboriginal trails providing travel routes accessing a multitude of diverse upland resources remain throughout this watershed today.

Beginning at least 1,500 years ago, Kalapuyans occupied the Upper Willamette Valley and its tributaries, including the LMFW. The Kalapuyans' settlement patterns and subsistence activities reflected a seasonal round that moved from valley floor to hillside. In his typology of Upper Willamette Valley and tributary sites, White (1975) suggests the Kalapuyans occupied the valley edges, in conjunction with the Douglas fir ecotone, during the late spring and summer to engage in diversified hunting, tool manufacturing, and hide preparation. Given what is known about the fluctuation in elevation of the floral community over time (Delting 1968) the locations of these sites in the sub-basins of the Western Cascades may fluctuate just as drastically, since food resources tend to be more lucrative in the ecotone.

The Southern Molalla migrated into the Upper Willamette, pushing out the Kalapuyans after AD 1600 (Swanton 1968). Ethnographic literature dealing with the Molalla is elusive to non-existent. Consequently, little is known about their culture, but it is reasonable to presume their subsistence style was similar to other groups in the Western Cascades.

During the early 1800's Euroamericans began moving into the Willamette Valley. By mid-century settlements were developing along the LMFW. The horse, acquired at white contact, enabled the Klamath Indians to travel over the Calapooya Divide via Staley Ridge and down the Middle Fork. Over the centuries, Indian groups developed a well-defined trail system they used until after Euroamerican settlement in the area. Some of the trails included the Staley Ridge Trail and the trail that later became the Oregon Central Military Wagon Road.

By 1855, most of the Indians who had survived the influx of disease brought in with the white settlements, were relocated to reservations at both Grand Ronde and Warm Springs.

Early Euroamerican settlers in the upper reaches of the Willamette found life difficult. They learned to utilize the resources available to them in an environment where their communication with the outside world was primarily limited to the dry season. In order to survive, settlers would bell their cattle and summer them on the Calapooya Divide. To gain access to the Divide, they widened Indian trails for the herds of livestock.

Records indicate that several cabins existed in the area of Oakridge. A locally famous inhabitant of one of these cabins was Stephen Rigdon. Unique to 19th century transportation histories are the log books he kept. This Willamette Valley farmer went each year from 1871 to 1896 to the meadows near the western base of the Cascades near Emigrant Pass to graze his cattle and maintained a way-station for travelers frequenting the Oregon Central Military Wagon Road (OCMWR).

The OCMWR is the most completely documented route of 19th century travel in Oregon. The documentation for this road includes: log books from travelers from 1871 to 1896, the diary of the road surveyor, contemporary newspaper accounts about the construction of the road in 1865-66, and hundreds of pages of testimony relating to litigation about the road in the years 1889-91.

Initial interest in this route was sparked when in the spring of 1852 residents of the upper Willamette Valley explored the Middle Fork to try to find a route over the Cascades. During the summer of 1853 more then 1500 people with between 250 and 300 wagons used this Free Emigrant Route to cross the upper Willamette Valley (Menefee and Tiller 1977). Through the late 1850's and early 1860's gold miners, occasional emigrants, and others who needed to cross the Cascades passed over the lands along the LMFW.

The OCMWR was the result of several factors. It was built because of the increasing commitment in the 1860's of the federal government to improvements in transportation in the Trans-Mississippi West . It was also a result of the growing interest of inhabitants of the upper Willamette Valley in the development of the resources of central Oregon, especially in the lush meadowlands surrounding water resources in those areas. Settlers transferred their shareholder land grants into farmsteads. Some built hunting lodges initiating utilization of the area for recreational purposes (Jensen 1970). The road was to become a major route of emigration for the second generation of Oregon pioneers, those who engaged in eastward bound migration from the Willamette and Umpqua Valleys into the central and southeastern parts of the state after 1868.

By the 1870's, interest in the economic potential of the timber available in the Cascades resulted in utilization of the Middle Fork River to drive logs to mills in the Eugene area (Mason 1973). Log driving reached its peak between 1890 and

1910. As supplies became exhausted the loggers moved upstream to such places as Fall Creek, Winberry Creek and the North Fork of the Middle Fork. Contract loggers such as Jasper Hills figured prominently in the activities. By 1912, the river drives had been replaced by the advent of the logging railroad and the lack of available timber near the driving streams.

In 1893, the Cascade Range Forest Reserve was established under the auspices of the U.S. Department of the Interior. The Reserve covered a large portion of the Cascade Range. Initially it was a closed area, but by 1897 the land was reopened to settlers, miners, stockmen and lumbermen for their use. In order to enforce the regulations of the U.S. Department of the Interior and later the Department of Agriculture in 1905, forest rangers were hired to patrol the area. Rangers working in the area of the MFWDT engaged in activities that included patrolling, acting a s game warden, surveying, erecting cabins, trail building, timber marking, log scaling, locating sites for mills and hotels, fire fighting, and being a deputy U.S. Marshal.

During the early 1900's the Cascade Range National Forest underwent several administrative changes. In 1908, the U.S. Forest Service created the contemporary Umpqua National Forest in the Cascade Mountains from the Cascade Reserve. The forest included lands south of the Middle Fork Willamette River and north of the Rogue-Umpqua Divide. In 1911, lands north of the Calapooya Divide were placed under the jurisdiction of the Cascade (now Willamette) National Forest that later included the Oakridge Ranger District and in 1947, the Rigdon Ranger District. The 1911 land administrative land exchange between the Umpqua and Willamette National Forests moved the Forests' common boundary to its current position along the crest of the Calapooya Divide.

Twentieth century development of the Upper Willamette was expedited by the advent of the railroad, the contemporary road system, and the logging truck. In an effort to control forest fires, several lookout towers were built including those at Hills Peak (1923), Bearbones (1934), and Balm Mtn. (1934). Presumably the Civilian Conservation Corps were utilized by the U.S. Forest Service since records indicate their presence in the forest from 1933 to 1942. Telephone access was provided the towers such as the line laid from Johnson Meadows to Bearbones in 1930. The towers were utilized for several years, eventually being replaced by aerial patrols, radio communication, and a complex National Forest road system.

A study of this area in the 19th and early 20th centuries is a study of resource developments, trends and making this all happen - people. With the exception of the archaeological record, investigator's know little about the Indians as individuals prior to white contact. The literature of the 19th and early 20th centuries, however, refers to personalities such as Charlie Tufti and John Chuck

who were Indians who homesteaded on the Middle Fork of the Willamette River (Jensen 1970). Mountain stockmen and trappers, including William D. Bradley (Bradley Lake, Flat and Trail) and Elijah Bristow (Bristow Prairie), opened up the area. Forest rangers, such as W.F. Staley (Staley Creek and Ridge), also left their mark.

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Appendix J

Wildlife Documents

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July 1995

ISSUE: VEGETATION MANIPULATION

VM1: HABITAT/WILDLIFE DIVERSITY

REFERENCE

Wildlife species are tied to habitat types suitable for the species to live and reproduce. Some species are generalists as deer and bears and utilize multiple types of habitats. At the other extreme, some species are specialists and tightly tied to one type of habitat, as pikas are with tallus rock. Most species in the watershed are between the generalists and specialists, in utilizing several, but not many, habitat types, as early and mid seral forest, or mid and late seral forest, or aquatic and riparian forest, either early and mid seral riparian or mid and late riparian forest habitats.

Likewise, some species, as the northern spotted owl, survives best in large acreages of interior late seral forests of the mid to lower western hemlock/Douglas-fir zone, while the black-backed woodpecker favors a mosaic of late seral mountain hemlock and true firs, found at the higher elevations.

Guilds of species utilizing the similar habitats are numerous and can be viewed in a separate document for the Forest and west Cascades. The analysis for this watershed takes the approach of addressing the various habitats, instead of listing off wildlife and plant species. Maintaining respresentations of the habitats is the primary tool for maintaining the species, if one further recognize that habitat includes size, disteribution and microclimate, also.

Initial discussion arranges the timber series/timber types as dominate habitat types; the western hemlock/Douglas-fir habitat type, which includes the dry-site Douglas-fir with pines, and the mountain hemlock/true fir habitat type, which lumps the "white woods" because of similiar habitat features and use. The riverine hardwood habitat and the "special habitats" are recognizably smaller in percentage of the watershed, but are considered as dominate habitats with the conifer habitats due their obvious habitat structural difference and their importance in species richness.

Within the conifer habitat types, subsets of seral habitats are addressed, due the change in suitability for different wildlife and plant species. These subsets are the early seral habitats (stand reinitiation), the pole-small timber seral habitat (stem exclusion), and the mature/old growth seral habitat, which includes timber that's >21" dbh.

The guilds of wildlife species developed thus far fit the dominate habitat types and subset of seral habitats mentioned above. Of the conifer habitat types, there are further defined subsets of habitats types, or habitat characteristics. These are not portrayed in the guilds developed thus far, but are of difference habitat characteristics that determine habitat suitability for many wildlife and plants species.

These further defined habitat types, or habitat characteristics, are represented as open forest habitat, utilized by species as goshawks, great horned owls, flamuated owls and chipping sparrows, mixed hardwood/conifer habitat, utilized by black-headed grosbeaks and black-throated gray warbler, and pure conifer habitat, utilized by western tanagers, Hermit's warblers and Townsend's warbler.

Maintaining habitat types, or characteristics, that a given site in the watershed would provide is one of the better methods of providing for and maintaining species viability and distribution, as directed by the NFMA. An old Arkansas axiom says: "If the habitats are provided, including adequate size and distribution, the species will come, if they can get there (a connecivity function).".

FOUR DOMINATE HABITAT TYPES

WESTERN HEMLOCK/DOUGLAS-FIR HABITAT:

Western hemlock/Douglas-fir forests comprised the largest habitat type. This habitat type then consisted of a larger subset of habitats, as early seral forest habitats, pole-size and small timber habitats, mature and old growth habitats, ponderosa pine/douglas-fir habitats, pure conifer habitats and mixed hardwood/conifer habitats.

The ponderosa pine/Douglas-fir habitat was notably different in species composition and habitat structure from the remaining habitats making up the dominate western hemlock/Douglas-fir habitat type. Douglas-fir and ponderosa pine habitat existed in the low elevation along the eastern side of the river and in the lower portion of Coal Creek. The pines were more prevelant in the Youngs Creek - Deadhorse Creek area. Sugar pine was also intermixed with the Douglas-fir habitats and was more common in the Buck Creek to Estep Creek area.

MOUNTAIN HEMLOCK AND TRUE FIR HABITAT:

Mountain hemlock and the true firs comprised about 5% of the watershed, as provided by stand description. However, this percentage may be underrated with Pacific silver fir/Douglas-fir stands being described as Douglas-fir stands.

Mountain hemlock and Noble fir/ Pacific silver fir habitats existed at the higher elevations along the Calapooyia Ridge, notably in upper Coal Creek, and at the higher elevations from Warner Mountain area to Groundhog Mountain area. Grand fir was distributed in relation to the Western hemlock/Douglas-fir habitats, but gained its own habitat type in upper Gold Creek where a small stand of old growth grand fir exists.

The major ridgelines extending westward from the main Cascades Crest provided disjuncted and stringers of these mountain hemlock and true fir habitat types into the watershed, adding diversity and range of wildlife species, as the black-backed woodpecker, pine marten and great gray owls.

HARDWOOD HABITAT:

Riparian hardwood habitats formed the edges of the river and many class II streams and along many Class IIIs streams after fire events and until conifers closed canopy over the hardwoods. Hardwood trees were a component of the conifer forest habitats in the mid to lower elevations. Small stands of white oaks (<2 acres) existed, as at present Packard Campground, and scattering of individual oaks are believed to have been more common than currently.

SPECIAL HABITATS:

Special habitats comprise habitats as seeps, springs, caves, meadows, rock outcrops, bogs, marshes, small lakes and ponds. Special habitats varies in size from ~25-acre meadow with surrounding forest to a small spring on a forested hillside. Though special habitats comprise only 1%-2% of the watershed acreages, they provide a higher species richness than the general forest habitats and contribute to the overall biodiversity across the landscape. Many species, particularly plant species, are specifically dependent of special habitats for their micro-site needs.

Special habitats of the same type, as wet meadows, were commonly very diverse from each other in their botanical composition and structure, thus influencing the types and richness of insect and larger wildlife species that utilized the special habitats. Examples would be dry non-forested tallus slopes that often have currant bushes around the edges, which are depended on by hummingbirds, as pikas depended on the cavities amongst rocks for cover and denning. Wet non-forested tallus slopes often had Sitka alder or other brushy vegetation around the edges, which provided a constant brush habitat, whereas the brush habitats of the general forest came and went with fires and regeneration of conifers. Forested, old tallus slopes are essential habitat for wildlife as the Dunn's salamander. These shaded and litter covered tallus slopes provide a cool and moist environment essential for egg mass maturation and for the adults to survived the periods of dry and hot weather above ground.

PROCESSES AFFECTING HABITAT TYPES:

The frequencies and intensities of fires were the dominate factors affecting habitat diversity. Over the centuries most of the watershed experienced fire at varying frequencies and to varying intensities.

