

FFR SCHEDULE L-2

(v.10/24/03 WFPA PJH)

Schedule L-2 lists specific projects associate with the issues identified for adaptive management research in the Forests and Fish Report. All of the definition and Key Questions identified on pages one and two of Schedule L-1 apply. Text and tables in the first column, titled Performance Targets and Measures should be identical to the wording that appears in Schedule L-1.

Column Headings: 1. Performance targets and measures are taken from Schedule L-1. 6/21/00
2. Projects are from the “Research Budget FWS_NMFS” (L-1b) dated 1/31/00.
3. First year of funding denotes project initiation priority from “Research Budget FWS_NMFS” (L-1b) dated 1/31/2000.
4. Total \$ x 1000 - the total project cost estimated by “Research Budget FWS_NMFS” (L-1b) dated 1/31/2000.
5. Priority: PR = Priority Research, OR = Other Research from FFR 4/29/99
6. FFR. This column references the origins of the project in FFR 4/29/99. App refers to Appendix. Sch refers to Schedule

Other Notes: Yellow highlighted or shaded text in the Project column show FFR L-1 text that varied from the FWS_NMFS list (L-1b)
The “G” general projects are mostly from “Other Priority Research” on the last page of L-1.

Research questions that are in FFR Schedule L01 but do not appear in FWS_NMFS list (L-1b) and are not in this draft of L-2.

Heat/Water Temperature Other Research b): Test the effectiveness of the eastside basal area prescriptions in meeting shade targets.

LWD/Organic Inputs Priority Research j): Determine LWD targets for type N streams (e.g., for sediment retention and amphibians).

Sediment Priority Research f): Develop 10 m DEM state-wide; explore laser mapping. (Included in DNR budget and task list).

Other Priority Research e): Assess the historical ranges of conditions in disturbance regimes of the eastside riparian ecosystem.

Fish Habitat

Functional Objective: Type “fish habitat” streams to include habitat which is used by fish at any life stage at any time of the year, including potential habitat like to be used by fish which could be recovered by restoration or management, and including off-channel habitat, by using a multi-parameter, field-verified, peer-reviewed, GIS logistic regression model using geomorphic parameters such as basin size, gradient, elevation, and other indicators.

Performance Target (measures in bold)¹	Project² (First Year of Funding³)	Tot \$ ⁴	Priority ⁵	FFR ⁶
Accuracy of predictive model Fish habitat model: statistical accuracy of +/- 5% with line between fish and non-fish habitat waters equally likely to be over and under inclusive.	G1. Develop a predictive model (e.g. the logistic regression model in FFR) to serve as the basis for stream typing in Washington State. (00)	1,000	PR	<u>App</u> B.1(a)
	G3. Develop and validate habitat suitability and distribution protocols for bull trout currently under development by AFS. (00)	700	PR	<u>Sch</u> L-1 Other Pri. Res. a)
	G5. Validate last-fish habitat model for upper extent of bull trout and other fish. (00)	300	PR	<u>Sch</u> L-1 Other Pri. Res. a)

Amphibians

Functional Objective : *(In Progress)*

Performance Target (measures in bold)¹	Project² (First Year of Funding³)	Tot \$ ⁴	Priority ⁵	FFR ⁶
In progress	G4. Verify the stream-associated amphibian models. (00)	620	PR	<u>Sch</u> L-1 Other Pri. Res. a)
	G7. Test the effectiveness of the “patch buffer” prescriptions for westside type N streams in maintaining the long-term viability of amphibians. (00)	670	PR	<u>App</u> B.4(d)(iv)
	Also see TH9 (Platform for developing amphibian performance targets)			

Fish Passage

Functional Objective: *Maintain or restore for fish in all life stages and provide for the passage of some woody debris by building and maintaining roads with adequate stream crossings.*

Performance Target (measures in bold) ¹	Project ² (First Year of Funding ³)	Tot \$ ⁴	Priority ⁵	FFR ⁶
Access Barriers <u>Eliminate road-related access barriers over the time-frame for road management plans.</u>	G6. Test the effectiveness of fish passage prescriptions at restoring and maintaining passage. (03)	200	PR	<u>Sch L-1 Other</u> Pri. Res. b)

Other Research

Functional Objectives: *(In progress)*

Performance Target (measures in bold) ¹	Project ² (First Year of Funding ³)	Tot \$ ⁴	Priority ⁵	FFR ⁶
	G8. Develop an effective strategy to retain snags in riparian areas on the Eastside. (03)	200	OR	<u>Sch L-1 Other</u> Pri. Res. d)

Performance Target (measures in bold) ¹	Project ² (First Year of Funding ³)	Tot \$ ⁴	Priority ⁵	FFR ⁶
	G2. Long-term Course-Level Ambient Monitoring of FFR, incl. Infrastructure for data management and archiving. (01)	200	PR	<u>App L.3 (a)</u>



