Upper Middle Fork Watershed Analysis Update 2008

Introduction

This watershed analysis update is designed to supplement the August 1996 Upper Middle Fork of the Willamette River Watershed Analysis and the January 2002 Upper Middle Fork Watershed Analysis Update.

Purpose of the Watershed Analysis Update

Watershed analysis is the process of studying and analyzing watershed information to guide projects and restoration activities in watersheds. The analyses are designed to be living documents. As new information becomes available or is identified, and/or management direction changes, that information is incorporated into the watershed analyses. The initial need for an update of the Upper Middle Fork Watershed Analysis was to incorporate the information from the Watershed Prioritization Process of 2006 and to support the development of Forest Action Plans. Given the limited funding and recent 2002 update, this update focuses on improving the vegetation and transportation databases in order to support the analyses of upland vegetation and wildlife issues not considered in any detail during the past watershed analyses. This update also includes a review of the past recommendations to document which recommendations have or have not been accomplished, whether the recommendations are still valid, and to update the list of recommendations. The following lists of tasks were identified to be accomplished with this watershed analysis update:

1. Update the vegetation GIS database to support the various analysis
2. Update the transportation GIS database to support analysis
3. Analyze the mix conifer forest type
4. Update information on botany (invasive weeds and special habitats)
5. Update information on fire and fuels
6. Analyze road maintenance and closure priorities
7. Update the bull trout information
8. Re-analyze wildlife big game emphasis areas
9. Re-analyze the hydrologic recovery percentages
10. Re-analyze riparian reserves vegetation conditions
11. Update the list of Recommendations (to support the Forest Watershed Action Plans)

Tiering to Past Watershed Analyses

This update tiers to the 2002 Update and 1996 Watershed Analysis. This update provides new information in the form of appendices to those Watershed Analyses. Most of the topics are formatted according to the 6 step process described in the Federal Guide for Watershed Analysis. Also included in the Appendices is an update list of Findings and Recommendations to guide restoration and management projects in the Upper Middle Fork based on new information.

Appendices

Appendix A - Update List of Recommendations

Appendix B - Mixed Conifer Forest Type Analysis

Appendix C – Botany Update

Appendix D – Fire and Fuels

Appendix E – Road Management Analysis and Action Plan

Appendix F – Fisheries – Bull Trout

Appendix G - Big Game Emphasis Area Analysis

Appendix H - Hydrologic Recovery Percentages Analysis

Appendix I - Riparian Reserve Vegetation Conditions

Appendix J – Vegetation Update

Appendix K – Roads Update

Updated List of Recommendations - UMF WA 2008 Update

Mixed Conifer Forest Type Analysis

Somewhere around 2,274 acres of closed canopy, mid-development young forest and 7,648 acres of closed canopy late-successional forest need to be treated in some fashion to make them considerably less dense. See Appendix B, Table 1, page 13 *(Reference 9e, 17a, 21a, 35a, 35c,35d, 43a)(references the number given to recommendations from previously WAs)*

A Forest Plan amendment is recommended to create a Management Area with the goals and objectives for restoring and maintaining an open forest type for biodiversity enhancement.

Prioritize treatment in areas not encumbered by conflicting land uses such as Critical Habitat Units or Late-Successional Reserves.

The areas to focus on would be the northwestern portion of the forest type; that area from Deadhorse Creek to Hill's Creek Reservoir which includes the Buck, Cone, Estep, Pine, Boulder, and Young's Creek drainages. Additionally, the Jim's Oak Patch and surrounding area (the lower portions of the Coal and Indian Creek drainages) should also be considered for immediate restoration.

There are also several areas outside the contiguous Mixed Conifer forest type (and hence outside of the Seral Stage Condition Class analysis presented above) that exhibit similar vegetative characteristics and are not encumbered by other land use classifications. Those areas could generate some biodiversity benefits if restored, but would likely not have a large effect on the Fire Regime Condition Class of the landscape. These areas include portions of the Willow, Little Willow, and Bull Creek drainages east of the Hill's Creek Reservoir, and the areas adjacent to and including Packard Creek Campground on the west shore of the Reservoir.

Botany

Non-Forested Special Habitats Recommendations

- Use prescribed burning to keep the disturbance regime in fire maintained special habitat communities as long as mitigation against increasing noxious weeds can be effective. (*Reference 17a, 27*)
- Target non-forested special habitats for noxious weed survey and control using mechanical, biological and chemical methods within guidelines set by the Willamette National Forest's Integrated Weed Management Environmental Assessment (March 2007)
- Restore and maintain special habitat areas. (*Reference 20*)

Specific Area Recommendations
The areas below are specific recommendations. Other areas that are recommended for treatment are special habitats in the Buck Creek 5th field watershed, Little Willow Creek and any planning area that has these features.

Calapooya Divide

- Reconnaissance of these meadows is needed to plan treatment methods and priorities.
- Use whip felling, tree falling, broadcast burning, and seeding with natives to restore meadows.
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Grassy Glade Meadow

- Manually pull St. John's wort, cut and chemically treat the isolated blackberry patch along the road side. Cut and scatter conifers under 10" dbh around the meadow edge and along the fingers of the meadow.

Bear Mountain Meadow

- Visit to decide treatment methods.
- Treat weeds, increase big game forage, possibly cut encroaching conifers around meadow edge.

Rigdon Point

- This area should be visited and surveyed by fire, botany, ecology and silvicultural personnel to determine possible treatments to increase habitat for knobcone pine.

Botanical Species

- Most of the watershed has not been surveyed for sensitive species. Inventory and document sensitive species sites during project planning.(*Reference 31*)
- Monitor known sensitive plant locations to insure that their habitats are being maintained for the persistence of the species. .(*Reference 31*)
- Control or eradicate invasive species, remove vehicle access to sensitive plant sites, and manage vegetation to maintain sensitive species habitat.
- Restore and manage potential habitat for sensitive species.

Botanical Species Distribution Recommendations

(*Reference #33)*

- Most of the watershed has not been inventoried for non-native species. Inventory and document invasive species.
- Species that are new invaders to the watershed will be targeted for eradication. Established weed populations will be prioritized for treatment and treated.
- Noxious weeds will be controlled using mechanical, biological and chemical methods within guidelines set by the Willamette National Forest's Integrated Weed Management Environmental Assessment (March 2007).
- Roads that are listed for closure in this analysis and update will be surveyed and pre-treated for invasive plant species.
- Invasive plant species in the Hills Creek Reservoir area will be treated in accordance with the related plan (Hills Creek Reservoir Plan 2008).

Re-vegetation Recommendations

- Genetically appropriate (local) native plant materials are the first choice for restoration and rehabilitation where timely natural regeneration of the native plant community is not likely to occur. *National Policy is Forest Service Manual Chapter 2000, Chapter 2070- Vegetation Ecology 1/14/08*
- In 2005 the *USDA Forest Service Decision Notice for Pacific Northwest Region Invasive Plant Program Preventing and Managing Invasive Plants, ROD* amended our Forest Plan to include Standard 13: "Native plant materials are the first choice in revegetation for restoration and rehabilitation where timely natural regeneration of the native plant community is not likely to occur."
- Use native local genetic seed as the first choice when seeding any areas. Use weed free or native straw for mulch.
- Areas that are disturbed from maintenance

Fire and Fuels

Prescribing controlled burning in timber harvest areas where dead/down fuel loadings are not excessive and residual trees are fire resistant species and >15"dbh. **(**Vegetation Condition and Pattern—Fire Process (p.104 of 1998 document)

Road Management

See Appendix D for listing of recommended road work.(reference

Fisheries

1). Continue Phase II and III work at Indigo Springs to provide bull trout passage at Rd. 2100 and complete the new spawning channel reference(*Reference 3c*).

a) Phase II will complete the upstream portion of the spawning channel.
b) Phase III connect the upper spawning channel with lower channel by competing a passage structure under Rd 2100.
c) Continue to develop Indigo Springs into an outdoor education arena where the public can witness bull trout in the wild.

2). Continue LWM placement in the MFW and tributaries occupied by bull trout and spring Chinook salmon (*Reference 4, 5a, 5b, 5c, 48a, 49b*))

a) Swift Creek, from confluence of Bear Creek to confluence with Middle Fork Willamette (three miles of habitat).
b) Bear Creek, from confluence with Swift Creek upstream to Rd 2149 crossing (two miles), if it is determined that bull trout continue to use these sections.

c) Echo Creek from the confluence with Middle Fork Willamette upstream two miles.
d) Middle Fork Willamette River from confluence of tumblebug Creek to Sand Prairie Campground.
e) Staley Creek, from confluence with Middle Fork Willamette upstream two miles.

3). Continue to close high risk roads that were identified in ATM and focus on areas around high quality bull trout and salmon habitat (*Reference 3f, 14, 50b,).*

a) list in spreadsheet the red roads in the three polygons from the 2002 WA update.
b) Field truth roads deemed high risk and focus on roads with greatest potential to contribute sediments to the stream network.

4). Analyze historic data and information to better understand what the river system looked like historically. Understand when we have reached a "completed" level in adding wood to the MF (Reference 3g).

5). Monitor bull trout populations annually. Continue PIT tag tracking program to monitor adult spawning populations and trapping operations for juveniles (Reference 1b, 3g,).

6). Complete repair, removal or replacement of top ten impassable culverts (see Map 1) (*Reference 3e*)

a) Indigo Spring Rd. 2100
b) Buck Creek Rd. 2100
c) Upper Coal
d) Lower Coal Rd. 2134
e) Windfall Rd. 2117
f) South Fork Staley Creek
g) Noisy Creek Rd. 2100
h) Simpson Creek Rd. 2135-283
i) Bear Creek Rd. 2149
j) Gold Creek Rd. 2117.138

7). Continue to transfer genetic material from the McKenzie watershed to ensure a prolonged and viable bull trout population.

8). Asses bull trout usage of Hills Creek Reservoir and other areas such as Hills Creek Watershed.

9) Conduct habitat modeling exercise to show all habitat favorable to bull trout life cycle in the watershed.

10) Maintain Human use statement and Wild and Scenic options as listed in WA pg 103

Big Game Habitat Management

The top five big game emphasis areas recommended for road closures are:

1. Upper Staley and Lower Staley
2. Buck Creek 6th
3. Coffeepot Creek
4. Paddy's Valley
5. Swift Creek

Hydrologic Recovery Percentages

The following tables present an updated analysis of the hydrologic aggregated recovery percentages for the Forest Plan planning subdrainages in both the Upper Middle Fork and Hill Creek Reservoir watershed.

PSUB #	PSUB Name	Forest Plan Mid Point ARP	Current 2008 ARP	
187	Hatchery	70		
18A	Oakridge	60		
20A	Montieth Rock	75		
211	Deadhorse	75		
212	Indian South	70		
213	Rigdon	70		
214	Coffeepot	70		
215	Waterdog	70		
216	Emile Fir	75		
217	South Packard	75		
218	Coal Fork	70		
219	Gold	75		
21A	Modoc	65		
21B	Willow	70		
21C	Coffeepot Head	75		
21D	Powder Buck	70		
21E	Cone Bills	70		
21F	Dry Pine	70		
21G	Young	70		
21H	Deadwood	65		
21I	Steeple	70		
21J	Coal Center	70		
21K	Coal Head	70		
21L	Indian North	70		
21M	Spring Snake	75		
21N	Bohemia	75		
21P	Windfall	75		
21Q	McFarland	75		
21R	Packard North	75		
21S	Stony Snow	75		
21T	Packard Cove	75		
21U	Larison Head	75		
21V	Larison Mouth	75		
21W	Lower Larison	75		
21X	Major Alias	75		
21Y	Gray Deception	75		
21Z	Chilly Spot	70		
22A	CT Beach	70		

PSUB #	PSUB Name	Forest Plan Mid Point ARP	Current 2008 ARP	
231	Potter	70		
232	Laura's Neighbor	70		
233	Umpqua Staley	65		
234	Rigdon Point	70		
235	Spider Plus	70		
236	Little Dome	65		
237	River	70		
238	Calapooya	70		
239	Dome	70		
23A	Warner Simpson	70		
23B	Simpson	70		
23C	Noisy Head	65		
23D	Noisy Mouth	75		
23E	Coulee Moss	70		
23F	Swift Head	65		
23G	Bear	65		
23H	Lower Bear	65		
23I	Indigo Skunk	75		
23J	Corrigan Gulch	65		
23K	Emmigrant Beaver	65		
23L	Paddy's Center	75		
23M	Paddy's Valley	75		
23N	Start O' Willamette	60		
23P	Tumblebug	65		
23Q	Douglas Lane	70		
23R	Gorge	70		
23S	McGowan Tumble	65		
23T	Lighthouse	65		
23U	Grassy Echo	75		
23V	Echo East	70		
23W	Echo Start	60		
23X	North Fork Lizard	65		
23Y	South X	60		
23Z	Staley South Fork	65		

The following subdrainages are recommended to having the midpoint ARP percentages i

Riparian Reserve Vegetation Conditions

6th field Subwatershed				
Buck				
Coal				
Echo				
Gray				
Larison				
Packard				
Paddy's Valley				
Pioneer Gulch				
Staley				
Swift				

The top three sub-watersheds recommended for silviculture treatments in the Riparian Reserve to improve stand conditions are:

1. Buck
2. XXX
3. XXX

Upper Middle Fork 2002 Update Recommendations

Ref #	Recommendations	Status
	Bull Trout Habitat	
1a	Complete NEPA and repair the Echo Creek culvert.	Completed
1b	Conduct annual surveys to identify and map primary Bull Trout spawning and rearing habitat in the Middle Fork from below the gorge to Swift Creek. Monitor spawning populations.	Completed, Ongoing
1c	Conduct a groundwater surveys to identify and map upwelling areas that could be used by Bull Trout in the Upper Middle Fork watershed.	Completed, Ongoing
	Bull Trout Recovery	
2a	Implement the U.S.F.W.S. Bull Trout Recovery Plan.	Working with template, still valid
2b	Key elements to be implemented on the District include protection of 'high quality habitat, reduction in road densities, barrier removal, adaptive management, and monitoring.	Ongoing
2c	Increase efforts in public education through information/interpretation of the Bull Trout fishery with emphasis in the high quality habitat areas.	Ongoing
2d	Explore opportunities to evaluate special emphasis areas around high quality Bull Trout habitat.	Still valid
	Bull Trout Threats and Restoration	
3a	Complete District road analysis using the map generated in figure 3-1 as a guide prioritizing road systems that are directly tributary to Bull Trout habitat. These are areas delineated in the "High Quality Habitat".	Completed
3b	Develop a road maintenance plan.	Ongoing
3c	Apply for watershed restoration grants to obtain funding Bull Trout habitat restoration (pp. 7).	Completed, Ongoing
3d	Encourage partnerships and collaborative efforts that facilitate fish passage around the dams located below the watershed.	Ongoing
3e	Repair two sites on Swift Creek and one on Echo Creek, for fish passage. The remaining 9 will be treated to support fish passage in the future. All are scheduled for replacement as funding becomes available.	Swift and Echo completed, 7 still valid
3f	Prioritize funding in the sixth field watersheds 23-6, Echo Creek and 23-5 Swift Creek, which have higher road	Completed

Ref #	Recommendations	Status
	aquatic risk ratings	
3g	Conduct annual surveys to identify and map primary spawning and rearing habitat. Continue to monitor to determine if temperature is an issue in these areas	Completed, Ongoing
3h	Continue to work cooperatively with state arid federal agencies	Ongoing
3i	Utilize riparian silviculture treatments (density control) to encourage development of future large wood	Limited acreage completed in thinning, Still valid
3j	Utilize density management treatments in 35-80 year old stands to encourage stand structural development, complexity (snags and downed wood), favor minor species, under-planting, reduce fire risk, and reduced risk of loss from insect and disease damage.	Limited acreage completed in thinning, Still valid
3k	Monitor use of the known dispersed recreation sites listed in high quality Bull Trout habitat.	Completed, Ongoing
3l	Where appropriate, apply riparian silviculture treatments to enhance stream shading vegetation, this can include planting, thinning, and fertilization.	Still Valid
3m	Complete the Middle Fork water quality restoration plan.	Completed, Ongoing
3n	Work collaboratively with other agencies to improve public awareness of bull trout value and habitat restoration by placing interpretive signs at dispersed campsites.	Completed, Ongoing
	Bull Trout Refugia	
4	Focus large wood restoration in/around high quality habitat refugia.	Completed, Ongoing
	Large Woody Material	
5a	Implement large woody in-stream projects that focus on full tree lengths where root wads are attached. Projects to introduce big wood (>24”) are needed in reaches 5, 8, 11, and 14; corresponding to the reaches Staley Creek to Swift Creek, Tumblebug Creek to Middle Fork gorge, and Lower Paddy’s Valley.	Completed, Ongoing
5b	Using adaptive management, experiment with different methods to hold wood jams in the Upper Middle Fork river channel.	Completed, Ongoing
5c	Modify upland woody debris levels based on Fire history (p.36) in the Upper Middle Fork watershed, Northwest Forest Plan ROD (ROD C-40). Opportunities to vary the woody debris requirements in the Upper Middle Fork would follow levels outlined in the table.	Still Valid, Ongoing (with info from DECAID)
	Bull Trout Riparian Reserve	
6	Retain current riparian widths using average forest site tree widths.	Completed,

Ref #	Recommendations	Status
		Ongoing
	Hydrologic Recovery Rates	
7	Conduct intensive site-specific analysis and cumulative effects analysis when proposing to reduce crown closure within the 23-6 watershed (Willamette National Forest Plan, Appendix E).	Still Valid, Ongoing
	Slope Stability	
8	At the extensive inventory level: use the 1996 Watershed Analysis mapping that provides a sixth field landscape analysis of the Upper Middle Fork slope stability. This analysis is contained in the Upper Middle Fork WA, 1996, Appendix A. At the intensive project level, complete field inventories of soil stability.	Still Valid, Ongoing
	LSRs and Riparian Reserves	
9a	Implement prescriptions that emphasize species diversity and near term development of large wood sources for future in-stream wood in riparian and downed woody in the upland matrix habitat. Habitat structure, vertical diversity, connectivity and late-successional stand characteristics can be enhanced using variable density management prescriptions. (p.54)	Limited acreage completed in thinning, Still valid
9b	Monitor response of riparian thinning in terms of stand growth, understory development, and vigor. Adjust thinning schedules so that riparian treatments rotate through landscapes as treated stands close canopy. Adjacent stand riparian areas need IDT analysis if treatment is planned within 10 years of each other for cumulative effects.	Still Valid, Ongoing
9c	Heavy thinning treatments in riparian reserves and late successional reserves need to be considered, (20% RD), where suppressed shade tolerant seedlings and saplings exist, for release of understories.	Limited acreage completed in thinning, Still valid but constrained during other federal agencies consultation
9d	There may be secondary needs for this heavy thinning treatment, such as across landscapes in designated future connectivity corridors in the upland matrix (Swift Creek, and Pioneer Creek).	Limited acreage completed in thinning, Still valid but constrained during other federal agencies consultation

Ref #	Recommendations	Status
9e	Many silvicultural prescription alternatives exist on droughty, Douglas-fir climax sites. This includes mechanical removal of competing Douglas-fir. This could be done in groups or over stands areas or localized around residual ponderosa and sugar pine. A treatment zone of 75' from the drip line of large over story mixed conifer pine in the Upper Middle Fork is a second option i LSRs or s areas. This treatment needs to be accomplished across the mixed conifer forest type (to create growing space and seedbed for pine regeneration. Mechanical treatment will be necessary). A range of 70-120 (<63 Ft^2) B.A. ft. could be the target stocking where entire stands are treated. In LSRs it may be necessary to cut green trees in the co-dominant and intermediate crown class to get stocking low enough to reduce competition. In riparian reserves, some partial cutting is also judiciously prescribed around over story pine. Repeated under-burning is needed in this type.	Partially completed with Jim's Creek Project in adjacent watershed and with Rx adjustments, Still Valid, Needs Update.
9f	Due to elevated fuels accumulation and fuel ladders across the Upper Middle Fork, mechanical removal of green trees and slash will be needed before repeated under-burning can be accomplished. Subsequent thinning of the understory can be accomplished with a drip torch.	Completed with Jim's Creek Project, Still Valid, Update
	Partnerships	
10a	Follow the USFWS Draft Bull Trout Recovery plan pertaining to monitoring.	Completed, Ongoing
10b	Continue with inter-agency monitoring, collaborative learning; and public participation efforts.	Completed, Ongoing
	Lynx Habitat	
11	Acceptance of the Lynx Biology Team recommendation and current direction results in exemption from conservation measures listed in the LCAS as they may have applied to the small amount of acreage that otherwise met the criteria for lynx habitat within watershed 23 or elsewhere on the Forest. However, if lynx are detected, consultation on that site-specific project will be initiated with FWS to ensure protection of the individual under provisions of the ESA.	De-emphasized, Ongoing
	Threats to Forest Carnivores	
12a	Evaluate future transportation projects (road and trail) following a process, such as that outlined by Youmans (1999), as a step towards reducing the potential for adverse impacts to rare forest carnivores.	Still Valid
12b	Incorporate considerations regarding impacts to rare native forest carnivore habitat into the District Road Analysis process when evaluating transportation systems in the watershed.	Completed, Ongoing
12c	Because of the importance of large mammals as principle prey species in the diet of rare native forest carnivores (particularly wolverine), follow through on recommendations made in the 1996 Watershed 23 Analysis pertaining to road closures necessary to meet current elk emphasis area Standards and Guidelines.	Still Valid, Ongoing

Ref #	Recommendations	Status
12d	Increase emphasis for road closures to enhance big game populations and to bring open road densities into compliance with current Forest Plan Standards and Guidelines.	Still Valid, Ongoing
12e	With respect to management practices that would result in long-term beneficial effects for rare native forest carnivores such as fisher and wolverine, continue to consider the recommendations presented in the 1 996 Watershed 23 analysis (pp 103-1 06) pertaining to stand characteristics, fragmentation and interior forest habitat, upslope and inter-drainage connectivity, riparian reserves, terrestrial large woody material, non-forested special habitats and wildlife species.	Still Valid, Ongoing
12f	Consider and incorporate management practices that recognize specific habitat requirements of prey species for fisher and wolverine in future vegetation management planning	Still Valid, Ongoing
12g	Management supporting the viability of rare native forest carnivore species such as fisher and wolverine cannot be accomplished within a single 5 field watershed such as the Upper Middle Fork of the Willamette. Because these species have extremely large home ranges in proportion to their body size, and considering that the largest ranges may occur in the poorest quality habitat (Powell and Zielinski 1994), effective management for these species will ultimately require a coordinated ecosystem approach across the landscape. II is recommended that managers better address this approach through a strategy such as that presented by Heinemeyer and Jones (1994) or Lyon et al. (1994) by integrating a planning process modeled on Youmans' (1999) that is responsive to applicable regulation and policy (Joslin 1999).	De-emphasized, Ongoing,
12h	It is recommended that surveys to detect the presence of fisher and wolverine be initiated in order to establish a current understanding of occupancy by these rare native forest carnivores in Watershed 23.	Still Valid
12i	It is recommended that a review be conducted of existing Willamette National Forest Standard and Guidelines for Management Areas 2a and 2b, as well as OCRA Management Plan Direction, and action taken to resolve conflicting objectives with respect to wolverine habitat management.	Still Valid
12j	Evaluate future recreation projects following a process such as that outlined by Youmans (1999) as a step towards reducing the potential for adverse impacts to rare forest carnivores.	Still Valid
12k	A prioritized approach to future management activities within Watershed 23 is recommended that would respond to the rank of potential wolverine denning habitat zones (1 watersheds) based on the current assessed level of impacts to habitat.	Still Valid
12l	Limits of Acceptable Change (LAC) inventories of dispersed recreation sites throughout Watershed 23 (particularly in 6t1 fields 23-3 and 23-5) should be completed and reviewed to identify where potential negative impacts to rare native forest carnivores may exist, It is recommended that an interdisciplinary review of LAC inventories identify potential areas for obliterating as a step towards reducing the potential for human disturbances i fisher and wolverine denning habitat.,	Still Valid, Needs Update

Ref #	Recommendations	Status
	Northern Spotted Owls Habitat and LSRs	
13a	Continue to assess need and implement projects that would reduce the potential for catastrophic disturbance, especially fire, within LSRs R0221 and 222. These LSRs will be important in the future in providing habitat for the spotted owl, especially as projects continue to alter or remove suitable habitat in matrix lands. From a vegetation standpoint, a significant portion of this watershed exists in mixed conifer stands, more indicative of forest conditions to the south in the Southern Oregon Klamath Province. The ROD identifies the need to take additional measures in those LSRs where levels of risk are particularly high. "Consequently, management activities designed to reduce risk levels are encouraged in those Late-Successional Reserves even if a portion of the activities must take place in currently late-successional habitat (USDA, 1994)."	Still Valid
13b	Assess fuel loadings adjacent to these areas and establish priorities for treatment of those fuels where loadings and risks are high for potential loss of reserved LSRS habitat. Higher priority areas to treat may be in mixed conifer stands with evidence of frequent historic fire occurrence or late-successional forest stands with high fuel loadings.	Still Valid
13c	As site-specific planning is implemented in the watershed, consider silvicultural prescriptions that might degrade instead of downgrade (for instance moving from nesting habitat to foraging habitat); or remove suitable habitat (where it still functions as habitat). Consider these prescriptions as treatments in designated critical spotted owl habitat	Still Valid
13d	Consider harvest areas that would avoid blocks of nesting habitat as identified in Figure 14-3 in the short term (10-30 years). If entry is necessary in these blocks, consider entry into smaller blocks first, while maintaining the larger, more contiguous nesting habitat as alternative core areas in case of LSRS loss. Consider entry into foraging habitat first and reduce impacts to NRF habitat. Consider maintaining blocks that are immediately adjacent to known spotted owl activity centers as priority. As the riparian reserve system begins to function as intended in the NWFP, maintaining blocks of habitat outside of the RR system may not be as critical in the long run.	Still Valid

Upper Middle Fork 1996 Recommendations

Ref#	Recommendations	Status
	Roads Conditions, Density, Use and Location	
	Process, Habitat and Species	
14	The following roads, with potential problems and high to moderate priority culverts, listed in Table 23, are recommended for further evaluation through the District Road Analysis process. The issues associated with the roads center around elk use in the area, resident fish passage, and sediment run-off and routing into the streams. See Table 23. Road management opportunities related to road density, age and location	Needs Updating
	Wildlife Species	
15a	Reassess Forest Plan Elk emphasis area concept, associated standards and guides, and the verbal agreement with ODFW to determine their compatibility with management direction provided by the 1994 NW Forest Plan Amendment (the President's Forest Plan). As a result of the 1994 NW Forest Plan Amendment, changes in land allocations and reduced timber management in Matrix reduce the ability to meet S & G's for elk habitat management Lack of documentation and official approval of the 1990 verbal agreement presents a lack of mutual understanding of intended objectives and implementation of the verbal agreement. This agreement needs to be revisited with ODFW.	Needs Updating - Revisit Agreement on High Elk Use Area (HEUA)
15b	Table 24. Road closures necessary to meet elk emphasis, Forest Plan S & G's.	Needs Updating - Revisit Agreement on High Elk Use Area (HEUA)
	Human Use	
16a	Implement as budget allows, Forest Plan recommendations for additional trails, including barrier free trails, to disperse recreation use. Begin planning of the proposed Middle Fork and Staley Creek barrier free trails and fishing platforms to provide additional physically challenged use opportunities. These will help disperse use and provide greater variety of experiences for users.	Partially Completed, Still Valid
16b	Upgrade spur road into Lizard Lake to reduce surface erosion; re-vegetate degraded bank and dispersed roads, and block vehicle access at lake edge.	Still Valid

Ref#	Recommendations	Status
16c	Prepare a re-vegetation plan for Indigo Springs Campground.	Still Valid
16d	Complete inventory of dispersed sites and prioritize restoration o	Still Valid, Ongoing
16e	Inventory spurs roads as far as need for recreation access. Determine if they are consistent with the Aquatic Conservation Strategy.	Still Valid
16f	Inventory existing facilities to determine if they are consistent with Aquatic Conservation Strategy Objectives.	Still Valid
16g	Evaluate dispersed sites location, riparian condition, and vehicle access, for improved management of Riparian Reserves and human use.	Still Valid
16h	To maintain access to campsites and trailheads, it is recommended that the following roads remain open: RD 21, 2154, 2134, 2134-250, 2134-251, 23, 2149, and 2160.	Review District Road Analysis
	Vegetation Condition and Pattern	
	Fire Process	
17a	Restore historical ecological processes by: • Prescribing controlled burning to restore and retain fire-maintained non-forested special habitats and their zone of influence in historical conditions. • Prescribing controlled burning in non-harvest allocated forest habitats (such as LSRs) to re establish open stand characteristic where site-specific analysis determines and ecological need to maintain these conditions. Prime candidates for consideration would be upland Douglas fir stands on slopes less than approximately 60%. (Consider larger block management to provide for future interior habitat i.e., harvest several 100 acres blocks to simulate historic overstory conditions) • Developing a prescribed natural fire plan (PNC) for high elevation habitat (silver fir, mountain hemlock and lodgepole pine) in non-harvest allocations.'	Still Valid, Ongoing Needs Updating given constraints of consultation Still Valid, Ongoing
17b	Treat for fire management objectives by: • Breaking up contiguous fuel loading patterns in matrix allocations. • Reducing fuel loading in: ➢ Doug fir stands which are fuel model 10 or high fuel model 8 with heavy load of ladder fuels ➢ High elevation stands which are fuel model 10 ➢ Western hemlock stands which are fuel model 10 and occur in large contiguous blocks or steep terrain	Still Valid, Ongoing Still Valid Still Valid Still Valid
	Erosion Process & Hydrologic Recovery	
18	Table 25. Percent hydrologic recovery through time as compared to pre-management hydrologic recovery range	Needs Updating

Ref#	Recommendations	Status
	of 73-80 percent, as indicated by forest type mapping in 1947 and 1949.	
	Channel Processes	
19a	V4/B Moderate Gradient Step/Pool Channels in Alluviated Mountain Valley Segments F3/C, wide main stem valley response reaches express high to moderate sensitivity to peak flows, It is recommended that: • Retain integrity of downed trees in the floodplain be retained whenever possible. • Use whole trees with root wads and branches attached to add and retain CWM. • Reconnect and enhance historic side channels	 Still Valid, Ongoing Still Valid, Ongoing Still Valid, Ongoing
19b	F4/B Moderate Gradient Step/Pool or Pool/Riffle on Alluvial/Colluvial Fans A loss of floodplain connectivity has occurred in Swift Reach 1. Reduction of riparian functions from vegetation removal by harvest and flood is apparent in other step/pool dominant streams in alluvial or colluvial fans. To alleviate this occurrence it is recommended to: • Reconnect and enhance side channels in Swift Reach 1 Lower retention of CWM in Staley Reaches 2 and 3 due to riparian impacts from harvest and floods is evident. In addition, fine sediments are accumulating in S. Fork Staley Reach 4. To alleviate this occurrence it is recommended to: • Careful replication of natural debris jams in Staley Reaches 2 & 3 • Monitor fine sediment accumulation especially in restored section of S. Fork Staley Reach 4 • Locate and reduce fine sediment input to S. Fork Staley Reach 4	 Needs Updating Needs Updating Needs Updating Needs Updating
19c	Ul/C-U2/B Moderate to Low Gradient Pool/Riffle Channels in Glaciated U-Shaped Valleys Supply of coarse and fine sediment may be approaching transport capacity in response segments located in cascade and step/pool dominant streams in u-shaped trough valleys, due to increases from erosive soils, roads run-off and unstable banks. Near-term CWM recruitment is has been reduced through harvest and past floods, reducing floodplain connectivity. It is recommended to: • Construct a sediment budget for the watershed which accounts for input, storage, transport, and output • Monitor channel adjustment through time	 Needs Updating