Before the mid-1850 series of fires, approximately 95%-97% of the forested habitats are thought to have gained a mature/old growth habitat conditions during a period of low intensity fires.

Then, a series of large, intense fires occurred during the mid-1800's, converting thousands of forest acres to early seral forest habitats. Another low intensity period occurred while the early seral forest habitats grew into pole-size and small timber habitats. Around the turn of the century, another series of large, intense fires occurred, again converting thousands of forest acres to early seral forest habitats. This scenario presented a forest landscape with a mixture of early seral habitats, pole-size and small timber forest habitats, and mature/old growth forest habitats.

The intense stand replacement fires of the mid-1800's created large blocks of early seral forest habitats in the upper Packard Creek drainage and the upper Coal Creek drainage and created extensive mosaic pattern in the Larison Ridge area.

Of the mid-1800's fires on the east side of the river, acreages of stand replacement fires creating early seral forest habitats in the western hemlock/Douglas-fir habitats were smaller; 1000 acres and generally of a few hundred acres or less. The larger of these were across the middle reaches of Bull Creek, Willow Creek and Coffepot Creek, in the lower Youngs Creek to Deadhorse Creek and across to lower Coal Creek area, in the lower to middle Coal Creek area, the middle Coal Creek area. The majority of the fire acres east of the river, especially southern aspects, should have appeared as open forest habitats, with hardwoods, brush and grasses.

The true fir zones of Upper Coal Creek and the Warner Mountain to Groundhog Mountain incurred stand replacement fires, and resulting early seral habitat, a short period before 1835 (170 to 200 years ago) and are considered part of the mid-1800's fires.

The Youngs Creek, Deadhorse Creek, lower Coal Creek area of Douglas-fir/Ponderosa pine, and the upper Coal Creek Pacific silver fir/Douglas-fir area retained a higher percentage of green, residual overstory trees, providing an early seral habitat with sparse overstory trees.

The series of fires around the turn of the century created early seral forest habitats in more of a mosaic pattern, verse large blocks, and also were concentrated heavily in the Larison and Pavckard area, with fewer small patches of early seral habitats created across the remaining watershed.

Fire frequency often determined fuel loading, as accumulations of dead wood, and often determined fuel ladders, as understory limbs which could carry a fire into the overstory canopies. Levels of fuel loading and fuel ladders also typified the habitat that many forest wildlife responded to. The fuel loading and fuel ladders also determined the habitat types that resulted from a fire, as an early seral habitat of grasses, forbs and brush dominated from a stand replacement fire, or open woodland habitat, or multi-canopy forest.

Early seral habitats were developed in small patches, complex mosaic patterns, and large acreage blocks. Small patches and mosaic patterns of early seral habitats often provided a high degree of fragmentation and edge habitats. However, large areas of early seral habitat created by stand replacement fires would have provided a greater species richness, or number of wildlife species, associated with early seral habitat (Bunnell, F. 1995). Such large areas generally have a greater diversity of habitat sites within them, as small patches or strips of unburned sites and greater number of microhabitat sites with varying aspects, moisture regimes and plant associations.

As the areas of stand replacement fires regenerated predominately with conifers, two scenarios of habitat structure and composition commonly occurred, depending on sites. One scenario is where hardwood trees weren't a component of the site, and the regeneration developed as mostly pure conifers. The second scenario is where hardwood trees were a component, sometimes densely so, and the regeneration developed as mix hardwood/conifer habitat.

Areas of frequent underburning should have shown a low concentration of large logs and snags, as old ones were consumed and a few new ones recruited. These areas typically had more open understory, with minor lower canopy structure. Such habitats of frequent underburning commonly existed on southern aspects. These areas also normally had a corresponding low concentration and fluctuation in wildlife species associated with the habitat components of large logs, snags and dense understory canopies, while having a higher concentration of wildlife species associated with open forest habitat.

Areas of very infrequent fires, as in several hundred years, should have shown high concentrations of large logs and snags and corresponding high concentration of wildlife species associated with large logs and snags and with multiple canopy structures. These areas also tend to experience very intense fires when fires did occur.

With the stand replacement fires, most of the watershed still remained in mature and old growth forest habitats. Though much of these forested habitats periodically underburned, the large residual green trees still provided a forested environment.

Brush and hardwood trees were important components in the habitat diversity and determined the habitat suitability for many wildlife species. Brush-associated wildlife, as brush rabbits, benefitted by stand replacement fires, as Ceanothus, vine maple and other brush tended to dominate the burn areas until the regenerated conifers overtopped and suppressed the brush. In parts of the watershed, as the ponderosa pine areas, grasses predominated and provided an open timber/grass habitat favored by species as the flamuated owl, XXXX.

Hardwood trees, as big-leaf maple, cottonwood, red alder, white oak, madrone and chinkapin, provided a mix hardwood/conifer forest habitat, favored by wildlife such as the white-breasted nuthatch, Bohemian waxwing, and silver gray squirrel. Hardwood trees provide invaluable food sources in the form of seeds, catkins, and insects that feed on the leaves. Big-leaf maples, oaks, cottonwoods and red alders with defect are favored by some cavity nesters, as the downy woodpecker.

Several of these hardwood tree species tend to resprout after fires and gain an initial height advantage over the young conifers. Unlike many of the brush species, the hardwood trees tended to persist longer into the age of the second growth conifer, resisting shade suppression until the conifers developed a mature forest.

The hardwood riparian forest of the larger, low gradient river and streams usually were affected by flood events more dramatically than by fires. The hardwood riparian areas on steeper gradient streams had a greater variance in effects from fires.

The main processes affecting special habitats were slope instability, flood events, and fire. Slope instability often formed the hillside bogs and small lakes, as Windfall Lake. "Slump" ponds, as found in Bull Creek drainage, were created by a hillside movements and became essential reproductive sites for red-legged frogs, a Sensitive species, Northwesten salamanders, and often western pond turtles, another Sensitive species. Flood events in the lower gradient streams also made and eliminated flood channel ponds or quiet waters, that benefitted the species above as well as beavers and otters.

Fire was the main factor in maintaining meadow areas, and meadows often fluctuated in size as a result of fires and the absent of fires. During periods of no fires, conifers encroached into meadows, slowly narrowing the meadows size. Periodical fire tended to burn out the encroaching trees, restoring the meadows'

size. Frequency and intensity of fires determined the effectiveness of abating the encroachment of trees.

Within the Matrix, there's a potential for about 2,100 acres of small, unmapped special habitats and surrounding forested buffer zones.

In the early 1900's, emphasis on fire suppression precluded large acreages of early seral forest habitats from occurring by stand replacement fires. The sizes of natural fires were effectively reduced to small acreages, and early seral forest habitats quickly grew into pole-size habitat, and then into small timber habitat.

Forest habitats that were characterized as having low levels of logs and snags and open understory began to change, with incremental increases in down logs, snags, and young understory trees filling in the open forest floor. These changes in habitat characteristics would beneficiallyly influence the suitability for some wildlife species, as the spotted owl, the pileated woodpecker, and the pine marten. The loss of open forest habitats would decrease habitat suitability for other species, as the flamulated owl and the northern goshawk.

CURRENT

The western hemlock/Douglas-fir, Mountain hemlock/true fir, hardwood riparian, and special habitats are still dominate habitat types on the landscape, with the addition of the Hills Creek Lake reservoir.

The acreages of seral habitats, or subset habitats of the forest-type habitats have changed substantially. The 34,046 acres of early seral habitat have increased 9100% from the 370 acres in the 1940's. Compared with the 18,447 acres at the turn of the century and the 23,000 acres around the mid-1850's, the changes are 84% increase and 48% increase, respectively.

The 14,708 acres of pole/small timber seral habitats increased by 27% from the 11,568 acres in the 1940's. Compared with the 19,550 acres at the turn of the century and the 1,000 acres around the mid-1850's, the changes are 25% decrease and 137% increase, respectively.

Meanwhile, the 50,515 acres of the mature/old growth habitats have decreased about 46% from the 93,993 acres in the 1940's. Compared with the 67,581 acres at the turn of the century and the 82,328 acres around the mid-1850's, the changes are 25% decrease and 39% decrease, respectively.

The distribution pattern of these habitat seral stages, namely the early seral and the pole/small timber seral, and related edge conditions, have changed substantially, due the distribution practices of timber harvest. The change in

distribution pattern can be visualize with the HVEG map compared with today's harvest pattern.

The seral pattern of the private land has some resemblence to reference, or natural, condition with larger block-acreages of similarly aged habitat. The early and pole/small timber habitats on private land and the smaller managed plantations on NFS land are low or deficit in habitat components, as large logs, snags, and patchiness of residual trees.

Currently, the dominate habitat type is still mature and old growth forest habitats, although reduced in acreage and with a very different pattern and habitat structure across the landscape, resulting predominately from fire suppression and timber management practices, as harvest, regeneration, and stand improvement techniques.

Timber harvesting in the 1950's started the resurgence of early seral habitat, and steadily increased until the present, with the highest rate of early seral habitats being created during the 1970's and 1980's. On the National Forest System lands, the early seral habitat by timber harvest was distributed across the forested landscape in small harvest patches. The private lands started with small patch openings (30-50 acres in size), and ended up with large blocks consisting of early seral and pole-size habitats. The impoundment of Hills Creek Lake (~2240 acres) also reduced the forest and riparian habitats.

CONCLUSIONS

A gradual loss of the open mature/old growth forest habitats, as the mix of densely structured mature/old growth forest, open structured mature/old growth forest, and gradient between, shift toward the former with fire suppression.

A loss of large acreage-blocks of similar aged forest habitats, whether of early, mid or late seral, as result of patch-distribution of forest management in the Matrix. The LSR 0222 will trend toward large acreage-blocks of late seral forest habitats.

A loss in acreage of mature and old growth ponderosa pine/Douglas-fir forest habitats, with projected program of timber harvest.

A loss in non-forested habitats, as meadows, with conifer encroachments resulting from fire suppression.

A reduction in hardwood components in mid-seral mixed hardwood/conifer forest habitats, namely managed plantations, due pass emphasises on treatments favoring "crop tree" production.

A reduction in early and mid-seral forest structure, due pass emphasises on density stocking and even spacing of crop trees, and removal of competing trees.

TREND

An overall downward trend in habitat diversity exists for the watershed, due several reasons.

RECOMMENDATIONS:

Assess, develop and implement strategies to maintain representations of open forest habitats, where fire historically provided such, with priority emphasis to the ponderosa pine/Douglas-fir area.

Develop management strategies to provide large blocks of similar aged forest habitats, with priority emphasis to the ponderosa pine/Douglas-fir habitats.

Assess and develop management strategies in the ponderosa pine/Douglas-fir habitats to maintain functions of mature/old growth habitat. Such assessment would consider how the scenic allocations, the Green Tree Retention and Wildlife Tree (Snags) prescriptions meet those mature/old growth functions.

Assess and implement strategies to enhance and regain non-forested habitats, as meadows, with uses of silvilcuture and fire treatments.

During precommercial and commercial thinnings, apply silvicuture prescriptions which promote or maintain hardwood trees.

Diversify, or vary, stocking densities during reforestation, precommercial thinnings and commercial thinnings toward representations of sites' natural tendencies. Strategies would include maintaining small openings that are difficult to reforest, vary spacing during reforestation, vary spacing during precommercial and commercial thinnings, which include no-thin areas, maintain diversity of tree species during thinnings, and maintain some defective trees during thinnings.

VM2 INTERIOR HABITAT

REFERENCE

After the stand replacement fires of 1850 and prior, there were very large blocks of mature and old growth interior forest habitats. Much of these habitats likely had small, early seral opening resulting from previous underburn fires, but on the landscape, these blocks of mature and old growth habitats functioned as contiguous forests. The large blocks of interior mature and old growth forests

existing around 1850 were interpreted from the Historic Vegetation Map for the watershed.

Estimated 13,440 acres, Dinner Ridge, most of Larison Creek, lower Packard, lower Windfall Creek
Estimated 19,200 acres, Gold Creek south to lower Coal Creek
Estimated 10,880 acres, Buck Creek to Youngs Creek
Estimated 2,560 acres, Modoc Cr.-Bull Cr. area.
Much of the remaining mature/old growth habitats were in interior habitats ranging in sizes between 2,000 acres and 100 acres.

Areas as the Youngs Creek periodically burned. The sparseness of residual overstory canopy might have resulted in this area being characterized more of an open woodland, instead of intereior forest habitat.

Besides these large blocks of interior habitat, numerous smaller blocks of interior forest habitats were distributed across the landscape..

The turn of the century stand replacement fires were well distributed across the watershed, with the greatest acreage concentration occurring from Larison Creek drainage northward over Larison Ridge and down toward the river, across from the City of Oakridge. These turn of the century fires were highly mosaic in pattern in the Larison area and the Windfall Creek-lower Packard Creek area. Across the remaining watershed, these fires were in more of a patch pattern.