Heat Temperature

Functional Objective: Provide cool water by maintaining shade, groundwater temperature, flow, and other watershed processes controlling stream temperature

Performance Target (measures in bold) ¹	Project ² (First Year of Funding ³)	Tot \$ ⁴	Priority ⁵	FFR ⁶
Stream Temperature <ul style="list-style-type: none"> Water quality standards - current and anticipated in next triennial review (e.g., for bull trout). 	TH1. Validate cumulative effects of forest practices upon temperatures of F and S streams at the basin scale. (00) (FFR: Investigate basin-wide cumulative effects of forest practices, and potentially other land uses, on attainment of temperature targets.)	550	OR	Sch L-1 Heat/Water Temp 2) d)
	TH2. Improve shade model to better predict relationships between shade and other microhabitat variables and temperature at the reach scale. (00) (FFR: Improve the shade model to better predict relationships between shade and temperature at a regional level and at different spatial scales, and update to reflect current research and any updated water quality standards.)	500	PR	Sch L-1 Heat/Water Temp 1) a)
	TH3. Test effectiveness of 75' alternative to the shade rule in meeting temp and shade targets. (02)	450	OR	Sch L-1 Heat/ Water Temp 2) a)
Groundwater <ul style="list-style-type: none"> To be developed. (See TH5) 	TH4. Test the cumulative effect (at basin scale) of the westside Type N patch buffers and eastside type N buffers in meeting temperature targets. (00)	800	PR	Sch L-1 Heat/Water Temp 1) c)
	TH5. Understand the effects of forest practices on groundwater and on stream temperature (e.g. –hyporheic zones) and their relationship to temperature targets. (00)	900	PR	Sch L-1 Heat/Water Temp 1) d)
	TH6. Calibrate the shade model to meet bull trout temperature targets. (00)	100	PR	Sch L-1 Heat/Water Temp 1) e)

<p>Shade</p> <ul style="list-style-type: none"> Type F & S streams, except eastside bull trout habitat: that produced by shade model or, if model not used, 85-90% of all effective shade. Westside and eastside high elevation, Type N streams: shade available within 50' for at least 50% of stream length <p>Eastside: all available shade within 75' of designated bull trout habitat per predictive model</p>	<p>TH7. Test whether the management prescriptions for buffers are achieving shade and temperature targets, including: TH7a. Understand how local conditions affect the performance of the prescriptions (03); and TH7b. understanding the cumulative effects of yarding corridors on meeting temperature targets. (03)</p>	400	OR	<u>Sch</u> L-1 Heat/Water Temp 2) c)
	<p>TH8. Test whether the wetland prescriptions are effective in preventing downstream temperature increases beyond targets. (03)</p>	400	OR	
	<p>TH9. Determine whether amphibians or other designated uses require different temperature targets. (03)</p>	200	OR	<u>Sch</u> L-1 Heat/Water Temp 1) e)
		300	OR	Heat/Water Temp 1) f)

Large Woody Debris/Organic Inputs

Functional Objective: *Provide complex and productive in- and near-stream habitat by recruiting large woody debris and litter.*

Performance Target (measures in bold) ¹	Project ² (First Year of Funding ³)	Tot \$ ⁴	Priority ⁵	FFR ⁶
<p>Riparian Condition</p> <ul style="list-style-type: none"> Westside and high elevation eastside habitat: riparian stands are on pathways to meet Desired Future Condition (DFC) targets (species, basal area, trees per acre, growth, mortality) Eastside (except high elevation): Desired Future Condition; current stands on pathways to achieve eastside condition ranges for each habitat series <p>Litter fall</p> <ul style="list-style-type: none"> Westside Type N: at least 50% of recruitment available from within 50' Eastside Type N: at least 70% of recruitment available form within 50' <p>Pool Frequency</p> <ul style="list-style-type: none"> < 2 channel widths per pool <p>Instream LWD targets</p> <p>Westside:</p> <ul style="list-style-type: none"> Streams <20 m bankfull width: > 2 pieces (total wood) per channel width Streams <10 m bankfull width: >0.30 key pieces per channel width Streams ≥10 m bankfull width: >0.50 key pieces per channel width <p>Eastside:</p> <ul style="list-style-type: none"> (To be developed see LWD10) <p style="margin-left: 40px;"> ≥20 5.0 0.40 </p>	LWD1. Validate assumptions, models and data used to develop Desired Future Condition (DFC) targets and eastside stand conditions. Conduct field reconnaissance of mature riparian reference stands and compare results with interim targets. (00)	1050	PR	Sch L-1 LWD/Org Input 1) i)
	LWD2. Validate the assumptions, models, and data used to develop growth and succession pathways to riparian DFC's. Conduct field reconnaissance of riparian stands (management age and mature); utilize new data on validation and refinement of growth models. (00)	350	PR	Sch L-1 LWD/Org Input 1) a)
	LWD3. Improve and validate growth models for conifer/hardwood interactions, older ages, and riparian zone conditions. (02) ("older ages and riparian zone conditions" add to FFR version)	100	PR	Sch L-1 LWD/Org Input 1) b)
	LWD4. Determine rates of natural regeneration and tree mortality in riparian management zones and their effects on the ability of management prescriptions to provide riparian function(s), including LWD recruitment. Identify practices to reduce adverse impacts. (01)	560	PR	Sch L-1 LWD/Org Input 1) h)
	LWD5. Assess the historical ranges of conditions and disturbance regimes of the eastside riparian ecosystems. (04)	400	OR	Sch L-1 LWD/Org Input 2) g)
	LWD6. Test the effectiveness of the hardwood conversion in placing riparian forest stands on trajectory to DFC's. (04)	300	PR	Sch L-1 LWD/Org Input 1) d)
	LWD7. Evaluate the effects of riparian prescription Options I and II (thinning or clearcutting to DFC/floor) on LWD recruitment relative to riparian reference stand conditions. (01)	90	PR	Sch L-1 LWD/Org Input 1) e)
	LWD8. Assess the cumulative impacts of yarding corridors on LWD recruitment. (01)	90	PR	Sch L-1 LWD/Org Input 1) f)
	LWD9. Test the effectiveness of wood placement in helping achieve instream habitat conditions. (04)	100	PR	LWD/Org Input 1) g)