Ref#	Recommendations	Status
	• Reduce sediment input from high risk roads • Maintain floodplain connectivity	Still Valid, Ongoing Still Valid, Ongoing Still Valid, Ongoing
19d	VIIA Steep Confined Step-Pool/Cascade Channels in V-Shaped Moderate Gradient Valley In cascade dominant streams in v-shaped moderate gradient valleys transport segments, accumulation of fines in upper reaches maximizes potential for downstream cumulative impacts. It is recommended to: • Locate sources of fine sediment and reduce input • Monitor fine sediment in channel	Still Valid, Ongoing Still Valid, Ongoing
19e	V2/A Step-Pool/Cascade in V-Shaped High Gradient Valleys In cascade dominant streams in v-shaped moderate gradient valleys, anomalous accumulation of fine sediment in high energy channel types may have occurred. The streams position in upper channel network maximizes the potential for downstream cumulative impacts. It is recommended to: • Investigate to confirm data • Monitor and reduce sediment input as above	Still Valid, Ongoing Still Valid, Ongoing
19f	MI/B Moderate Gradient Step-Pool Channels in Moderate Slope Bound Valleys Step/pool habitats in moderate slope bound valleys exhibit long stretches of subsurface flow. It is recommended to: • Study unique hydrologic characteristics	Still Valid, Ongoing
19g	H3/A Cascade Channels in Very High Gradient Headwaters Cascade dominant channels in very high gradient headwaters are located in very high gradient headwaters. Sensitivity varies with channel stability and bank materials. It is recommended that the sensitivity of the reaches be evaluated on a site specific basis.	Still Valid, Ongoing
	Wildlife Habitat	
	Stand Characteristics	

Ref#	Recommendations	Status
20	Structure and composition of many stands has been altered by fire suppression and timber harvest. Management activities which favor structure and composition naturally occurring in these sites should be utilized. • Continue promoting stands of mixed conifers and hardwoods for maintaining a greater diversity of wildlife guilds. • Thin managed stands. In LSRs design prescriptions to promote stand structure and composition predictable for the location. In matrix lands, design prescriptions which provide a diverse array of habitat types to meet the needs of a larger number of wildlife species.	Still Valid, Ongoing Still Valid, Ongoing
	Fragmentation & Interior Forest Habitat	
21a	Timber harvest activities and associated road building have contributed to a landscape which is uncharacteristically fragmented, with interior forest under-represented compared to reference conditions. To move towards historical conditions: Within the scope of the Forest Plant, consider larger block management in harvest program to promote larger interior habitat blocks in future managed forests, thus providing habitat to maintain a greater number of wildlife species. • In gentle sloped areas (< approximately 60% slope) which were previously large blocks of open forest, consider harvest openings of several hundred acres in size with GTR/WLT simulating historic residual overstory conditions. Design future harvests to incorporate previous harvest units to form large blocks. • In steeper terrain (> approximately 60% slope) which were typically mosaics of denser forest with common 100-150 acre gaps and occasional 500+ acre gaps, consider a variety of harvest units sizes from small to several hundred acres with GTR/WLT clumped to simulate natural residual overstory conditions Within the scope of the Forest Plan, for the three large blocks of interior forest habitats (Lighthouse Rock, Bear Mountain, and harvest-allocated portion of Tumblebug Creek confluence, schedule harvest in this watershed to postpone entry into these large blocks, while promoting other large blocks of interior habitat, though of younger age (S&G FW-	Still Valid, Ongoing (~Jim's Creek) Still Valid Still Valid, Ongoing
	Upslope Forest Connectivity:	
22a	Upslope connectivity has been altered in the Swift Creek drainage, in the section of Middle Fork Willamette above the confluence with Pioneer Creek, and in the matrix allocation of the Calapooya Ridge. To maintain connectivity in these areas while adjoining managed stands develop into forested habitat conditions, consider:	

Ref#	Recommendations	Status
	• In Swift Creek drainage, schedule harvest to retain the remaining mature and old growth forest patch that provides connectivity across Swift Creek, joining the Juniper Ridge side on the north to the Bear Mountain side on the south; S&G FW-206.2. • Along the Middle Fork Willamette River in the vicinity of Beaver Creek drainage, schedule harvest to retain the remaining mature/old growth forest patch that provides connectivity across the river, joining the Diamond Peak Wilderness side on the north to the Happy Prairie Ridge side on the south; S&F FW-206.2 • Along the Calapooya Ridge in Matrix allocation, timber sale analyses should assess the rate and distribution of harvest in relation to connectivity needs of wildlife associated with the high elevation habitat types (SG FW-206.2)	Still Valid, Ongoing Still Valid, Ongoing Still Valid, Ongoing
	Inter-drainage Connectivity	
23a	Inter-drainage connectivity has been fragmented by previous management activities; inter-drainage connectivity map identifies potential key areas to consider management for present and future connectivity between drainages. Project analyses should reference this information as a starting point, and also further validate and refine this information. Specific recommendations to maintain and enhance inter-drainage connectivity function are: Implement practices which promote future inter-drainage forested connectivity such as: • Design future harvesting to establish similar-aged forested environment across the ridgeline; this might include harvested leave strips between old harvest units to establish a single large block. • Design placement of GTRs, WLT and CWM in association with future harvest units. • Utilize non-harvest allocations and non-suitable lands in connectivity corridor design. During project analyses, prioritize inter-drainage ridgeline connections and design projects that best maintain current inter-drainage connectivity while other connections recover from past management activities. During project analyses, identify and prioritize inter-drainage connections affected by past management activities and which could be further managed for providing future inter-drainage connectivity.	Still Valid, Ongoing Still Valid, Ongoing Still Valid, Ongoing Still Valid, Ongoing

Ref#	Recommendations	Status
		Still Valid, Ongoing
	Riparian Reserves: Connectivity	
24	Projected timber harvest within Matrix lands will continue to fragment connectivity across ridgelines between adjacent drainages faster than young ridgeline stands recover into functional connectivity corridors, increasing the reliance on Riparian Reserves to provide connectivity functions. • Based on site analyses and ACS, treat to promote late successional structure in Riparian Reserve lands which are managed stands or second-growth stands lacking structural diversity such as multi-layered canopy and coarse woody material. • During recovery of the Riparian Reserves' connectivity function, timber sale analyses should assess the scheduling of harvest in relation to maintaining corridors or large blocks of mature and old growth between the large Late Successional Reserves and the Cascades Crest.	Still Valid, Ongoing Still Valid, Ongoing
	Riparian Reserve: CWM Recruitment	
25	Riparian vegetation is critical for stability of erodible banks and bars, maintaining side channels, recruitment of CWM into the stream channels, and maintaining stream temperatures. These managed stands typically have a denser understory than natural stands. To alleviate these conditions, it is recommended that the managed stands be thinned to appropriate levels to restore CWM recruitment, stream bank stability, and stream shading functions. In addition, trees in natural stands may be felled to facilitate stream recovery due to past management or flood effects. High priority given to Sub-watersheds where stream temperatures are elevated. Specifically: • Enhance the Riparian Reserve toward MOG mixed conifer/deciduous stands	Still Valid, Ongoing
	Large Woody Material in the Terrestrial Setting	
26	• During site-specific project planning, identify priority areas which are deficit in CWM where reintroduction or promotion of CWM would be needed to meet specific ecological objectives se as connectivity or riparian function. • The 1990 Forest Plan Standards for CWM were based on p associations, and appeared to reasonably reflect the natural occurrences of CWM. During project analyses, use site specific information on habitat type of DECAID to develop CWM prescriptions.	Still Valid, Ongoing Needs Updating

Ref#	Recommendations	Status
	Non-Forested Special Habitats	
27	• Use prescribed burning to keep the disturbance regime in fire-maintained special habitat communities. • Target non-forested special habitats for noxious weed survey and control using mechanical, biological and chemical methods within guidelines set by the Willamette National Forest's EIS for noxious weed control with chemical agents. ➢ Set priorities for control efforts. Highest priority should be given to sites vulnerable to colonization by new invaders and sites which are sparsely infested. Lower priority should be given to sites with moderate to large infestations of established species. ➢ Identify those 9D and FW211 habitats which are most vulnerable to invasion; this would include those special habitats which are adjacent to roads or timber harvest units, in the vicinity of a new invader population, or are in the vicinity of recent soil disturbance. Prepare a management plant for special habitats included in LMP 9D allocations.	Still Valid, Ongoing Still Valid, Ongoing Still Valid, Ongoing Still Valid, Ongoing Still Valid
	Stream Temperatures	
28	Approximately one mile of the MFW from the mouth of Staley Creek to the watershed boundary, plus the entire length of the river in the Lower Middle Fork of the Willamette Watershed is currently on the DEQ list of water quality limited streams for temperature. Recent data from Staley and Simpson Creeks indicates that lower reaches of these streams will likely be listed in the future. Once a stream is listed as water quality impaired, a management plan designed to bring the temperatures into compliance is required by DEQ. Due to the cumulative effect of stream temperatures, this plan addresses factors affecting temperature throughout the perennial stream network. The plan should recognize the interaction of natural disturbance processes, such as floods, with the management related conditions of the watershed, such as riparian harvest.	Still Valid, Ongoing
	Terrestrial Species	

Ref#	Recommendations	Status
	Wildlife Species - Threatened and Endangered Species	
29	In the secondary and tertiary management zones for the peregrine falcon site, promote prescriptions for silvicultural treatments of managed units to maintain and enhance prey species richness and numbers.	De-Listed, Needs Updating, Ongoing
	Winter Range in Indigo-Skunk High Elk Emphasis Areas	
30	Promote an increase in Habitat Effectiveness (HE) for cover quality in winter range by: • Maintaining existing thermal and optimal thermal habitat • Promoting thermal cover toward optimum thermal habitat • Reducing the acreage of hiding cover which skews down the HE value for cover.	 Still Valid Still Valid Still Valid
	Botanical Species	
31	• Monitor known sensitive plant locations for presence of invader species.	Still Valid, Needs Updating
	Aquatic Species Habitat	
32	50 percent of the PACFISH standard for pools is reached or exceeded in the UMFW River, in Staley Creek and in Noisy Creek. None of the stream reaches meet or exceed the guidelines for CWM. • If this information is coupled with stream temperatures, hydrologic recovery and potential for peak flows, stream embeddedness and fish passage, it is apparent that the most imp response reach refugia area and protection for salmonid fish occurs in the UMFW River in the Timpanogas Subwatershed. The Staley Subwatershed, while it is recovering, accounts for 25 percent of the total response reach segments in the watershed and is therefore very important to protect and restore for aquatic spawning and rearing life stages, particularly resident fish species. • Spider Creek, in addition, may be an important cool water refugia for the Staley Subwatershed. • The relatively cool water Tumblebug Subwatershed makes the lower reaches important transport refugia and protection for salmonid fish. It is recommended that these areas be protected and enhanced for salmonid species use.	 Still Valid, Ongoing Still Valid, Ongoing Still Valid, Ongoing
	Botanical Species Distribution	
33	Since landscape-wide weed control may not be a viable objective, one concept in weed management is to give	Still Valid, Needs

Ref#	Recommendations	Status
	priority to eradicating and protecting core area such as Wilderness and OCRA lands, special habitats and botanically rich sites such as Rigdon Point RNA. The objective here would be to establish a line of containment which creates a buffer around each core area.	Updating
	Aquatic Species Distribution	
34	Stocking of lakes in the Beaver and Timpanogas Basins and warm stream temp has allowed downstream recruitment of all fish species. It is recommended to assess the impacts of this fishery, if any. on the resident fish and amphibian populations. It is also recommended to be proactive with the Oregon Department of Fish and Wildlife and local interest groups in assessing future stocking activities.	Still Valid, Ongoing Still Valid, Ongoing

Hill's Creek Reservoir Recommendations

Ref#	Recommendations	Status
	Habitat Diversity	
35a	Priority -- Assess and develop management strategies to maintain functions of open forest habitats in the ponderosa pine / Douglas-fir area.	Still Valid, Ongoing, Jim's Ck is example
35b	Priority. During planning efforts, inventory stand types and plant species in the Calapooya Mountains. This information will be used to verify the areas high biodiversity.	Still Valid
35c	Priority - Develop implement, and monitor a prescribed fire plan outside of the riparian reserves to: - • Maintain open forest habitats, with priority emphasis to the ponderosa pine / Douglas-fir area • Encourage germination of fire dependent species such as Woodland Milkvetch and branching montia in the area east of the MFW River • Reduce high fuel hazards especially in the Fuel Model 10 areas. See Figure 29 in Current Conditions for general location of FM 1O areas. • Treat areas of diseased trees and insect infestations especially in the ponderosa pine/Douglas-fir area.	Still Valid, Ongoing Still Valid, Ongoing Still Valid, Ongoing Still Valid, Ongoing
35d	Priority - Develop management strategies in matrix lands to provide large blocks of forest habit at with priority emphasis to the ponderosa pine/Douglas-fir habitat Use general concepts of J. Franklin s large, sloppy harvest units".	Still Valid, Ongoing
35e	Priority - Develop and implement a meadow management plan. Beginning with Groundhog, Johnson, Bristow, Holland, Lower Coal, Joe's Meadows and Gertrude Lake area.	Still Valid, Ongoing, Mid Fork Meadow Restoration is example
35f	During precommercial and commercial thinnings, apply silviculture prescriptions which promote or maintain what would normally be anticipated up to 10% of the units' site potential in hardwood trees.	Still Valid, Ongoing
35g	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	Still Valid, Ongoing

Ref#	Recommendations	Status
	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.	
35h	Use mitigation measures outlined in FEMAT, Appendix J of the Forest Plan and the forthcoming measures from the REQ to ensure survival of C3 species. This is especially necessary in Matrix lands and where riparian areas do not provide dispersal corridors.	Not Valid, Needs Updating
35i	Under-plant and modify understory vegetation to begin development of multistory stands in LSR and Riparian Reserves.	Still Valid
35j	Assess the LSR's for fuel loadings and the appropriate area for reintroduction of low intensity fire. This will help maintain diversity of Late Successional habitats and for reduce the potential for catastrophic fires.	Still Valid
	Habitat Connectivity	
36	Priority -- 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 / Young's Creek-Dead horse Creek drainages, including riparian and upslope terrestrial habitats. This strategy will stay within the current Standards and Guides. Figure 43 represents the corridors.	Still Valid
	Interior Habitat	
37a	Priority -- Assess Matrix lands for remaining stands of interior habitats for attributes of quality and landscape distribution. Then develop a strategy for prioritizing and managing timber around those to the extent feasible, considering other resources needs	Still Valid
37b	Silviculturally treat managed units in LSR, 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. Priorities of managed units are those that likely existed as late successional habitats over many centuries.	Still Valid
37c	Dense, young forest habitats have likely occurred within the LSR. An assessment is needed to identify the need for retaining some managed units with such habitat characteristic.	Completed, Ongoing
	Ecological Site Productivity	
38a	Priority -- Prioritize drainages that are not linking the LSR and LSRS. Restore the LWM component of these sites by enhancing the growth of large trees for future LWM recruitment. Restore LWM in units harvested along the main stem of Indian, Estep, Snake, Cc Big Willow, Gold Creeks. Use the Ridgeline Interconnection Map (Figure 44) as a guide in developing a connectivity plan between riparian areas of different drainages. These areas need to promote characteristics of mature, old-growth habitats and have adequate LWM. Design the retention of LWM, Green Tree Retentions, and Wildlife Trees to facilitate connectivity in interconnection areas with a proposed final harvest.	Still Valid
	Vegetation Manipulation Potential	

Ref#	Recommendations	Status
39a	Priority - Look at Matrix lands in Sub-watersheds 21-2 and 21-3 for the majority of regeneration harvest with tree reserves and commercial thinning and post and pole opportunities	Still Valid, Needs Updating
39b	Exams should be done to regional standards to facilitate project scheduling. Exams need to be standardized to be consistent across districts.	Still Valid, Ongoing
39c	Prune to increase product quality and improve tree vigor or to meet other objectives.	Still Valid, Needs Updating
39d	Reforest for establishment, stocking level maintenance, stand diversity development. Cone and other vegetative collections may be utilized.	Still Valid, Ongoing
39e	Release or removal of vegetation as stand density management, to promote vigor, tree size, stocking protection, or forest user safety or maintaining forest health.	Still Valid, Ongoing
39f	Seedling protection projects such as animal control. Remove snags and logs along roads, developed campgrounds and dispersed campsites to reduce hazards and utilize in areas deficient of LWM, commodity contract or restoration	Still Valid, Ongoing
39g	Harvest Special Forest Products when there is no effect or no significant adverse impacts to other resources	Still Valid, Ongoing
39h	Prioritize vegetation treatments on the 5622 acres of 16 -- 80 year old trees in the LSR	Still Valid, Needs Updating
	Fire Pattern, Behavior and Intensity	
40	In Matrix lands, run the current behavior models for all Fuel Model types. Use the results of the behavior models to develop and implement fuel treatment plans to reduce fuel loadings especially in Fuel Model 10 areas and to perpetuate desired plant communities	Still Valid, Ongoing
	Wildlife and Plant Habitat Quality	
41a	Priority - Apply treatments to reduce or eliminate of-non-native species invading special habitats along roads.	Still Valid, Ongoing
41b	Close and rehabilitate the section of Road 2106-445 to restore the hydrologic regime for the Thompson mistmaiden population on Dinner Ridge adjacent to the Orcal Timber Sale landing.	Still Valid, Needs Updating
41c	Identify and rehabilitate non-essential roads to a condition compatible with surrounding special habitats. Priority areas are: Loletta Lakes, Little Groundhog Mountain, Holland Meadows and the Gertrude Lake area. Study and implement road rehabilitation efforts to restore meadow habitat and hydrologic regime during District Road Analysis and SIA Management planning efforts.	Still Valid, Ongoing
	Fire Suppression Response Time	
42	Develop a District Road Analysis, including the LSR. Will need to balance fire suppression access priorities and need to reduce risks of human caused fires and damage to other late successional resources.	Completed, Ongoing

Ref#	Recommendations	Status
	Wildlife and Botanical Disturbance	
43a	Priority - Seventy-one (71) miles of open roads, in four elk emphasis areas, need closed to meet the Standards and Guidelines for maximum densities. 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 Creak Larison in 21 2: - 6 miles; Larison Creek drainage. Snake Fir in 21 3: —10 miles Snake Creek and Fir Creek drainages.	Still Valid, Needs Updating
43b	Priority - Submit Forest Plan Amendment to change Larison and Coal Head Moderate Elk Emphasis Area to low emphasis. Our ability to manage these emphasis areas is limited because they are mostly within the LSR and private land.	Still Valid, Needs Updating
43c	Close the one open road above the vicinity of one eagle nest, to alleviate potential disturbance.	Unknown
43d	Continue monitoring the Coal Creek population of Thompson's mistmaiden to ensure that the hydrologic regime remains intact. Conduct an extensive survey to delineate the whole population.	Still Valid
43e	Determine which roads need closed in the High Elk Use Areas within moderate and low elk emphasis areas to meet habitat effectiveness per verbal agreement with ODFW. Need to set up a meeting with ODFW, Herb Wick, South End Ranger Team, and Rig Wildlife Biologist needs to discuss the verbal agreement.	Still Valid, Needs Updating
	Non-Native Species Composition	
44a	Priority - Promote native seed production program for re-vegetation purposes for restoration and general erosion and forage projects	Still Valid, Ongoing
44b	Priority - Promote recovery of managed plantations in LSR in an manner that would deter expansion of barred owls.	Not Valid
44c	Control new invader noxious weeds at the following locations: see table	Still Valid, Needs Updating
44d	Monitor effectiveness of biological controls on St. Johnswort on Little Groundhog Prairie. If effective, use same treatment at Bristow Prairie.	Still Valid, Needs Updating
44e	Use the District Road Analysis process for possible roads to decommission to prevent further travel routes of noxious weeds.	Still Valid, Ongoing
44f	Test and monitor the use of prescribed fire to eradicate noxious weeds.	Still Valid, Ongoing
44g	Inventory blackberry and reed canary grass invasion in riparian reserves around Hill's Creek Lake. Reed canary grass was planted along Hill's Creek Lake for bank stabilization during the 1980's. It has moved up the riparian corridors into the natural stream systems.	Still Valid, Ongoing
44h	Curtail expansion of bullfrogs into the Watershed above Hills Creek Dam.	Still Valid

Ref#	Recommendations	Status
	Riparian Habitat Quality	
45a	Apply and monitor silvicultural treatments such as thinning and pruning to enhance growth and structural diversity and to vary stand density.	Still Valid, Ongoing
45b	Retain and replant diverse tree species.	Still Valid, Ongoing
45c	Only modify riparian reserves after an interdisciplinary site specific analysis.	Still Valid, Ongoing
45d	Rehabilitate unneeded roads in riparian reserves as determined in the District Road Analysis process.	Still Valid, Ongoing
45e	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. 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.	Still Valid
45f	Manage coves inhabited by the western pond turtle for protection from plinkers. For example, plant vegetation for a screen.	Still Valid, Ongoing
45g	Apply habitat enhancement practices within the coves and upslope areas for nesting to maintain the turtle population within the lake.	Still Valid, Ongoing
45h	Test low intensity prescribed underburns in some riparian reserves for effectiveness in reducing the 0" - 3" fuel loadings to better reflect historical levels of fuels. This may also help meet the Aquatic Conservation Strategy objective of restoring species composition and structural diversity of plant communities in the riparian area and restoring a less obstructed connectivity route for riparian dependent species.	Still Valid
	Landslides	
46a	Priority -- Stabilize slope failures on harvested slopes in Coal and Modoc Creek area and road 5850.	Still Valid, Needs Updating
46b	Priority -- Develop an inventory of road failure indicators. Develop a simple form for employees and the public to carry with them when traveling in the MFWDT	Still Valid, Ongoing
46c	Retain live trees, snags, and distribution of LWM to aid slope stability on harvested units. .	Still Valid, Ongoing
46d	Monitor sedimentation amounts from known sources	Still Valid, Ongoing
	Hydrologic Recovery	
47a	Priority - As supported in this document, the TSZ should be extended to include the ridgelines throughout the Watershed	Not Valid

Ref#	Recommendations	Status
47b	Priority - Conduct site specific cumulative effects analysis by stream watershed of landslide activity, aquatic habitat and riparian vegetation to determine the appropriate threshold for spatial hydrologic recovery. Until the analysis is complete, do not harvest greater than 35% of the canopy closure in areas where more than 35% of the ground is in a hydrologically un-recovered state.	Not Valid, Needs Updating
	Wood Recruitment and Shading.	
48a	Priority -- Conduct site evaluations of streams having past harvest activities on both sides for placement of LWM and regeneration success. Young's and Coal Creek, the MFW River, and Buck Creek are the high priority areas.	Still Valid, Needs Updating
48b	Priority - Develop and implement a long-term comprehensive water temperature monitoring program. Priority areas are the main stem MFW River, the mouths of major tributaries throughout MFWDT, including private land, and in areas of thermal refuge	Still Valid, Ongoing
48c	Develop and implement a monitoring protocol for riparian planting. See Appendix F, Aquatic Document for areas	Still Valid
48d	Provide shade for pump chances, excluding area needed for access	Still Valid
	Aquatic Habitat Complexity	
49a	Priority - Add LWM to the MFW River and low gradient tributaries to aid in short-term recovery and reconnect side channels where appropriate.	Still Valid, Ongoing
49b	Evaluate and implement placement of LWM in MFW River	Still Valid, Ongoing
49c	Evaluate effectiveness of past restoration efforts.	Still Valid, Ongoing
	Surface Runoff and Routing	
50a	Prioritize and implement maintenance of roadway \drainage structures.	Still Valid, Ongoing
50b	Prioritize decommissioning of roads to minimize ii to stream channels.	Still Valid, Ongoing
	Culvert Carrying Capacity	
51a	Priority - Hydraulic analysis of culverts with potential to affect streams with high aquatic value.	Still Valid, Ongoing
51b	If fish passage is not an immediate need, but a desired future condition, less expensive improvements to accommodate a 100-year flood (such as the addition of mid-fill culverts and retrofitting the existing culvert) should be considered until such time as a funding opportunity occurs for replacement.	Still Valid, Ongoing
51c	Plan and implement a program of culvert cleanout.	Still Valid, Ongoing

Ref#	Recommendations	Status
	Species Distribution & Migration	
52a	Priority - Modify or replace existing culverts in the high priority areas of Coal, Indian, Snake, Pine, Bohemia and Estep Creeks. •	Still Valid, Needs Updating
52b	Design new culverts for fish passage	Still Valid, Ongoing
52c	Establish baseline information to identify migration timing and flow characteristics for design of high priority culverts	Still Valid
52d	Design and implement a monitoring protocol for existing culvert enhancements	Still Valid
52e	Continue to monitor species abundance and distribution	Still Valid, Ongoing
	Species Composition	
53a	Priority -- Continue to monitor bull trout and Spring Chinook populations.	Still Valid, Ongoing
53b	Priority --Complete Hills Creek Lake Management Plan	Still Valid, Ongoing
	Hills Creek Lake Turbidity	
54a	Work with the Corps of Engineers to develop monitoring protocol.	Still Valid
54b	Continue Challenge Cost Share with Corps of Engineers to continue shoreline stabilization.	Still Valid
	Downstream Habitat Complexity	
55	Complete R6, level two survey of habitat below Hills Creek Dam.	Still Valid
	Recreational Use	
56a	Priority - To accommodate Hills Creek Lake recreationists, maintain the water surface at full pool until Labor Day Weekend.	Still Valid
56b	Evaluate the need for additional camping capacity in the form of developed campgrounds on Hills Creek Lake. This evaluation will need to look at the impacts of additional recreation facilities on bald eagle management on }Hills Creek Lake	Still Valid
56c	Investigate the opportunity for construction of a hardened surface bike trail loop around Hills Creek Lake.	Still Valid
	Resource Integrity and Function	
57a	Priority -- Using the Limits of Acceptable Change inventory method, evaluate all dispersed camping site locations on the MFW River for condition and appropriate location to reduce conflicts with other recreation users and riparian reserve values. Rehabilitate sites as needed.	Still Valid, Ongoing
57b	Control poison oak in developed sites	Completed, Ongoing

Ref#	Recommendations	Status
57c	Sell land used for the sewage treatment plant at fair market value to the City of Oakridge.	Completed
57d	Evaluate condition and ability of existing facilities to meet recreation needs.	Still Valid
	Riparian Reserve Widths	
58a	The interim riparian reserve widths, as stated in the Northwest Forest Plan, will be maintained until a site specific analysis is conducted and presented through the appropriate NEPA decision-making process. Use of the interim widths will begin the process of restoration and/or maintenance of riparian health for riparian-dependent species and resources in the MFWDT.	Still Valid, Ongoing
58b		

Middle Fork Mixed Conifer Forest Type Overview

Middle Fork of the Willamette River Watershed updates

Middle Fork Ranger District
Willamette National Forest

Prepared by:
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March, 2008

Introduction

This paper has been compiled to help facilitate an update of the Hill's Creek Reservoir and Upper Middle Fork of the Willamette Watershed Analyses (WAs; USDA 1995 and 1996). This update is needed, in part, because the original watershed analyses were completed over 10 years ago and at that time the extent, unique nature, and history of the Middle Fork Mixed Conifer forest type were not fully known or appreciated. In addition, the concept and ramifications of Fire Regime Condition Class (see USDA, et. al., 2005) was not fully formulated and these WAs did not recognize the current Condition Class of the Mixed Conifer forest type has significantly departed from its historic condition. This once open forest ecosystem has, over the last 150 years, developed a much denser canopy resulting from lack of underburning and suppression of wildfires. The Upper Middle Fork WA was updated in 2002 (USDA, 2002). This update was narrowly focused on bull trout and changed habitat conditions for that species, but a brief discussion of the Mixed Conifer type conditions and related recommendations was also included, so that update will be addressed in this report as well.

This paper uses the general format of the watershed analyses (subsections consisting of Characterization, Reference Conditions, Current Conditions, Integration, and Recommendations); it describes the current conditions of this unique forest type and presents a strategy to determine how much of the Mixed Conifer forest type on the southern portion of the Middle Fork Ranger District ultimately needs to or should be restored to its reference, more open, condition. These WAs also developed a set of Issues and a list of Key Questions related to each issue. This entire discussion relates to the Issues of vegetation condition and patterns and how these have been affected by past vegetation management and fire suppression, and related key questions.

The WAs, to a greater or lesser extent, recognized a general need to restore this forest type to its historic density. Several site-specific projects have been implemented to

further that objective. Over the last several decades there has been a small amount of work done to remove encroaching conifers from several oak and pine dominated meadow types through tree cutting and prescribed fire. The Boulderdash Timber sale (USDA, 1993) was the first attempt to restore the forested portions of this ecosystem. This was done with about 100 acres of group selection harvest units ranging from 3 to 16 acres in size in which ponderosa pine were retained and released. More recently, implementation of the Jim's Creek Savanna Restoration project (USDA, 2006), located more or less in the center of the Mixed Conifer forest type, has just begun. That project will restore about 400 acres of the Mixed Conifer type through removal of excess younger trees. The Jim's Creek project is seen as a test case for restoration methods in anticipation of a more comprehensive restoration effort.

The question of how much of this habitat should ultimately be restored initially came up during the development of the Jim's Creek project. Considerable amounts of public interest and involvement developed in relation to that project. Comments and suggestions received indicate that we need to test the methods selected for open forest restoration, but the amount of restoration work ultimately needed exceeds the amount initially done with the Jim's Creek Restoration project. This report and the Watershed Analyses update will make a specific recommendation for the amount of Mixed Conifer forest restoration that needs to occur to accomplish biodiversity maintenance and ecosystem function goals.

The general locations and conditions of these watersheds are addressed in the original WAs and the final watershed update document and will not be repeated here. A comprehensive statement of the general purpose and need for restoration of the Mixed Conifer type was developed in the environmental assessment for the Jim's Creek Savanna Restoration project (USDA, 2006, pages 10 to 16), and will also not be repeated here.