With the regeneration of the <1850 stand replacement fires still too young to serve as mature/old growth habitat, the turn of the century fires substantially reduced acreage sizes of interior mature/old growth habitats. Large blocks of interior mature/old gerowth habitats remaining were:

Lower Packard Cr. drainage:	estimated 7,600 acres
Upper Dinner Ridge/Larison Cr. area:	estimated. 1,280 acres
Mid. Larison Cr. area:	estimated. 1,920 acres
Lower Pine Cr. to Youngs Cr. area	estimated. 4,500 acres
Indian Cr.- lower Coal Cr. area:	estimated. 7,040 acres
Upper Bohemia Cr.- Spr. Butte Cr. area:	estimated. 8,960 acres
Upper Buck Cr area:	estimated. 2,300 acres
Cone Cr. area:	estimated. 2,200 acres

Numerous interior habitat blocks, ranging in sizes of 1000 acres and less, were distributed across the watershed.

CURRENT

With the advent of timber harvesting and continuing to the present, the remaining areas of large blocks of interior forest habitats are substantially smaller and are on NFS lands.

North slope of Larison Ridge:	est. 3,200 acres (~5 sq.mi); in LSR 0222
Upper Gray Creek drainage:	est. 1,600 acres (~2.5 sq.mi); in LSR 0222
Mid-Lower Larison Creek drainage:	est. 3,200 acres (~5 sq.mi); in LSR 0222
Upper Packard Creek drainage:	est. 2,560 acres (~4 sq.mi); in LSR 0222
Upper Bohemia Creek drainage:	est. 1,280 acres (~2 sq.mi); in LSR 0222
Lower Buck Creek drainage:	est. 1,280 acres (~2 sq.mi); in MATRIX
Upper Gold Creek drainage:	est. 1,088 acres (~1.7 sq.mi); in MATRIX
Mid Coal Creek drainage:	est. 2,560 acres (~4 sq.mi); in LSR 0222

The mid Coal creek interior habitat extends in a long lineal fashion in the mid and upper reach of of the drainage and along the upper, west aspect slopes of Dome Rock Ridge. About 60% of this 2,560 acres is the west slopes below Dome Rock and is characterized with mature second growth from the <1850 fires and stringers of old growth in the draws, and with a high number of rocky and shallow dry meadows. This 2,560 acres block is contiguous with about 1,600 acres of interior habitat on the east slope of Dome Rock Ridge in the adjoining watershed.

The mid and upper reaches of Windfall Creek drainage (Matrix) has an unfragmented 1,280 acres block of forested habitat, which is composed of mature second growth and old growth, and with several hundred acres of small timber habitat about 100 years old. Windfall T.S is planned to thin and to regenerate harvest the younger timber. The lower reach of Windfall Creek drainage has about 640 acres of mature second growth/old growth intermix habitat.

Distributed across the rest of the watershed (LSR and Matrix), there are blocks of interior habitat ranging in size of about 640 acres to 100 acres.

CONCLUSION

Acreages of interior mature/old growth forest habitats is substantially reduced from reference conditions, due the timber harvest and the past practice of distributing harvest units across the landscape. With the smaller acreages of remaining mature/old growth forest stands providing interior, the higher ratio of edge to stand acres further reduce the interior habitat acreages remaining.

INTERIOR HABITAT TREND

For the next five to six decades, until managed stands in the LSR grow into mature forest habitats, the trend will be a continuing loss of interior mature and old growth forest habitats, resulting from program of timber harvest in the Matrix lands.

RECOMMENDATIONS FOR INTERIOR HABITATS

1) For the Matrix lands, assess the remaining stands of interior habitats for attributes of quality and landscape distribution, and develop a strategy for prioritizing and around those to extent feasible, considering other resources needs.

2) As part of the above strategy, assess how large block-acreages of managed stands can be managed to provide some attributes of interior forest habitats.

3) For the LSR acres, promote the reduction in fragmentation and the increase of interior forest habitat with silvicultural treatments in the managed units, which might include both precommercial and commercial thinnings.

LSR 0222, REFERENCE

The area of the watershed which is now a part of a designated Late Successional Reserve (LSR-0222) have been mostly of mature and old growth forest, with the same distribution of western hemlock/Douglas-fir habitat types and Mountain hemlock and Noble fir/Pacific silver fir habitats.

The areas of Packard Creek and Larison Creek drainages had large stand replacement fires. Where the fires around the turn of the century overlapped and reburned some acres of the previous mid-1850's fires, a very low level of large woody material (logs) and snags exists.

LSR 0222, CURRENT:

Three portions of LSR 0222 within the watershed amount to 41,525 acres, or only 8% of the full LSR 0222 (504,688 ac.) that extends to the north, west and south of the watershed.

LSR 0222 extends into the watershed in three areas. The current forest habitat condition of the three areas and of the total LSR are:

ACRES	Early Seral (<1"-~5"dbh)	Pole & Sm. Tbr. (~5"-~21" dbh)	Mature/Old Growth (~21"+ dbh)
1) 22,148 ac.	3,441 ac.(16%)	3,052 ac.(14%)	15,655 ac.(70%)
2) 5,980 ac.	1,595 ac.(27%)	1,235 ac.(21%)	3,149 ac.(52%)
3) 13,477 ac.	2,746 ac.(20%)	1,201 ac.(10%)	9,450 ac.(70%)
4) 41,525 ac.	7,782 ac.(19%)	5,488 ac.(13%)	28,254 ac.(68%)

LOCATIONS AND SPECIFICS ON THE THREE AREAS OF LSR 0222 WITHIN THE WATERSHED:

1) GRAY CREEK, LARISON CREEK, PACKARD CREEK PORTION: About 22,148 acres in the northwest corner of the watershed, including Gray Creek drainage, Larison Ridge, Larison Creek drainage, and upper Packard Creek drainage. The acres are in the 6th field GRAY subwatershed (8,981 acres) and 6th field LAKE subwatershed (13,167 acres).

Limited amount of timber harvest started in the 1950's and steadily increased over the next four decades. Currently, the forest habitats consist of:

Early seral habitat (<5" dbh):	3,441 acres (~16%)
Pole-size habitat (5"- 9"):	1,465 acres (~ 7%)
Small timber habitat (9"-21" dbh):	1,587 acres (~ 7%)
Mature / old growth habitat (21"+ dbh):	15,655 acres (~70%)

The 1,465 acres of small timber habitat are the results of the fires around the turn of the century, and the average size would in the 18" to 21" dbh range.

The early and pole-size habitat resulted from timber harvest, and the vast majority of these acres exists within the Larison Creek and the Packard Creek drainages.

Ten known spotted owl activity centers, one of which has <40% suitable habitat within its home range. This one site is believed to be of owls which were displaced into the LSR from the timber harvesting of the adjacent private in the Packard Creek drainage. The north slope of Larison Ridge have not been fully surveyed, and habitat exists for at least two additional spotted owl activity centers. Three separate response locations of competitive, non-native Barred owls are known on the north slopes of Larison Ridge.

2) UPPER GOLD CREEK, UPPER BOHEMIA CREEK, MID SNAKE CREEK AREA: About 5,980 acres in the upper Gold Creek drainage, upper Bohemia Creek drainage, and part of Snake Creek drainage. These acres are within the 6th field 21 3 GOLD.

This LSR area didn't have stand replacement fires indicated from our historic vegetation map, although there are some second growth stringers evident within the LSR area in the headwaters of Bohemia Creek.

Early seral habitat created by timber harvesting started during the 1960's in the Snake Creek drainage, followed by harvest in upper Bohemia Creek in the 1970's, then distributed across this LSR area during the 1980's and early 1990's.

Currently, the forest habitats consist of:

Early seral habitat:	1,595 acres (~27%)
Pole-size habitat:	42 acres (<1%)
Small timber habitat:	1,193 acres (~20%)
Mature & old growth habitat:	3,149 acres (~52%)

The early and pole-size habitats are from timber harvesting. An estimated 340 acres of the small timber habitat might be of the first harvests in Snake Creek in the 1950's. The remaining 853 acres of small timber habitat should be of fire-history second growth not recorded on the historic vegetation map, and the average diameter should be in the 18" to 21" dbh range.

Five spotted owl activities exists within this LSR portion, one of which is of a Resident Single owl. This LSR portion have had extensive spotted owl surveys, and additional owls are not likely. One great gray owl response is recorded along Calapooyia Ridge area just south of Johnson Meadows.

About 1300 acres of this LSR portion forms an extension, through checker board private lands, toward the river corridor. Of the five activity centers, activitiy centers of two spotted owl pairs and the Resident Single exist within this 1300 acres extension. With harvested private lands and partially harvested NFS land on three sides of the LSR extension, suitable habitat exists for one owl home range.

An important function of this 1300 acres extension provides dispersal connectivity in this area for late successional species, from the larger body of the LSR toward the river corridor. Of the 640-acre square mile that forms the end of this extension and closes to the river corridor, an estimated 220 acres is of mature/old growth habitat; the remaining a mixture of early seral and pole-size habitats. Silvicultural treatments can be designed to enhance the future dispersal function of this 1300 acres with manipulation of the managed plantations within the 1300 acres and in NFS plantations along the river corridor. Private land (480 acres) blocks a contiguous connection with the river corridor.

3) About 13,397 acres in the middle and upper Coal Creek drainage and a small area of Indian Creek drainage. These acres are in 6th field COAL.

Since the late 1850's, there has been only a few, small scattered areas of early seral habitat created by the fires at the turn of the century; an estimated 640 acres of small scattered openings in the mid Coal Creek area and an estimated 340 acres of stringertype openings in the Deadhorse Creek drainage.

Early seral habitat created by timber harvesting started in the 1960's and continued until 1994. Currently, the forest habitats consists of:

Early seral habitat:	2,746 acres (~20%)
Pole-size habitat:	11 acres (<1%)
Small timber habitat:	1,190 acres (~ 9%)
Mature / old growth habitat:	9,450 acres (~70%)

Of the 1,190 acres of small timber habitat, about 980 acres would be from the fires at the turn of the century. The remaining estimated 210 acres would either of early harvests in 1960's on good growing siters or of slow growing second growth from the <1850 fires and located on the harsh sites of Dome Rock Ridge.

Five spotted owl activity centers are known in this LSR area, one of which is a resident single. Two barred owl locations are also known. A pair of great gray owls are known in the Loletta Lakes area.

TRENDS FOR LSR 0222:

1) Decrease in fragmentation (managed harvest units) during the next three decades, as the early seral habitats grow into pole-size/small timber habitat.

2) Increase in fire hazard, due fire suppression and accumulation of fuels in natural stands.

RECOMMENDATIONS:

1) Proceed with developing the eight (8) LSR assessments relating to this watershed portion, which would contribute to the overall LSR 0222 assessment and management plan.

2) Silviculturally treat managed units, which are <80 years of age, to promote growth and structural diversity leading to late successional forest habitat characteristics, including riparian and upslope terrestrial areas. Priority of managed units would be those which likely existed as late successional habitats over many centuries.

Dense, young forest habitats have likely occurred within the LSR, and an assessment is needed to identify need for retaining some managed units in such habitat characteristic.

3) Develop a Travel Access Management Plan for the LSR, to balance need for fire suppression access priorities and need to reduce risks of human caused fires and damage to other late successional resources, as aquatics.

VM3 CONNECTIVITY

REFERENCE

Connectivity is used herein to mean suitable habitat for wildlife and plant to move across the landscape for functions as foraging, dispersal of offsprings, genetic interchange between populations, recolonizing areas as habitats change and become suitable for a given species, and expansion and retraction in population distribution or range.

Connectivity is also addressed in terms of mature and old growth forest habitats, and associated wildlife species, as those habitats have been the dominate, long-term habitats on the landscape. Except for special habitats, as meadows, early seral forest habitats were relatively short-term (15-25 years) at any given location. Wildlife and plant species that are generalists in habitats or can tranverse long distances rapidly, as elk and many birds, have a less concern for connectivity.

Species which are limited to a few habitat types and of slow mobility have the higher concern for habitat connectivity. Many of the species of slow mobility need a distribution of their populations established across the landscape to function as connectivity.

Habitat for connectivity wasn't always contiguous or continuous across the landscape, nor in place at all times. Fire often disrupted connectivity of forested habitats for periods of time. The frequency and magnitude of fragmentation to connectivity affects different species differently, as between the long distance, mobile species and the short distance, less mobile species.

Different wildlife species utilized the landscape differently for foraging and dispersal. Upland wildlife, as deer, elk and wolves, would tend to utilize the upland forest and ridgelines, especially where the riparian areas were deeply incised and travel more difficult. Riparian associated species, as salamanders, naturally followed riparian areas until a need to transverse upland terrestrial habitat to gain access to another drainage and riparian.

PROCESSES AFFECTING CONNECTIVITY:

The large blocks of interior habitat existing after the turn of the century fires were still interconnected with mature and old growth forest habitats distributed across or around the areas of early seral habitats. The interconnections ensured dispersal and genetic interchange over time. In most situations, the mature and old growth habitats that served as interconnections among the large interior habitat blocks were themselves of adequate size and depth to serve as interior forest habitats.

Several riparian areas and associated low saddle ridges serving as dispersal connectivity into adjacent major watersheds were notably affected by these stand replacement fires at the turn of the century.

1) Coal Creek mid and upper reaches.
2) Buck Creek's upper-most reach.
3) Big Willow Creek mid-reach and the upper-most reach.
4) Packard Creek upper-middle reach.

Riparian habitats have played an important role for dispersal and genetic interchange for many wildlife species, particularly the riparian associated species, as frogs and salamanders, turtles, marsh voles and minks. The larger, more mobile wildlife are capable of overland travel, though great distances of unsuitable dispersal habitat might become an impedence.

The smaller, less mobile wildlife, as salamanders, have a greater dependency on suitable riparian habitats for dispersal and genetic interchange. Connectivity between major drainages occurred by two routes. One route is down drainage to a confluence, then travelling up the adjoining drainage. The second route were overland, crossing ridgelines usually at low saddles where terrestrial habitats were suitable for dispersal. For the less mobile species and the time to transverse the passage, suitable habitat often required cover from predators, a forage base, and especially for amphibians, suitable microclimate.

The overland route was likely important for species that were associated with Class III and IV streams, seeps and similar riparian habitats higher on the slopes. Overland would commonly be a shorter distance and more favorable to survival than dispersing down one drainage and up another.

All ridgelines between riparian drainages offered opportunity for interdrainage dispersal and connectivity. Some of the major drainages with low saddle ridges for overland connectivity to adjoining watersheds were:

1) Coal Creek drainage leading into Boulder Canyon of the Umpqua River system.
2) Indian Creek drainage leading into the Steamboat Creek drainage of the Umpqua River system.
3) Buck Creek drainage leading into Groundhog Creek drainage of the Hills Creek watershed.
4) Big Willow Creek drainage leading into the Landes Creek drainage of the Hills Creek watershed.
5) Windfall Creek drainage leading into the Brice Creek drainage of the South Fork of the Middle Fork of the Willamette River.
6) Packard Creek and Larison Creek drainages leading into the Layng Creek drainage of the South Fork of the Middle Fork of the Willamette River.

Fire periodically affected the riparian areas and the terrestrial routes over ridges. Fires commonly performed an underburn in the lower gradient riparian areas, retaining the larger overstory which hastened recovery. Where stand replacement fires occurred in the overland dispersal routes and steep gradient riparians, the suitability for dispersal would be reduced. The dead timber that later would fall hastened the recovery toward suitable dispersal habitat by providing a large quantity of logs in addition to the young regeneration. The amount of large logs promoted the suitability for cover, forage and microclimate.

Across the landscape, overland dispersal occurred over both the steep gradient and the gentler gradient terrain. The gentler gradient terrain likely served a greater number of species. Dispersal across steeper gradient terrain was likely an essential factor for species as the tailed frog, that inhabited steep gradient streams.

CURRENT

Across the landscape of the watershed, connectivity for upslope terrestrial and riparian associated wildlife species is highly fragmented, but negoiable by most wildlife species. The large blocks of managed private lands and the Hills Creek Lake form the greatest barriers for most upslope terrestrial and riparian wildlife species that travel on land, as opposed by air.

The connectivity of riparian habitats are affected worse than the upslope terrestrial habitats, as a result of past timber harvests across riparian areas. The upslope terrestrial connectivity is highly fragmented and in some areas blocked for some smaller species, as the red tree vole, but for the landscape, most areas are negoiable for dispersal and foraging by wildlife.

From the 1950' until today, the reservoir and timber harvesting have had the greates impacts on the connectivity processes of foraging, dispersal and the resulting processes of species' range expansion, colonization and genetic interchange.

Of the major connectivity corridors, riparian and upslope terrestrial, the current conditions are:

1) Coal Creek drainage: Riparian connectivity substantially affected, mostly by older harvest units now in pole-size habitats.
   Upslope terrestrial connecitivity is stiil reasonable good.
2) Buck Creek drainage: Riparian connecitivity and ridge saddle substantially affected by older managed units now in pole-size habitats.
   Upslope terrestrial connecivity substantially affected on the north side of the drainage. The mid-lower reach of the drainage's south side is in very good condition.
3) Big Willow Creek drainage: Riparian and upslope terrestrial connectivity substantially affected by older and recent timber harvests. Landscape connectivity across drainages curtailed by Hills Creek Lake.
4) Packard Creek drainage: Riparian and upslope terrestrial connecivity very good on the NFS lands in upper reach; mid and lower reaches curtailed by managed private lands and by Hills Creek Lake.
5) Windfall Creek drainage: Riparian and upslope terrestrial connectivity very good condition on drainmage's north side; affected on south side, mostly with older units of pole-size habitats.
6) Larison Creek drainage: Riparian and upslope connectivity moderately affected in upper reach; very good in mid and lower reaches. Landscape connecivity, particularly for riparian, is curtailed by Hills Creek Lake.
7) Indian Creek drainage: Riparian and upslope terrestrial connecivity substantially affected by older and recent harvest activities, including private lands.
8) Youngs Creek drainage: Riparian and upslope terrestrial connecivity moderately affected by older and recent harvest activities.

CONCLUSIONS

The Hills Creek Lake is a major break in connectivity for the river corridor. Species, as birds and larger mammals, can transverse around the lake. Smaller terrestrial species, as riparian-associated voles and salamanders, are essentially blocked. The large block of private property in the Packard Creek drainage basically augments the effect of the lake.

The connectivity of the remaining watershed is highly fragmented, both in the riparian reserves and upslope terrestrial areas. For most species, the

fragmentation can be negoiated around, either presently or as managed units recover to a forested environment.

TRENDS

On landscape level, considering all drainages within the watershed, the riparian connectivity will slowly inprove with ingrowth of regenerated harvest units within the riparian areas.

In the Matrix lands, the inter-riparian connections across ridges between adjoining drainages, within and outside the watershed, will continue a downward trend with program harvest. In the LSR lands, these inter-riparian connections across ridges will have an upward trend with ingrowth of regenerated harvest units.

In the Matrix lands, the upslope terrestrial connectivity will continue a downward trend with program harvest to a level relying on existing non-harvest, forested habitats, as the Green Tree Retention clumps, forested lands unsuited for timber management, and the 100-ac LSRs. Standards and Guides for the foreground scenic allocations will moderate the downward trends on those Matrix lands.

The LSR lands will have a slow upward trend for upslope terrestrial connectivity with ingrowth of regenerating harvest units.

Connectivity between the large LSR in the watershed and the large LSR 0221 in the adjacent Hills Creek drainage will have a downward trend in the Matrix for the upslope terrestrial connecivity and the ridgeline terrestrial connections between riparian areas, while the trend for the connectivity of riparian areas slowly increases. The downward trends will occur at a faster rate than the upward trend, due the program harvest rate verse the regeneration ingrowth toward mature/old growth conditions, including accumulation of large logs and snags, in the riparian areas.

RECOMMENDATIONS

1) In riparian areas affected by past harvests, apply silvicultural treatments to enhance growth and structural diversity resembling mature and old growth characteristics.

2) Maintain the prescribed riparian widths of the mainstem of the major drainages and selected tributaries within the Matrix lands. The RIDGELINE INTERCONNECTION MAP displays the drainages and tributaries considered for non-reduction of riparian reserve widths, and also displays the ridgeline interconnection areas that should be considered for overland connectivity, as per

the next recommendation; the Class IV riparian reserves tying these connections together are recommended for retention of prescribed widths. Site specific analysis can modify to wider or narroer widths.

3) In areas of ridgeline interconnections between riparian areas of different drainages, promote characteristics of mature/old growth habitats. Placement of large woody material (logs) in deficit areas within managed units would facilitate connecivity. For final harvests in these interconnection areas, design the retention of large woody material (logs), Green Tree Retentions, and Wildlife Trees to facilitate connecivity.

4) For connectivity between LSR 0222 and LSR 0221, design a connectivity strategy for the two routes of Windfall Creek/Buck Creek drainages and Coal Creek/Youngs Creek-Deadhorse Creek drainages, including riparian and upslope terrestrial habitats. Such strategy should consider silvicutural treatments in existing managed stands to promote growth and structural diversity, consider identifying and deferring harvest of some natural stands presently serving connectivity, consider areas for longer harvest rotations, particularly the ridgeline interconnection areas, and consider identifying areas for select harvest verse regentation harvests.

VM4: SITE PRODUCTIVITY

REFERENCE

Site productivity herein refers to ecological site productivity relating to large woody material (logs) and snags on the landscape.

Large logs and snags provide recycled nutrients and habitat for various nitrogen fixing bacteria, decay fungi, insects, salamanders, birds and mammals. Important factors for large logs and snags are the better moisture conditions and ability to last longer in the enviroment.

Mycorrhiza-forming fungi and their symbotic association with vascular plants have been well documented in recent years. Large logs serve several important functions during the dispersal of hypogeous mycorrhiza-forming fungi, which produce their fruiting bodies below ground. The logs serve as home sites and travel lanes, as well as supplying cover for small mammals that are the primary dispensers of these fungi. Also, the decomposed logs provide suitable sites for re-establishment of colonies of hypogeous fungi.

PROCESSES DETERMINING LARGE WOODY MATERIAL (LOGS) AND SNAGS:

Natural fires, wind, insects and disease were the main factors determining levels of logs and snags on the landscape. Whereas wind, insects and disease normally affected small areas of the watershed and generally always produced higher levels of logs and snags, fire periodically affected thousands of acreages and with contrasting results on the levels of logs and snags; low levels in areas of frequent stand replacement fires and high levels in areas of infrequent stand replacement fires.

Where fire was very infrequent, a gradual increase of large logs and snags was likely evident. Where frequent unburning occurred, the levels were likely low. In areas of stand replacement fires, the levels of large logs and snags were very high for many decades and then incurred a low level until the forest matured and supplied a recruitment of large logs and snags. In areas of frequent stand replacement fires, levels of large logs and snags were likely very low.

Roughly 60% to 70% of the watershed was of mature and old growth forest habitats and provided some levels of large logs and snags. The frequency and locations of underburning isn't known. The stand replacement fires of the mid-1850's and the turn of the century fires provided high levels of large logs and snags. Where the two fire series overlapped in the Larison and Packard drainages, the levels were low.

Starting with the fire suppression emphasis in the early 1900's, the levels of large logs and snags would likely have shown gradual increase.

CURRENT

Ecological site productivity, as pertains to LWM, is contrasting on the landscape. In natural forest habitat stands, where fire and salvage have been precluded, the sites have a gradual increase in LWM. In managed plantations, the sites are low or deficit in LWM for ecological productivity.

As a general rule, large woody material was commonly left on clearcut harvest units between the 1940's and 1970, due the low merchantable value during that period. About 23,000 acres of NFS lands would be of this condition and would be of the managed plantations that are 25 years of age and older. Private forest lands should be on similar conditions.

Starting in the mid-1970's and until the late 1980's, PUMing and YUMing of LWM from harvest units's left little to no LWM in harvest units. Similar conditions would hold for the majority of the private forest lands. The NFS acres would be about 37,700 acres for this period.

Also, during the late 1970's and mid-1980's, roadside salvaging tended to remove merchantable logs and snags from several hundred feet along both sides of the roads on NFS lands. Roadside salvagings differ from the old clearcut scenario of this period, in that options remain for recruitment of LWM in the short term.

For the clearcuts lands of the 1970's and early 1980's, recruitment of LWM would be long term on NFS lands, maybe a century and longer. On private lands, LWM might not be recruited, due more intensive management.

Ecological site productivity is still well distributed on the NFS lands, due mainly to the distribution pattern of the 1970 to mid-1980 clearcuts while retaining unmanaged forest stands across the landscape. These 30-40 acres clearcuts, generally, have surroundings of natural forest stands, which can influence and hasten the ecological functions within these older harvest units, as their regeneration grows into a young forest environment.

CONCLUSION

Most of the managed units have reduced ecological site productivity, as a result of past removal of LWM and snags. For the watershed as a whole, ecological site productivity is functional in the remaining natural stands. These natural stands are well distributed across the watershed's as leave strips and unentered blocks on the NFS lands. The acres harvested during the 1940's and 1950's have a fair quantity of LWM, while the acres harvested after the early 1960's and until around 1989 have relatively minor quantity of LWM and snags.

Of the private lands, the checkerboard holding south of the large Packard area have a higher percentage of 1940 - 1950's harvest units, with the higher quantity of LWM (cull logs) left on site. The large block of private holding in the Packard Creek area had a high percentage of the acres harvested after the early 1960's, resulting in a relatively minor quantity of LWM left on site. No or extremely few snags were left on the private lands.

TRENDS:

1) Slight upward trend in site ecological productivity for the watershed, as the NFS's LSR lands, as the older managed units within the LSR grows toward maturity and are inflenced by the surrounding mature forest environments.

2) Probable static trend in NFS's Matrix lands. For ecological site productivity relating to LWM, the continuing program of harvest will be offset with the S&G for LWM and contribution of falldown of trees from the Wildlife and Green Tree Retention left during harvests.

RECOMMENDATIONS:

1) Of areas deficit in LWM, as due past management practices, identify and prioritize those areas of landscape importance, as connectivity corridors, (riparian and upslope terrestrial) and refugias, and program to re-establish the sites' ecological productivity as relates to LWM. One mean of re-establishing a site's ecological productivity, pertaining to LWM, is delivery of LWM to the site. A long-term mean is silvicultural treatments to enhance large diameter trees as future recruitment to LWM.