Characterization

The Mixed Conifer forest type is so named because it contains a mixture of ponderosa pine, sugar pine, and incense cedar along with the more dominant Douglas-fir. This is a forest type unique on the Willamette National Forest, though it is similar to forest stands that occur more commonly on the Umpqua National Forest to the south of the Middle Fork watershed. Small patches of Oregon white oak habitat (usually associated with rocky meadows) occur throughout the Mixed Conifer type. The contiguous Mixed Conifer type (as delineated by Agar, 1998; see attached map) contains about 25,000 acres which typically occur south of Hills creek reservoir in lower elevations and southerly slopes. It occurs in the upper (southern) portion of the Hill's Creek Reservoir and the lower portions of the Upper Middle Fork 5th field watersheds, which together constitute the greater portion of the Middle Fork of the Willamette River watershed above the Hill's Creek dam.

Approximately half of the Mixed Conifer type has been harvested over the past ten to 50 years and about 8,000 acres of that is composed of private industrial forest lands. This

forest type was at one time a more open forest than it is now, and likely contained an open understory of grasses, forbs and some shrubs (Winkler, 1984; Hadley, 1997; Winkler and Bailey, 2002; Bailey and Kertis, 2002; and Bailey, 2005), as fully described below in the Reference (Past) Stand Conditions section.

Summary of Original Watershed Analyses Findings and Recommendations

The Watershed Analysis Report; Middle Fork Willamette River Downstream Tributaries Watershed (USDA, 1995; this watershed was subsequently renamed the Hill's Creek Reservoir of the Willamette River) recognized in a general sense the existence of what has become known as the Mixed Conifer forest type and recommends vague actions to maintain habitat structure and species diversity. Findings and recommendations of this analysis specific to the Mixed Conifer type were as follows:

- The ponderosa pine band in the lower Young's Creek and Deadwood Creek drainages is a unique feature (page 1-4);
- Fire suppression has altered the diversity of forest structure (page 2-3);
- There has been a gradual loss of meadow size and open forest habitat (page 3-4, 5-4);
- Early Pioneers claim the forest floor was open enough that stock and horses could be driven through the timber in many paces (page 3-17; Winkler, 1984);
- Areas with frequent fire would have a low concentration of large logs and snags and these areas had a more open understory. Such areas commonly existed on southern aspects (page 3-17)
- Annual underburning of the forest was intentionally used by native people throughout the watershed to increase the abundance of game and edible/useful plants (3-20);
- Special habitats such as meadows have decreased in size due to fire suppression. Some natural meadows have become fully forested by encroaching conifers (page 4-25);
- The overstory of mature old-growth ponderosa and sugar pine show stress and increased insect infestation due to moisture competition from the new understory (page 4-25);
- Fire exclusion has caused the gradual reduction in abundance and structure of hardwood trees in the mixed hardwood/conifer forests (page 4-25);
- Prescribed fire may be an effective way to perpetuate desired plant communities (page 5-9);
- Priorities – assess and develop management strategies to maintain the functions of open forest habitats in the ponderosa pine/Douglas-fir area. Develop, implement and monitor a prescribed fire plan to maintain open forest habitats. Develop management strategies in matrix lands to provide large blocks of forest habitats with priority emphasis to the ponderosa pine/Douglas-fir habitats (page 6-2);
- In Matrix Lands develop and implement fuel treatment plans to reduce fuels loadings especially in Fuel Model 10 areas and to perpetuate desired plant communities (page 6-5)

This analysis did not specifically recognize the need for mechanical treatments to reduce density of the Mixed Conifer type. As far as this author knows, no recommendations directly related to the Mixed Conifer type has been implemented in the 12 plus years since this WA was completed other than the site-specific Boulder Dash Timber Sale (USDA, 1993) and Jim's Creek Savanna Restoration projects (USDA, 2006). No comprehensive management strategies or plans have been developed to address maintenance of open forests or fuel treatments to perpetuate desired plant communities. An on-going meadow maintenance project is nearly ripe for decision; this project will be using a combination of prescribed fire and small tree cutting in several meadows in the Mixed Conifer type to remove young encroaching trees.

The Upper Middle Fork Watershed Analysis (USDA, 1996) only peripherally addressed this forest type (pages 15 and 56 referred to it as "large block open forest") and recommended only that prescribed underburning be implemented to restore and retain non-forest vegetation types and within Late-Successional Reserves. Findings and recommendations of this analysis specific to the Mixed Conifer type were as follows:

- Periodic fire has been the principle, natural, recurring disturbance in the ecosystem that has shaped vegetation patch dynamics and stand characteristics (pages 15, 56);
- Due to the Calapooya Mountains rain shadow, dry site species such as ponderosa pine, sugar pine, incense cedar and tall Oregon grape occur in a fashion more typical of the southern Cascades (page 16);
- Fire suppression has altered landscape patterns (page 25);
- Plant associations with frequent underburning tended to have lower quantities of coarse woody material; they are now higher than historic levels (page 54, 56);
- Fire suppression has resulted in increased fuel loading across the landscape, increasing the risk of high fire intensity, and altering ecological processes in up-slope Douglas-fir stands in the "large block of open forest pattern areas" where fuel loading was kept low by frequent underburns (page 56);
- Open forest habitat is less common since fire suppression has created uncharacteristically dense understories. Fire intolerant and shade tolerant species have increased (pages 56, 62);
- Large Block Open Forest on slopes <60% are associated with Simpson Creek, Swift Creek, Pioneer Creek and Staley Creek basins (page 57);
- Low to moderate severity underburning removed surface fuels and understory with minimal overstory mortality (page 57);
- Open forests of primarily Douglas-fir with significant amounts of ponderosa pine occurred in very large blocks with dense multi-layered canopies forming between fires and serving open-forest species after fires (page 57);
- With continued fire exclusion fuels will continue to increase, resulting in a high probability of severe fire. Natural stands will continue to be unnaturally dense (page 62);
- Non-forest special habitats were maintained by regular fire return and fire exclusion has caused encroachment of many such dry and mesic habitats (page 64);

- Prescribe burn to restore and maintain fire-maintained and non-forest special habitats, and in non-harvest land allocations such as Late-Successional Reserves to re-establish open stand characteristics where site specific analysis determines an ecological need; primarily upland Douglas-fir stands with slopes <60% (pages 104, 109);
- Continue promoting stands with mixed conifers and hardwoods to maintain a greater diversity of wildlife guilds (page 107);
- Consider larger block management to provide for larger future blocks of interior habitat in previous large blocks of open forest – harvest several hundred acres with retained trees simulating historic residual overstory condition.

The Upper Middle Fork WA also did not recognize the role of Native Americans in the reference conditions fire regime. It generally did not fully recognize that overstories of these stands were once much less dense, nor the inability for reintroduction of prescribed fire to effectively reduce the density of these stands (see USDA, 2006, page 45). The Reference Conditions used for this WA were from the late 1940's (page 48); a time when most if not all the Mixed Conifer type had already become a closed canopy forest. This analysis also does not appear to have recognized the high fire frequency regime in the "large block open forest" type, as it states that dense understories developed between fires (page 57), implying that fires were infrequent enough that a dense stand of trees could develop in the interval between ground fires. The WA also implied that overstory densities in this type have always been at current levels.

As far as this author knows, no recommendations directly related to the Mixed Conifer type has been implemented within this watershed in the 12 plus years since the WA was completed.

The Upper Middle Fork Watershed Analysis Update (USDA, 2002) was done to address specific questions raised by the US Fish and Wildlife Service regarding changed watershed conditions in relation to the listing of bull trout as threatened, spotted owl habitat, and potential lynx habitat presence. This update made the following observations and recommendations regarding the Mixed Conifer forest type while addressing a question relating to identification of conflicts and opportunities to meet both aquatic and terrestrial objectives within Riparian and Late-Successional Reserves (LSR):

- Riparian Reserves overlay a diverse and unique mixed conifer vegetation type….stands in this type represent a legacy of this forest type left over from a drier, warmer period….thick, platy barked ponderosa pine, sugar pine and incense cedar dominate the overstory with Oregon white oak, Douglas-fir, Pacific madrone, and grand fir forming a second and third cohort (page 64);
- Many old growth pine are dying from disease and insect attack due to stress related to overstocking. Fire historically removed competing understories, reduced stand density, and exposed soil to favor pine regeneration (page 64);
- The biological capacity of the dry site climax species limits their ability to support multiple layered forests. Without fire or other disturbances, these sites will

convert to Douglas-fir or grand fir, then burn in a stand replacement event. This reality conflicts with riparian and LSR objectives (page 64);

- It is recommended that NW Forest Plan standards for incurring only short-term, neutral, long-term beneficial effects be changed to a standard that promotes future natural biodiversity and long-term forest health and stability while possibly incurring some short-term sacrifices of old-growth stand structure (page 64);
- An objective should be to create open growing space and suitable seedbed conditions for natural regeneration of pine in riparian and late-successional reserves. Mechanical treatments will probably be necessary to achieve these objectives. These treatments may consist of thinning, logging of excess trees, burning slash, followed by repeated prescribed burning (page 65);
- There is an opportunity on these sites to manage for both dry site species and provide commodities from these sites on a long rotation. Oak and pine should be managed for in matrix land in this vegetation type within the context of producing commercial wood products (page 65);
- Conservation does not exclude management or disturbance; moderate levels of ground and canopy disturbance serve to perpetuate the fire climax species. Land allocations that prescribed no actions put the open mixed conifer forest at risk if it converts to dense coniferous understories that can be completely killed if there is a fire. Management that disturbs this vegetation type needs to be encouraged across all land allocations. (page 65);
- Silvicultural prescriptions for droughty, Douglas-fir climax sites include mechanical removal of competing Douglas-fir which can be done in groups, over stand areas, or localized around residual ponderosa and sugar pine. A treatment zone of 75 feet from the drip line of a large pine is another option in LSRs or scenic areas. This treatment needs to be accomplished across the mixed conifer type. In the LSR it may be necessary to cut green trees in the co-dominant and intermediate crowns class to get stocking low enough to reduce competition (page 100);
- Due to elevated fuel accumulation and fuels ladders, mechanical removal of green trees and slash will be needed before repeated underburning can be implemented to maintain the open forest (page 100).

At the time of this WA update the nature and importance of the Mixed Conifer type had been more fully realized. As can be seen, the characterizations and recommendations above extend to matrix lands as well, even though the question being responded to was specific to riparian reserves and LSRs. It is not known how regulatory agencies might react to suggestions that currently dense forests in LSRs and riparian reserves be made less dense through management actions.

It should be noted that implementation of the recommended release of large pine (the second to last bullet above) would result in a 0.6 acre clearing around each such tree. If these legacy trees were evenly dispersed across the landscape (and they are not) and there were an average of two such trees per acre (there is likely somewhat more than that), such a recommendation would result in the retention of just two trees per acre.

Findings of Other Programmatic and Site-Specific Analyses

The Integrated Natural Fuels Management Strategy (USDA/USDI, 2000) also recognized the importance and rarity of pine and oak dominated sites (page 15) in the Pacific Northwest, established the need to maintain and restore such habitats (Appendix D-2), and recommended that oak and pine stands may need treatment, including mechanical treatments, to provide for retention of oak, pine and native vegetation (pages 16, 24, 27).

The Middle Fork Willamette Viewshed Corridor Study (USDA, 1988) also established the uniqueness of the large ponderosa pine in the river viewshed corridor and the desirability of maintaining these specimen trees, but contained no specific recommendations for treatment.

In 2006 the Middle Fork Ranger District produced a document titled "Watershed Prioritization Process, Priority I Watershed Opportunities" that covered both these watersheds. This paper presented Desired Future Conditions for the watersheds and developed a list of goals and objectives by resource, the objectives consisting of generally quantified activities to be accomplished over the next ten years. This current Watershed Analysis Update process is essentially an extension of this 2006 effort, and the recommendations this update will contain are essentially the same ones listed in 2006 with more specificity in terms activities and where they may occur.

While all the integrated resource analyses (including the WAs) recognized, in some sense, the importance of the open mixed conifer and oak forest for diversity, a general need to return fire regime condition class to its historic level, and recommended treatments of some kind be conducted to restore this forest type which has been changed so dramatically by fire exclusion, none identified any specific area within the Middle Fork mixed conifer type for any type of treatment.

The recent, site-specific analysis in the Jim's Creek Jim's Creek Savanna Restoration Stewardship project Environmental Assessment (USDA, 2006) was supported in large part by the general recommendations for needed actions in the Mixed Conifer type contained in the WAs discussed above. The analysis for this project determined (USDA, 2006, pages 45-47, and Bailey, 2005, pages 28 and 29) that prescribed fire alone cannot accomplish the goal of restoring open forests in many places within this type due to the size of the understory tree stems and the thickness of their bark. It also established that physical removal of most of the 100 to 150 year cohort of invaded trees is needed to facilitate full and appropriate restoration. This analysis also established the need to proceed with restoration of this forest type relatively quickly since key ecosystem components (as in the legacy ponderosa pine and Oregon White oaks, and remnant native bunchgrass plants) are being lost year by year (pages 15 and 49).

Reference (Past) Stand Conditions

Stand Structure

Prior to development of the 100-150 year old cohort of Douglas-fir, incense cedar, ponderosa pine, and grand fir, these forests were relatively open, with about 10 or less up to 40 large trees per acre, scattered variably across the landscape. There were areas possibly up to several acres in size which are not today associated with a meadow that appear to have been free of mature trees 100 to 150 years ago. The tree species distribution in this open forest was roughly evenly split between ponderosa pine and Douglas-fir, with occasional sugar pine and incense cedar and large, open-grown Oregon white oak in some places.

Judging from the extent of large dead braches on the lower stems of the legacy conifers, crown depth before the 100 plus year old cohort developed was probably in excess of 60% of total tree heights. Crown closure in the original savanna was likely quite variable, ranging from nearly zero where there were few trees to as high as 50 or 60 percent.

Since evidence of smaller trees no longer exists on these sites, it is not known to what degree smaller seedlings, saplings, or pole-sized trees might have existed in these stands 150 years ago. Given the fire frequency (see below) there were likely few small trees, or their abundance was episodic. Certainly some survived the periodic fires to replace the larger, more fire resistant trees as they succumbed to old age, windthrow, diseases or insects, and the occasional locally extreme fire.

Ground Vegetation

It can be surmised that this open forest contained a more or less dense understory of bunchgrasses. Sparse remnants of a native bunchgrass, *Festuca californicum*, still exist under the younger canopy. This grass is known to thrive in open forest conditions, and this is also the grass that has responded so well in some of the young plantations. It can also be surmised that since soil moisture and ground level sunlight levels were higher in the more open forest that a large variety of herbs and forbs were also present, such as camas, tarweed, mule's ear daisies, wood lilies, etc.

Fire regime

Based primarily upon commonly observed complex fires scars on old ponderosa pine and the widespread occurrence of charred bark on legacy Douglas-fir in these forests, 150 years ago this area had a regime of frequent, low intensity fires (Fire Regime I - see the interagency Fire Regime Condition Class (FRCC) website at www.frcc.gov for definitions and discussion of fire regimes, USDA, et. al., 2005 and UDA/USDI, 2007). From my field observations, triangular shaped basal fire scars on ponderosa pine are only forms by repeated fire scarring; such scars, while they do not occur on all ponderosa pine in this vegetation type, are ubiquitous across the landscape and often contain more than several visually obvious scars that have yet to be covered by live callus tissue. These frequent fires kept young conifer density low, providing growing space for ponderosa pine and Oregon white oak regeneration, and facilitated the persistence of native bunchgrasses and other herbs. The bunchgrass formed the fuel bed in which these fires

could burn frequently with a low severity. The fire scars on remnant ponderosa pine indicate the fire frequency prior to 150 years ago was at least every ten to 12 years and more frequent than that in some areas, especially those close to known high use Native American sites (Bailey, 2005, pages 21 to 23).

While there is no direct evidence other than casual or anecdotal historical accounts, this frequent fire regime appears to be partially if not entirely a result of intentional application of fire by the original inhabitants of this landscape (Winkler, 1984, Hadley, 1999, Bailey, 2005; USDA, 2006, page 99; USDA/USDI, 2000, pages C-4 and 5).

Current Stand Conditions

Stand Structure

Since this forest type occurs across a wide elevational range and on all slopes and aspects (see the attached map and USDA/USDI, 2005 description of the Southwest Oregon Mixed Conifer type) the remaining mature forest is quite variable in species composition, tree spacing, average diameter, and the spacing of the older trees, but the area can be generally characterized as a closed canopy forest of 100 to 150 year old Douglas-fir. These forests contain a scattered, emergent overstory of Douglas-fir and ponderosa pine and some sugar pine and incense cedar with diameters from 30 to over 72 inches. These are remnants of the previous open stand condition and range from less than one to very few, to 20 or more trees per acre.

About half or more of the original large ponderosa pine have died of old age, competition stresses from the dense younger cohort, or both, though the ultimate cause of death typically is mountain pine beetle attack. Most stands within the forest type experience older pine mortality every year; my suspicion is this pine mortality is accelerating and most legacy pine in these stands will die over the next several decades if actions are not taken to make them more vigorous. Most of the legacy Douglas-fir are still alive and doing relatively well. Older sugar pine and oaks have suffered a higher mortality rate than the ponderosa pine; many sugar pine have succumbed to white pine blister rust and most oaks (aside from those still associated with meadows) have been completely suppressed out by the younger cohort. Probably as much as 90 percent of the large, open-grown oaks that once populated this landscape have died.

The diameters of the 100-150 year old cohort of trees range from less than 8 inches to as large as 36 inches, averaging about 15 inches. This wide spread in diameters in this age class indicates the area seeded in over a period of time. Some trees appear to have become established before others and were then free to grow with little competition so as to achieve an early and rapid diameter growth. This originally open-grown condition is evidenced not only by the large diameter of the residual trees, but also by larger, persistent dead branches lower on these larger tree stems, indicating the trees grew with ample room for crown expansion. These large young cohort trees can be distinguished from legacy open forest trees without direct aging by the lack of fire scars or char on the

bark and their generally vigorous and pointed crown structure, indicating they are still growing in height.

The 150 year old trees average about 130 feet tall. The older legacy trees may approach 200 feet in height. Crown depths range from 25% to 35% of the total height of the 100-150 year old cohort and 30 to 50% for the remnant older trees. Crown closures range from 60 to 85% (exclusive of meadows and small forest openings that likely were meadows 50 or more years ago).

Ground Vegetation

Shrubby understory vegetation is generally very sparse in this type, consisting, where it exists, primarily of poison oak, tall Oregon grape, ocean spray, and hazelnut. In many places the shrub layer is non-existent and the forest floor is dominated by either mosses, litter, or both. Herbaceous ground vegetation is also very sparse, consisting primarily of very shaded remnants of the apparently original native bunchgrasses, tarweed, woodland star, bracken fern, Oregon grape, and a number of even more sparsely distributed forest floor herbs. Several species of Orchidaceae are also common in the forest floor vegetation; likely an artifact of recently increased shade and lack of competition.

Meadows

The Mixed Conifer landscape still contains a number of small to larger (up to ten acres), grassy openings. These meadows are typically rocky and thin soiled and become very dry during the summer, hence they resist conifer encroachment, but they contain a wide assortment of plants in the spring, including camas, various grass species, and some unusual forbs more typical of areas further to the south. These meadows often contain Oregon white oak, typically around the margins where soils are a bit deeper. Most of these meadows contain some amount of weedy, non-native annual plants, including some grass species, such as cheat grass, considered to be invasive. Since this entire area was grazed into the early part of the 20th century, these weedy species were probably brought in by livestock.

Plantations

As mentioned above, nearly 12,000 acres of this forest type consists of plantations from 10 to 50 years old created by past regeneration harvest. About 8000 acres of these plantations are composed of private industrial forest lands in a contiguous block. These harvested areas consist of clear cuts and shelterwoods, the former of which being more numerous, now containing trees from eight to 80 feet tall. Most of these stands are more or less fully stocked with conifers, though many do not comprise a closed canopy forest yet. Some of these plantations are nearly pure ponderosa pine and most have some pine component.

Some plantations also contain naturally regenerated Oregon white oak. Many of these young managed stands have developed a grassy understory vegetation, though the grass layer is denser in the clearcut stands. The grass consists mostly of California fescue, the native bunch grass that appears to have been common on this landscape before the open

stands closed canopy. This grass is being or will soon be shaded out as these stands continue to increase in canopy closure.

Condition Class

Based upon the fire scar evidence described above, and also according to the description of the Mixed Conifer – Southwest Oregon Potential natural Vegetation Group (USDA/USDI, 2007), this vegetation type, prior to fire suppression and cessation of Native use of prescribed fire, had a fire regime of frequent, low intensity fires (Fire Regime I) with a median fire return interval of 10 to 15 years. This fire regime of frequent low intensity fires described above was halted about 150 years ago. The mixed conifer stands described above have seen no fire for the last 100 to 150 years (aside from periodic and localized, and usually quite severe wildfire), so from 10 to 15 fire cycles have been missed on most acreage. While there have been some minor attempts over the past 20 years to use prescribed fire to maintain meadows (USDA, 2006, page 103), the original fire regime has been entirely prevented at the landscape level.

Wildfires do occur in this area (USDA 1995 page 1-4 and 5, 4-22 to 26; USDA 1996 pages 15 and 56-57; USDA, 2006, page 166) but are episodic, vigorously suppressed, and tend to be stand replacing since these stands contain more fuels than they ever had in the past, there are ladder fuels into the continuous canopy in some paces, and less severe ground fires are easily suppressed (thus significantly reducing their extent). This change in fire frequency has resulted in the development of the existing closed canopy stand of Douglas-fir and in some areas a spotty to moderate understory of conifers and/or shrubs. Accordingly, the Mixed Conifer forest type can now be said to have a fire regime of mixed to high severity (Fire regime group II and III, as per USDA/USDI, 2007), with return intervals from 35 to 50 years. The general landscape now has a Condition Class of III (USDA/USDI, 2007), based upon the large departure from the historic fire regime.

Regional Fire Regime Condition Class mapping (see USDA/USDI, 2007) indicates that most portions of the Mixed Conifer landscape are in Condition Class II (defined, in part, as having fire frequencies that have departed from natural levels by one or more return intervals with a resultant moderate risk of losing key ecosystem elements). This classification is in conflict with my conclusions above. The Regional classification is based upon remote aerial sensing and certain assumptions about where various Biophysical Setting/Potential Natural Vegetation Groups occur in landscapes. While such remote assessments may have value for depicting Regional conditions, they are not necessary accurate enough to have value for site specific analysis and determinations. I believe it is more appropriate to base determinations of condition class upon site specific conditions, specifically evidence that shows such a dramatic departure from historic median fire return intervals as presented above.

Additionally, when using the “Simple 7” Training Form (see the table on the next pages and USDA/USDI, 2007), the numbers for departures from the ideal successional stage conditions and amounts for this potential natural vegetation group, and final determination of fire regime conditions class shows this landscape as being in conditions

“Simple 7” Training Form - Fire Regime Condition Class (FRCC)

Project Code *(Field 2)* _____ Project Number *(3)* _____ Project Char. Date *(4)* _____
Project Name *(6)* **Middle Fork Willamette Mixed Confier** Size *(7)* **25,300 acres**
Lat *(10)* _____ Long *(11)* _____ Datum *(15)* _____

Stratum *(21)* _____ Date *(24)* _____ BpS *(25)*:R#CONsw – Mixed Conifer – Southwest Oregon
Stratum Comp *(41)* _____%
Stratum Lat *(43)* _____ Stratum Long *(44)* _____Stratum Datum *(48)* _____

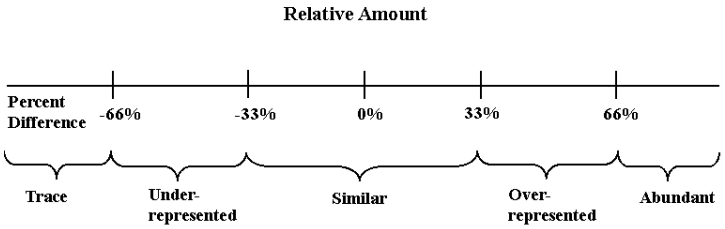
Fire Frequency-Severity	Reference *(51 & 53)*	Current *(52 & 54)*	Sim ((smaller/larger)*100)	Dep (100-Sim)
Fire Frequency (yrs) Sim = (smaller/larger)*100	10 to 12	20-40		
Fire Severity Sim = (smaller/larger)*100	low	Moderate to severe		
Fire Frequency-Severity Condition = (Frequency Dep + Severity Dep) / 2 *(87)*				
Fire Frequency-Severity Condition Class (0-33 = 1; 34-66 = 2; 67-100 = 3) *(88)*				

Vegetation-Fuel *(62)*	Reference % *(72)*	Current % *(73)*	Similarity (lower of Ref or Cur) *(77)*	Difference *(79)* if (cur<ref) diff = ((cur-ref)/ref)*100 if (cur ≥ref) diff = ((cur-ref)/cur)*100	Relative Amount[1] *(80)*	Stand Condition Class[2] *(82)*
A – Early	15	31	15	52	O	2
B – Mid Closed	5	14	5	64	O	2
C – Mid Open	10	3	3	-70	T	1
D – Late Open	50	1	1	-98	T	1
E – Late Closed	20	50	20	60	O	2+
U – Uncharacteristic	0		0	100 %	abundant	3
Sum	100	100				
Departure = (100%-Sum Similarity) *(83)*						56
Vegetation-Fuel Condition Class (0-33 = 1; 34-66 = 2; 67-100 = 3) *(84)*						2

Stratum Fire Regime Condition Class *(89)* = Higher of Vegetation-Fuel *(84)* or Frequency-Severity *(88)*	

Comments _____
_____

[1]Amount based on Difference
T – TRACE (<or=-66% departure)
U –UNDER REPRESENTED (>-66% and <or= -33% departure)
S - SIMILAR (> -33% and < +33% departure)
O – OVER REPRESENTED (>or= +33% and <+66% departure)
A - ABUNDANT (>or= +66% departure or > 0% uncharacteristic classes)



[2] Determine Stand Condition Class (1, 2, or 3) Using the Following Rules:
If VFC Relative Amount (f80) is T, U or S enter 1 for Condition Class 1.
If VFC Relative Amount (f80) is O enter 2 for Condition Class 2.
If VFC Relative Amount (f80) is A enter 3 for Condition Class 3.

(#) = Field number corresponding to the FRCC Worksheet and Software.

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class II. Again a classification implies only a moderate departure from natural median fire return intervals and in that sense is misleading in terms of describing the changes that have occurred. Note that the Simple 7 calculations puts the departure for this landscape near the upper end of Condition Class II; implying that not much more additional change would be needed to move that conditions into Class I. Much of the early seral acreage will be moving into mid-seral condition and most of those acreages will be mid-seral closed, further aggravating the departure of this seral component.

Though this potential natural vegetation group apparently had a considerable acreage in a late-seral closed condition in pre fire suppression, these types of stands certainly underburned occasionally, given the fire regime of the landscape, and as evidenced by the fire scars that still can be seen in such stands. Such underburns would have significantly reduced the amount of ground vegetation and/or secondary canopy levels. These late-seral closed canopies stands now contain fairly dense understory vegetation and may be subject to uncharacteristically intense fires since they contain some amount of ladder fuels that could lead to a stand-replacing crown fire. Additionally, the current small number of late-seral open forest acreage is entirely the result of past shelterwood harvest

where the shelter overstory was not removed after reforestation has been accomplished. All 350 acres of this seral stage has developed a more or less dense young conifer understory and as such do not have the same structure and function as the historic late-seral open stands they are representing. Fire has still not played its proper role in modifying the fuel level and structure of these open forests. In both open and closed conditions, late-seral stands are more departed from historical conditions than would be recognized by the Difference value (Field 79) on the "Simple 7" training form.

Finally, regardless of the absolute magnitude of the acreage discrepancies between reference and current conditions, key ecosystem components, primarily the ponderosa pine and Oregon white oak, are being lost from this ecosystem at a relatively rapid rate. Not only are these species threatened by stand replacement fire but the current density of the stands they are embedded in has and continues to cause mortality from competition and insect activity aggravated by the stress these trees are currently and will continue to experience. In recognition of these factors and the historical fire frequency visible in all mature stands in this landscape, I believe it is most appropriate to consider the landscape in a Fire Regime Condition Class 3; with a high departure from the natural (historic) regime and severity and there is a high risk of losing key ecosystem components, particularly the legacy pines and oak.

Integration

Goals and Objectives

The basic goal of current management in this area is to restore aquatic and terrestrial biodiversity. There is a secondary goal to manage National Forest System lands to be within fire regime Condition Class I, with fuels loading, vegetation structure, and fire return intervals that are within the historic ranges for the vegetation types in the area. This would constitute a measure of satisfactory ecological conditions and would keep future wildfire severity at levels that would not compromise other values (including biological and social). The current Condition Class is III, implying a significant departure from the natural range of fire frequency, creating a high risk of losing key ecosystem components due to wildfire severity. These key ecosystem components include legacy conifers (particularly ponderosa and sugar pines), mature oaks and all the wildlife species dependant upon them, riparian vegetation, and water quality. In order to accomplish the goals above there is a need to move the entire forest type towards Condition Class I status. Focus on individual stands may provide site specific biodiversity benefits but may not prevent landscape level wildfire damage in untreated stands.

Objectives for this vegetation type analysis:

- Determine how many acres of the mixed conifer treatment need to be restored to bring the forest type's Fire Regime Condition Class back to I;

- Determine if future Forest Plan allocation changes need to be made; the type of actions that are needed to accomplish the goals may eventually require a Forest Plan Management Area amendment since the results of those actions needed to accomplish restoration may conflict with current allocation direction. We need to determine how much needs to be restored, in part, so that a future Forest Plan amendments could address all future landscape needs;
- Determine what limitations there may be on how much of the mixed conifer acreage can be restored;
- Develop and prioritize site-specific restoration treatments.

Strategy for Determining the Extent of Needed Restoration

It seems intuitive, especially given the current emphasis on restoration in public land management, that this area should be restored. But the question of how much of this forest type should be returned to its past, more open forest condition is still relevant. There are many resource concerns that exist today that did not exist in the past. Restoration of this forest's original condition could affect spotted owl dispersal and water quality for two listed fish species which inhabit the Middle Fork of the Willamette River running through the middle of this forest type. Given that we may not be able to restore the entire forest type due to funding constraints, lack of personnel availability, and environmental concerns, the question becomes how much needs to be restored to change the Fire Regime Condition Class of the area back to a I.

One approach to determine how much of the Mixed Conifer type should be restored to its previous, more open conditions would be to refer to the amount of early seral, mid- and late seral open and closed canopy forest structure that typically occurred in the past in this type of forest and fire regime. The Interagency LandFire website (USDA/USDI, 2005) contains Reference Condition Characteristics for a number of Forested Potential Natural Vegetation Groups (PNVGs). These reference conditions give such percentages of historic seral stages and conditions. These percentage distributions reflect a Condition Class of I. Perhaps this information can be used to determine how many acres of the Middle Fork Mixed Conifer forest type would need to be treated to bring the landscape Condition Class from a III to a I.

Based upon the vegetation assemblage and the historic fire frequency as evidenced by fire scars on legacy trees, the Mixed Conifer area in the Middle Fork watershed is most accurately represented by a single PNVG Group, the California Mixed Conifer - Southwest Oregon type (PNVG code MCONsw, as in USDA/USDI, 2007), which encompasses, geographically, southwestern Oregon and northern California from the Klamath/Siskiyou region to the southern Cascades in the Rogue, Umpqua and southern Willamette Valley. The following table presents the historic average distribution of seral stages and conditions in such a landscape, the current distribution for the Middle Fork Mixed Conifer landscape, and its degree of departure from those historic conditions.

Middle Fork Mixed Conifer Departure from historic seral stage distribution for the Mixed Conifer – Southwest Oregon PNVG

Seral Stage/Condition	**Ave. pre-settlement condition**	**Ideal acreage** (on 25,300 acres)	**Existing Condition** acres(%)	**Discrepancy** in acreage
Post replacement (dia. < 5")	15%	3,795	7,957 (31%)	+4,162
Mid-development - open (dia. 5 to 20"; CC < 30%	10%	2,530	744 (3%)	-1,786
Mid-development - closed (dia. 5 to 20"; CC > 30%	5%	1,265	3,539 (14%)	+2,274
Late-successional – open (dia. >20"; CC < 30%	50%	12,650	352 (1%)	-12,298
Late-successional – closed (dia. >20"; CC > 30%	20%	5,060	12,708 (50%)	+7,648

USDA/USDI, 2007 (page 12) indicates an overall landscape departure percentage value can be calculated from departure values expressed as a percentage of the ideal acreage weighted by the ideal acreage for each seral class and condition. A weighted average of zero indicates no departure and one of 100 percent indicates the landscape has totally departed from its historic condition. This weighted average departure for the numbers above is 99.88%. This is a fairly intuitive result given the absolute magnitude of the departure acreages and the fact that the landscape has departed from historic conditions in all seral stage categories. This result is also supported by field observations that this landscape has missed ten or more natural fire cycles.

Alternatively, the "Simple 7" form, as discussed above, indicates the area is not quite so significantly departed from historic (natural) conditions; the total departure (Field 83) is only 56 out of a possible 100, putting this landscape into the Condition Class II category (see Field 88). This is a bit counter-intuitive for the reasons discussed above

How much should be restored? The simplest approach to how much restoration needs to occur in the Middle Fork Mixed Conifer forest type is to look at the acreage of departure presented in the table above. A positive number in the last column indicates the landscape now contains more of that seral stage/condition than it did in the past. A negative number means the landscape is short that amount of seral stage and condition. To the extent that one can logically establish that this forest type had, 100 to 150 years ago, that sort of seral stage distribution, and to the extent that it is desirable (which is implied by the fire regime condition class ratings) to return to this historic condition, it

seems clear that over 7,600 acres of late-successional forest and 2,300 acres of mid-seral forest need to be made less dense.

Alternatively, according to the numbers on the "Simple 7" form above, a Similarity sum (Field 77) of 70 results in a total departure (Field 83) of 30, generating a Condition Class of I (though a "high" I, indicating it could move back to Class II relatively quickly). This amount of departure could be generated by restoring about 2,500 acres of the late-seral closed forest to a more open condition (less than 40% canopy closure). Interestingly, restoration of any amount of mid-seral closed canopy forest to a more open condition would not materially change the overall landscape condition class without dropping considerably below the reference percentage for mid-seral closed stands.

There also needs to be less acreage of post-replacement forest, but there is not much to be done about that in the sort-term aside from making sure these forests are free to grow and attain diameters greater than five inches. Many of the post-replacement stands are close to becoming Mid-development – closed stands, so as that progression occurs, additional acreage of Mid-development-open stands will need to be created.

The extent of needed restoration based upon historic conditions may be constrained by social or overriding biological factors such as the listing of various species as threatened or endangered, the need to maintain later-seral forest connections, the presence of private lands within and adjacent to the mixed conifer forest type, the amount of past forest management that has occurred in the forest type, and the degree to which it may not be socially acceptable to apply frequent prescribed fire to large acreages in some areas (which would be necessary to maintain open forest conditions and a desirable condition class). Certain geographic areas may also better lend themselves to prescribed fire application in terms of ease of control and smoke dispersal.

Objectives relating to maintenance of late-successional forest conditions conflict with mixed conifer restoration goals. Late-successional habitat typically consists of dense, multi-layered canopies where canopy closures exceed 40 percent by a considerable amount. Most of these mixed conifer forests, if restored to their previous conditions, would likely have canopies with a 10 to 30 percent coverage, and secondary canopies would consist only of scattered clumps of young conifers and Oregon white oak.

Another consideration in determining where restoration treatment should occur might also be the presence of young, managed stands that have had some components of the natural vegetation assemblage. Examples are the plantations scattered throughout the forest type which have seen redevelopment of bunchgrass and oak regeneration. Further restoration activities and treatments could build off these existing restored elements by folding plantations with such characteristics in to a larger, adjacent restoration effort.

Conclusions and Recommendations

The most basic indicator of the need to restore the Mixed Conifer landscape is the Fire Regime Condition Class, which is III and represents a significant departure from historic conditions. From a strictly biological/biodiversity standpoint, to fully restore historic vegetative types and patterns and to maintain the landscape in a condition that is less vulnerable to catastrophic fire, the answer to the question posed above is answered by the figures in the above Table. Somewhere around 2,274 acres of closed canopy, mid-development young forest and 7,648 acres of closed canopy late-successional forest need to be treated in some fashion to make them considerably less dense. This amount of restoration would result in a weighted average departure from historical seral stage conditions of 69.5% (100% being totally departed), since there is no immediate remedy for having too much post replacement acreage and not enough total late-successional open and closed acreage. The answer to this question is muddied somewhat by the various ways can be quantified, as discussed above. If the "Simple 7" form numbers and evaluations are relied upon, one could get to a Class I status by opening up only 2500 acres of late-seral closed canopy forest but the time the landscape would remain in that conditions could be relatively short as these stands continue to grow and close canopy.

One important point to consider when contemplating restoration of this unique forest type is the potential for climate change and the need to maintain this plant association's resiliency should the climate change. Without density reduction, these mixed conifer forests are at risk on several different fronts in the face of a potentially warmer, drier climate. The sites on which these stands occur currently seem capable of supporting a healthy, closed canopy forest in the climate regime of the recent past, though the legacy pine are adversely affected by current stand densities. However, in a warmer and drier climate regime these dense stands could very well experience some to considerable mortality from insect outbreaks and various diseases as the many trees become stressed due to a competitive lack of moisture. A warmer, drier climate would also puts these dense forests at increased risk from wildfire. If the density of these stands is substantially reduced they would be more resilient in the sense that they would more likely survive a severe fire event, and the remaining trees would be more vigorous and better able to fend off insect attacks and diseases.

The biodiversity enhancement and maintenance purpose and need for action as articulated by the Jim's Creek Savanna Restoration project is related to restoring the Mixed Conifer type to a condition that would be more resilient to climate change, and that analysis did peripherally mention that retention of oaks and pines more resilient to warm and drier conditions would create a refugia for that plant association that could expand it's range in the face of that sort of climatic change. A more complete restoration of this forest type could very well be the only way to assure that there are fully functioning forests in this landscape if the climate indeed does change to a warmer and drier regime.

Recommended Actions: From a Fire Regime Condition Class and biodiversity restoration standpoint, all the acreage mentioned above should be restored to its originally more open condition (See USDA 2002 Ref.#9e, USDA 1996 Ref. # 21a, and

USDA 1995 Ref #s 35a and c in the Appendix to the Watershed Update document). Given the constraints mentioned above and further discussed below, this may not be a very realistic action to propose. If those constraints cannot be overcome, I recommend that as much of the acreage mentioned above be restored without compromising other resource values through stand density reduction, re-establishment of the historic forest floor vegetation, and periodic application of prescribed fire. Resource values that may constrain the amount of such restoration will be described by other resources specialist reports prepared for this Watershed Analysis update and subsequent analyses for future project proposals. Specific prescriptions for this density reduction should be based on site-specific stand conditions and objectives. Such a density reduction would be most economically accomplished by selling the 100 to 150 year old cohort of trees that need to be removed, as most have considerable commercial value. This sale would help fund the equally important forest floor revegetation, and maybe even the also equally important prescribed fire regime that is needed to return this landscape to a Fire Regime Condition Class I and maintain the open nature of the restored forests.

The forest floor will likely need to be actively revegetated in most places with appropriate grasses and forbs, since most stands are dense enough that the original open forest floor vegetation has been shaded out. Prescribed fire would need to be applied at least every five or ten years to maintain the open forest, its historic fire regime, and its Condition Class I status. This fire regime cannot be reinstated until the original grassy understory vegetation is reestablished; it is this fine fuel bed that will provide for the frequent, short duration, and low flame-length fires that are integral to maintaining the open forest without unduly damaging the residual mature trees.

Many of the 4,000 plus acres of publicly owned plantations in the Mixed Conifer type have some components of the original forest; most contain some pine species, many have developed relatively dense stands of the native bunchgrass, and some have Oregon white oak regeneration. To fully restore this landscape and to facilitate as close a return to a Condition Class of I as possible, these plantations should also be restored. Such restoration would entail considerable reduction in stand densities, and replanting Oregon white oak and native ground vegetation where these species are appropriate and absent. A prescribed fire regime should also be applied to the plantations to facilitate their restoration.

Constraints: As mentioned above, the presence of habitat for threatened or endangered species, the need to maintain later-seral forest connections and riparian reserves, the presence of private lands, the amount of past forest management that has occurred in the forest type, and the degree to which it may not be socially acceptable to apply frequent prescribed fire to large acreages in some areas all may constrain the amount of restoration that could occur, overriding general biodiversity maintenance objectives. In this case the number of acres to be restored will be determined by a mapping exercise rather than the analytical process presented here.

Regarding the objective to maintain late-successional habitat, about 22 percent of the type is currently classified as Late-Successional Reserves. An additional 16 percent of

the Mixed Conifer type is classified as a northern spotted owl Critical Habitat Unit (CHUs – there is considerable overlap between the LSR and CHU). The overgrown Mixed Conifer forests in the LSR or CHU generally do not constitute typical or classic late-succession habitat. While they do contain scattered older trees with defect and complex crown structures, the forests do not contain an abundant, secondary, and shade tolerant canopy; usually do not have a well-developed ground vegetation layer; contain low levels of large snags and down wood; and due to site limitations will likely never develop such structures. If these stands are left in their current condition, they are at risk of stand replacement wildfire. Such an event would remove marginal habitat for late-successional habitat dependant species as well as kill the legacy structure and species from the original more open forest. This risk may be increasing due to climate change.

Restoration may be constrained for one reason or another on about 38 percent of the Mixed Conifer forest type (not including riparian reserves). Restoration of the remaining acreage would roughly result in half the total acreage of potential restoration, so the weighted average departure from historical seral stage conditions would be anywhere from 80 to 90%. With this degree of departure, and only a 10 to 20 percent improvement of the current totally departed condition, we may not be able to legitimately claim that the Condition Class of this landscape has been materially improved. However, such an amount of restoration would still have considerable ecosystem biodiversity and habitat benefits.

Forest Plan Amendment: Should a substantial proportion of the Mixed Conifer forest type be managed to promote historic conditions, a number of Forest Plan (USDA, 1990) Management Area allocations and standards and guidelines would no longer be appropriate or could not be complied with fully. For example, such restorative management would not provide for maximum wood fiber production (the stands would not be maintained in a "fully stocked" condition, at least in terms of coniferous tree species), and prescribed fire could preclude retention of prescribed levels of snags and down woody material. Ideally, if what ever portion of the Mixed Conifer type is restored, the Management Area allocations of areas to be managed as open forest should be changed. Experience with the Jim's Creek Savanna Restoration project indicates this would not have to be done immediately, or as a condition of the restoration commencing. Considering that there are really not any existing Management Area prescriptions in the current Forest Plan that fit well with the goals and objectives for restoring and maintaining an open forest type for biodiversity enhancement, it would probably be best if the crafting and designation of a Management Area with associated standards and guidelines for the Mixed Conifer type be developed at the time of the next Forest Plan revision, which is currently scheduled to begin in 2012.

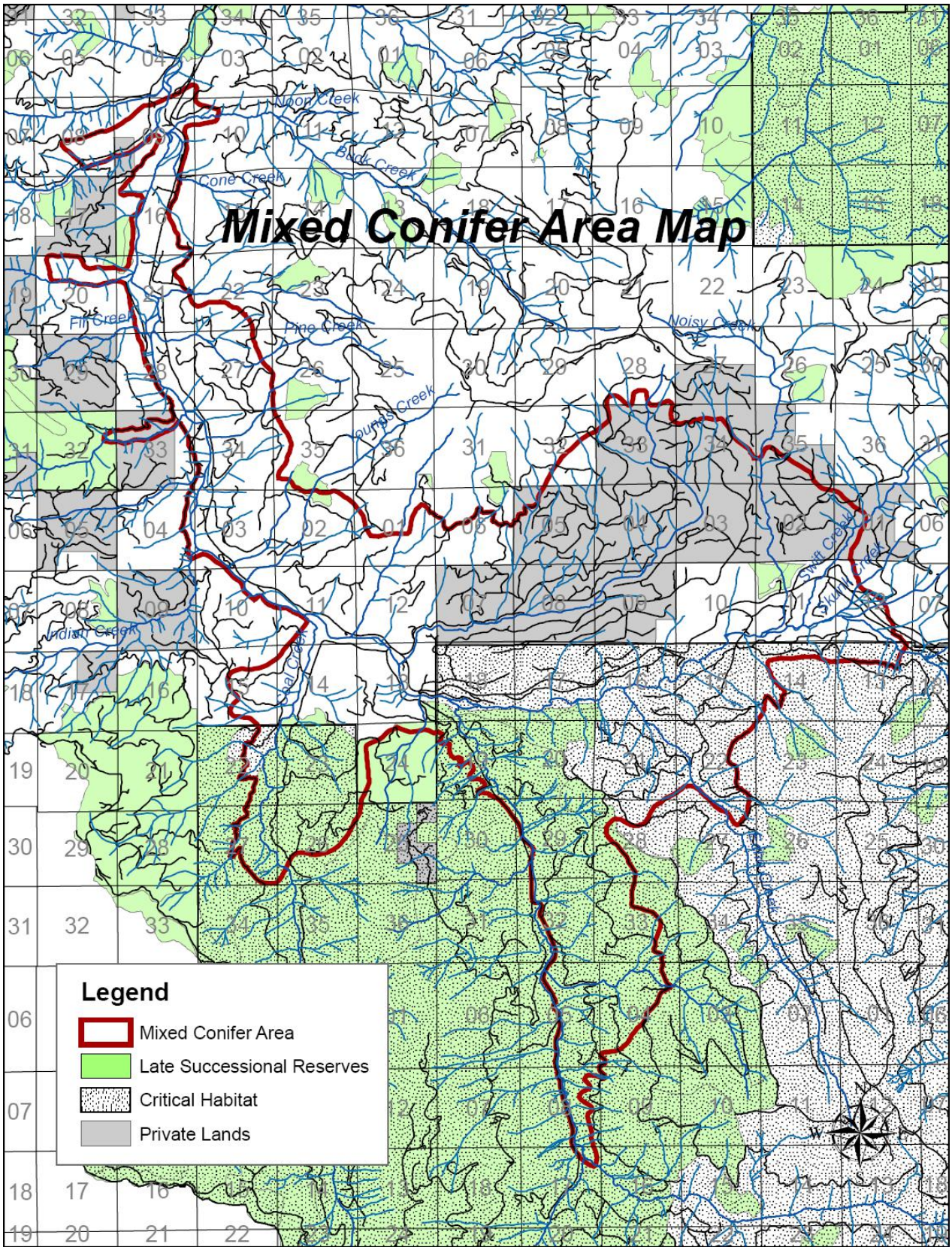
Prioritization of Treatments: There does not appear to be any one area within the Mixed Conifer forest type that needs restoration sooner or more urgently than other areas. Key ecosystem components are being lost throughout the landscape at a relatively rapid rate through competition from dense coniferous canopies. I suggest prioritizing treatment in areas not encumbered by conflicting land uses such as Critical Habitat Units or Late-Successional Reserves since considerable time may be required for analysis of proposals

within those areas in order to overcome administrative and regulatory obstacles. Accordingly, the area to focus on would be the northwestern portion of the forest type; that area from Deadhorse Creek to Hill's Creek Reservoir which includes the Buck, Cone, Estep, Pine, Boulder, and Young's Creek drainages. Additionally, the Jim's Oak Patch and surrounding area (the lower portions of the Coal and Indian Creek drainages) should also be considered for immediate restoration.

There are also several areas outside the contiguous Mixed Conifer forest type (and hence outside of the Seral Stage Condition Class analysis presented above) that exhibit similar vegetative characteristics and are not encumbered by other land use classifications. Those areas could generate some biodiversity benefits if restored, but would likely not have a large effect on the Fire Regime Condition Class of the landscape. These areas include portions of the Willow, Little Willow, and Bull Creek drainages east of the Hill's Creek Reservoir, and the areas adjacent to and including Packard Creek Campground on the west shore of the Reservoir.

Postscript: After this paper was completed the long awaited Northern Spotted Owl Recovery Plan was released. This plan essentially eliminated Critical Habitat Units that are not overlain by Late-Successional Reserves. Rumor has it this plan will be legally challenged but if this new guidance persists, additional acreage in the Mixed Conifer forest type would be freed up to be restored without considerable interagency involvement, consultation, and concern.

This scenario would make restoration of the south slopes between Big Pine Openings and Swift Creek a more likely proposition. These slopes that occur in the heart of the Mixed Conifer forest type contain some classic mixed conifer stands that still retain a considerable old ponderosa pine component, and are also immediately south of a large block of private, second-growth forest land. This area may well provide a high priority for initial restoration, as the sort of restoration envisioned would protect, to some extent, National Forest lands from any intense fires that start and spread from the contiguous areas of dense second-growth forest. Additionally, the stands in this area tend to be less fragmented, would be somewhat more visible to the public, and likely most importantly, restoration in this area would generate less concern (and hence provide for a greater and more ecologically significant amount of restoration) over late-successional connectivity due to the adjacent large block of early to mid-successional habitat on the private land to the north.


Mixed Conifer Area Map
Legend
Mixed Conifer Area
Late Successional Reserves
Critical Habitat
Private Lands

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Upper Middle Fork of the Willamette Watershed Analysis
2008 Botanical Update

Step 1: CHARACTERIZATION

Terrestrial Patterns and Processes

3. Rare and Non-Forested Special Habitats
Reference the following pages from the Upper Middle Fork Watershed Analysis (UMFWA) and the Middle Fork Willamette River Downstream Tributaries Watershed Analysis (MFWDT) on the pages listed. The information below is new or updated information that should be used with the information from the previous analysis and updates.
Reference: UMFWA pg 1, MFWDT pg 1-5,

Non forested special habitats cover approximately 2% of the 8560 acres of land in the Upper Middle Fork watershed and although they are not a high percentage of the total area their distribution across the landscape is important for biodiversity of plant and animal species. 85% of flowering plants in the central western Cascades are found in non-forested areas such as rock outcrops and meadows (Hickman 1976) and many of the documented sensitive species locations in this watershed are found in non forested special habitat areas. Many of the special habitat areas identified in the Special Habitat Management Guide (WNF 1992) are present within the watershed. Many of the special habitats were digitized into ArcGIS using areal photo imagery and not all have been groundtruthed for accuracy so more on the ground investigation is needed.

In addition to the broad upland forest categories, this watershed has stands which have been classified in the Special Habitat Management Guide (WNF 1992) as rare forested and unusual plant associations. These stands contribute to the watershed's diversity of community types, may reflect unusual environmental conditions, or may represent the outlying extent of that community. These communities are concentrated in two locations: one group occurs at the base of Diamond Peak and one on the Calapooya Ridge. The Calapooya ridge area also has many meadows. Like many meadows in the Pacific Northwest these meadows are shrinking because of conifer encroachment due to the lack of fire.

Rigdon Point RNA

The watershed also contains Rigdon Point Research Natural Area (RNA) in the southern extent of the forest and contains the headwaters of tributaries to Staley Creek. The vegetation of the RNA contains examples of dry-site Douglas fir (*Pseudotsuga menziesii)* and knobcone pine (*Pinus attenuata).* The plant communities and the knobcone pine stands have been identified as empty cells in the Oregon Natural Heritage Plan (Appendix A, Oregon Natural Heritage Advisory Council to the State Land Board 1988).

Historically, the area has received little use because of its inaccessibility. Only 10 acres in the southern tip have been logged, it has not been grazed. Recreational use is low because of its location.

This 457 acre, rocky, steep, forested area was established in 1996 with two objectives:

- Preservation of one of the northern most populations of knobcone pine (*Pinus attenuata*).
- Preservation of good examples of dry-site plant associations that is common in the southern part of the Willamette National Forest but rare elsewhere on the forest.

Detailed management recommendations and more information about this area can be found in the Rigdon Point Research Natural Area Establishment Record signed in April of 1996.

Terrestrial TE & S and Unique Species

Reference the following pages from the Upper Middle Fork Watershed Analysis (UMFWA) and the Middle Fork Willamette River Downstream Tributaries Watershed Analysis (MFWDT) on the pages listed. The information below is new or updated information that should be used with the information from the previous analysis and updates.

Reference: UMFWA pg 17-18, MFWDT pg 1-5 through 1-6

Botanical

Four species listed as sensitive on the Regional Forester's Special Status Species list (January 2008) are documented in the watersheds.

- Columbia Gorge Lewisia (*Lewisia columbiana var. columbiana*) is associated with dry rocky sites;
- *Rhizomnium nudum* grows in moist cool riparian areas and is associated with Pacific silver fir and Englemann spruce above 3000 feet.
- Thompson's Mistmaiden *(Romanzoffia thomponii) is found* in moist seasonally seepy springs on south facing slopes.
- Scheuchzeria *(Scheuchzeria palustris ssp. americana)* is associated with sphagnum bogs and lake margins above 3000 feet.

In addition 32 species from the Forest Concern, Watch and Review lists are found within the watershed boundary. Although these species are not on the special status species list they are unique or rare due to limited species abundance or distribution. Many of these species are at the edge of their known range and are found only on this part of the Willamette National Forest. Species include; green flowering ginger (*Asarum wagnerii*), bushy bird's beak (*Cordylanthus ramosus*) and Bolander's Hawkweed (*Hieracium bolanderi*). Species that are not listed but that have been found only in these locations in lane county include*; Frittilaria atropurpurea, Frittilaria glauca, and Rosa spithamaea, Asclepias cordifolia, Ageratina occidentale, Ceanothus prostrates, Cordylanthus tenius ssp. viscidus, and Lilium pardalinum.*

Terrestrial Non-Native Species
Reference the following pages from the Upper Middle Fork Watershed Analysis (UMFWA) and the Middle Fork Willamette River Downstream Tributaries Watershed Analysis (MFWDT) on the pages listed. The information below is new or updated information that should be used with the information from the previous analysis and updates.
Reference: UMFWA pg 18, MFWDT 1-6

Botanical
Invasive plant species in the watersheds are most common in previously disturbed areas and roadsides. Some species are limited to these disturbed areas and a few are able to move into non-disturbed stands. Special habitat meadow areas have been impacted by past management practices that included seeding with non-native species for erosion control and forage enhancement. Due to this practice, most meadows include a large component of non-native grass species.

STEP 2: ISSUES AND KEY QUESTIONS

Reference the following pages from the Upper Middle Fork Watershed Analysis (UMFWA) and the Middle Fork Willamette River Downstream Tributaries Watershed Analysis (MFWDT) on the pages listed. The information below is new or updated information that should be used with the information from the previous analysis and updates. No new Issues or Key questions were identified in the watershed update process.

Issue Density, Condition, Location and Use of Roads
Reference*: UMFWA pg 23- 24*

Issue Intensity and Pattern of Vegetation Manipulation
Reference: *MFWDT 2-2, UMFWA pg 24*

Issue: Non-Native Species Introduction
Reference: *UMFWA pg 23and MFWDT 2-4 through 2-6*

STEP 3, 4 and 5: REFERENCE, CURRENT, TREND CONDITIONS

Reference the following pages from the Upper Middle Fork Watershed Analysis (UMFWA) and the Middle Fork Willamette River Downstream Tributaries Watershed Analysis (MFWDT) on the pages listed. The information below is new or updated information to use with the information from the previous analysis and updates.

Special Habitats

Reference: UPMFWA pg 61, MFWDT 3-5

Special habitat areas within the two watersheds are listed by habitat type in the tables 1a and 1b below.

Table 1a. Upper Middle Fork of the Willamette Special Habitat Areas			
Habitat Type	**Symbol**	**Number of habitat features in WA**	**Acres**
Dry Rock Garden S. Slope	GD alone and with secondary types	168.0	1296.8
Moist Rock Garden	GM	1.0	0.5
Dry Meadow South Slope	MD alone and with secondary types	33.0	108.9
Mesic Meadow	MM alone and with secondary types	122.0	673.0
Swamp	MP	1.0	5.4
Sedge Meadow	MS alone and with secondary types	2.0	4.5
Wet Meadow	MW alone and with secondary	17.0	118.7
Cliff	RC alone and with secondary	5.0	2310.0
Gravel bar	RG alone and with secondary	2.0	13.0
Landslide	RL alone and with secondary	2.0	6.0
Rock Outcrop	RO alone and with secondary	12.0	175.6
Rock Quarry	RQ alone and with secondary	1.0	4.0
Talus	RT alone and with secondary	13.0	44.1
Sitka Alder	SA alone and with secondary	20.0	76.7
Vine Maple (rocky soil)	SR alone and with secondary	1.0	7.4
Vine Maple (talus)	ST alone and with secondary	2.0	5.7
Rare forested Plant association	UF	1.0	0.5
Not attributed			871.3
Count of SHAB Features	**403**	**Total Acres**	**5722.1**

Table 1b. Hills Creek Reservoir Watershed Special Habitats			
Habitat Type	**Symbol**	**Number of habitat features in WA**	**Acres**
Buildings, structures roads	AB	1.0	1.2
Dry Rock Garden S. Slope	GD alone and with secondary types	111.0	573.1
Hardwood Inclusion	HD alone and secondary types	5.0	46.3
Dry Meadow South Slope	MD alone and with secondary types	59.0	456.5
Mesic Meadow	MM alone and with secondary types	105.0	697.0
Sedge Meadow	MS alone and with secondary types	1.0	0.9
Wet Meadow	MW alone and with secondary	31.0	230.1
Cliff	RC alone and with secondary	3.0	26.9
Gravel bar	RG alone and with secondary	6.0	110.5
Landslide	RL alone and with secondary	2.0	51.0
Rock Outcrop	RO alone and with secondary	14.0	61.4
Rock Quarry	RQ alone and with secondary	2.0	36.0
Talus	RT alone and with secondary	27.0	92.0
Sitka Alder	SA alone and with secondary	9.0	29.1
Vine Maple (rocky soil)	SR alone and with secondary	4.0	37.2
Vine Maple (talus)	ST alone and with secondary	3.0	9.4
Rare forested Plant association	UF	1.0	3.4
Not attributed			253.4
Count of SHAB Features	**384**	**Total Acres**	**2715.3**

Current Trends

Calapooya Divide Meadows

Meadows are being encroached by conifers. If this trend continues there would a continued loss of meadow habitats.

Grassy Glade Meadow

Grassy Glade meadow has some encroachment from small conifers. The meadow extends in down through forested areas in "fingers". There are larger (over 10" diameter) trees around the meadow edges. Native plant species include Lemmon's needle grass (*Acnatherum lemmonii*), California brome (Bromus carinatus), California oatgrass (*Danthonia californica*), blue wildrye (*Elymus glaucus*), California fescue (*Festuca californica*) Invasive plant species St John's Wort, cheatgrass and other annual bromes and a patch of blackberry are all present here. The soil is thin and rocky and the vegetation is generally sparse and would probably not carry a prescribed fire.

Bear Mountain Meadow

This meadow is also being encroached by conifers and invasive plants. If the current trend continues the meadow habitat would continue to shrink.

Other Dry/Mesic and Wet Meadows

- This includes meadows in the rest of the watershed planning area.
- Currently encroachment by conifers and invasive plant species effects special habitat meadow areas. Meadow habitat and species diversity would increase if the current trend continues.
- Native plant species and species richness has decreased as a result of higher canopy closure and change from open meadow to a more forested canopy.
- The Upper Middle Fork Meadow Enhancement project has started work on meadows in the watershed area. This project includes Rigdon Meadows, Mutton Meadow, Big Pine Opening and Jim's Oak Patch. The vegetation response is being measured in these areas and this information should be used to assist in further meadow restoration planning.

Rigdon Point RNA

Historically this habitat was maintained by periodic fires. Knobcone pine is dependent on frequent fires to regenerate. Fire suppression has resulted in a decreased area of knobcone pine and currently they are only found in scattered populations.
Current fire exclusion in this area will lead to further encroachment shading out of the knobcone pine. If this trend continues without a prescribed or natural fire it is possible that knobcone pine could be extirpated from the RNA.

Terrestrial TE &S and Unique Species

Reference the following pages from the Upper Middle Fork Watershed Analysis (UMFWA) and the Middle Fork Willamette River Downstream Tributaries Watershed Analysis (MFWDT) on the pages listed. The information below is new or updated information that should be used with the information from the previous analysis and updates.
Reference: UMFWA pg 66, MFWDT pg 3-18, 4-4, 4-25, 4-27

Current Trends

- Current trends have not changed since the watershed analysis or update was written. Some species have dropped off the list and other species have been added to the sensitive list. See the Regional Forester's Special Status Species List 2008 for a complete list of species.
- The forest concern, review and watch list species are not listed here but face many of the same threats as sensitive plant species. This list was also updated and some species have been added and others dropped.
- Some new surveys have been conducted in the watersheds; however most of the watershed remains un-surveyed and it is likely that some plant populations have not been located and may be vulnerable.

Non-Native Species

Reference the following pages from the Upper Middle Fork Watershed Analysis (UMFWA) and the Middle Fork Willamette River Downstream Tributaries Watershed Analysis (MFWDT) on the pages listed. The information below is new or updated information that should be used with the information from the previous analysis and updates.

Reference: MFWWDT 3-18, 3-21, Current Conditions 4-3 through 4-5 Interpretations and Trends 5-2 through 5-11.

Reference

The Willamette National Forest Integrated Weed Management Environmental Assessment Decision Record was signed June 25, 2007. This document provides a framework for weed treatment on the forest. In summary; it prioritizes treatment of new invaders using the early detection rapid response approach The purpose of the project is to effectively control invasive plants according to new management direction provided in the *Pacific Northwest Region Invasive Plant Program, Preventing and Managing Invasive Plants* Record of Decision (USDA Forest Service 2005a).

Revegetation

In January 2008 National Policy Forest Service Manual Chapter 2000, Chapter 2070- Vegetation Ecology

National Policy is Forest Service Manual Chapter 2000, Chapter 2070- Vegetation Ecology 1/14/08

2070.2 – Objectives

Objectives for the use of native plant materials in revegetation, rehabilitation, and restoration of both aquatic and terrestrial ecosystems are to:

1. Maintain, restore or rehabilitate native ecosystems so that they are self-sustaining, resistant to invasion by non-native invasive species and/or provide habitat for a broad range of species including, threatened, endangered, and rare species.
2. Maintain adequate protection for soil and water resources, through timely and effective revegetation of disturbed sites that could not be restored naturally.
3. Promote the use of native plant materials for the revegetation, rehabilitation and restoration of native ecosystems.