VM4 RIPARIAN HABITAT

REFERENCE

Riparian areas of the river, streams and wetlands provide some of the most important habitat for wildlife and plant species. Many of the wildlife species that either feed or reproduce in the aquatic area of the riparian are directly dependent on the adjoining riparian habitats. Harlequin ducks (Sensitive species) and water dippers are good examples of reproducing in the riparian habitat and feeding in the aquatic environment. Red-legged frogs (Sensitive species) and northwestern salamanders are examples of the reverse scenario.

Riparian areas also serve a landscape function of connectivity, for dispersal and genetic interchange of riparian associated species.

PROCESSES AFFECTING RIPARIAN HABITATS:

Fires, floods and, to lesser extent, debris slides and deep-seated mass movements were the factors affecting riparian habitats. Debris slides usually affected only the aquatic fringes of the riparian areas, were of small occurrences and area within the watershed, and generally added to the complexity of the riparian area at spot locations where log jams came to rest.

Deep-seated mass movements occasionally created "slump" ponds and wetlands, with resulting riparian habitats around them. Floods had little effect, overall, to the upland riparian habitats. In the lower gradient river system, floods tended to cause changes in channel alignment, resulting in some loss of forested riparian habitat while the abandoned channel alignment revegetated. Floods also maintain a complex of side channels, many of which provided ideal conditions beavers to dam and create wetlands serving as habitat for many wetland associated wildlife and plant species.

Fires probably had the greatest effects to riparian habitat, and conditions as slope gradient, aspects, weather, fuel loading and weather were variables. The

steep gradient slopes showed higher incidences of stand replacement fires, affecting riparian habitats associated with Class IV and some Class III streams. The lower gradient riparian habitats associated with Class I and II streams usually incurred a light underburn, if affected at all.

Riparian habitats associated with Class III and some Class II streams were affected differently by fire. A few, as mid Windfall and mid Big Willow experienced intense stand replacement fires in the mid-1850's, resulting in high accumulation of snags and logs, and early seral riparian forest habitat. A few riparian areas, as various reaches in mid and upper Packard experienced moderate intensity fires, resulting in sparse riparian overstory forest. Most, however, experienced underburns with low intensity closer to the streams and low to moderate intensity farther from the streams. Fuel loading, winds, and/or size of fires that create their own weather conditions were likely cause for the higher intensity fires in these reaches of riparian habitat.

CURRENT:

TABLE 25: PERCENTAGE RIPARIAN VEGETATION provides a quantification of riparian habitats in natural, relatively unmanaged condition and of riparian habitats that have been substantially altered, mostly by past harvest activities.

From the TABLE, the 53% that is >55 years of age (1940 and older) is assumed to be natural riparian areas, providing most or all riparian habitat components, as LWM, snags, multi-aged forest; multi-aged forest being of mature or old growth habitat characteristics.

The 26% that is less than 35 years of age and the unshown 21% between ages 35 and 55 years are assumed to be riparian areas that have altered, mostly by timber harvest and to a lesser extent by roads.

For the 26% that transpired since 1960, a good portion is assumed to be deficit in the riparian habitat components mentioned above. During this period, the clearcut practice and the chip market provided the incentive to remove all merchatable material, including cull logs. Starting around mid-1980's, riparian reserves started being prescribed for timber sales being planned at that time. The riparian widths provided after the mid-1980's to present were smaller than presently prescribed by the Forest Plan, as amended by the NW Forest Plan.

During the years between 1940 and early 1960's, the riparian habitats were harvested of timber, as after the early 1960's, although cull logs were often left, providing some level of LWM within the riparian areas.

In addition to the traditional harvest units, salvage of LWM and snags commonly occurred in riparian areas that are within several hundred feet of roads.

CONCLUSION:

About 53% of the watershed's riparian habitats provides full width and habitat components of LWM, snags and multi-aged forest. These riparian habitats are providing habitat for riparian-associated species. The riparian function of connectivity, however, is disrupted by fragmentation resulting from past harvest practices and the Hills Creek Lake. All major drainages within the watershed have had some level of riparian habitat harvested of timber.

The 21% of riparian habitat, between ages 35 and 55 years, would be of small timber riparian habitat, with some level of LWM, and providing habitat and dispersal for many of the terrestrial riparian-associated species.

Much of the 26% riparian areas harvested since the early 1960's are of early seral and pole-size habitat, with none to minimal LWM. These areas are of the greater concern for future recovery of riparian habitat and connectivity, as LWM is a critical habitat component for some species, as the red-backed vole.

TRENDS:

From present, riparian habitat from the past harvest activities will gradually recover, with the growth of the regenerated trees. To recover to a functioning mature/old growth riparian system, including connectivity, the scope of time is beyond this analysis.

If the managed units within the riparian areas are left to natural progression, the density of tree stocking in most units would substantially slow the recovery of the riparian habitats. As these stands move into a small timber riparian habitat, the heavy stocking density would promote an even-aged stand with small canopies and disproportionate height to bole diameter during an extended time period of stem exclusion. These stands would also be highly subject to windthrow, especially when future timber harvests occur adjacent to them.

RECOMMENDATIONS:

1) Provide LWM into riparian reserves that are deficit of LWM, as due to past removal by harvest or other practices. Providing LWM would aid the suitablity of riparian habitat for many of the terrestrial species while the regenerated forest grows toward maturity.

While the riparian connectivity is fragamented across the landscape, as result of past dispersal of harvest units, emphasis for retoring LWM into deficit areas of the riparian reserves would be for prioritizing those riparian reserves systems that interconnect Late Successional Reserves. The riparian reserves are considered one of the main landscape characters to provide connectivity between LSRs.

2) Where trees within riparian reserves need to be felled, as for road, or are naturally felled, as by wind, the function as LWM should be first assessed as site specific needs. A critical point for assessment is the health of the riparian reserve within the drainage of concern. Where the riparian habitats have been heavily fragmented within a drainage, or small segments of functioning riparian habitat has been isolated, as between managed units, the quantity of LWM needed might be higher than 'assumed' natural occurrence or the standard & guide of 240 lineal feet prescribed for harvest units.

The function of a higher quantity would be to sustain riparian-associated species in the small isolated riparian habitats. Opportunity also exists to distribute such felled trees into deficit areas to aid recovery of connectivity for terrestrial species, as voles and amphibians.

ISSUE: FIRE SUPPRESSION

NF2 HOW HAS HABITAT DIVERSITY CHANGED WITH FIRE SUPPRESSION

REFERENCE

The frequencies and intensities of fires were the dominate factors affecting habitat diversity. Over the centuries most of the watershed experienced fire at varying frequencies and to varying intensities. Large fires are thought to have been cyclic over the centuries, relating to long periods of moderate climate resulting in low to moderate fire intensities creating small openings and underburn conditions. As fuel loading and weather patterns changed, conditions evolved for intense large fires, resulting in large fires with high acreages of forest habitats being converted to early seral forest habitats. A range between those two extremes was likely the norm.

Fire frequency often determined fuel loading, as accumulations of dead wood, and often determined fuel ladders, as understory limbs which could carry a fire into the overstory canopies. Levels of fuel loading and fuel ladders also typified the habitat that many forest wildlife responded to. The fuel loading and fuel ladders also determined the habitat types that resulted from a fire, as an early

seral habitat of grasses, forbs and brush dominated from a stand replacement fire, or open woodland habitat, or multi-canopy forest.

Early seral habitats were developed in small patches, complex mosaic patterns, and large acreage blocks. Small patches and mosaic patterns of early seral habitats often provided a high degree of fragmentation and edge habitats. However, large areas of early seral habitat created by stand replacement fires would have provided a greater species richness, or number of wildlife species, associated with early seral habitat (Bunnell, F. 1995). Such large areas generally have a greater diversity of habitat sites within them, as small patches or strips of unburned sites and greater number of microhabitat sites with varying aspects, moisture regimes and plant associations.

As the areas of stand replacement fires regenerated predominately with conifers, two scenarios of habitat structure and composition commonly occurred, depending on sites. One scenario is where hardwood trees weren't a component of the site, and the regeneration developed as mostly pure conifers. The second scenario is where hardwood trees were a component, sometimes densely so, and the regeneration developed as mix hardwood/conifer habitat.

Areas of frequent underburning should have shown a low concentration of large logs and snags, as old ones were consumed and a few new ones recruited. These areas typically had more open understory, with minor lower canopy structure. Such habitats of frequent underburning commonly existed on southern aspects. These areas also normally had a corresponding low concentration and fluctuation in wildlife species associated with the habitat components of large logs, snags and dense understory canopies, while having a higher concentration of wildlife species associated with open forest habitat.

Areas of very infrequent fires, as in several hundred years, should have shown high concentrations of large logs and snags and corresponding high concentration of wildlife species associated with large logs and snags and with multiple canopy structures. These areas also tend to experience very intense fires when fires did occur.

With the stand replacement fires, most of the watershed still remained in mature and old growth forest habitats. Though much of these forested habitats periodically underburned, the large residual green trees still provided a forested environment.

Brush and hardwood trees upslope from the riparian areas were important components in the habitat diversity and determined the habitat suitability for many wildlife species. Brush occurred in several habitat forms. In areas of Ceanothus, a fire dependent species, the density of Ceanothus regrowth was related to the intensity of the fire. Ceanothus brush 'fields' occurred after high

intensity stand replacement fires. These brush habitats tended to dominate the sites for decades by suppressing the regeneration of the conifers. A low intensity underburn would have formed an open forest habitat with a low density of Ceanothus brush forming the habitat structure on the forest's floor.

Other brush habitats, as vine maple, ocean spray, etc., varied in brush densities, dependent on sites. The diversity of brush species at a site added diversity to the habitat structure and wildlife species which utilized them.

Hardwood trees, as big-leaf maple, cottonwood, red alder, white oak, madrone and chinkapin, provided a mix hardwood/conifer forest habitat across the landscape, commonly on the warmer sites. Several of these hardwood tree species tend to resprout after fires and gain an initial height advantage over the young conifers. Unlike many of the brush species, the hardwood trees tended to persist longer into the age of the second growth conifer, resisting shade suppression until the conifers developed a mature forest.

Hardwood trees provide invaluable food sources in the form of seeds, catkins, and insects that feed on the leaves. Big-leaf maples, oaks, cottonwoods and red alders with defect are favored by some cavity nesters, as the downy woodpecker.

The hardwood riparian forest of the larger, low gradient river and streams usually were affected by flood events more dramatically than by fires. The hardwood riparian areas on steeper gradient streams had a greater variance in effects from fires.

The main processes affecting special habitats were fire, slope instability and flood events. Slope instability often formed the hillside bogs and small lakes, as Windfall Lake. "Slump" ponds, as found in Bull Creek drainage, were created by a hillside movements and became essential reproductive sites for red-legged frogs, a Sensitive species, Northwesten salamanders, and often western pond turtles, another Sensitive species. Flood events in the lower gradient streams also made and eliminated flood channel ponds or quiet waters, that benefitted the species above as well as beavers and otters.

Fire was the main factor in maintaining meadow areas, and meadows often fluctuated in size as a result of fires and the absent of fires. During periods of no fires, conifers encroached into meadows, slowly narrowing the meadows size. Periodical fire tended to burn out the encroaching trees, restoring the meadows' size. Frequency and intensity of fires determined the effectiveness of abating the encroachment of trees.

CURRENT

In the early 1900's, emphasis on fire suppression precluded large acreages of early seral forest habitats from occurring by stand replacement fires. The sizes of natural fires were effectively reduced to small acreages, and early seral forest habitats quickly grew into pole-size habitat, and then into small timber habitat.

Forest habitats that were characterized as having low levels of logs and snags and open understory began to change, with incremental increases in down logs, snags, and young understory trees filling in the open forest floor. These changes in habitat characteristics would beneficially influence the suitability for some wildlife species, as the spotted owl, the pileated woodpecker, and the pine marten. The loss of open forest habitats would decrease habitat suitability for other species, as the northern goshawk, and the flamulated owl in the ponderosa pine areas.

Additionally, the mature and old growth pines appear to be showing increased pine beetle infestations, due likely to increased competition from understory Douglass-fir during the recent drought years.

Fire exclusion has permitted the gradual reduction in open forest habitats and gradual reduction in the adundance and structure of hardwood trees in the mix hardwood/conifer forest habitats, due continued suppression by succession.

Special habitats, especially non-forested habitats as meadows, have lost acreages in size. Some natural meadows have become full forested by encroaching conifers, as the 9d Special Habitat designated in lower Coal Creek that had been an oak/meadow complex (T.24 S.,R.3.,Sec.14, SE).

CONCLUSIONS

A gradual loss of the open mature/old growth forest habitats, as the mix of densely structured mature/old growth forest, open structured mature/old growth forest, and gradient between, shift toward the former with fire suppression.

A reduction in hardwood components in mature/old growth forest habitats by continued shade suppression

Increase in high intensity fire hazard of remaining mature/old growth forest habitats, with increasing levels of ground and ladder fuels.

A loss in non-forested habitats, as meadows, with conifer encroachments resulting from fire suppression.