4. Promote the appropriate use and availability of both native and non-native plant materials.
5. Cooperate with other federal agencies, state agencies and local governments, tribes, academic institutions and the private sector to increase the knowledge and availability of native plant materials, including developing sources of genetically appropriate plant materials.
6. Increase and disseminate information which will guide the selection, use, and availability of genetically appropriate plant materials.
7. Promote the study, planning, and implementation of actions which will maintain, restore and rehabilitate native ecosystems on NFS lands and other lands administered by the Forest Service and in the United States.

2070.3 – Policy

Policy for selection, use, and storage of native and non-native plant materials that are used in the revegetation, restoration and rehabilitation of National Forest System lands are as follows:
1. Ensure genetically appropriate native plant materials are given primary consideration.
2. Restrict use of persistent, non-native, non-invasive plant materials to only those situations when timely reestablishment of a native plant community either through natural regeneration or with the use of native plant materials is not likely to occur. Examples include but are not limited to the following:
a. When emergency conditions exist where it becomes necessary to protect basic resource values (such as, soil stability, water quality, and prevention of establishment of invasive species).
b. When native plant materials are not available and/or are not economically feasible.
c. In permanently, highly altered plant communities, such as road cuts, permanent and temporary wildlife openings, log landings, skid trails, temporary roads that have been closed and are used for linear wildlife openings and sites dominated by nonnative, invasive species.
d. In designated historical sites where maintenance of historical vegetation communities, including agricultural crops, is needed to maintain historical integrity (FSM 2630).
3. Select non-native plants as interim, non-persistent plant materials provided they will not hybridize with local species, will not permanently displace native species or offer serious long-term competition to the recovery of endemic plants, and are designed to aid in the re-establishment of native plant communities.

Regional EIS that amended our Forest Plan

USDA Forest Service. 2005. Decision Notice for Pacific Northwest Region Invasive Plant Program Preventing and Managing Invasive Plants, USDA Forest Service, Pacific Northwest Region, Portland, Oregon.

This ROD has amended our Forest Plan to include Standard 13:
"Native plant materials are the first choice in revegetation for restoration and rehabilitation where timely natural regeneration of the native plant community is not likely to occur. Non-

native, noninvasive plant species may be used ***in any of the following situations:*** 1) when needed in emergency conditions to protect basic resource values (e.g., soil stability, water quality and to help prevent the establishment of invasive species), 2) as an interim, non-persistent measure designed to aid in the reestablishment of native plants, 3) if native plant materials are not available, ***or*** 4) in permanently altered plant communities. Under no circumstances will nonnative invasive plant species be used for revegetation."

Current Trends

Non-native plant species classified as noxious weeds in the watersheds have been treated with chemical, biological control, manual, and mechanical methods. New invaders such as False Brome (*Brachypodium sylvaticum*), and sulfur cinquefoil (*Potentilla recta*) have been found in limited numbers in the watershed. Much of the area in the watershed has not been surveyed for invasive plant species and it is likely that some species are already present. Established weed species such as scotch broom (*Cystisus scoparius*), Himalayan Blackberry (*Rubus armeniacus)*, and Meadow Knapweed (*Centaurea pratensis*) have been treated as time and money allows. Table 2 shows a list of the known non-native plant species in the watersheds.

- Current and ongoing ground disturbing activities such as logging, fuels reduction projects, and road maintenance have the potential to spread and establish non-native plant species.
- Some past erosion control and forage enhancement projects planted species that continue to persist along roadsides and in meadows.
- Recreational users (hiker, mountain bikers, ATV users) spread non native species along trails in the watershed area.
- Native species were collected and will be grown out for re-seeding in the Jim's Creek project area.
- Invasive species in the Jim's Creek area will be treated as part of the project.

Table 2. Known Invasive Plant Species				
Common Name	**Scientific Name**	**Extent of Infestation**	**Current Treatment**	**Management Goal**
Butterfly Bush	*Buddelia davidsonii*	0.1	None	Eradication
Spotted Knapweed	*Centaurea maculosa*	8.7	Chemical	Containment
Meadow Knapweed	*Centaurea pratensis*	2.4	Chemical	Containment
Foxglove	*Digitals purpurea*	3.1	None	Containment
St. Johns's Wort	*Hypericum perforatum*	Not Known	None	
Purple loose strife	*Lythrum salicaria*	0.1	Hand pull	Eradication
Reed Canarygrass	*Phalaris arundinacea*	0.1	None	Containment
Giant Knotweed	*Polygonum sachalinense*	0.1	Chemical	Eradication (treated check to see if still present)
Himalayan Blackberry	*Rubus armeniacus (discolor)*	0.6	None	Minimize spread
	Total Acres	**15.2**		

STEP 6: RECOMMENDATIONS

The recommendations below are in addition to the recommendations already determined to be valid in the prior versions of the watershed analysis.

Non-Forested Special Habitats Recommendations

- Use prescribed burning to keep the disturbance regime in fire maintained special habitat communities as long as mitigation against increasing noxious weeds can be effective. (*Reference 17a, 27 UMF 1996*)
- Target non-forested special habitats for noxious weed survey and control using mechanical, biological and chemical methods within guidelines set by the Willamette National Forest's Integrated Weed Management Environmental Assessment (March 2007)
- Restore and maintain special habitat areas. (*Reference 20 UMF 1996*)

Specific Area Recommendations

The areas below are specific recommendations. Other areas that are recommended for treatment are special habitats in the Buck Creek 5th field watershed, Little Willow Creek and any planning area that has these features.

Calapooya Divide

- Reconnaissance of these meadows is needed to plan treatment methods and priorities.
- Use whip felling, tree falling, broadcast burning, and seeding with natives to restore meadows.
-

Grassy Glade Meadow

- Manually pull St. John's wort, cut and chemically treat the isolated blackberry patch along the road side. Cut and scatter conifers under 10" dbh around the meadow edge and along the fingers of the meadow.

Bear Mountain Meadow

- Visit to decide treatment methods.
- Treat weeds, increase big game forage, and possibly cut encroaching conifers around meadow edge.

Rigdon Point

- This area should be visited and surveyed by fire, botany, ecology and silvicultural personnel to determine possible treatments to increase habitat for knobcone pine.

Botanical Species

- Most of the watershed has not been surveyed for sensitive species. Inventory and document sensitive species sites during project planning.(*Reference 31UMF 1996*)
- Monitor known sensitive plant locations to insure that their habitats are being maintained for the persistence of the species. .(*Reference 31UMF 1996*)
- Control or eradicate invasive species, remove vehicle access to sensitive plant sites, and manage vegetation to maintain sensitive species habitat.
- Restore and manage potential habitat for sensitive species.

Botanical Species Distribution Recommendations

(*Reference #33 UMF WA 1996)*

- Most of the watershed has not been inventoried for non-native species. Inventory and document invasive species.
- Species that are new invaders to the watershed will be targeted for eradication. Established weed populations will be prioritized for treatment and treated.
- Noxious weeds will be controlled using mechanical, biological and chemical methods within guidelines set by the Willamette National Forest's Integrated Weed Management Environmental Assessment (March 2007).
- Roads that are listed for closure in this analysis and update will be surveyed and pre-treated for invasive plant species.
- Invasive plant species in the Hills Creek Reservoir area will be treated in accordance with the related plan (Hills Creek Reservoir Plan 2008).

Revegetation Recommendations

- Genetically appropriate (local) native plant materials are the first choice for restoration and rehabilitation where timely natural regeneration of the native plant community is not likely to occur. *National Policy is Forest Service Manual Chapter 2000, Chapter 2070- Vegetation Ecology 1/14/08*
- In 2005 the *USDA Forest Service Decision Notice for Pacific Northwest Region Invasive Plant Program Preventing and Managing Invasive Plants, ROD* amended our Forest Plan to include Standard 13: "Native plant materials are the first choice in revegetation for restoration and rehabilitation where timely natural regeneration of the native plant community is not likely to occur."
- Use native local genetic seed as the first choice when seeding any areas. Use weed free or native straw for mulch.
- Areas that are disturbed from maintenance

Road Management

This WA includes an update to the analysis on roads which started with a check and update of database and GIS coverage for roads. The main attribute checked and updated was the operation maintenance levels (current road closures). An analysis of erosion and landslide potential in the watershed was also completed using the NetMap (Brenda, et al) model (See Map 1). The NetMap model was used to help identify and/or validate the listing of prioritized road work which includes roads with high maintenance needs and roads proposed for closure.

Base on a variety of sources which included the District Supplemental Road Analysis, NetMap and professional experience and knowledge of the watershed, the following areas were identified and prioritize for work:

1. Staley and Echo Creeks
2. Swift Creek
3. Buck Creek
4. Larison Creek
5. Paddy's Valley

The following tables display a summary of the current road conditions (see Map 2), current 2008 road work planned with county funding (see Map 3) and a proposed action plan for the next five years (see Map 4). Specific road numbers and miles, proposed prescriptions, and year in which the road work is scheduled can be found on the subsequent tables that follow the summary tables.

Table 1 – Summary of Road Status

Subwatershed	Total Roads	Total Rx'ed to be Closed/ Prohibit*	Current Closed Roads
Buck	237.9	91.3	20.6
Coal	66.7	32.1	15.3
Echo	141.8	41	15
Grey	67.9	16.1	3.6
Larison	69.8	15.5	10.2
Packard	183	45.1	21
Paddy's Valley	99.1	18.5	27.7
Pioneer Gulch	47.1	15	17.7
Staley	135.2	64.8	15.1
Swift	61.8	14.5	15.1
Tumblebug	60	20.1	19.8
Totals	1170.3	374	181.1

* District Supplemental Road Analysis (District Access and Travel Management Plan)

Table 2 - 5 year Action Plan for Road Management

Subwatershed	Type of Work	2008 Planned Roadwork	2009 Planned Roadwork	2010 Planned Roadwork	2011 Planned Roadwork	2012 Planned Roadwork	2013 Planned Roadwork	Totals
Buck	Payco Maintenance	57.8	-	-	-	-	-	**57.8**
	Maintenance	45.4	0.3	4.1	17.7	-	-	**67.1**
	Closures	-	-	-	23.0	-	1.5	**24.5**
Coal	Payco Maintenance	12.6	-	-	-	-	-	**12.6**
	Maintenance	0.3	-	16.4	3.6	-	-	**20.3**
	Closures	-	1.6	9.6	0.2	-	-	**11.4**
Echo	Payco Maintenance	11.1	-	-	-	-	-	**11.1**
	Maintenance	2.4	15.4	0.9	-	-	-	**18.7**
	Closures	-	-	1.0	-	-	-	**1.0**
Grey	Payco Maintenance	-	-	-	-	-	-	**-**
	Maintenance	3.2	-	-	-	-	-	**3.2**
	Closures	-	-	-	-	-	-	**-**
Larison	Payco Maintenance	-	-	-	-	-	-	**-**
	Maintenance	1.4	-	-	-	3.4	0.9	**5.7**
	Closures	-	-	-	-	8.5	-	**8.5**
Packard	Payco Maintenance	13.3	-	-	-	-	-	**13.3**
	Maintenance	1.0	-	-	-	-	1.9	**2.9**
	Closures		-	-	6.4	-	0.01	**6.4**
Paddy's Valley	Payco Maintenance	13.5	-	-	-	-	-	**13.5**
	Maintenance	11.9	-	-	-	-	5.6	**17.5**
	Closures	-	-	-	-	-	7.0	**7.0**
Pioneer Gulch	Payco Maintenance	6.6		-	-	-	-	**6.6**
	Maintenance	-		10.8	-	-	-	**10.8**
	Closures	-		5.6	-	-	-	**5.6**
Staley	Payco Maintenance	42.6	-	-	-	-	-	**42.6**
	Maintenance	12.3	28.6	2.6	-	-	-	**43.5**
	Closures	-	32.7	-	-	-	-	**32.7**
Swift	Payco Maintenance	17.5	-	-	-	-	-	**17.5**
	Maintenance	5.2	-	7.7	-	-	-	**12.9**
	Closures		-	20.0	-	-	-	**20.0**

Subwatershed	Type of Work	2008 Planned Roadwork	2009 Planned Roadwork	2010 Planned Roadwork	2011 Planned Roadwork	2012 Planned Roadwork	2013 Planned Roadwork	Totals
Tumblebug	Payco Maintenance	8.2	-	-	-	-	-	**8.2**
	Maintenance	1.0	-	14.3	-	-	5.9	**21.2**
	Closures	-	-	-	-	-	-	**-**
Totals	**Payco Maintenance**	**183.2**	**-**	**-**	**-**			**183.2**
	Maintenance	**84.1**	**44.3**	**56.8**	**21.3**	**3.4**	**14.3**	**224.2**
	Closures	**-**	**34.3**	**36.2**	**29.6**	**8.5**	**8.5**	**117.12**

Payco Maintenance = Driveable Waterbars
Maintenance = Varies from Low and High frequency and Low to High Intensity (see specific road prescriptions)
Closures = Varies from Low to High Intensity (see specific road prescriptions)

The tables on the following pages present the listing of specific road numbers and prescriptions for each of the given years. The following closure and maintenance definitions were used.

Closure Types

1. Administrative Closure – seasonal or year-round closure by gate for a specific reason, usually wildlife related. Administrative access only
2. Low level closure: Close with a physical barrier and water bar as needed. Water bars would not be drivable. Cost: $2,000 - $5,000/mile
3. Moderate level closure: Close with a physical barrier and water bar as needed. Water bars would not be drivable. Include the following work items listed below as needed. Cost: $5,000 - $15,000/mile
   Remove culverts from stream channels with fills of shallow to moderate depth.
   Reduce fill depth for culverts in deep fill locations.

   Pull back side cast material
4. High level closure (Decommissioning): Close with a physical barrier and water bar as needed. Water bars would not be drivable. Include work items described at the moderate level and as listed below as needed. Closed: $15,000 - $30,000/mile.
   Remove culverts from stream channels in deep fills
   Sub-soiling

Maintenance Types:

1. Low Intensity: Work may consist of brushing of roadside vegetation, falling of danger trees, blading of roadbed, cleaning of ditches and culvert inlets and outlets, removing slough and slide material and placing aggregate and/or asphalt surfacing. In addition, culverts in dry, intermittent channels and ditch relief pipes would be replaced as needed. $12,000/mile

2. Moderate Intensity: Includes work mentioned above with the addition of replacing culverts in non-fish bearing perennial streams. The need to place a high number of culverts in close proximity to fish bearing streams could result in placing a road segment in this classification. $20,000/mile

3. High Intensity: All the above-mentioned work items could be included with the addition of replacing culverts or other in-stream work in fish-bearing, perennial streams, repairing of major road failures in riparian areas and road realignments. $60,000/mile

For each category, “frequency” would be defined as high (once every 1 to 2 years), moderate (once every 3 to 4 years) or low (once every 5 years or more).

Table 2 – 2008 Road Work

6th Field Sub-watershed	Road #	Miles	Prescription
BUCK CREEK			
	2117135	3.47	Driveable Waterbars
	2117143	5.28	Driveable Waterbars
	2117144	1.64	Driveable Waterbars
	2117145	0.52	Driveable Waterbars
	2117146	0.2	Driveable Waterbars
	2117147	0.54	Driveable Waterbars
	2117148	0.16	Driveable Waterbars
	2117153	0.59	Driveable Waterbars
	2117155	0.06	Driveable Waterbars
	2119448	0.89	Driveable Waterbars
	2119449	0.67	Driveable Waterbars
	2119477	0.7	Driveable Waterbars
	2119478	0.7	Driveable Waterbars
	2119490	0.48	Driveable Waterbars
	2124161	0.82	Driveable Waterbars
	2124162	0.5	Driveable Waterbars
	2124163	0.25	Driveable Waterbars
	2124164	0.26	Driveable Waterbars
	2124165	0.57	Driveable Waterbars
	2124166	0.54	Driveable Waterbars
	2124167	0.09	Driveable Waterbars
	2124168	0.24	Driveable Waterbars
	2124169	0.46	Driveable Waterbars
	2124170	0.27	Driveable Waterbars
	2124171	1.9	Driveable Waterbars
	2125000	1.88	Driveable Waterbars
	2125034	0.11	Driveable Waterbars
	2125198	0.73	Driveable Waterbars
	2125200	1.17	Driveable Waterbars
	2125203	0.41	Driveable Waterbars
	2125204	0.31	Driveable Waterbars
	2125205	1.65	Driveable Waterbars
	2125210	0.97	Driveable Waterbars
	2125211	0.16	Driveable Waterbars
	2125228	0.81	Driveable Waterbars
	2125229	0.55	Driveable Waterbars
	2127182	1.68	Driveable Waterbars
	2127185	1.86	Driveable Waterbars
	2129036	0.91	Driveable Waterbars
	2129037	0.26	Driveable Waterbars
	2129440	0.38	Driveable Waterbars
	2129441	0.24	Driveable Waterbars
	2129442	1.29	Driveable Waterbars
	2129443	0.9	Driveable Waterbars
	2129446	2.93	Driveable Waterbars
	2129456	0.64	Driveable Waterbars
	2133225	0.63	Driveable Waterbars
	2309440	0.89	Driveable Waterbars

6th Field Sub-watershed	Road #	Miles	Prescription
	2309447	0.77	Driveable Waterbars
	5850027	0.38	Driveable Waterbars
	5850028	0.64	Driveable Waterbars
	5850189	2.86	Driveable Waterbars
	5850288	0.07	Driveable Waterbars
	2118480	1.55	Driveable Waterbars
	2118486	0.02	Driveable Waterbars
	2118492	0.01	Driveable Waterbars
	2118493	0.23	Driveable Waterbars
	2118495	1.46	Driveable Waterbars
	2118497	0.08	Driveable Waterbars
	2120101	0.1	Driveable Waterbars
	2120102	0.07	Driveable Waterbars
	2120103	0.24	Driveable Waterbars
	2120447	3.83	Driveable Waterbars
	2120448	1.16	Driveable Waterbars
	2120470	0.57	Driveable Waterbars
	2120474	0.38	Driveable Waterbars
	2120478	0.2	Driveable Waterbars
		57.8	
	2117000	10.83	Maintenance Low Low
	2309000	4.06	Maintenance Mod Low
	5850000	9.02	Maintenance Mod Low
	2120000	0.44	Maintenance-High Low
	2120000	11.15	Maintenance High Low
	2129000	9.85	Maintenance-High Low
		45.35	
BUCK CREEK Total		**103.15**	
COAL CREEK			
	2125195	0.28	Driveable Waterbars
	2125197	0.29	Driveable Waterbars
	2125200	0.82	Driveable Waterbars
	2125204	0.01	Driveable Waterbars
	2125205	0.18	Driveable Waterbars
	2125207	1.32	Driveable Waterbars
	2125208	1.56	Driveable Waterbars
	2125212	0.43	Driveable Waterbars
	2133211	1.14	Driveable Waterbars
	2133225	0.16	Driveable Waterbars
	5850151	0.96	Driveable Waterbars
	5850205	0.4	Driveable Waterbars
	5850209	1.2	Driveable Waterbars
	5850210	0.41	Driveable Waterbars
	5850215	1.81	Driveable Waterbars
	5850228	0.21	Driveable Waterbars
	5851109	0.16	Driveable Waterbars
	5851110	0.91	Driveable Waterbars
	5851319	0.34	Driveable Waterbars
		12.59	

6th Field Sub-watershed	Road #	Miles	Prescription
	5850000	**0.29**	Maintenance-Mod Low
COAL CREEK Total		**12.88**	
ECHO CREEK			
	2143315	1.37	Driveable Waterbars
	2143319	0.88	Driveable Waterbars
	2143320	1.76	Driveable Waterbars
	2143321	0.61	Driveable Waterbars
	2143322	0.97	Driveable Waterbars
	2143324	0.83	Driveable Waterbars
	2143329	0.95	Driveable Waterbars
	2300415	3.68	Driveable Waterbars
		11.05	
	2120000	**2.41**	Maintenance High Low
ECHO CREEK Total		**13.46**	
GREY CREEK			
	5850000	**3.17**	Maintenance Mod Low
GREY CREEK Total		**3.17**	
LARISON CREEK			
	5850000	**1.42**	Maintenance Mod Low
LARISON CREEK Total		**1.42**	
PACKARD CREEK			
	2117153	0.1	Driveable Waterbars
	2117155	0.42	Driveable Waterbars
	2119464	0.52	Driveable Waterbars
	2119478	0.72	Driveable Waterbars
	2119483	0.51	Driveable Waterbars
	2119488	0.44	Driveable Waterbars
	2119511	0.5	Driveable Waterbars
	2119521	0.19	Driveable Waterbars
	2118477	0.57	Driveable Waterbars
	2118480	5.18	Driveable Waterbars
	2118481	1.56	Driveable Waterbars
	2118486	0.49	Driveable Waterbars
	2118487	0.6	Driveable Waterbars
	2118488	0.13	Driveable Waterbars
	2118492	0.87	Driveable Waterbars
	2118493	0.14	Driveable Waterbars
	2118494	0.34	Driveable Waterbars
	2118495	0.01	Driveable Waterbars
		13.29	
	2117000	0.82	Maintenance Low Low

6th Field Sub-watershed	Road #	Miles	Prescription
	5850000	0.2	Maintenance Mod Low
		1.02	
PACKARD CREEK Total		**14.31**	
PADDY'S VALLEY			
	2153353	7.05	Driveable Waterbars
	2153355	2.3	Driveable Waterbars
	2153360	0.71	Driveable Waterbars
	2153371	1.13	Driveable Waterbars
	2153372	0.42	Driveable Waterbars
	2154378	1.05	Driveable Waterbars
	2154404	0.13	Driveable Waterbars
	2154403	0.69	Driveable Waterbars
		13.48	
	2153000	11.18	Maintenance ModfreqLow
	2153000	0.69	Maintenance-ModfreqLow
		11.87	
PADDY'S VALLEY Total		**25.35**	
PIONEER GULCH			
	2144299	1.97	Driveable Waterbars
	2100400	2.97	Driveable Waterbars
	2100407	0.15	Driveable Waterbars
	2100415	0.24	Driveable Waterbars
	2149410	0.27	Driveable Waterbars
	2149417	1.02	Driveable Waterbars
		6.62	
PIONEER GULCH Total		**6.62**	
STALEY CREEK			
	2134248	6.15	Driveable Waterbars
	2134249	1.11	Driveable Waterbars
	2134350	0.34	Driveable Waterbars
	2136258	0.28	Driveable Waterbars
	2136260	0.51	Driveable Waterbars
	2136263	0.38	Driveable Waterbars
	2136265	5.16	Driveable Waterbars
	2136266	1.76	Driveable Waterbars
	2136267	3.46	Driveable Waterbars
	2136268	1.01	Driveable Waterbars
	2136269	2.54	Driveable Waterbars
	2136272	0.18	Driveable Waterbars
	2136273	0.15	Driveable Waterbars
	2136274	0.5	Driveable Waterbars
	2136275	0.57	Driveable Waterbars
	2136283	0.29	Driveable Waterbars
	2136300	5.05	Driveable Waterbars
	2137264	6.1	Driveable Waterbars

6th Field Sub-watershed	Road #	Miles	Prescription
	2137266	0.4	Driveable Waterbars
	2137268	2.09	Driveable Waterbars
	2137270	0.23	Driveable Waterbars
	2137273	0.78	Driveable Waterbars
	2144335	3.02	Driveable Waterbars
	2154175	0.58	Driveable Waterbars
		42.6	
	2136000	**12.29**	Maintenance Mod Low
STALEY CREEK Total		**54.93**	
SWIFT CREEK			
	2100400	4.87	Driveable Waterbars
	2100407	0.7	Driveable Waterbars
	2100415	0.13	Driveable Waterbars
	2100416	3.15	Driveable Waterbars
	2100417	0.31	Driveable Waterbars
	2100420	0.14	Driveable Waterbars
	2149410	1.33	Driveable Waterbars
	2149411	0.73	Driveable Waterbars
	2149414	0.44	Driveable Waterbars
	2149415	0.85	Driveable Waterbars
	2149418	0.37	Driveable Waterbars
	2149419	0.03	Driveable Waterbars
	2149426	0.37	Driveable Waterbars
	2300420	3.23	Driveable Waterbars
	2300425	0.87	Driveable Waterbars
		17.52	
	2120000	**5.21**	Maintenance High Low
SWIFT CREEK Total		**22.73**	
TUMBLEBUG CREEK	2144310	2.16	Driveable Waterbars
	2144316	1.54	Driveable Waterbars
	2153382	2.01	Driveable Waterbars
	2153386	1.24	Driveable Waterbars
	2153390	1.2	Driveable Waterbars
		8.15	
	2153000	**1.02**	Maintenance-Mod Low
TUMBLEBUG CREEK Total		**9.17**	
Grand Total		**182.4**	Driveable Waterbars
		84.74	Maintenance
		267.145	

Table 3 – 2009 Road Work

6th Field Sub-watersheds	Road #	Miles	Prescription
BUCK CREEK			
	2134000	0.32	Maintenance-Mod Low
BUCK CREEK Total		**0.32**	
COAL CREEK			
	5851109	0.16	Close Road
	5851110	0.91	Close Road
	5851319	0.34	Close Road
	5850228	0.21	Close Mod, Pull Coal Ck Culvert
COAL CREEK Total		**1.62**	
ECHO CREEK			
	2143261	**6.57**	Rework to Improve & Stabilize
	2300415	3.68	Maintenance Low Low
	2143000	4.11	Maintenance Mod Low
	2134000	1.05	Maintenance-Mod Low
		8.84	
ECHO CREEK Total		**15.41**	
STALEY CREEK			
	2134252	1.17	Close Road
	2134261	0.23	Close Road
	2134350	0.34	Close Road
	2136263	0.38	Close Road
	2136269	1.41	Close Road
	2136272	0.18	Close Road
	2136275	0.57	Close Road
	2154175	0.58	Close Road
	2136265	5.16	High Close Road
	2134248	6.15	M-H Close Road
	2134249	1.11	M-H Close Road
	2134243	1.73	M-H Close Road
	2144335	3.02	Mod Close Road
	2134250	2.71	Mod Close Road
	2136267	3.46	Mod Close Road
	2136268	1.01	Mod Close Road
	2134250	2.4	Road Close Itself
		31.61	
	2137000	14.1	Maintenance HighfreqLow
	2134245	3.34	Maintenance Lowfreq-Mod
	2134000	7.76	Maintenance ModfreqLow
	2134000	3.37	Maintenance-ModfreqLow
		28.57	

6th Field Sub-watersheds	Road #	Miles	Prescription
STALEY CREEK Total		**60.18**	
Grand Total		**44.30**	Maintenance
		33.23	Close Roads
		77.53	

Table 4 – 2010 Road Work

6th Field Sub-watershed	Road #	Miles	Prescription
BUCK CREEK			
	5850000	4.06	Maintenance Mod Low
BUCK CREEK Total		**4.06**	
COAL CREEK			
	5850209	1.2	Mod Road Close
	5850210	0.41	Mod Road Close
	5850215	1.81	Mod Road Close
	5850250	0.37	Mod Road Close
	5850294	0.29	Mod Road Close
	2133210	5.56	Rework M-H Road Close
		9.64	
	2133000	4.25	Maintenance High Low
	5850000	1.83	Maintenance High Low
	5850000	10.27	Maintenance Mod Low
		16.35	
COAL CREEK Total		**25.99**	
ECHO CREEK			
	2144000	0.87	Maintenance Mod Low
	2120422	1.01	Re-evaluate Rx & Close Road
ECHO CREEK Total		**1.88**	
PIONEER GULCH			
	2100400	2.97	M-H Road Close
	2144299	1.66	Mod Road Close
	2100407	0.15	Close Road
	2100415	0.24	Close Road
	2144299	0.31	Close Road
	2149410	0.27	Close Road
		5.6	
	2144000	3.85	Maintenance Mod Low
	2149000	6.98	Maintenance Mod Low
		10.83	
PIONEER GULCH Total		**16.43**	
STALEY CREEK			
	2144000	2.6	Maintenance Mod Low
STALEY CREEK Total		**2.6**	

6th Field Sub-watershed	Road #	Miles	Prescription
SWIFT CREEK			
	2100400	4.87	M-H Road Close
	2100416	3.15	M-H Road Close
	2300420	3.23	M-H Road Close
	2100407	0.7	Close Road
	2100415	0.13	Close Road
	2100417	0.31	Close Road
	2149410	1.33	Close Road
	2149411	0.73	Close Road
	2149415	0.85	Close Road
	2149418	0.37	Close Road
	2149419	0.03	Close Road
	2149426	0.37	Close Road
	2120422	3.92	Re-evaluate Rx & Close Road
		19.99	
	2149000	5.45	Maintenance Mod Low
	2120422	2.27	Maintenance Mod Low
		7.72	
SWIFT CREEK Total		**27.71**	
TUMBLEBUG CREEK			
	2144000	**14.31**	Maintenance Mod Low
TUMBLEBUG CREEK Total		**14.31**	
Grand Total		**56.8**	Maintenance
		36.2	Close Roads
		93.0	

Table 5 – 2011 Road Work

6th Field Sub-watershed	Road #	Miles	Prescription
BUCK CREEK			
	2117135	3.47	Low Road Close
	2117143	5.28	Mod Road Close
	2117144	1.64	Mod Road Close
	2117145	0.52	Mod Road Close
	2117146	0.2	Mod Road Close
	2117149	0.31	Mod Road Close
	2117147	0.54	Close Road
	2117154	0.22	Close Road
	2117203	0.1	Close Road
	2117216	0.12	Close Road
	2117217	0.03	Close Road
	2118104	0.13	Close Road
	2118105	0.21	Close Road
	2118480	1.55	Close Road
	2118497	0.08	Close Road
	2125196	1	Close Road
	2125205	1.65	Close Road
	2120101	0.1	Close road & pull temp bridge
	2120102	0.07	Close road & pull temp bridge
	2120103	0.24	Close road & pull temp bridge
	2120447	3.83	Close road & pull temp bridge
	2120448	1.16	Close road & pull temp bridge
	2120470	0.57	Close road & pull temp bridge
		23.02	
	2117000	9.73	Maintenance High Low
	2120000	0.44	Repair Road @ Powder Ck
	5850000	2.86	Maintenance High Low
	2125000	2.81	Maintenance Mod Low
	2125000	1.88	Maintenance Mod Low
		17.7	
BUCK CREEK Total		**30.57**	
COAL CREEK	2125205	**0.18**	Close Road
	2125000	**3.61**	Maintenance Mod Low
COAL CREEK Total		**3.79**	
PACKARD CREEK			
	2118103	0.15	Close Road
	2118480	5.18	Close Road
	2118487	0.6	Close Road
	2118488	0.13	Close Road
	2118494	0.34	Close Road
		6.4	

6th Field Sub-watershed	Road #	Miles	Prescription
PACKARD CREEK Total		**6.4**	
Grand Total		**21.3**	Maintenance
		29.6	Close Roads
		40.76	

Table 6 – 2012 Road Work

6th Field Sub-Watershed	Road #	Miles	Prescription
LARISON CREEK			
	2102101	8.38	Mod Road Close
	2102205	0.11	Close Road
		8.49	
	2118000	**3.34**	Maintenance Upgrade & Stabilization
LARISON CREEK Total		**11.83**	
Grand Total		**3.34**	Maintenance
		8.49	Close Road
		11.83	

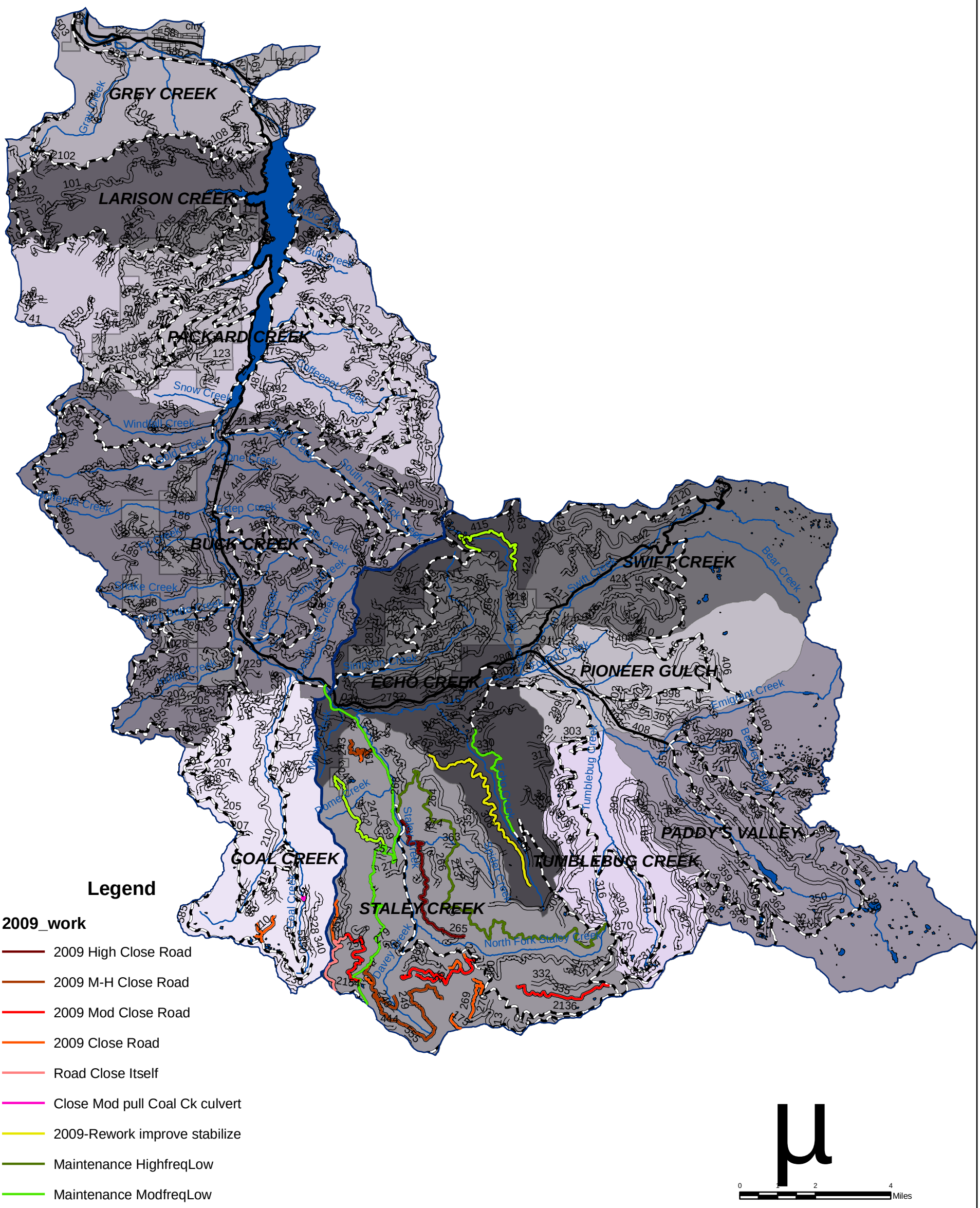
Table 7 – 2013 Road Work

6th Field Sub-Watershed	Road #	Miles	Prescription
BUCK CREEK			
	2118495	1.46	Close Road
BUCK CREEK Total		**1.46**	
LARISON CREEK			
	2302000	0.87	Maintenance High Low
LARISON CREEK Total		**0.87**	
PACKARD CREEK			
	2118495	**0.01**	Close Road
	2302000	**1.88**	Maintenance High Low
PACKARD CREEK Total		**1.89**	
PADDY'S VALLEY			
	2153353	2.05	Low Road Close
	2153355	2.3	Mod Road Close
	2153353	1.41	Close Road
	2153352	1.27	M-H Road Close
		7.03	
	2153375	3.4	Maintenance High Low
	2153370	2.23	Maintenance Mod Low
		5.63	
PADDY'S VALLEY Total		**12.66**	
TUMBLEBUG CREEK	2153370	**5.86**	Maintenance Mod Low
TUMBLEBUG CREEK Total		**5.86**	
Grand Total		**14.24**	Maintenance
		8.48	Close Roads
		22.74	

Lee Benda, Daniel Miller, Kevin Andras, Paul Bigelow, Gordon Reeves, and David Michael. NetMap: A New Tool in Support of Watershed Science and Resource Management, FOR. SCI. 53(2):206 –219.

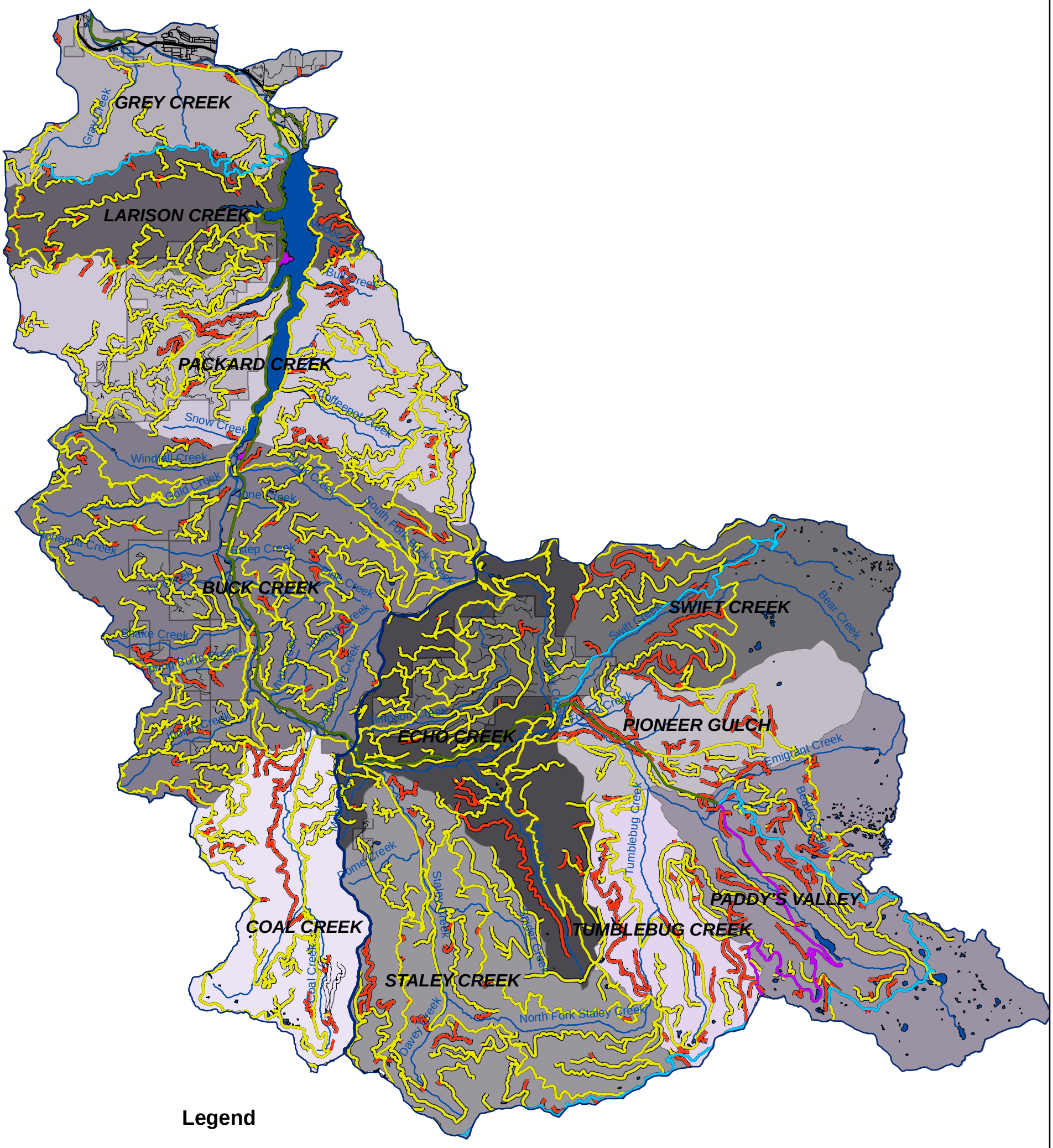
Hill's Creek Reservoir and Upper Middle Fork Watersheds

2009 Road Work



Hill's Creek Reservoir and Upper Middle Fork Watersheds

Operational Maintenance Levels



Legend

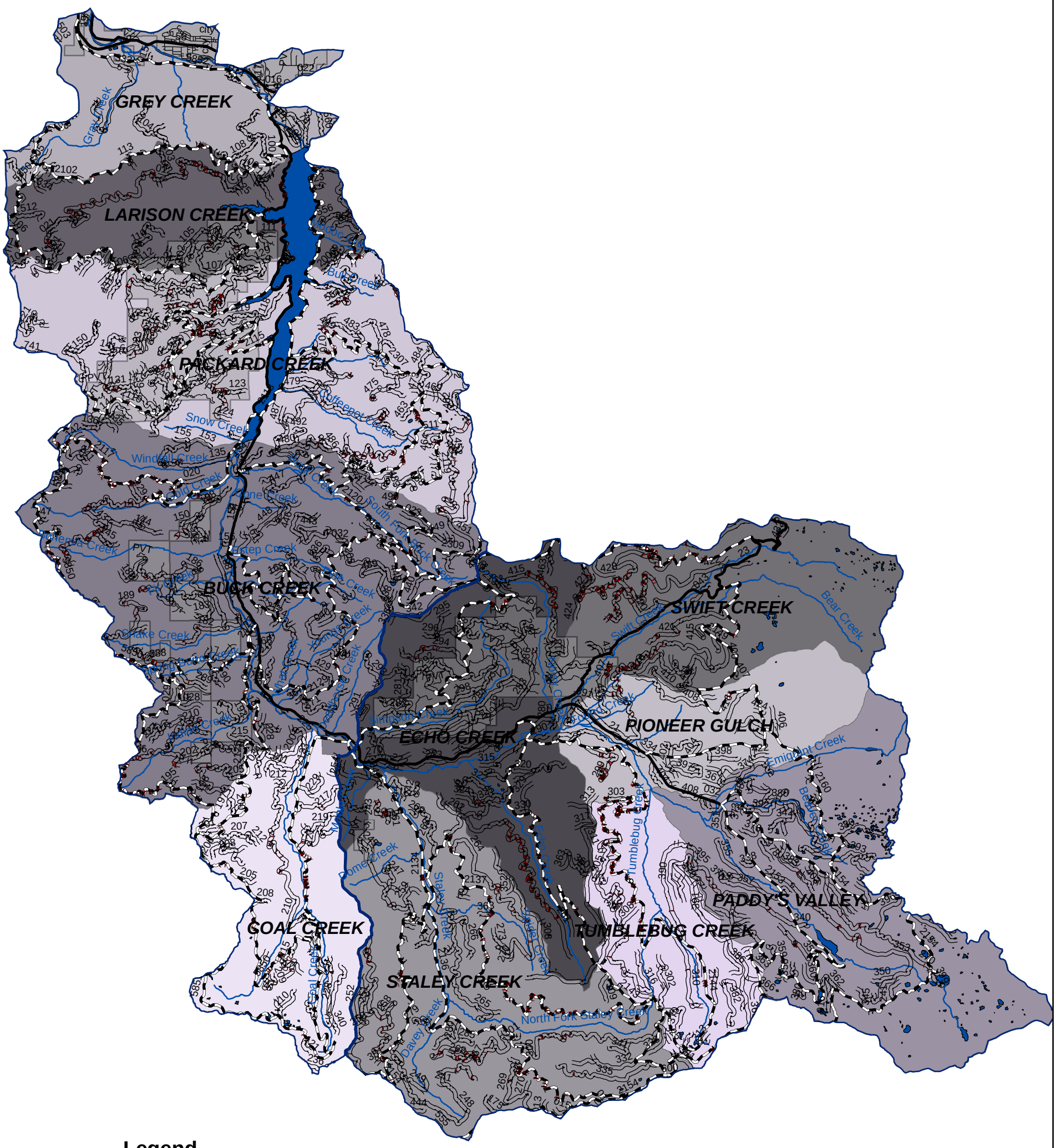
Operational Maintenance Level

- 1 - BASIC CUSTODIAL CARE (CLOSED)
- 2 - HIGH CLEARANCE VEHICLES
- 3 - SUITABLE FOR PASSENGER CARS
- 4 - MODERATE DEGREE OF USER COMFORT
- 5 - HIGH DEGREE OF USER COMFORT
- Watershed Boundary

0 1 2 4 Miles

Hill's Creek Reservoir and Upper Middle Fork Watersheds

NetMap- High Landslide Potential



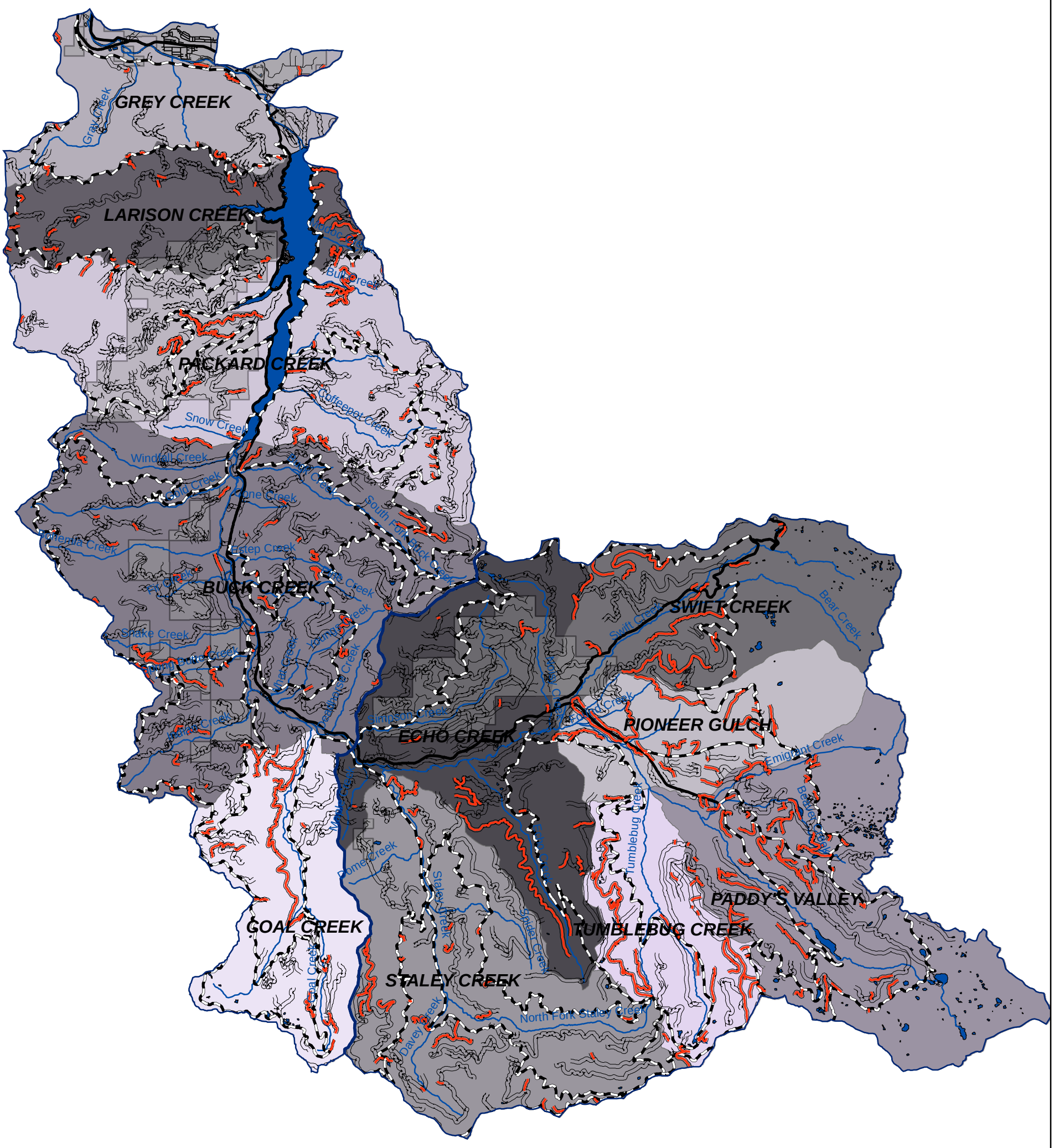
Legend

- High Landslide Potential
- High Landslide Potential
- Watershed Boundary

0 1 2 4 Miles

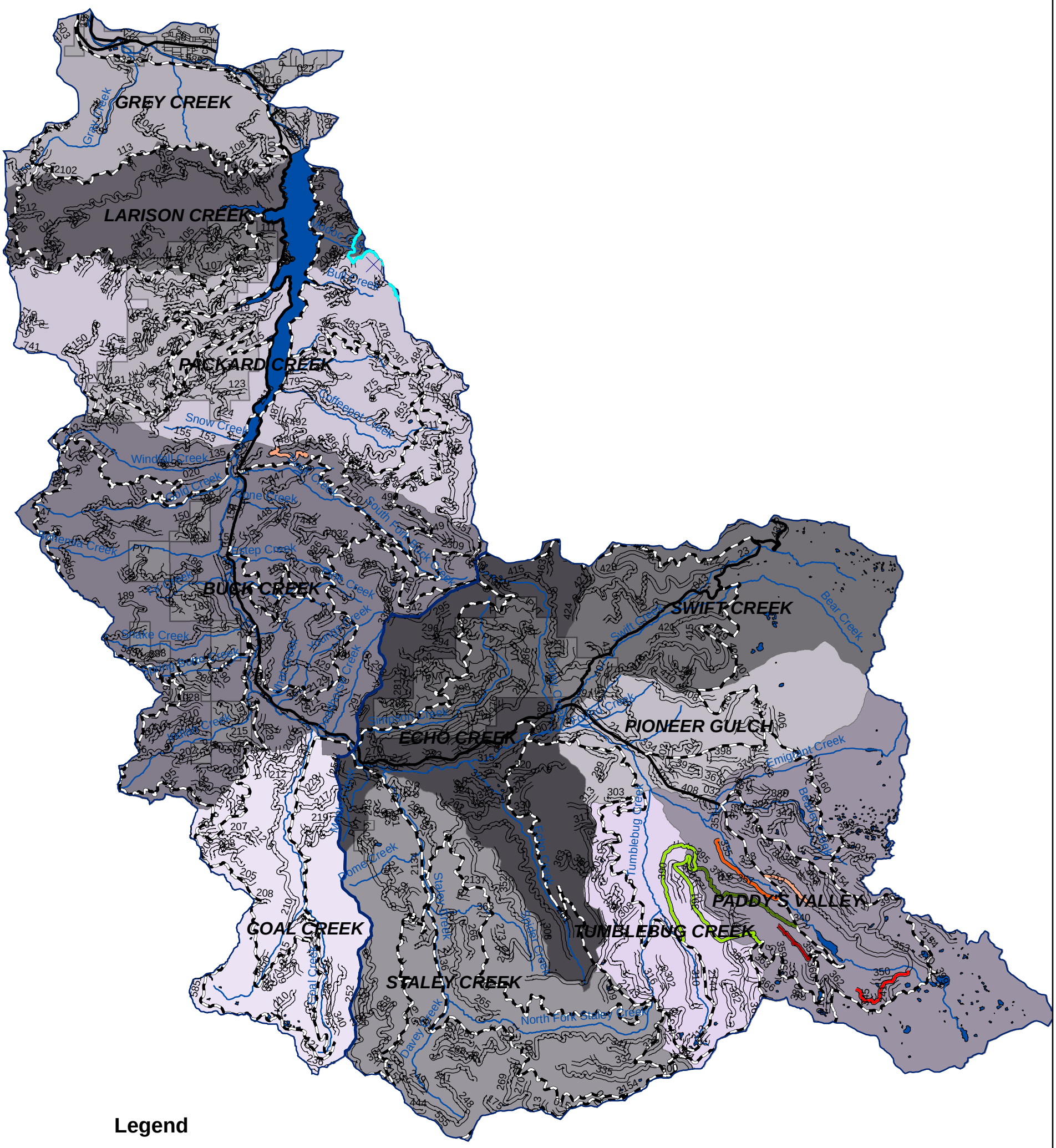
Hill's Creek Reservoir and Upper Middle Fork Watersheds

Current Closed Roads



Hill's Creek Reservoir and Upper Middle Fork Watersheds

2013 Road Work



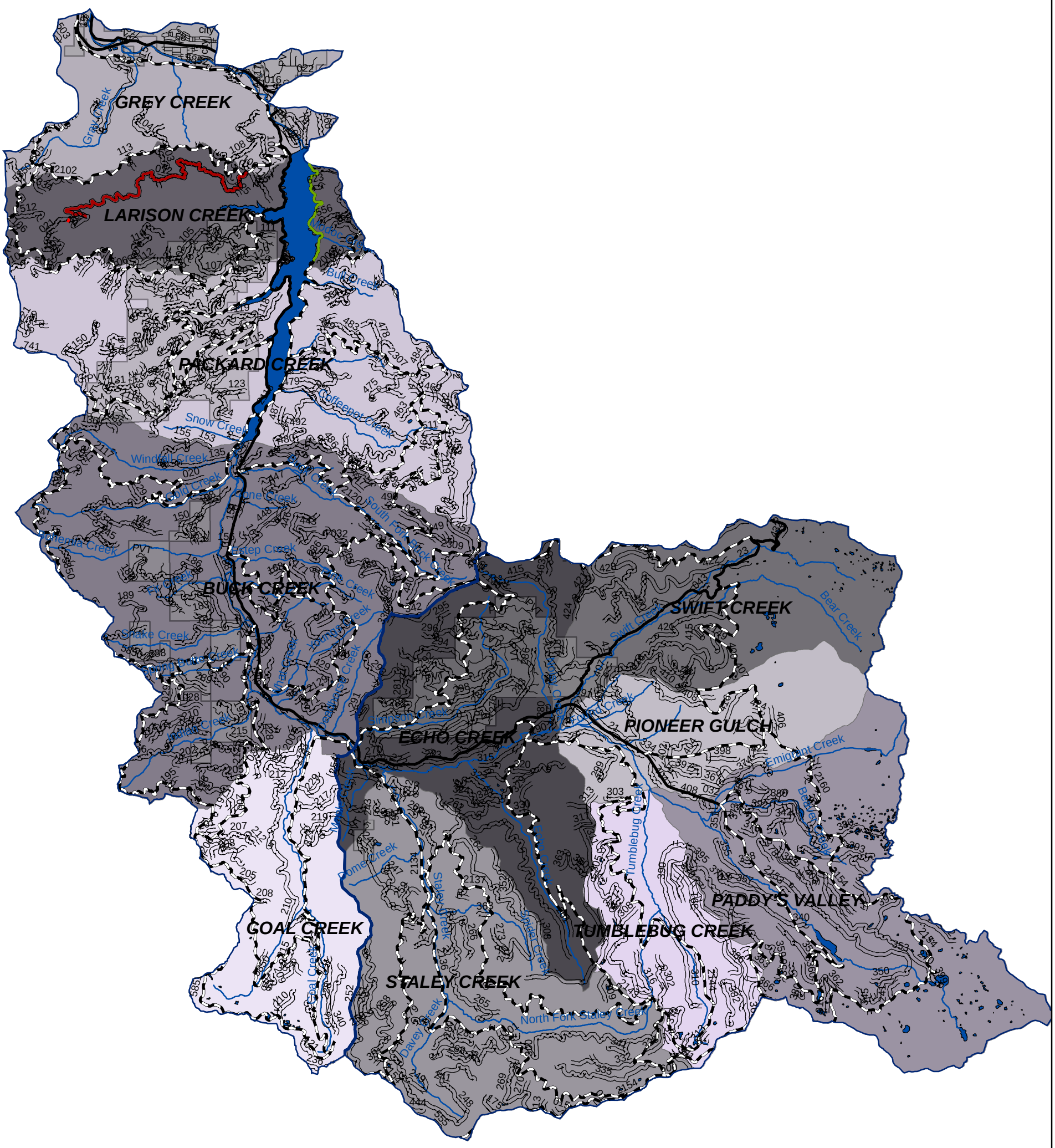
Legend

2013_work

- M-H Road Close
- 2013 Mod Road Close
- 2013 Low Road Close
- 2013-Close Road
- Maintenance HighfreqLow
- Maintenance ModfreqLow

Hill's Creek Reservoir and Upper Middle Fork Watersheds

2012 Road Work



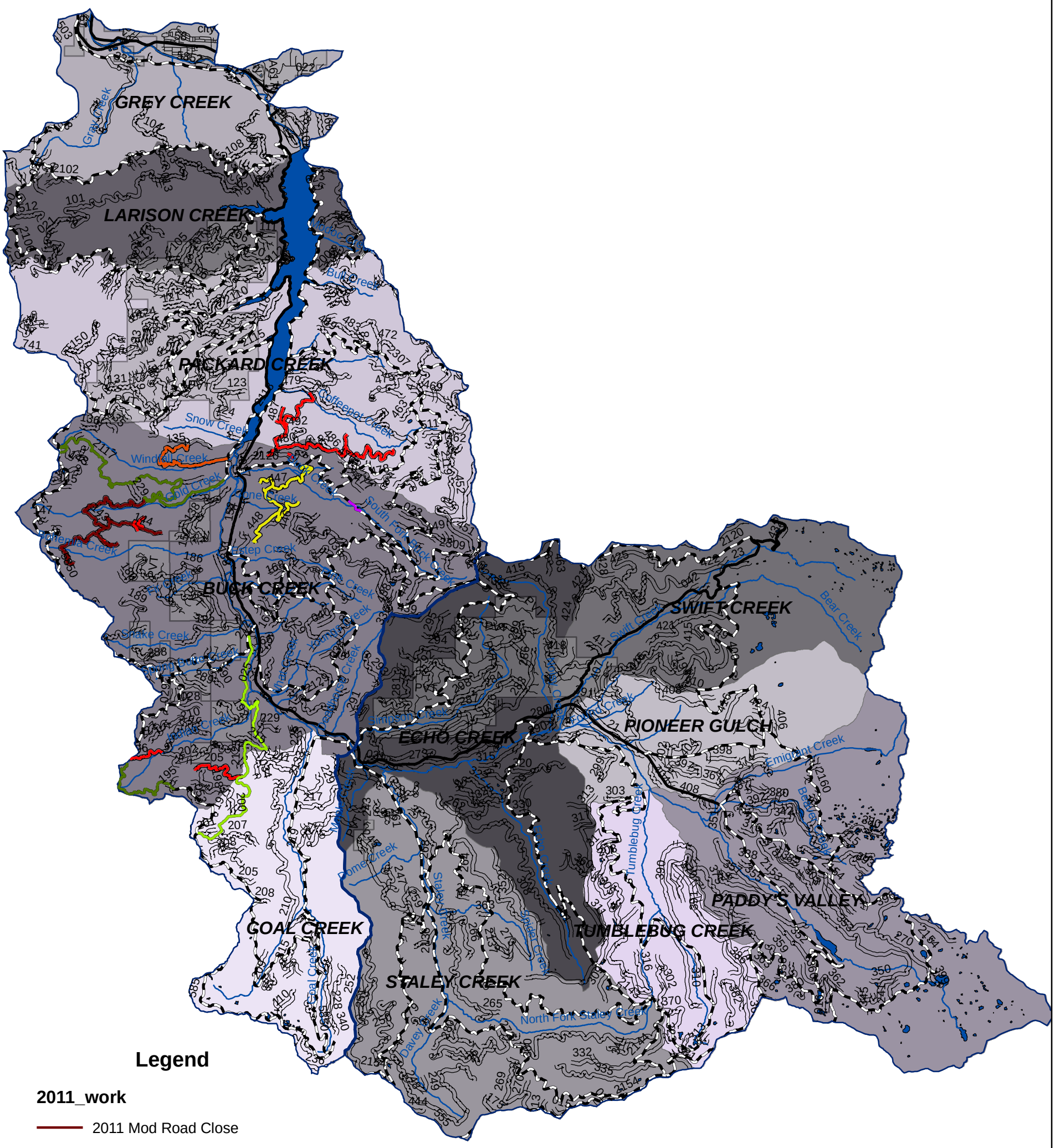
Legend

2012_work

- 2012 Mod Road Close
- 2012-Close Road
- 2012-Upgrade & Stabilization

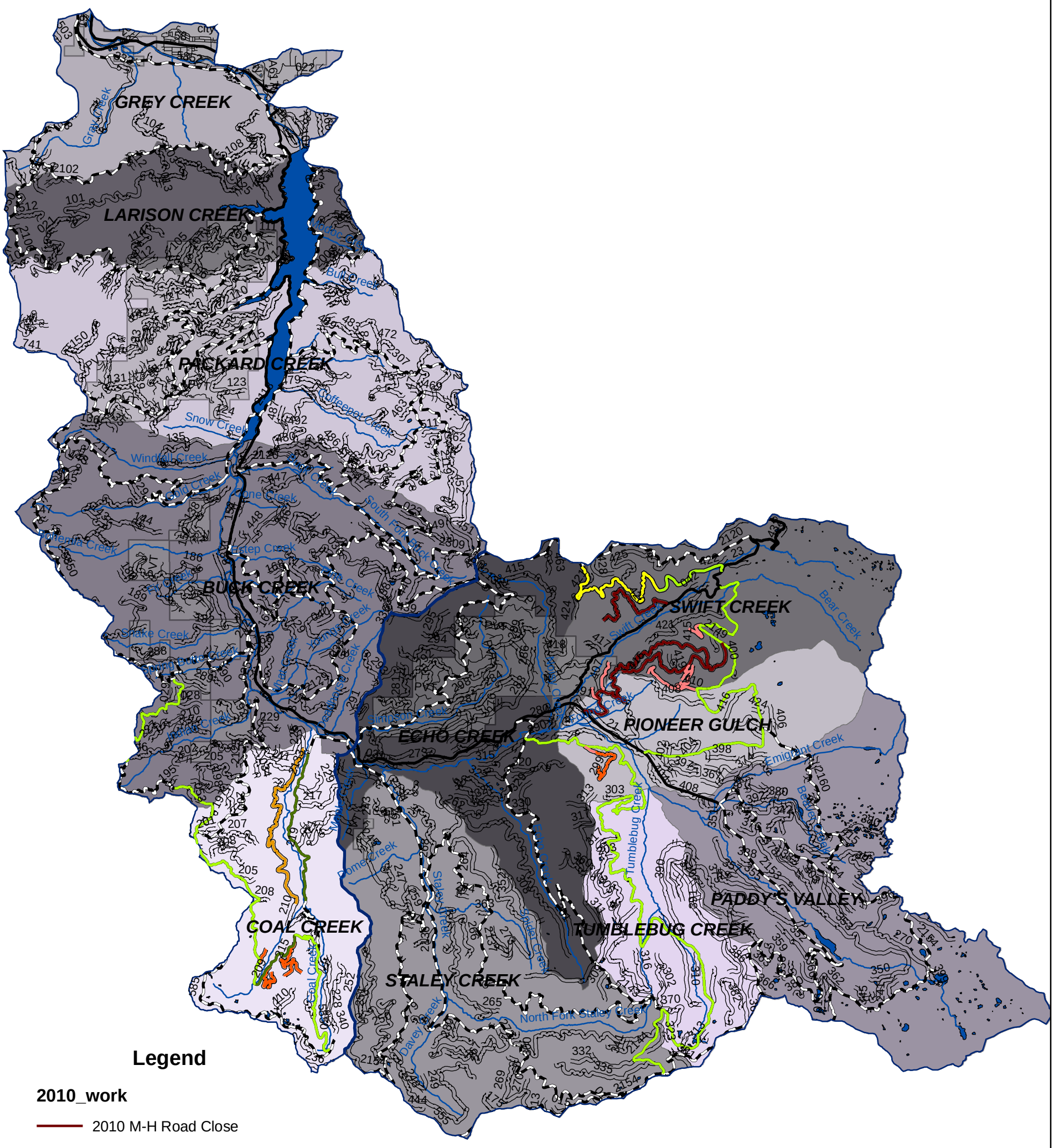
Hill's Creek Reservoir and Upper Middle Fork Watersheds