TREND

An overall downward trend in habitat diversity exists for the watershed, due several reasons.

RECOMMENDATIONS

Assess, develop and implement strategies to maintain representations of open forest habitats, where fire historically provided such, with priority emphasis to the ponderosa pine/Douglas-fir area.

Assess and implement strategies to enhance and regain non-forested habitats, as meadows, with uses of silvilcuture and fire treatments.

NF3 FIRE SUPPRESSION & WILDLIFE THREATENED, ENDANGERED & SENSITIVE SPECIES

REFERENCE

Of the wildlife species currently listed as Threatened, Endangered or Sensitive, the ones that would have inhabited this watershed in the 1940's and prior and would have their habitats affected by fire and fire suppression are the American peregrine falcon (Endangered), the northern spotted owl (Threatened), and the northern red-legged frog, Pacific fisher, and wolverine, which are listed as Sensitive. The northern bald eagle (Threatened) likely did not inhabit the watershed for nesting, but likely was an infrequent forager of the watershed, especially during their non-nesting seasons.

AMERICAN PEREGRINE FALCON:

For the peregrine falcon, the series of fires around the 1850's and the turn of the century created various habitat conditions in the western hemlock/Douglas-fir dominate habitat zone and in the mountain hemlock/true fir dominate habitat zone, as well as keeping meadow areas open. The diversed array of habitat conditions provided for a diverse array of bird prey for the falcons, as: yellow warblers in the river hardwood habitats; savannah sparrows in the meadows; MacGillivaray's warblers in the early seral fire-created brush fields; black-throated gray warblers in the mixed hardwood/conifer second growths; Hermit thrushes in mature true fir forests; and many of the woodpeckers utilizing snags created by the fires.

NORTHERN SPOTTED OWL:

For the northern spotted owl, the early fires tended to reduce its habitat acres, and the owl's population in the watershed probably fluctuated to a small extent as a result of the large fires. With the large block-acreages of mature/old growth forest converted to early seral forest habitat, pairs would have been shifted around in the landscape, with possibly several pairs becoming non-reproductive due to being displaced into adjoining owl home ranges. The great horned owl populations was probably at a higher level following the two fire series, as the habitats of early seral, pole-size and open forest conditions were more suited for this large owl to forage. The great horned owl probably also caused a displacement of some spotted owl pairs.

For the wolverine which ranges over large areas, the fires probably had little effect to its habitat use, other than possibly a decrease of use within the large block-acreages of fire-created early seral forest habitats.

PACIFIC FISHER:

The Pacific fisher probably was favored by periodic fires in the ponderosa pine/Douglas-fir area. In the this area, periodic fires should have kept some acres in mixed stands of pine ages, which would have favored the porcupines, a prey species for the fisher. The fisher probably wasn't numerous in the western hemlock/Douglas-fir areas of the very large fires in the Packard and Larison drainages.

RED-LEGGED FROG:

The red-legged frog tend to favor a forested environment for foraging. The areas of the large block-acreages of fire-created early seral habitats were in steeper terrain were red-legged frog were not. A favored breeding habitat are "slump" ponds, and these areas are generally on gentler terrain that incurred underburning, retaining a forest environment.

CURRENT

The early seral forest habitats were substantially reduced in acreage (~370 acres) as they grew into pole-size and small timber forest habitats (~11,500 acres) during the early years of fire suppression emphasis.

With the advent of timber harvest in the late 1940's, acres of early seral forest habitats started to increase, with about 34,046 acres existing today. The pattern across the landscape is roughly evenly distributed in small patches, which provides an even distribution of early seral forest prey species.

Though the acres of pole-size and small timber forest habitats fluctuated over the years since the early 1900's, the acres of pole-size and small timber habitats of the 1940's (~11,500 acres) and of today (~14,700 acres) are representative of the same habitat acres (~19,550 acres) that grew out of the 1850's fires and were present at the turn of the century.

The mature/old growth forest habitats (21" dbh) increased in acreage during the years of fire suppression and before timber harvesting and are at a historic low today (~50,500 acres), due timber harvest, reservoir, roads and other land uses.

P-BIRD

The reduction in early seral habitats was probably the greatest effect of fire suppression on peregrine falcon's foraging habitats before the advent of timber harvest on a large scale. With the fire suppression emphasis starting in the early 1900's, early seral forest habitats, open mature/old growth forest habitats and meadow habitats started to decrease in acreages.

The slow ingrowth of understory trees in mature/old growth forest areas that had been maintained as open forest habitats affected a guild of prey species, as the American robin and the cedar waxwing.

OWL

The advent of fire suppression was favorable to the spotted owl. As the areas of fire-created early seral habitats grew into small timber and mature forest habitats, these areas once again became suitable for foraging by the spotted owls, less favorable for the great horned owls, and substantially reduced the the fires' fragmentation and edge effects to interior forest habitats.

The ingrowth of understory trees in the once open forest habitats has mixed effects for the spotted owl. One effect in some areas, as the pine area, is the reduction in foraging suitability on the forest floor due the density of stunted, young Douglas-fir sapling and pole-size understory. Other areas have shown an increase in advancing red cedar and western hemlock understory, forming an additional canopy structure favorable to the spotted owl. The gradual increase of large woody material is favorable for the spotted owl for rodent production, but also presents an increasing fire hazard that could result in higher mortality of the overstory trees when a fire does occur.

The advent of timber harvest reversed the loss of early seral forest habitats and presented a greater fragmentation pattern existing today.

WOLVERINE

During the period of fire suppression leading up to the 1940's, the areas of pole-size and small timber forest habitats probably received some foraging use by wolverines where there were large levels of large logs for rodent habitat.

Likewise in the unmanaged, mature/old growth forest habitats, the gradual increase in large woody material would be enhance foraging habitat for the wolverine, as for the spotted owl. The ingrowth of understory trees likely has no significant effect to the wolverine, except for the higher density areas of some of the pine area.

The numbers of wolverines that actually uses this watershed is very few. The wolverine population was never very abundance and was nearly extirpated from the Cascades by trapping in the earlier years. One confirmed sighting in recent years was in the southern portion of this watershed. Present useage of the watershed is considered as being dispersal in nature.

FISHER

The fire suppression emphasis from the early 1900's to the 1940's probably had no significant effects of the fisher or their habitats. Fishers were having the same worry as the wolverine, fur trade, and was extirpated from this watershed.

With the advent of timber harvest, some managed units were and are still being reforested with ponderosa pine to provide the young pines favored by the fisher's prey, the porcupine. Only one uncomfirmed sighting (late 1980's) of a fisher on the district, and that was crossing RD 21 near the southern end of the watershed, in the vicinity of Deadhorse Creek.

RED-LEGGED FROG

The period of fire suppression between 1900 and the 1940's only maintained the frog's forest habitat. Of the remaining mature/old growth forest habitat in the mid and lower elevation range of this frog, the gradual accumulation of large woody material and ingrowth of understory trees should have a slight beneficial effect for the frog's foraging needs.

CONCLUSIONS

Fire suppression benefits some T&E and Sensitive species and does not benefit others within the watershed.

For spotted owls and red-leeged frogs, fire suppression can be considered beneficial. Gradual increase in LWM and understory of natural forest habitats

promote the prey habitat for both species, and the LWM promote moist cover for the frog during dry and hot weather.

Conversely for the spotted owl and red-legged frog, fire suppression gradually increases the fuel loading and ladder fuels, leading to increased fire hazard. Concern about large stand replacement fires within the LSR 0222 will increase, as this LSR becomes the remaining mature and old growth habitat environment for these two species within this watershed.

For peregrine falcons, fire suppression promotes the gradual loss of diversity in forest habitat, such as the gradual loss of open forest habitat in the mature/old growth seral stage, and the gradual loss of meadow sizes. Loss in acreage of these two habitats have a coinciding reduction in prey species utilized by the falcon.

Information on fire suppression's correlation to benefit or non-benefit for the wolverine and fisher is weak and not pursued further.

TRENDS

1) The slight downward trend for the peregrine associated with a downward trend in diversity of prey species available, resulting from fire suppression effects on meadow acreages, and associated prey, and effects of open mature/old growth forest habitats, and associated prey. Future program harvest in the Matrix will hasten the downward trend of the open mature/old growth forest prey species.

2) An upward trend for the remaining spotted owl habitat in the LSR, as the increase in large woody material enhances prey habitat, and younger habitats are permitted to grow toward suitable foraging habitat.

3) An upward trend in fire hazard in owl habitat of the LSR 0222 and the smaller 100-ac LSRs within the matrix.

4) A static trend for the wolverine and fisher.

5) Possibly a slight upward trend for the red-legged frog in the LSR 0222, as fire suppression increases large woody material.

RECOMMENDATIONS

1) Reintroduce fire and silviculture treatments, as thinning, where appropriate to maintain meadow complexes and to maintain open forest mature/old growth characteristics and resulting associated peregrine prey.

2) Assess the fuel loadings and appropriate areas of the LSR 0222 and smaller Matrix LSRs for reintroduction of low intensity fire, to maintain diversity of Late Successional habitats and for reducing potential for catastrophic fires in these areas. Such assessment would assist with the larger assessment for the full LSR 0222.

ISSUE: NON-NATIVE SPECIES

NS1 NON-NATIVE SPECIES (Wildlife)

REFERENCE

Prior to European settlement in mid-1850's, introduction of non-native wildlife is considered non-existent. Native species had evolved with each other to maintain their individual viability, though fluctuation in habitat conditions caused fluctuations of species populations, favoring some and disfavoring others.

By the 1930's and 1940's, certain non-native wildlife and plant species, as the bullfrog, o'possum, and Himilayan blackberry, had been introduced into the Pacific Northwest. Their presence or noticeable effects in this watershed was doubtful at that time.

CURRENT

Himilayan blackberries and bullfrogs have expanded throughout the riparian areas and ponds along the river below the Hills Creek Dam. The Himilayan blackberries form dense cover, shading out the loer riparian plant species and are believed to have an adverse effect of shading nesting sites of the westrern pond turtles.

The bullfrogs have had a major impact to native frogs and turtle populations in the ponds and backwaters of the river below the dam. The bullfrog is known to eat any that it can get into its mouth and swallow. The native species of frogs and the turtle evolved without this type of predator and have not ability to effectively avoid the bullfrog where they must inhabit the same habitat. The bullfrog has effectively eliminated the recruitment of juvenile turtles in the Ferrin Ponds and the pond below the dam.

A recent report of bullfrogs seen in the Hills Creek Lake indicates a possible expansion of bull frogs into the lake, which would threaten the low reproduction of the turtles in the lake, and in the adjacent "slump" ponds in Modoc Creek and Bull Creek drainages.

The o'possum is an opportunist that will feed on just about any smaller that itself. Native species that would be affected by this newcomer are ground nesting birds, as grouse, quail, juncos, and species that nest in low brush, as many of the warblers. The o'possum has have become fairly common around the City of Oakridge area. A sighting in upper Hills Creek suggest that this non-native is beginning to expand out into the forest environme, eventually including this watershed above the dam.

A more recent arrived non-native is the barred owl of the eastern United States. The barred owl is a close cousin of the spotted owl, with similar appearance. The barred and the spotted are of the same genera, Strix, which migrated to North America thousands of years ago via the Bering land bridge. Likely, the original Strix that arrived in North America became geographically separated by the non-forested Great Plains and evolved as slightly different species.

The Barred and the spotted are close-enough cousins to interbreed and produce fertile offsprings, called sparred owls.

THe barred owls is a little larger and much more aggressive than the native spotted owl. The barred owl also have a stronger tendency to inhabitat forested habitats with an intermix of early seral habitat, as meadows and recent timber harvest units.

Where the barred owls established a home range, displacement of or interbreeding with spotted owls is likely to occur. The harvest pattern during the past decades create ideal habitat for the barred owls, and their population growth is still in an expansion mode within the watershed.

Presently known, there are four separate observation locations from just below the dam and along the north slope of Larison Ridge, one in Bull Creek, one in Deadhorse Creek, two in Coal Creek.

CONCLUSION

Bullfrogs and barred owls are the main non-native wildlife species of concern. The expansion in range of both species has negative effects to native species, as predation on native turtles and amphibians by the bullfrogs and displacement and genetic delution of the spotted owls by the barred owls.

TRENDS

1) Upward trend in continuing expansions of non-native farther into the watershed.

In the Matrix with a program of timber harvest, the barred owl will likely become the dominate Strix species. The barred will continue to expand into the LSR 0222, until leveling off and declining as the recently harvest units grow out of early seral habitat. A dilution of spotted owl genetics as result of interbreeding by barred owls.

2) Downward trend in affected native species within the watershed.

RECOMMENDATIONS

1) Introduce water moccasions to control bullfrogs in the ponds down river from the dam.

2) Active program to eliminate expansion of bullfrogs into the watershed above the dam. Such may require special permit from the State to spotlight and shot bullfrogs at night from a boat on the lake.

3) Silvicultural treatments of managed harvest units within and adjacent the LSR 0222 to promote growth of regerated conifers for reducing the open patch-work of habitat favored by barred owls.