2011Road Work



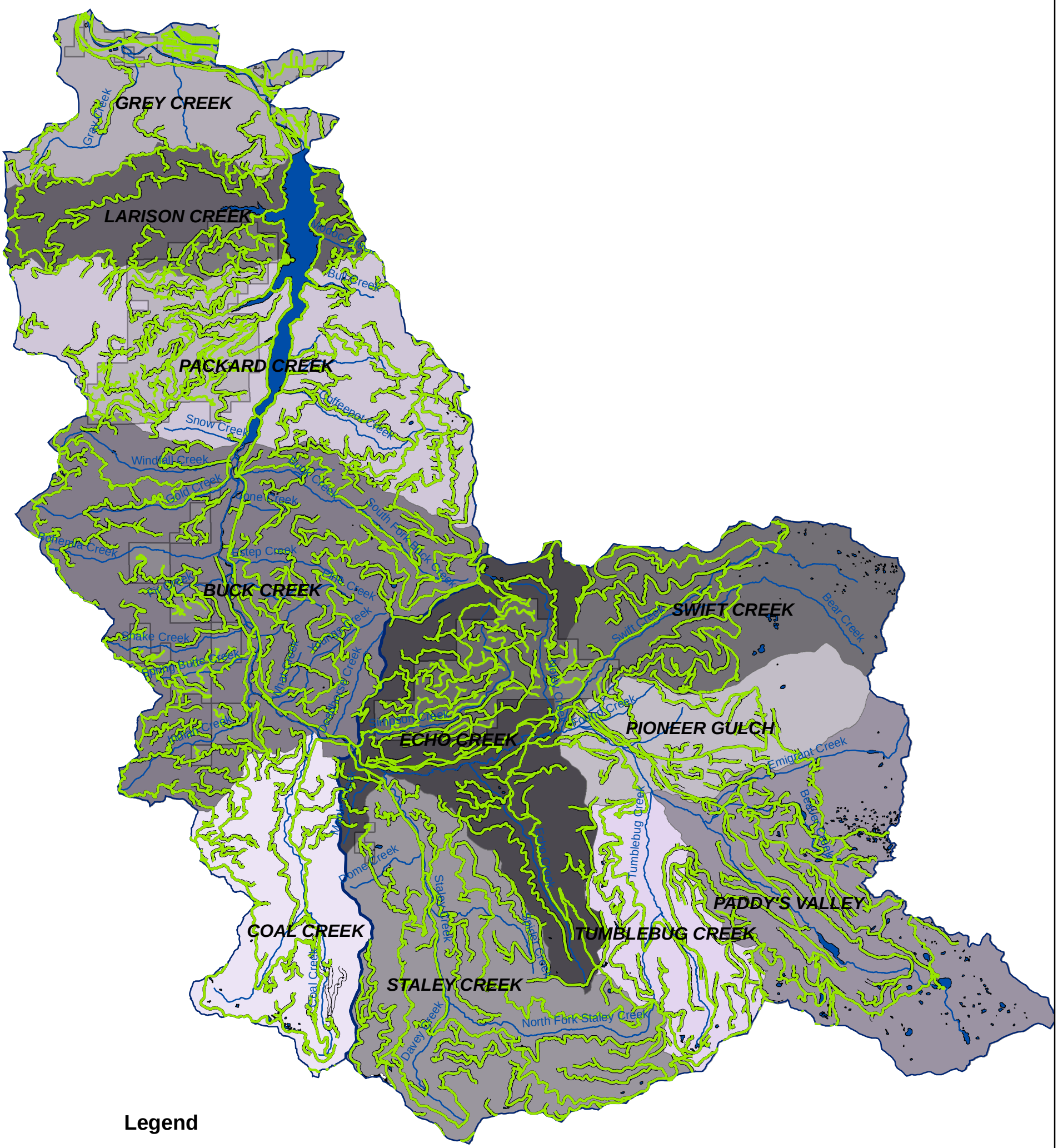
Hill's Creek Reservoir and Upper Middle Fork Watersheds

2010 Road Work



Hill's Creek Reservoir and Upper Middle Fork Watersheds

2008 County & Legacy Road Work - Driveable Waterbars



Fisheries

Step 1: Characterization

In 1993, the Oregon Department of Fish and Wildlife (ODFW) listed all of the state's bull trout populations as "sensitive". Buchanan et al. (1997) listed bull trout populations in the Middle Fork Willamette as "probably extinct" and on June 10, 1998, the US Fish and Wildlife Service (USFWS) listed the Columbia River bull trout population segment (including the Willamette Basin populations) as *Threatened* under the Endangered Species Act. Critical Habitat was later designated for bull trout by the US Fish and Wildlife Service (70 FR 56212; effective October 26, 2005). The USFWS designated critical habitat for bull trout in the Willamette River basin in the following streams: Blue River, Horse Creek, Lost Creek, McKenzie River, Middle Fork Willamette River, South Fork McKenzie River, Swift Creek, West Fork Horse Creek, and Willamette River. However, they excluded (pursuant to section 4 (a)(3) of the ESA) all stream reaches flowing through Federal land in the basin stating that it is adequately protected by the Northwest Forest Plan Aquatic Conservation Strategy.

Detailed descriptions on the Upper Middle fork Bull Trout Rehabilitation Program, life history and habitat requirements of bull trout can be referenced in the 2002, Upper Middle Fork Watershed Analysis Update. Since the bull trout rehabilitation program began in 1997, we have collected a great deal of data on local bull trout population dynamics, growth, and life history. Based on this data we have also completed numerous habitat enhancement projects that focus on creating better spawning and rearing conditions for bull trout, salmon, and other native aquatic species in the watershed.

Spring Chinook salmon are also endemic to the upper Middle Fork Willamette River and surrounding drainages. Salmon and bull trout habitat largely overlap in the watershed and juvenile salmon are known to be a valuable food source for bull trout. However, artificial propagation and transportation are required to maintain existing populations because upstream migration of spawning adults in the Middle Fork Willamette is blocked by three dams; Dexter at river-mile (RM) 192, Lookout Point (RM 195), and Hills Creek (RM 221). Spring Chinook salmon were federally listed as *threatened* in 1999, due in part to a decline in populations within the Upper Willamette River ESU. NOAA Fisheries has designated critical habitat for 12 Evolutionarily Significant Units of West Coast Salmon and Steelhead in Washington, Oregon, and Idaho (70 FR 52630; effective January 2, 2006).

Step 2: Issues and Key Questions

Step 3 and 4: Reference, Current, Trend Conditions

A great deal of effort by multiple agencies and partnerships has been put into the bull trout rehabilitation program from its inception. Through these relationships we have bean able to acquire large amounts of funding to apply towards habitat restoration, public education, and overall watershed health programs.

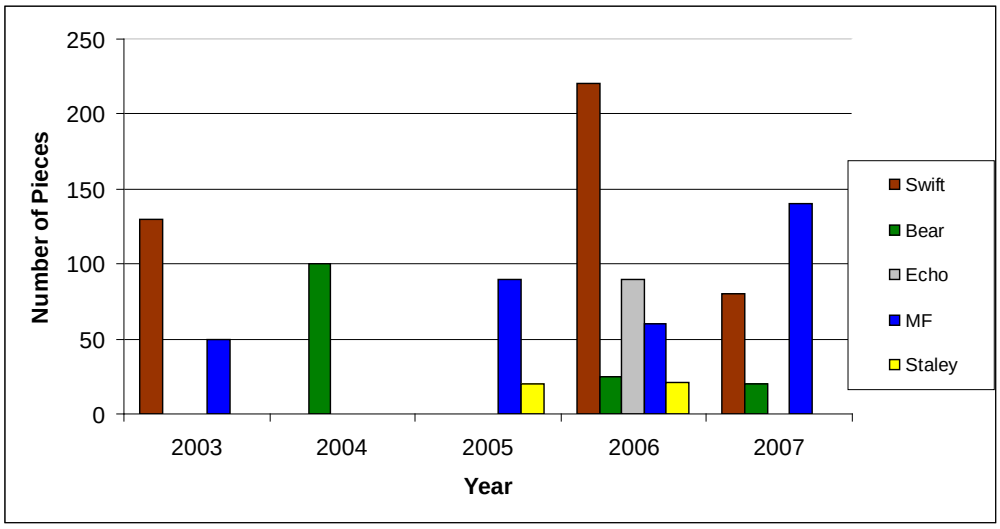
Public Education

In the last five years we have developed public education in the watershed into a top level program. In cooperation with ODFW we now have large signs posted in the watershed to heighten the awareness of visitors that they are in an area that harbors a rare bull trout population. These signs also help anglers identify bull trout and remind them that they are to release any bull trout caught while angling. We now have colored pocket cards that show the differences between bull trout and brook trout that are available to anglers where licenses and regulation books are available. In 2006, we designed and constructed a kiosk at Indigo Springs Campground that contains an interpretive sign that was designed by local artists that tells the story of the bull trout life cycle. Indigo Springs will also be developed into an area where we intend to conduct future outdoor education programs and provide a place where the public can see bull trout spawning in the wild.

Habitat Enhancement Program

Bull trout and spring Chinook salmon have high habitat quality standards, and prior to the bull trout rehabilitation project, rearing and spawning habitat were at a minimum throughout the Middle Fork Willamette and its tributaries. Over the past few years multiple large scale restoration projects have occurred. To date; 1,400 logs, 85 rot wads, 26 boulders, 20 whole trees with root-wads, and 50 yards of suitable spawning gravel have been placed throughout the Middle Fork and tributaries. Additionally, three culverts have been replaced or removed, approximately 14 miles of roads have been decommissioned, and currently the development of a bypass spawning channel is nearing completion at Indigo Springs. Habitat enhancement projects have thus far focused on known bull trout and salmon spawning and rearing areas. However, future projects will also consider areas such as migration corridors in the lower watershed. Large wood and habitat structures are an important component to aquatic species in these areas as well. Table xx shows the amount and location of LWD from enhancements project that have been completed in the last five years.

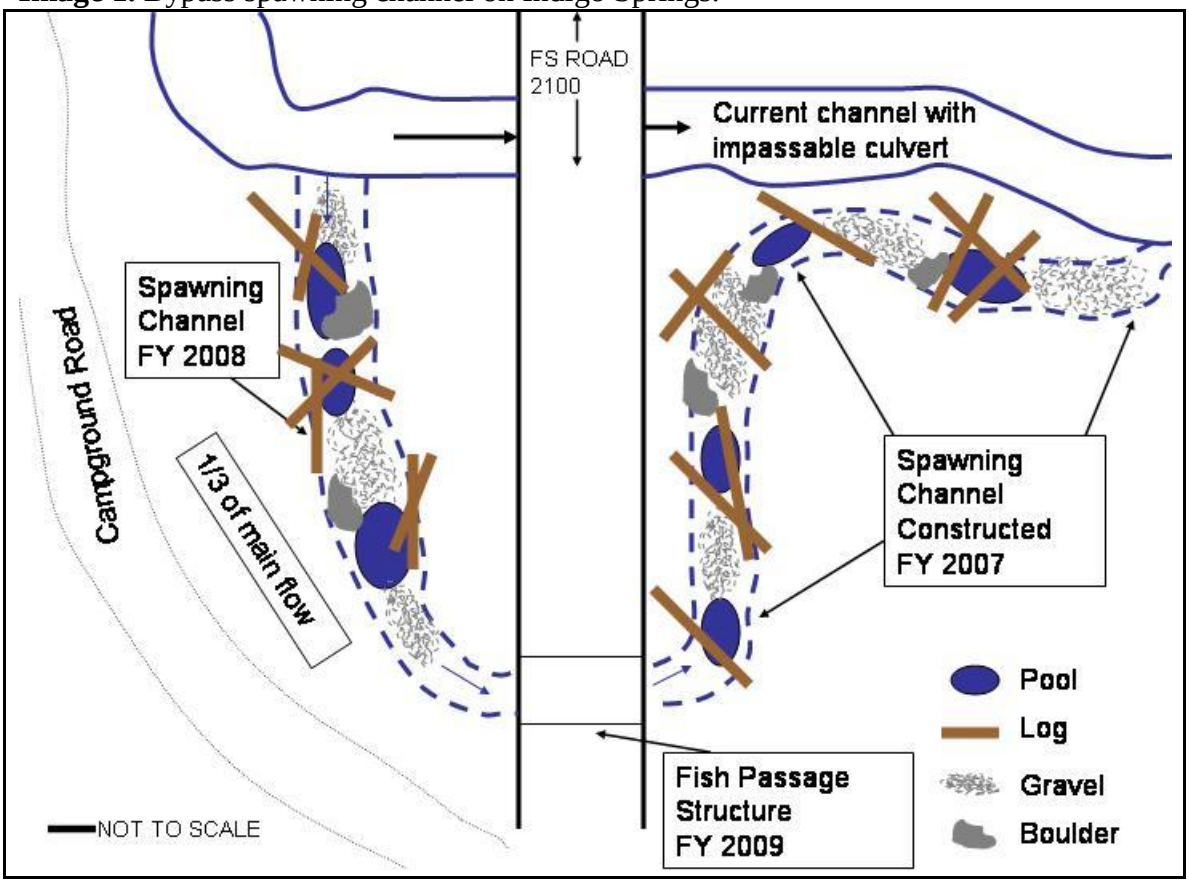
Table xx. Large woody material placed in the watershed above Hills Ck Reservoir.



Indigo Springs Bypass Spawning Channel

Indigo Springs is a designated release site that offers outstanding rearing and spawning habitat. Previous population estimates have determined that Indigo Springs has the highest density of juvenile bull trout for its habitat than any other release site. Approximately 500 feet of the best spawning and rearing habitat in Indigo Springs is blocked by an impassable culvert. In 2006, we reevaluated alternatives to get fish passage into Indigo Springs. We designed a plan to construct a bypass spawning channel that would not only allow upstream fish passage but would also increase suitable habitat.

Image 1. Bypass spawning channel on Indigo Springs.



Culvert Replacement

Several large culverts have been replaced or removed within the Middle Fork watershed. In 2003, two large culverts on Swift Creek that prevented juvenile bull trout from migrating into prime upstream habitat were replaced with structures that allowed passage at all life stages. Also, in 2003 a culvert on Echo Creek that created an impassable barrier was completely removed and the stream banks returned to a more natural state. By removing the migration blockages on these streams we increased the available bull trout habitat by over three miles.

Accomplished Objectives and Current Project Status

Bull trout Fry Transfer:
Beginning in 1997 through 2005, bull trout fry were collected and transported from the Anderson Creek population located on McKenzie River and released into designated sites in the Upper Middle Fork Willamette River upstream of Hills Creek Dam (map 1). Release sites were designated by habitat requirements such as adequate forage opportunities, suitable rearing habitat and water temperature. A total of 10,408 bull trout fry were released into the Upper Middle Fork Willamette River. In 2006, the Bull Trout Working Group decided to discontinue fry transfers to evaluate both the donor and recipient populations.
Swift Creek is the only known historic juvenile rearing habitat in the Upper Middle Fork Willamette and Bear Creek is a cold water tributary to Swift Creek. Due to the timing of fry release, access to these release sites is typically blocked by snow during normal winter months. In 2007, a total of 300 bull trout fry were collected from the Anderson Creek population throughout the migration period of February to June and were reared at the Leaburg McKenzie Hatchery. Fry were reared to allow later access into Swift Creek and Bear Creek and to increase survival rates. Of the 300 fry collected, 238 survived in the hatchery until released on October 30, 2007 into Swift Creek and Bear Creek. See Table xx for 1997-2007 fry transfers.

Table xx. Fry transfers from 1997-2007

Year	Iko	Shadow	Chuckle	Indigo	Swift	Skunk	Found	Bear	Echo	Total
1997			96	26		56				178
1998	938	150	411							1499
1999	1,000	148	302		526					1976
2000	1,075	53	349	204	822		285			2788
2001	418		269		96			673		1456
2002	75		177					38		290
2003	439		365	242				388	28	1462
2004	129		149	109	155			75		617
2005	81		61							142
2006										0
2007					158			80		238
	4155	351	2179	581	1757	56	285	1254	28	10646

Monitoring:
Multiple monitoring methods are annually used to track and determine bull trout movements and population dynamics including minnow traps, spawning and snorkel surveys and screw traps. The primary tracking method used is half-duplex passive integrated tags (PIT). Beginning in 2003, 242 bull trout have been captured and tagged **(Table 1).** Tagged fished are monitored by constructing in-stream antennas made of copper wire that span the width of the river and allow for individual fish that pass through to be uniquely identified. Sites are powered by 12-18 volt batteries that are either exchanged weekly or charged by solar-panel arrangement. Today, we operate up to 11 detecting sites along the bull trout migration path. Another primary sampling method to determine annual adult population estimates is completed by operating a 5 foot rotary screw trap to capture post-spawned adults as they return to Hills Creek Reservoir

Table 1: Number of bull trout captured and tagged to date.

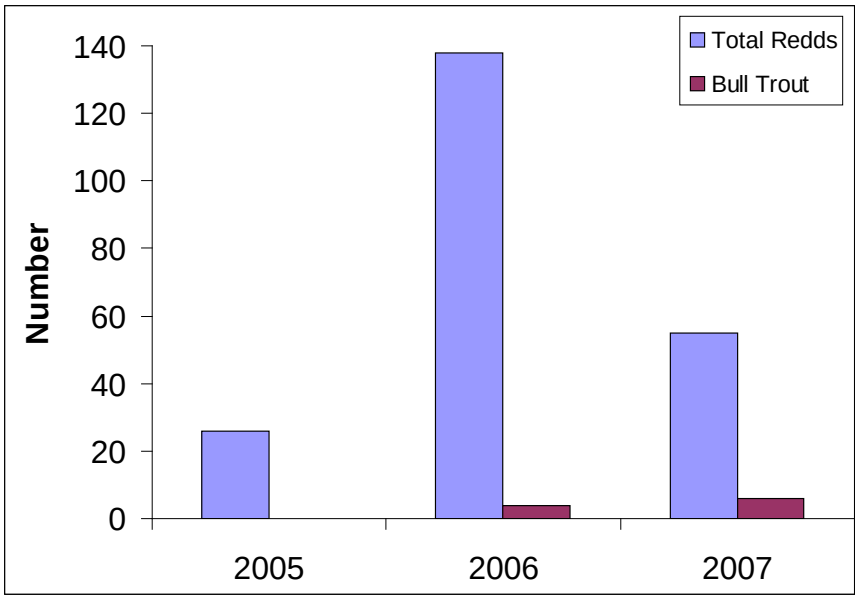
		Year				
	2003	**2004**	**2005**	**2006**	**2007**	**Total**
>400	1	3	11	2	0	17
>200		0	3	3	4	10
>100		59	111	33	11	214
Total	1	62	125	38	15	241

Our sampling methods allow us to determine how successful our rehabilitation efforts have been. In 2005 we documented the first sexually mature adult bull trout. In the spring of 2006, we documented the first naturally reproduced bull trout fry in the Upper Middle Fork Willamette River in over 15 years. The following spawning seasons of 2006 and 2007 we continued to document sexually mature bull trout and in the spring of 2007 we observed more naturally reproduced bull trout fry in Iko and Chuckle Springs. Figures xx and xx show redd count and total bull trout caught in the screw trap.

Minnow trapping population estimates: I need to finish this section

	2001		**2002**		**2005**		**2006**		**2007**	
	# Traps	**# Fish**	**# Traps**	**# Fish**	**# Traps**	**# Fish**	**# Traps**	**# Fish**	**# Traps**	**# Fish**
Echo									118	0
Swift			60	0	200				375	0
Swift SC	169	1							20	0
Bear			10	0	33	0			60	0
Found	12	0	40	1	26	0			35	0
Iko	494	70			400	57	127	13		
Indigo			20	1	199	43	33	12		
Chuckle					202	24	60	3		
Shadow			15	2					60	0
BT Springs					19	0				
MF					158	6				

Figure xx: Spawning survey (redd count) data[1].



[1]Although no known bull trout redds were detected in 2005, bull trout spawning did occur as naturally reproduced bull trout fry were documented in the late winter of 2006.

Step 5: Synthesis

Step 6: Recommendations

Middle Fork Willamette River Downstream Tributaries Watershed Recommendations.

Have they been completed? How were they achieved.

Wood Recruitment and Shading

1). Priority: Conduct site evaluations of streams having past harvest activities on both sides for placement of LWM and regeneration success. Youngs Creek, Coal Creek, MFW River, and Buck Creek are high priority areas.

Many of these areas have been analyzed and are in much better condition then when the WA was completed. Natural wood has entered the system in the last few years and we have completed numerous large wood placement projects in the area. Buck Creek will see further restoration in 2009 with a new passable culvert at RD 2100 and large wood placed in the lower stream channel to augment existent habitat.

Aquatic Habitat Complexity

2). Priority: Add LWM to the MFW River and low gradient tributaries to aid in short term recovery and reconnect side channels where appropriate.

Evaluate and implement placement of LWM in the MFW River.

Evaluate effectiveness of past restoration efforts.

Several LWM addition projects have occurred since the WA was completed and several more are planned for the near future. The majority of projects will add several hundred pieces of LWM to the MF and its tributaries. All past restoration projects have been monitored in the MFW River over the years. Some areas remain intact while others have broken up and migrated downstream. All in all the vast majority of restoration wood remains in the system.

Culverts and Carrying Capacity

3). Priority: Hydraulic analysis of culverts with potential to affect streams with high aquatic value. If fish passage is not an immediate need, but a desired future condition, less expensive improvements to accommodate a 100 year flood (such as the addition of mid-fill culverts and retrofitting the existing culvert) should be considered until such time as a funding opportunity occurs for replacement.

Plan and implement a program of culvert cleanout.

Culvert design is site specific and many variables are considered before a final product is approved. In the last few years the cost to replace culverts has increased to a point where it is difficult to acquire funding to cover the costs. A typical culvert replaced by and arch today can exceed $600K. Therefore, design modifications that cut costs are essential to complete these jobs. In areas where high quality fish habitat occurs, fish passage is the primary concern and in general is achieved.

Species Distribution & Migration

Priority: Modify or replace existing culverts in the high priority areas of Coal, Indian, Snake, Pine, Bohemia, and Estep creeks.

> These areas have recently taken on a secondary priority as we now know bull trout and spring Chinook salmon do not use these areas like they do others in the Upper Middle Fork watershed. The majority of available funding is directed to that watershed.

Design new culverts for fish passage.

> All culverts are designed for fish passage unless it is determined there is not suitable habitat above the culvert.

Establish baseline information to identify migration timing and flow characteristics for design of high priority culverts.

This has been accomplished for the high priority culverts.

Design and implement a monitoring protocol for existing culvert enhancements.

Culvert replacement projects are continuously monitored using open fish passage for all life stages and passage of a 100 year flood as the criteria.

Continue to monitor species abundance and distribution.

This is part of our annual program of work for listed species as well as resident species, such as cutthroat, rainbow trout, etc.

Species Composition

Priority: Continue to monitor bull trout and spring Chinook populations.

This is completed on an annual basis with a wealth of partnerships and funds. We monitor adult and juvenile bull trout populations in the Middle Fork Watershed each year by PIT recorders and stationary recording devices, trapping, and snorkel surveys. We work in conjunction with USFWS, ODFW and a wealth of other partners for funding to support this work on an annual basis.

Upper Middle Fork Watershed Analysis Updated Fisheries Recommendations.
Have they been completed? How were they achieved.

The Upper Middle Fork Watershed Analysis was last updated in January 2002. The update was largely related to bull trout issues within the watershed. Numerous recommendations from habitat restoration, population size estimating and monitoring, and incorporating the US Fish and Wildlife Service, Bull Trout Recovery Plan into Forest Service management plans were an integral part of the update. The Middle Fork Fisheries Department has completed the majority of tasks outlined in the recommendations section of the WA update. The following is a list of the recommendations related to bull trout in the 2002 update and a brief description on how we have satisfied the requirements of the recommendation.

1). Complete NEPA and repair the Echo Creek culvert (2143-325).

The impassable culvert was removed in 2002. The removal of the culvert now allows fish of all age classes to move through the area.

2). Conduct annual surveys to identify and map primary bull trout spawning and rearing habitat in the Middle Fork from below the gorge to Swift Creek. Monitor spawning populations.

We monitor adult and juvenile bull trout populations in the Middle Fork Watershed each year by PIT recorders and stationary recording devices, trapping, and snorkel surveys. We work in conjunction

with USFWS, ODFW and a wealth of other partners for funding to support this work on an annual basis.

3) Conduct groundwater surveys to identify and map upwelling areas that could be used by bull trout in the Upper Middle Fork watershed.

We have complete surveys of the entire distribution of bull trout in the watershed and feel we have a good understanding on where they currently spawn and areas where they may spawn in the future.

4). Implement the USFWS Bull Trout Recovery Plan.

We model all of our activities around the Watershed Analysis and the USFWS Recovery Plan.

5). Key elements to be implemented on the District include protection of high quality habitat, reduction in road densities, barrier removal, adaptive management, and monitoring.

We identified high quality bull trout habitat in the 2002 WA update and have structured the ATM road closures to focus in those areas. We have completed closure on approx. 4o miles of road and continue to work on more each year. With one exception (Indigo Springs) we have completed all work to correct impassable culverts within known or suspected bull trout habitat in the watershed. Monitoring is an ongoing and continuous process and involves trapping, tagging, and snorkel surveys with numerous partnerships for funding.

6). Increase efforts in public education through information/interpretation of the bull trout fishery with emphasis in the high quality habitat areas.

The FS and out partnerships have created wallet size ID cards (bull trout vs brook trout), color brochures, road signs, and interpretive signs to educate the public on bull trout issues in the watershed and other surrounding areas. Approx. cost: 30K

7). Explore opportunities to evaluate special emphasis areas around high quality bull trout habitat.

The FS is working with ODFW to enact new regulations to protect adult bull trout and the head of Hills Creek Reservoir. We are concerned that numerous adult bull trout are lost to angling each year as they reenter the Middle Fork Willamette River in this area.

8). Complete an ATM analysis using the map generated in Figure 3-1 as a guide prioritizing road systems that are directly tributary to bull trout habitat. These are areas delineated in the High Quality Habitat, polygons designed in black figure 3-1.

This task was completed when the ATM plan was finalized for the Upper Middle Fork Watershed.

9). Apply for watershed restoration grants to obtain funding for bull trout habitat restoration.

The FS has collected a large amount of funding from various sources to complete bull trout habitat restoration work in the last five years alone. Approx $400K in FS, Challenge Cost Share grants, $40K in OWEB Joint venture funds, $20K in USFWS grants, $200K in Title II Payco grants, $600K CIP fish passage funds, $10K Trout Unlimited grant. In addition, nearly all of our FS appropriated NFWF (80K per year) funding goes towards bull trout monitoring.

10). Encourage partnerships and collaborative efforts that facilitate fish passage around dams located below the watershed.

This is an ongoing process with USFWS and USACE.

11). Repair two sites on Swift Creek and one on Echo Creek for fish passage. The remaining nine will be treated to support fish passage in the future.

These culverts have been replaced (2003) with stream simulation structures and are currently operating to allow fish passage at all life stages.

12). Prioritize funding in the sixth field watersheds 23-6 Echo Creek and 23-5 Swift Creek, which have higher road aquatic risk ratings.

The majority of all bull trout related funding is utilized in these watersheds. Largely due to the fact that these are the areas bull trout spawn and rear.

13). Conduct annual surveys to identify and map primary spawning and rearing habitat. Continue to monitor to determine if temperature is an issue in these areas.

We monitor the entire watershed each year through various methods and are strongly encouraged that temperature is not a limiting issue for bull trout in at least some areas of the watershed. We do feel that temperature is absolutely and issue in others.

14) Continue to work cooperatively with state and federal agencies.

All bull trout related work is coordinated with the Bull Trout Working Group (Forest Service, USFWS, ODFW, EWEB, USACE, private consultants, etc.). In addition, we maintain numerous other partnerships throughout the year with a multitude of groups and agencies (Trout Unlimited, OWEB, Challenger Cost Share, Lane County, City of Oakridge, Outdoor School, Classrooms to Stream, Native American Tribes, etc.

15). Monitor use of the six dispersed recreation sites listed in high quality bull trout habitat.

We believe these sites are stable at this time and have little to no influence on the persistence of bull trout in the watershed.

16). Work collaboratively with other agencies to improve public awareness of bull trout value and habitat restoration by placing interpretive signs at dispersed campsites.

This has been completed. See question # 6

17). Focus large wood restoration in/around high quality habitat refugia.

All restoration work to date has occurred in high use bull trout areas in the watershed. In the future we will turn our attention to migratory corridors that adult bull trout pass through to reach spawning areas. We expect to turn some areas that are currently uninhabited by juveniles into suitable habitat for rearing in the lower watershed.

18). Implement large wood in-stream projects that focus on full tree lengths where root wads are attached. Projects to introduce big wood (>24") are in need in reaches 5,8,11, and 14; corresponding to the reaches Staley Creek to Swift Creek, Tumblebug to the Middle Fork gorge, and lower Paddy's Valley.