ISSUE: TRANSPORTATION SYSTEM

TR TRANSPORTATION (ROADS) AND SPECIAL HABITATS

REFERENCE

Special habitats were not affected by road transportation system within this watershed. The road system was confined to the City of Oakridge area and along the Middle Fork Willamette River, following the old military road. Though special habitats are generally considered as the specific habitats, as meadow, rock outcrops, bogs, etc., the surrounding forest also is a component of these habitats, by providing the interface for microclimate and habitat depended upon for plants and wildlife to inhabit or utilize the special habitats.

CURRENT

Since the commencement of timber harvesting in the 1940's, roads have been constructed throughout the watershed, transversing from riparian areas across

mid-slopes to ridgelines. Ridgelines are often logical locations to access to facilitate current logging systems.

Special habitats are likewise distributed across the landscape, with the prominant special habitats, as meadows and rock outcrops, aligned on the ridgelines.

Several special habitats, and surrounding forest edges, have been impacted by placement of roads through or adjacent to the special habitats. Some of the noteable special habitats affected are:

Holland Meadows, with road through the meadow complex.
Unnamed rock outcrop with sensitive plant population affected by road and landing atop (T.22 S.,R.2 E.,Sec.13; Packard Cr.)
Johnson Meadow, with road through the meadow complex.
Bristow Meadow, with road through the meadow complex.
Joe's Prairie Meadow, with road along and through meadow complex.
Groundhog Meadow, with road through forested edge.
Unnamed meadow in Deadwood Creek, with road 5851 across top slope.
Stone Mountain, with road and rock quarry.
Loletta Lakes Meadows, with roads through the meadow complex.

CONCLUSION

Where roads cut through special habitats, as meadows and rock outcrops, the loss of that acreage is obvious. Extended effects are changes in soil and moisture regimes, affecting the botanical species and composition, usually in the downslope portions of the special habitats, and affecting wildlife species useage by road traffic disturbance.

The effect of altering the soil and moisture regimes is usually related to the road cut and fill. The road cut intercepts the surface and subsurface moisture flow to the remaining special habitat below, altering the moisture regime in the habitat below the road, either creating a wetter condition below culverts or drier conditions between culverts. Plant species and composition change accordingly. Road cuts also present an opportunity for meadow edges at the road cut to begin eroding back into the meadow.

Road fills are normally drier and promote dry-site plant species. Often, these alterations in soil and moisture regime promote off-site species to invade into the habitats.

The rock outcrop site in Packard Creek drainage with the sensitive plant species is characteristic of the effects described above. The road and landing removed a portion of the habitat. The road, thereafter, changed the drainage to the habitat below the road, providing a higher volume of runoff, and sediment, to one side of

the habitat, while decreasing the water flow to the other side of the habitat below the road. The one site of the sensitive plant is located between these two extremes.

TREND

Under current standards and guides, new road construction would not affect additional special habitat, unless an assessment determined that any specific special habitat is insignificant for maintaining biodiversity.

RECOMMENDATIONS

1) Assess the roads affecting special habitats for future needs or non-needs. For non-needed roads, consider rehabilitating the roads back to habitat conditions compatible with the special habitats.

2) Apply treatments to reduce or eliminate off-site species invading special habitats, as result of past road constructions.

TR6 ROADS AFFECT RIPARIAN RESERVES

REFERENCE

Prior to the 1940's, the roads within this watershed was limited to the vicinity of the City of Oakridge, Willamette City, the Hills Creek community of Hilltop at the confluence of Hills Creek and the Middle Fork of the Willamette River, and the road up the river system following the old Military Road.

The approximate length of the Middle Fork of the Willamette River within this watershed is 30 miles. With today's standards, a minimum 800-ft riparian width (400-ft each side) would provide about 2910 acres of riparian (reserve).

The development of Willamette City along the river probably had the largest impact on riparian habitat for a single location. Considering about a mile length of residential area (maximum) and a riparian reserve width of 400-ft on one side of the river, about 48 acres of riparian reserve would have been affected by residential area including streets.

The road up the river stayed pretty much in the flatter floodplain and riparian area of the river. This road was about 22 miles in length within the watershed. Considering an average width of 40 feet for that time period, about 107 acres of river riparian habitat would have been converted to road.

With the Willamette City and the middle fork road, about 5% of the river riparian might have been affected by conversion to roads, streets and residential settings. In assumption, all the other riparian areas were not affected.

CURRENT

The total acres of riparian reserve associated with Class I - IV streams on National Forest System (NFS) lands in this watershed is 21,387 acres.

Currently, from GIS data on riparian reserves / road intersection for Class I, II and III streams, about 806 acres of riparian reserves have been lost by road construction on the NFS lands within the watershed. The deeded lands are not included as are not the Class IV riparian reserves.

Of the 21,387 acres of riparian reserves on NFS lands, the loss of 807 acres associated with Class I - III streams account for about 4%. Road impacted acres of riparian reserve associated with Class IV streams weren't calculated.

To include the riparian reserve acres of Class IV streams impacted by roads, the overall percentage would rise above the 4%, as given for the Class I-III stream riparian reserves.

CONCLUSION

Loss of 806 acres of riparian reserves associated with Class I, II and III streams. Impact to riparian reserves associated with Class IV streams wasn't assessed.

TRENDS

1) On the NFS lands, the impacts to riparian reserves initially appear minor, keeping in mind that riparian reserve acres for Class IV stream weren't assessed for overlap with roads. Usefulness of this information is as a component for assessing overall conditions of riparian reserves.

2) An upward trend in acres of riparian reserves impacted by roads if analysis includes the road intersection with Class IV stream riparian reserves.

3) A slight downward trend in riparian reserves acres affected by new road construction, mostly to Class IV stream riparian reserves and occasional spur road needs in the riparian reserves of the large streams, as we continue our program of harvest in the Matrix.

RECOMMENDATIONS

Finish the analysis for the Class IV stream riparian reserves on NFS lands that are currently affected by roads.

Where roads within riparian reserves have no further requirement for transportation needs (motor vehicle travel), rehabilitate the road to enhance recovery of riparian reserve functions. Where roads within riparian areas have no further requirement for transportation needs within the near future, one to several decades, close the road to permit riparian habitat to function without disturbance.

TR7 ROADS AFFECTS WILDLIFE

REFERENCE

The road system of the 1940's and before had very little effect to wildlife. Roads provided limited access for hunting and trapping, which were important economic uses as food and fur trade during that time period. Other than the roads in and round the City of Oakridge, the watershed had only the road up the Middle Fork Willamette River.

CURRENT

Since the 1940's, the watershed has been extensively roaded. For most wildlife species, the effects of roads are nominal. The species of concerns for roads are the big games species, namely deer and elk, and the Threatened and Endangered species.

Roads have a negative effect on habitat effectivenes for deer and elk. The watershed is divided into 13 elk emphasis areas. Each emphasis areas, High, Moderate or Low, has maximum open road density objectives for habitat effectiveness.

The effects of roads pertain to increased human access, both in numbers and frequency, and the resulting consequences of disturbance and harvest of elk and deer. The disturbance result is related to energy expenditures.

Wildlife species, including deer and elk, need the spring, summer and fall to put on fat reserves (energy reserves). The fat reserves are the primary sources of energy for surviving through the winters. Increased frequencies of disturbance and resulting increased expeditures of energy during the spring, summer and fall reduce the quantity of fat reserves that deer and elk have to enter the winter season. Likewise, the increased expenditures of energy, due disturbances

during the winter, hasten the loss of energy reserves and can have a detrimental effect of herd numbers by increaseing winter mortality and decreasing the number of live births carried through to the spring.

During the mid-1980s, the Oregon Department of Fish & Wildlife conducted a study of the elk herds' reproductive success. The study on Rigdon Anger District included this watershed. The study showed that the reproductive success of the elk herds was around 72%, which was considered within normal range.

Increased disturbances also affect calving sites for elk. Direct effects to survival of elk calves are considered very low. A higher effect would be indirect, as revealing calves to predators, namely bears and mountain lions.

In this watershed, the elk population has grown substantially over the past decades, since the 1940's, despite the coinciding increase in road mileage. However, the current rate of elk population growth is beginning to level.

Roads enhance the human access which into turn enhance the numbers of deer and elk harvested. Legal harvest is currently directed at bulls and has little to no effect to population growth. Illegal hunting takes a higher percentage of cows than bulls, which does influence population growth.

Effect of roads to Threatened and Endangered species is predominately access and disturbance by humans, which can affect reproductive success during the nesting seasons.

Presently, two bald eagle nest sites and one peregrine falcon nest site exist within this watershed. Roads exists within disturbance distances of each site. The roads of concern within vicnity of one eagle nest and of the peregrine falcon nest sites are closed during the nesting season. One road on concern within vicinity of the second eagle nest is presently open. Locations of these sites and associated road numbers are confidential.

Human access, as provided by roads, has a lesser potential for direct effects to spotted owls, as these owls have a lesser tendency to be disturbed by humans. Isolated locations are a concern, however, where nest areas are adjacent to roads. Potential for indirect effects of roads to these owls, and other wildlife, is the higher risk of human-caused wildfires related to high density of roads and access.

EMPHASIS SPECIES, ELK:

Elk migrated into North America from Seberia during the last Ice Age. The Roosevelt elk species of western Oregon is considered a product of that migration. The Lewis and Clark Expedition survived and replenished their food stocks with elk and fish during their winter stay in northwest Oregon. The first settlers in and near this watershed included elk in their sources of food. Elk numbers and locations weren't described for this watershed. Assumptions are that the elk numbers were moderate to low, compared to today's numbers, and that the predominate use area by elk was on the east side of the river from Hills Creek confluence at the north end and the Deadhorse Creek at south end of the watershed.

Assumptions are that there were small resident herds of elk, while most elk migrated through the watershed to winter toward the Willamette Valley and to summer on the east side of the Cascades Crest. Habitats that the elk would have used would be similar as today; forested areas for thermal cover and limited forage, and burned areas principally for forage. Fire areas that underburned and that were stand replacements would have provided forage.

With unregulated hunting and developing meat market in the mid and late 1800's, the elk populations were severely reduced. Around 1900, the State instituted a No Hunting restriction which lasted for thirty years. Coinciding with the late 1800's and until sometime in the 1940's, predator control was instituted in the Cascades, leading to the extirpation of the grizzly and substantial reduction in the mountain lion and the wolf populations; species which influenced the populations of elk.

ELK, CURRENT

In the 1950's elk was still considered scarce in the watershed. During the 1950's, roads were just being constructed into various drainages for timber harvest, converting forested habitat into early seral habitat that provided forage. By the 1980's every drainage had been entered for timber harvest.

With regulated hunting, low predator populations, and an increasing supply of sustaining forage, the elk populations rebounded from the lows at the turn of the century to more than three hundred head in this watershed. The largest numbers still exist east of the river and in the Coal Creek drainage.

The 1990 Wilammete National Forest Plan designated elk emphasis areas across the forest. Management emphasises for elk habitat are rated as High, Moderate or Low for each emphasis area. There are thirteen elk emphasis areas within the watershed, as described below:

5th field	Emphasis Area	Dominant Emphasis	Land Allocations
21 1 Gray	Gray	Low	LSR 0222
21 2 Lake	Modoc Bull	Moderate	Matrix
21 2 Lake	Larison	Moderate	LSR 0222
21 2 Lake	Packard	Low	LSR 0222 upper Packard, mostly Pvt. lower
21 2 Lake	Coffeehead	Moderate	Matrix
21 3 Lake	Windfall	Moderate	Matrix
21 3 Gold	Gold	Low	Matrix/LSR/Pvt.
21 3 Gold	Snake Fir	Moderate	Matrix/LSR/Pvt.
21 3 Gold	Dry Pine	High	Matrix
21 3 Gold	Indian Steeple	Moderate	Matrix/LSR/Pvt.
21 4 Coal	Coal Head	Moderate	LSR

Habitat Effectiveness Indices (HEI) for each habitat variable and overall geomentric means for the High, Moderate and Low emphasis areas are:

High Elk Emphasis Area
HEI valves for Cover, Forage, Road Density, and Size & Spacing of cover & forage should be within >0.5 and 1.0 indices. The overall geometric mean should be maintained above or increased to >0.6 within first 10 years.

The HEI valve of 0.5 for cover applies to winter range portion of the area.

Moderate Elk Emphasis Areas

HEI valves for Cover, Forage, Road Density, and Size & Spacing of cover & forage should be within >0.4 and 1.0 indices. The overall geometric mean should be maintained above or increased to >0.5 within the first 10 years.

Low Elk Emphasis Areas
HEI valves for Cover, Forage, Road Density, and Size and Spacing of cover & forage should be within >0.2 and 1.0 indices.

In addition to elk emphasis areas designated, agreement between the Oregon Department of Fish and Wildlife (ODFW) and the Rigdon Ranger District designated 'high elk use areas' within the Moderate and the Low emphasis areas to be managed with the same elk habitat principles that would apply to the High Elk Emphasis Area. Even though the minimum HEI values might be meet within most of the Low and the Moderate emphasis areas, where 'high elk use areas' exist within these emphasis areas, practices as road closures, forage enhancements, size and spacing of forage and cover, particular thermal cover, should be addresses in similar manner as the habitat variables would be for a

High Elk Emphasis Area. Presently, the 'high elk use areas' which ODFW agreed to are on a paper map at the district and need to be placed into GIS.

Of the Moderate emphasis areas, the percentages of 'high elk use area' are:

Modoc Bull:	40% high elk use area (habitat)
Larison:	40% " " " " "
Windfall:	30% " " " " "
Coffepot Head:	70% " " " " "
Snake Fir:	30% " " " " "
Indian Steeple:	80% " " " " "
Coal Head:	40% " " " " "

The percentages of the Low emphasis areas that have 'high elk use areas' within them haven't been calculated.

Current Condition of Dry Pine High Elk Emphasis Area:
For the Dry Pine High Elk Emphasis Area, after harvest of Boulderdash T.S. and application of prescriptions and KV projects, the HEI valves would be:

HEI Cover:	0.52;	ten year trend: 0.51
HEI Forage:	0.45;	" " " : 0.41
HEI Roads:	0.39;	" " " : 0.39
HEI S&S:	0.89;	" " " : 0.90
Geo. Means:	0.54;	" " " : 0.52

The decreasing trend in HEI Cover would result from continued decrease in thermal cover by program harvest and an increase in hiding cover ingrowth, which tend to weigh down the overall cover index.

The decreasing trend in HEI Forage would result from increasing acreage of lower forage quality, on assumption that less broadcast fuel burning, seeding and fertilization might occur.

For the HEI Roads, about 12 miles are prescribed for closure in the Boulderdash EA, leaving about 30 miles to be closed to meet the target of 1.9 miles of open roads/sq. mile. Currently, there's 83 miles of roads at a density of 3.8/sq mile. A problem that applies to most areas with meeting some desired HEI valves, as road density, is the tradition of using KV funds, which are tied to a specific timber sale area that's only a small part of a larger emphasis area. Infrequent timber sale entries during past several years hinders the ability to apply KV projects and funding across a full ehasis area.

Current Condition of Coffepot Head Moderate Elk Emphasis Area:
For this Moderate emphasis area, after completion of Weeping T.S., Stonepot T.S., and Mocha T.S., and application of prescriptions and KV projects, the HEI valves would be:

HEI Cover:	0.43;	ten year trend:	0.44
HEI Forage:	0.50;	" " "	: 0.42
HEI Roads:	0.46;	" " "	: 0.46
HEI S&S:	0.86;	" " "	: 0.78
Geo. Means:	0.54;	" " "	: 0.48

The decrease in HEI Cover would result from program harvest reducing optimal thermal cover acres in the emphasis area.

The decrease in HEI Forage would result from assumption that less harvested acres in the future would be broadcast burned, seeded and fertilized.

The decrease in the Geometric Mean index would primarily result from decreaing HEI valves for Cover, Forage and Size & Spacing.

The HEI Roads is within parameters, but could enhance the Geo. Mean by lowering the miles of open roads. Currently, there's 3.39 miles of open roads per square mile. The preferable ratio for a Moderate emphasis area is 2.8 miles of open roads/sq. mile, which closure of 14 miles would accomplish.

□Current Condition of Snake Fir Moderate Elk Emphasis Area:□
For this Moderate emphasis area, after completion of Slinky T.S. and applied prescription and KV projects, the HEI valves would be:

HEI Cover:	0.33	Ten Year Trend wasn't conducted for this emphasis area.
HEI Forage:	0.36	
HEI Roads:	0.36	
HEI S&S:	0.77	
Geo.Mean:	0.43	

The HEI Cover value is a result of a high ratio of hiding cover to thermal and especially optimum thermal cover. About 40% of this area is of checker-board private lands. This area has extensive acreages of older managed plantations, on National Forest System (NFS) lands and private lands, that are providing hiding cover. The future trend for HEI Cover should increase slightly in the future as many units of hiding cover grow into thermal cover. However, that trend is not expected to reach >0.4 due the five years left of the first 10 year period and also the low acreage of optimum thermal cover.

The HEI Forage is a result of not enhancing forage by seeding and fertilizing.

The HEI Roads was increased from 0.31 to 0.36 by Slinky T.S's prescription to close 4 miles of roads. Another 5.5 miles of open roads will still need to be closed to reach the desired 2.8 mi/sq.mi density. To acheive that 5.5 miles of road closure requires cooperation with the private land owner, as most of the open roads also provide private land access.

□Current Condition of Gold Low Elk Emphasis Area:□
The current HEI conditions for this emphasis area are:

HEI Cover:	0.38	Ten Year Trend not conducted for this emphasis area.
HEI Forage:	0.37	
HEI Roads:	0.42	
HEI S&S:	0.82	
Geo. Mean:	0.47	

Other Elk Emphasis Areas have not had their HEI values fully assessed. The other two Low Emphasis Areas should easily meet the >0.2 indices. The Gray Low Elk Emphasis Area might be close to the minimum for HEI Forage and S&S, as most of this area is forested. However, the portion of the emphasis area with the higher potential of elk use, Gray Creek drainage, has recent harvest units providing forage. The Gray emphasis area is fully within the LSR, and opportunities to maintain forage and size & spacing of forage and cover may be lacking in the future.

The Packard Low Elk Emphasis Area is about 50% private land, is one large block on the lower half of Packard Creek drainage, contains most of the available winter range, and has been fully harvested of timber, with resulting mix of forage and hiding cover, no thermal cover. A small portion of the winter range of this area consists of the fringe of NFS land along the Hills Creek Reservoir and in Snow Creek. The upper reach of Packard Creek on NFS land is summer range and also fully within the LSR.

The Larison emphasis area needs about six miles of roads closed to meet the desired target of 2.8 miles/sq. mile, and the HEI Forage index should be slightly above >0.4 value. This area is fully within the LSR, and opportunities to maintain forage and size & spacing of forage and cover will be lacking.

Coal Head emphasis area is fully within the LSR, and opportunities to maintain forage and size & spacing of forage and cover will be lacking. However, most elk use in this emphasis area is on summer range toward Calappoyia Ridge where several large meadows will provide forage.

The Modoc Bull emphasis area might currently have difficulty meeting the size & spacing HEI value. The forage acres is mostly one large block resulting from the Shady Beach Fire and following salvage sales. Most of the cover quality is of thermalk and optimum thermal but is located mostly in one area on the north aspect slopes of Bull Creek drainage. Modoc Bull emphasis area is winter range, and optimum thermal cover is desirable on a southern aspect in winter range. The future trend (□>□15 years) is a loss of forage acres.

The Windfall, the Modoc Bull, the Indian Steeple, and the Coal Head moderate elk emphasis areas have open road densities low enough to meet the 2.58 mi/sq. mile maximum for moderate areas.

CONCLUSION; Elk

Elk herds have increased substantially from the reference conditions, due institution of regulated harvest and management of the habitats with provision of distributed pattern of forage and cover. However, the current management objectives for elk emphasis areas will be difficult to meet for the High and possibily the Moderate emphasis areas. Several reasons: Reliance of timber sales scheduling and KV funds; Meeting forage quality objectives with de-emphasis on broadcast burning, seeding non-native forage species; Potential conflicts in meeting road density objectives.

TRENDS; Elk

1) A downward trend for the Dry Pine High Elk Emphasis Area geometric mean, verse an upward trend to an 0.6 valve, due mainly to increasing acreages of hiding cover lowering the HEI Cover values and to reduced forage acreages and quality.

2) A downward trend for the Coffeepot Head Moderate Elk Emphasis Area geometric mean, verse an upward trend to an 0.5 value, due mainly to reduced forage acreages and quality.

3) A downward trend for the Gray, the Larison, and the Packard emphasis areas, due LSR and resulting reductions in forage acreages and size & spacing values.

4) Meeting the 10-year trend objectives for the remaining Moderate emphasis areas may be difficult, also.

5) With current practices, meeting some objectives for elk emphasis may be difficult with meeting some objectives for multiple species and site productivity. Examples: to meet forage quality values, broadcast burning, seeding, and

repeated fertilizer applications are practices; logistics for current emphasis for native plant seeding isn't developed; reduced acres of broadcast burning.

RECOMMENDATIONS:

1) Request Forest Plan amendments to change Larison Moderate Elk Emphasis Area to a low emphasis, due LSR overlap.

2) Further promote program of native seed production.

3) Continue reducing open road miles to meet the elk emphasis areas objectives of 1.9 miles/square mile for the High and 2.8 miles/square mile for the Moderate emphasis areas. For the High Elk Use Areas in Moderates and Low emphasis areas, open road densities would need to be lowered toward the 1.9 miles/square mile objective of a High emphasis area.

CONCLUSIONS

Four elk emphasis areas are above the open road density maximum for desired objectives. A total of 71 miles of open road within these four emphasis areas would need to be closed to meet the desired open road density objectives for habitat effectiveness relating to road density.

Additionally, several of the other Moderate and Low emphasis areas have High Elk Use Areas where roads would need to be closed to meet a Forest Plan agreement with ODFW.

One road within vicinity of a bald eagle nest area has potential for allowing disturbance during nesting season.

TREND

1) A static trend in effects to wildlife species, with a static trend in new road mileage.

RECOMMENDATIONS:

1) Increase habitat effectiveness for deer and elk by closure of open roads to meet the road density objectives for the elk emphasis areas within the watershed. Seventy-one (71) miles of open roads would need to be closed to meet the maximum densities for four elk emphasis areas:
Coffeehead in 21 2: ~14 miles to close; Willow Creek to Buck Creek.
Dry Pine in 21 3: ~42 miles to close; Cone Creek to Deadhorse Creek.
Larison in 21 2: ~6 miles; Larison Creek drainage.
Snake Fir in 21 3: ~10 miles; Snake Creek and Fir Creek drainages.

In addition to the 71 miles of open roads to close within the above elk emphasis areas, High Elk Use Areas within the other elk emphasis areas need to assessed for road closures to meet habitat effectiveness as pertains to open road densities.

2) Close the one open road that's within vicinity of one eagle nest, to alleviate potential disturbance.

3) Change the Moderate Emphasis for the Packard and the Coal Head emphasis areas to Low Emphasis, due the LSR/private land overlaps and projected inability to manage in the future to meet the moderate emphasis HEI objectives.

ISSUE: HILLS CREEK LAKE

HL1 HILLS LAKE AND WILDLIFE MIGRATION BLOCK

REFERENCE

Prior to the building of the Hills Creek Dam and impoundment of the Lake, the 12 miles of river floodplain and riparian habitats served as wintering areas and migration route for many terrestrial wildlife, as deer and elk, and served as a part of the fuller riparian connective corridor of the river system and tributary systems as the Larison, Packard, Big Willow, and Bull creek drainages.

Riparian associated species, as frogs, salamanders, turtles, beavers, otters, inhabited the riparian habitats of the wide floodplain, providing a continuum for interpopulation genetic interchange.

CURRENT

The dam and 12 miles of lake form a barrier for connectivity (dispersal, migration, foraging, and genetic interchange) of many species, particularly the riparian associated species as the white-footed vole.

The elk herds of the Bull Creek, Big Willow Creek and Coffeepot Creek area that once used the riparian habitats and for winter cover and forage now are restricted to the mid-slopes of those drainages for their winters.

The forested slopes around the lake are of upslope, dry forest habitat characteristics, and blocks movement for the smaller, less mobile species as salamanders and mollusks (slugs and snails). More mobile species, as beavers and river otters, are impeded by the lake's 12 miles distance, but likely not fully blocked. Birds which follow the river riparian corridor can still transverse around the lake in the upslope forest habitat.

The western pond turtle, a Sensitive species, that once inhabited the river system, have occupied some of the sheltered cove around the lake, although the lake, with its draw down regime, isn't considered ideal habitat for the turtles. Though of low possibility, maintaining these turtles in the lake provide a potential for genetic interchange between the turtles farther up river and turtle down river below the dam.

The lake has provided suitable foraging habitat for bald eagles, a Threatened species. Presently, two pairs of eagles nest in vicinity of the lake and utilize it for foraging.

CONCLUSION

The Hills Creek Lake and designated riparian reserve impedes migration and travel for most riparian-associated wildlife, due mainly that the riparian reserved provided is steep, upslope forest habitat, verse riparian habitat.

TRENDS

No change

RECOMMENDATIONS

1) Apply silvicultural treatments to the dense, overstocked young conifers between the high pool line and the road system on both sides of the lake to promote growth and canopy structure. Several stretches along the lake that were harvested of timber as preparation for impoundment of the lake have regenerated into dense stands of Douglas-fir. Opening these stands by thinning would hasten their development to large trees with deep canopies and facilitate passage around the lake by those species that can or could utilize the shoreline for dispersal and migration.

2) Windthrow and felled hazard trees should remain in the prescribed riparian reserve around the lake to facilitate overland movement for the less mobile species.

3) Coves which are inhabited by the western pond turtle should be managed to protect the the turtles from plinkers, as providing vegetative screening.

4) Apply habitat enhancement practices within the coves and upslope areas for nesting to maintain a the population within the lake.

4) Management activities within a quarter-mile of such coves need to be assessed for potential impacts to turtle nesting areas.