Our restoration projects currently utilize entire trees pulled over that act as structural anchor points for large log jams. We feel these structures have more utility for bull trout then any other structure type in large stream channels. We back stack the pulled tree with several root wads and smaller tress to complete the jam. Our past experience with this method has resulted in numerous improvements to bull trout habitat.

19). Using adaptive management, experiment with different methods to hold wood jams in the Upper Middle Fork River Channel.

See reply to #18

New Recommendations for the Upper and Lower Middle Fork Watershed

1). Continue Phase II and III work at Indigo Springs to provide bull trout passage at Rd. 2100 and complete the new spawning channel.

a) Phase II will complete the upstream portion of the spawning channel.
b) Phase III connect the upper spawning channel with lower channel by competing a passage structure under Rd 2100.
c) Continue to develop Indigo Springs into an outdoor education arena where the public can witness bull trout in the wild.

2). Continue LWM placement in the MFW and tributaries occupied by bull trout and spring Chinook salmon.

a) Swift Creek, from confluence of Bear Creek to confluence with Middle Fork Willamette (three miles of habitat).
b) Bear Creek, from confluence with Swift Creek upstream to Rd 2149 crossing (two miles), if it is determined that bull trout continue to use these sections.
c) Echo Creek from the confluence with Middle Fork Willamette upstream two miles.
d) Middle Fork Willamette River from confluence of tumblebug Creek to Sand Prairie Campground.

e) Staley Creek, from confluence with Middle Fork Willamette upstream two miles.

3). Continue to close high risk roads that were identified in ATM and focus on areas around high quality bull trout and salmon habitat.

a) list in spreadsheet the red roads in the three polygons from the 2002 WA update.
b) Field truth roads deemed high risk and focus on roads with greatest potential to contribute sediments to the stream network.

4). Analyze historic data and information to better understand what the river system looked like historically. Understand when we have reached a "completed" level in adding wood to the MF.

5). Monitor bull trout populations annually. Continue PIT tag tracking program to monitor adult spawning populations and trapping operations for juveniles.

6). Complete repair, removal or replacement of top ten impassable culverts. (Map 1)

a) Indigo Spring Rd. 2100
b) Buck Creek Rd. 2100
c) Upper Coal
d) Lower Coal Rd. 2134
e) Windfall Rd. 2117
f) South Fork Staley Creek
g) Noisy Creek Rd. 2100
h) Simpson Creek Rd. 2135-283
i) Bear Creek Rd. 2149
j) Gold Creek Rd. 2117.138

7). Continue to transfer genetic material from the McKenzie watershed to ensure a prolonged and viable bull trout population.

8). Asses bull trout usage of Hills Creek Reservoir and other areas such as Hills Creek Watershed.

9) Conduct habitat modeling exercise to show all habitat favorable to bull trout life cycle in the watershed.

10) Maintain Human use statement and Wild and Scenic options as listed in WA pg 103

Deer and Elk Emphasis Area – Upper Middle and Hill's Creek Reservoir

BGEA	Forest Plan Emphasis Level	HEr	HEc	HEf	HEs&s	HE
Coal Head	Mod					
Coffeepot	Mod					
Coulee Moss	Low					
CT Beach	Low					
Douglas Lane	Low					
Dry Pine	High					
Echo East	Mod					
Emmigrant Beaver	High					
Flat	Low					
Gold	Low					
Gray Deception	Low					
Larison Mouth	Mod					
Little Dome	High Mod					
Modoc	Mod					
Monteith Rock	Mod					
Noisy Head	Mod					
Packard Cove	Low					
Paddy's Valley	Mod					
Simpson	Mod					
Spider Plus	High					
Spring Snake	Mod					
Steeple	Mod					
Swift Head	Mod					
Windfall	High					

Hydrologic Aggregated Recovery Percentages

The following tables present the results of the ARP analysis at three different scales of analysis; watersheds, sub-watersheds, and the Forest Plan planning sub-drainages. The two maps following the tables identify the locations of the sub-watersheds and planning sub-drainages within the watershed.

Table 1 - Watershed (Fifth Field)

Watershed Name	ARP 2008	ARP 2013	ARP 2018
Hill Creek Reservoir	83.40	86.07	87.70
Upper Middle Fork	80.44	84.37	87.18

Table 2 - Sub-watershed (Sixth Field)

Subwatershed Name	ARP 2008	ARP 2013	ARP 2018
Coal Creek	85.00	87.48	89.05
Buck Creek	85.47	87.36	88.50
Gray Creek	87.00	87.96	88.48
Larison Creek	84.95	87.72	89.32
Packard Creek	77.47	82.07	84.92
Pioneer Gulch	86.82	89.46	91.33
Staley Creek	82.87	85.76	87.78
Swift Creek	77.81	81.42	84.11
Tumblebug	79.47	84.77	89.75
Echo Creek	74.95	81.03	84.94
Paddy's Valley	84.51	86.71	88.59

Table 3 - Forest Plan Planning Sub-drainages

Number	Name	Forest Plan Mid point ARP	ARP 2008	ARP 2013	ARP 2018
187	Hatchery (partial)	70	82.70	82.70	82.70
211	Deadhorse	75	84.11	85.71	86.91
212	Indian South	70	83.95	86.64	88.48
213	Rigdon	70	94.48	94.61	94.61
214	Coffeepot	70	80.06	81.69	82.77
215	Waterdog	70	83.81	85.28	86.21
216	Emile Fir	75	84.25	88.08	90.52
217	South Packard	75	88.33	90.92	92.24
218	Coal Fork	70	78.29	81.24	82.58
219	Gold	75	84.27	86.09	86.63

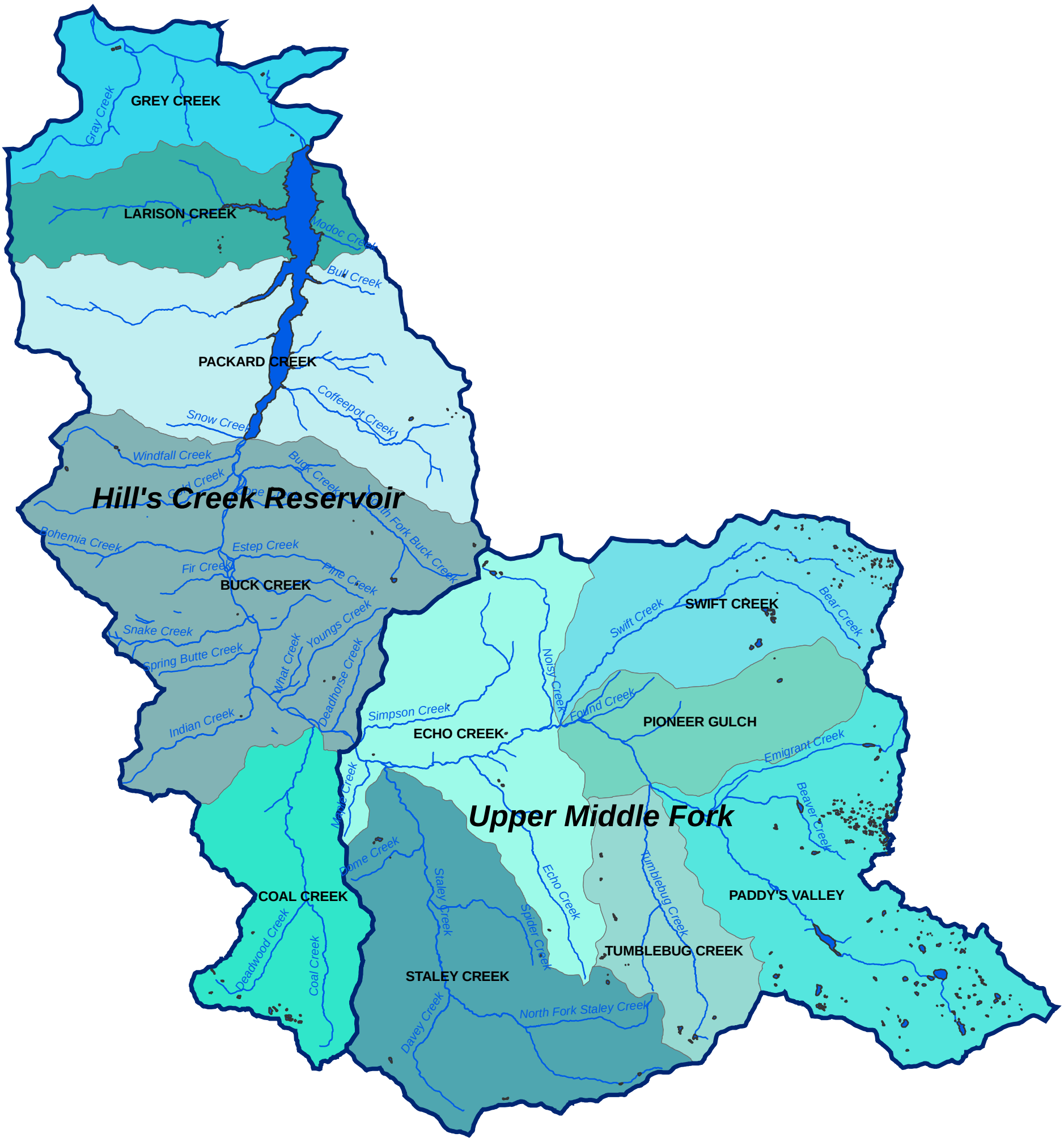
Number	Name	Forest Plan Mid point ARP	ARP 2008	ARP 2013	ARP 2018
231	Potter	70	80.06	82.60	84.01
232	Laura's Neighbor	70	78.09	82.26	86.75
233	Umpqua Staley	65	77.56	82.25	86.87
234	Rigdon Point	70	86.87	88.48	89.04
235	Spider Plus	70	83.93	87.57	90.07
236	Little Dome	65	86.96	89.64	91.01
237	River	70	78.88	86.31	89.94
238	Calapooya	70	89.54	90.97	91.45
239	Dome	70	86.00	88.96	90.67
18A	Oakridge (partial)	60	46.40	47.08	47.50
20A	Montieth Rock (partial)	75	87.75	87.75	87.75
21A	Modoc	65	74.22	77.24	80.53
21B	Willow	70	80.50	83.06	84.64
21C	Coffeepot Head	75	79.09	82.16	85.42
21D	Powder Buck	70	86.87	87.96	88.23
21E	Cone Bills	70	83.50	85.06	86.23
21F	Dry Pine	70	85.66	87.70	89.17
21G	Young	70	84.53	85.71	87.17
21H	Deadwood	65	80.50	84.14	86.57
21I	Steeple	70	81.33	84.71	87.41
21J	Coal Center	70	94.11	94.93	95.02
21K	Coal Head	70	82.51	85.21	86.83
21L	Indian North	70	89.09	90.75	91.04
21M	Spring Snake	75	83.64	87.10	89.10
21N	Bohemia	75	92.04	92.79	93.03
21P	Windfall	75	83.25	85.14	86.92
21Q	McFarland	75	71.69	83.92	89.37
21R	Packard North	75	79.93	85.22	88.77
21S	Stony Snow	75	74.05	78.57	81.02
21T	Packard Cove	75	68.98	76.64	80.94
21U	Larison Head	75	90.99	93.62	94.77
21V	Larison Mouth	75	79.09	82.14	83.10
21W	Lower Larison	75	92.70	93.78	94.54
21X	Major Alias	75	95.36	96.35	96.65
21Y	Gray Deception	75	91.75	93.62	94.74
21Z	Chilly Spot	70	86.93	87.52	88.17
22A	CT Beach (partial)	70	86.50	87.26	87.33
23A	Warner Simpson	70	67.93	76.43	81.99
23B	Simpson	70	63.08	70.86	76.61
23C	Noisy Head	65	82.55	88.20	91.46
23D	Noisy Mouth	75	69.87	73.26	75.56
23E	Coulee Moss	70	76.60	79.75	81.71
23F	Swift Head	65	74.31	76.98	79.55
23G	Bear	65	86.77	88.73	89.99
23H	Lower Bear	65	74.85	81.96	87.52
23I	Indigo Skunk	75	91.85	93.07	93.43

Number	Name	Forest Plan Mid point ARP	ARP 2008	ARP 2013	ARP 2018
23J	Corrigan Gulch	65	82.69	85.82	88.92
23K	Emmigrant Beaver	65	87.25	88.85	89.83
23L	Paddy's Center	75	84.36	85.71	86.87
23M	Paddy's Valley	75	83.02	86.20	89.19
23P	Tumblebug	65	90.87	90.87	90.87
23Q	Douglas Lane	70	86.89	89.09	91.22
23R	Gorge	70	52.34	68.99	85.18
23S	McGowan Tumble	65	92.25	92.25	92.25
23T	Lighthouse	65	90.04	92.49	93.18
23U	Grassy Echo	75	75.09	83.96	90.37
23V	Echo East	70	86.25	88.49	89.54
23W	Echo Start	60	75.66	79.16	83.18
23X	North Fork Lizard	65	80.48	82.41	85.13
23Y	South X	60	90.72	91.33	91.76
23Z	Staley South Fork	65	67.68	70.92	73.71

There are seven sub-drainages (highlighted rows in tables above and red highlighted on map) that have current 2008 ARPs less than the recommended Forest Plan mid-point ARP). Six of the seven sub-drainages are predominately in private lands ownership. The cumulative effects assessment process (Forest Plan Appendix E) should be used to validate watershed specific conditions in these seven sub-drainages before future vegetation management projects are purposed.

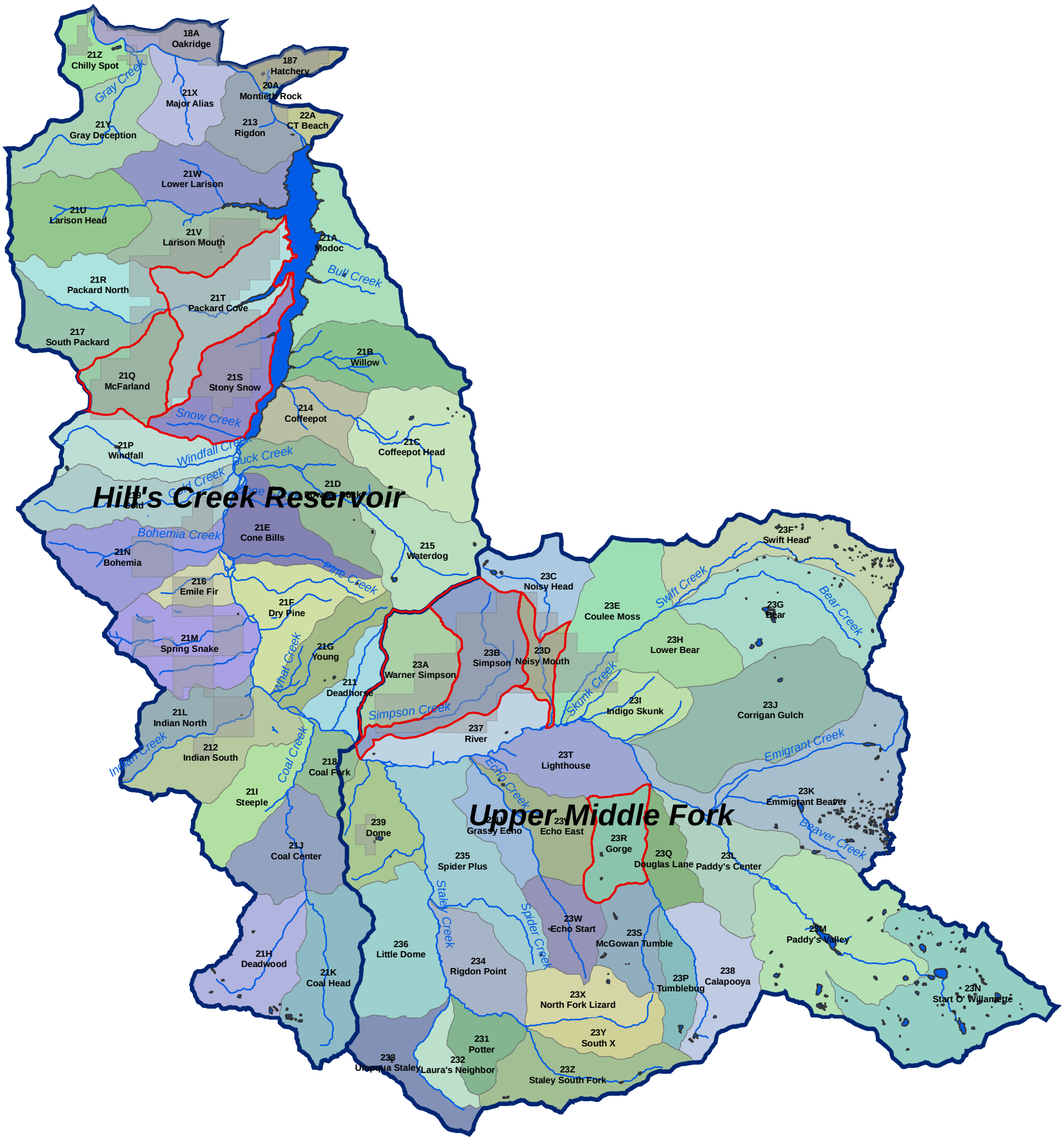
Hill's Creek Reservoir and Upper Middle Fork Watersheds

Sub-Watersheds



Hill's Creek Reservoir and Upper Middle Fork Watersheds

Planning Sub-drainages



Legend

- Low ARP PSUBs
- Private Lands

μ

0 1 2 4 Miles

Summary of Veg Layer Attribute Table, Upper Middle Fork Planning Area, Clipped to Riparian Areas of 60 and 170 feet

	UMF Forested Stands Near Perennial Water	
	Within 170 ft	Within 60 ft
m2	75,804,019	27,829,153
acres	18,732	6,877

	Within 60 ft			Within 170 ft		
Area in:	m2	Acres	%	m2	Acres	%
Early Seral	6,086,484	1,504	22%	17,384,854	4,296	23%
Mid Seral	4,219,222	1,043	15%	10,912,862	2,697	14%
Late Seral	5,481,387	1,354	20%	15,473,660	3,824	20%
Old	11,983,861	2,961	43%	31,917,799	7,887	42%
Shab	58,200	14	0%	114,843	28	0%
Total		6,877	100%		18,732	100%

	Within 60 ft			Within 170 ft		
Area by Stand Age	m2	Acres	%	m2	Acres	%
0-30	5,915,428	1,462	21%	16,947,756	4,188	22%
30-80	4,390,278	1,085	16%	11,349,961	2,805	15%
80-150	3,641,039	900	13%	10,319,644	2,550	14%
>150	13,882,408	3,430	50%	37,186,658	9,189	49%
Total		6,877	100%		18,732	100%

Riparian Reserves (170 ft) Vegetation Conditions along Perrenial Streams

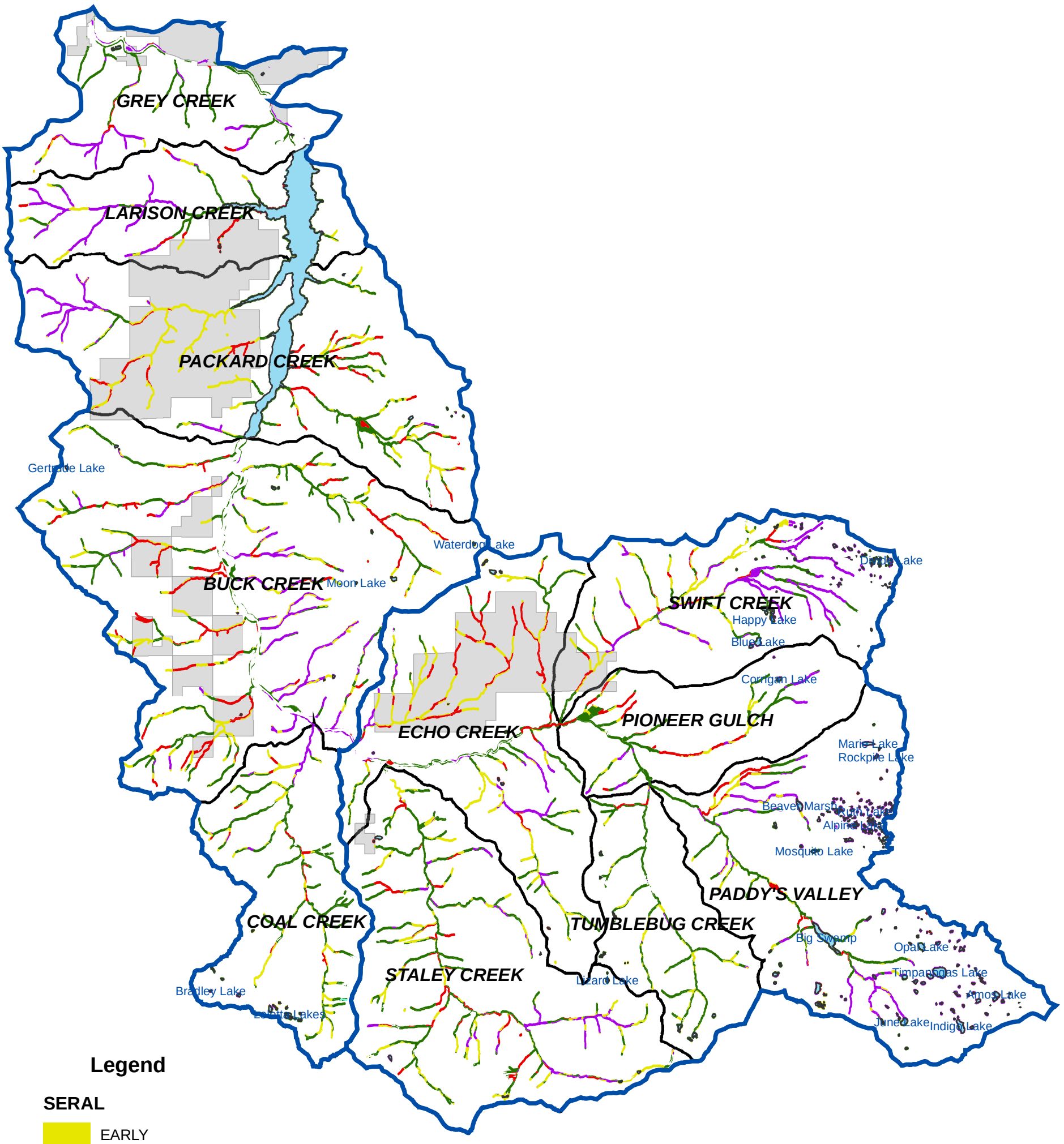
6th Field Sub-Watershed	Seral	Acres
BUCK CREEK	EARLY	887.3
	MID	818.8
	LATE	633.8
	OLD	1406.8
BUCK CREEK Total		3746.7
COAL CREEK	EARLY	309.3
	MID	76.2
	LATE	86.8
	OLD	742.0
	SHAB	25.3
COAL CREEK Total		1239.6
ECHO CREEK	EARLY	707.9
	MID	446.3
	LATE	217.6
	OLD	622.8
ECHO CREEK Total		1994.4
GREY CREEK	EARLY	37.5
	MID	51.8
	LATE	241.0
	OLD	488.4
GREY CREEK Total		818.6
LARISON CREEK	EARLY	126.3
	MID	104.5
	LATE	358.6
	OLD	370.4
	SHAB	3.1
LARISON CREEK Total		962.9
PACKARD CREEK	EARLY	762.9
	MID	382.7
	LATE	268.6
	OLD	912.5
PACKARD CREEK Total		2326.7
PADDY'S VALLEY	EARLY	223.4
	MID	206.3
	LATE	878.3
	OLD	675.3
PADDY'S VALLEY Total		1983.3
PIONEER GULCH	EARLY	124.5
	MID	177.5
	LATE	93.7
	OLD	470.0
PIONEER GULCH Total		865.6

Early = 0=30 years
Mid = 31-80 years
Late = 81-200 years
Old = 200+ years

STALEY CREEK	EARLY	589.4
	MID	278.0
	LATE	293.9
	OLD	1159.5
STALEY CREEK Total		2320.8
SWIFT CREEK	EARLY	381.1
	MID	134.6
	LATE	738.4
	OLD	492.9
SWIFT CREEK Total		1747.0
TUMBLEBUG CREEK	EARLY	146.4
	MID	20.0
	LATE	13.0
	OLD	546.4
TUMBLEBUG CREEK Total		725.8
Grand Total		18731.6

Hill's Creek Reservoir and Upper Middle Fork Watersheds

Riparian Vegetation



Upper Middle Fork Watershed Analysis Update (February, 2008)

Fire and Fuels

1996 WA: Characterization Update (see Step 1, page 15 of 1996 WA)

This section of the 1996 Upper Middle Fork Watershed Analysis provides a concise and accurate representation of historic wildfire occurrence that has occurred naturally on this landscape. Since 1996, changes in terminology are more notable than actual changes in scientific understanding of fire processes. Most notably, Fire Regime Condition Class (FRCC) has become a commonly accepted modeling tool for understanding forest/ecosystem health as it relates to natural disturbance processes like wildfire. In these terms, the vast majority of this watershed may be described as Fire Regime 3, or having a mixed-severity fire history with fire occurrence ranging from 25-200 years, depending on the location. Approximately 10% of the watershed may be described as Fire Regime 5, or having a stand replacement fire history with fire occurrence occurring every 200-400 years. Current Condition Class in the watershed exist in the following, approximate proportions: Condition Class 1=60%; Condition Class 2=25%; Condition Class 3=15%.

The 2002 WA Update does not attempt to address characterization of fire/fuels within the same format as the 1996 WA.

1996 WA: Issues and Key Questions (see Step 2, p.25 of 1996 document)

No fire/fuels updates to the 1996 WA are recommended.

No fire/fuels updates to the 2002 WA Update are recommended.

1996 WA: Reference, Current, Trend Conditions (see Steps 3&4, page 26 of 1996 WA)

Key Question 2 of 1996 WA is pertinent to fire/fuels concerns.
KQ2: *Where and to what extent have management practices Influenced fire processes?*

1996 WA: Density, Condition, Location and Use of Roads (see Issue 1 of 1996 WA)

No fire/fuels updates to 1996 WA are recommended.

1996 WA: Vegetation Condition and Patterns (see Issue 2, p.56 of 1998 document)

See Key Question 2 (above)
In addressing Key Question 2, this section of the 1996 Upper Middle Fork Watershed Analysis provides an accurate assessment of the influence of management practices in shaping fire processes. As noted in Step 1 of this update, Fire Regime Condition Class (FRCC) is currently the most common way of describing forest health relative to fire processes. Using FRCC terminology, it would be accurate to say that that forest landscape within this watershed is in the process of moving away from the range of natural variability for vegetation characteristics, fuel composition, fire frequency, fire severity, and associated disturbances. This type of change is the also the definition of worsening Condition Class. As noted in the 1998 Watershed Analysis, this change has largely been brought about by many decades of wildfire suppression/exclusion.

1996 WA: Synthesis (see Step 5, p.98 of 1998 document)
No fire/fuels updates to 1996 WA are recommended.

1996 WA: Recommendations (see Issue 2, p.104 of 1998 document)
Issue 2: Vegetation Condition and Pattern—Fire Process
The following is a summary of the 1996 recommendations, with comments/updates in italics where appropriate.

Fire Process

-Restore historical ecological processes by:

a) prescribing controlled burning to restore and retain fire-maintained non-forested special habitats and their zone of influence in historical conditions.
2008 Update/Response: recommendation is valid and restoration in these areas is currently being implemented in the watershed.

b) prescribing controlled burning in non-harvest allocated forest habitats (such as LSRs) to re-establish open stand characteristics where site specific analyis determines an ecological need to maintain these conditions. Prime candidates for consideration would be upland Douglas fir stands on slopes less than approximately 60%.
2008 Update/Response: recommendation is valid; however, given current policy with regard to modifying stand structure in LSRs, it is unlikely that these recommendations will be implemented in the near future. A more realistic recommendation would be to implement prescribed fire in stands adjacent to LSRs for the purpose of 'fire-safeing' LSRs in the event of a large wildfire. Burning should be focused on Condition Class 2 and 3 stands.

c) develop a prescribed natural fire plan for high elevation habitat (silver fir, mountain hemlock and lodgepole pine) in non-harvest allocations. Prime candidates for consideration would be upland Douglas fir stands on slopes less than approximately 60%.
2008 Update/Response: recommendation is valid; the Forest plans to develop a Wildfire Use Plan for wildernesses in the Cascades; Fire Use outside wilderness areas is unlikely to occur in the near future.

d) breaking up contiguous fuel loading patterns in matrix allocations.
2008 Update/Response: recommendation is valid; restoring fire to the landscape where fire suppression has excluded fire should be a primary goal of landscape planning. Prescribed underburning should be done in all harvest stands where the following conditions are met: 1) a natural fire interval has been missed. 2) residual tree species/size will allow under burning with low resultant mortality (<15% mortality). Burning should be focused on Condition Class 2 and 3 stands.

e) Reducing fuel loading in the following:

f) Doug fir stands which are fuel model 10 or high fuel model 8 with heavy load of ladder fuels.

g) High elevation stands which are fuel model 10.

h) Western hemlock stands which are fuel model 10 and occur in large contiguous blocks or steep terrain.
2008 Update/Response: recommendations are essentially valid; however, in many situations, fuel model 10 represents natural/historic conditions in the Western Cascades. Of greater emphasis should be to return fire to systems where it has been excluded, regardless of fuel model. Burning should be focused on Condition Class 2 and 3 stands.

The following, additional recommendation to the Upper Middle Fork WA is as follows:
Prescribing controlled burning in timber harvest areas where residual trees are fire resistant species and >15"dbh.

2002 Plan Update: Fire/Fuels Issues
Existing recommendations in the 2002 WA Update are in response to Questions 10 and 14. These recommendations do not address fire/fuels issues in a substantial or comprehensive way. For this reason, deference should be given to the 1996 recommendations and 2008 updates (see previous section of this document).

Hills Creek Reservoir Watershed Update to 1995 WA
Recommendations in the 1995 which pertain to fire/fuels issues are Habitat Diversity, Fire Pattern/Behavior/Intensity and Fire Suppression Response Time. Recommendations made in the 1996 Upper Middle Fork WA (and 2008 update) are also valid for the Hills Creek Reservoir watershed. In fact, the 1995 Hills Creek WA is less comprehensive than the 1996 Upper Middle Fork WA in terms of appropriate fire/fuels recommendations.

Habitat Diversity
2008 Update/Response: Defer to Upper Middle Fork WA 1996 and 2008 recommendations under Issue 2: Vegetation Condition and Pattern—Fire Process.

Fire Pattern, Behavior and Intensity
2008 Update/Response: Defer to Upper Middle Fork WA 1996 and 2008 recommendations under Issue 2: Vegetation Condition and Pattern—Fire Process.

Fire Suppression Response Time
1995 WA recommendation: Develop an Access and Travel Management Plan, including the LSR. Will need to balance fire suppression access priorities and need to reduce risks of human caused fires and damage to other late successional resources.

2008 Update/Response: recommendation is generally valid; plan is in an ongoing process of development.