Performance Target (measures in bold) ¹	Project ² (First Year of Funding ³)	Tot \$ ⁴	Priority ⁵	FFR ⁶
Residual Pool Depth Mean Segment Min Unit Size Minimum Residual Pool Bankfull Width M M Depth M 0 to <2.5 0.5 0.10 ≥2.5 to <5.0 1.0 0.20 ≥5.0 to 10.0 2.0 0.25 ≥10 to <15 3.0 0.30 ≥15 to <20 4.0 0.35	LWD10. Develop <i>(or validate current)</i> Performance Targets for instream LWD amounts for all stream types. (00)	100		Not in FFR
	LWD11. Investigate the delivery of LWD from off-site, upstream locations, and test the cumulative effectiveness of the riparian and mass wasting prescriptions in contributing LWD to down-stream channels. (03)	400	OR	Sch L-1 LWD/Org Input 2) a)
	LWD12 Test the effectiveness of trees in the outer buffer (outer zone) in contributing LWD to streams. (01)	250	OR	Sch L-1 LWD/Org Input 2) b)
	LWD13. Test the effectiveness of the riparian prescriptions for recruiting LWD under different site conditions. (01)	250	OR	Sch L-1 LWD/Org Input 2) c)
	LWD14. Test the regeneration capacity of forested wetlands in riparian zones. (01)	350	OR	Sch L-1 LWD/Org Input 2) d)

Performance Target (measures in bold) ¹	Project ² (First Year of Funding ³)	Tot \$ ⁴	Priority ⁵	FFR ⁶
	LWD15 Evaluate the effectiveness of current WMZ s in meeting in-stream LWD targets (Not certain of intent/scope of this study. Need to discuss) (02)	100	OR	Sch L-1 LWD/Org Input 2) e)
	LWD16. Validate the assumptions underlying in-stream LWD targets by determining the effectiveness of different LWD sizes in habitat formation and the probability of recruitment and long-term stability. (03)	300		Not in FFR
	LWD17. Develop (priority) and validate indexes of LWD recruitment in relation to eastside disturbance regimes. (02)	100	OR	Sch L-1 LWD/Org Input 2) f) Sch L-1
	LWD18. Determine targets for LWD for Dunn and Van Dyke salamanders, and determine the effectiveness of Type N prescriptions in meeting them. (02)	300	OR	LWD/Org Input 2) h)
	LWD19. Determine basin-wide targets for LWD loading, and test the cumulative effectiveness of the prescriptions in meeting them Validate models to predict regional LWD recruitment. (03)	300	OR	Sch L-1 LWD/Org Input 2) i)
	LWD20. Determine targets for nutrient cycling on type N streams, and test the effectiveness of the prescriptions in meeting them. (02)	100	OR	Sch L-1 LWD/Org Input 2) j)
	LWD21. Investigate the role of groundwater in nutrient cycle in aquatic ecosystems, whether forest practices have significant adverse impacts, and whether additional targets or prescriptions are needed. (02)	100	OR	Sch L-1 LWD/Org Input 2) k)

Sediment

Functional Objective: *Provide clean water and substrate and maintain channel forming processes by minimizing, to the maximum extent practicable, the delivery of management-induced coarse and fine sediment to streams (including timing and quantity) by protecting stream bank integrity, providing vegetative filtering, protecting unstable slopes, and preventing the routing of sediment to streams.*

Performance Target (measures in bold) ¹	Project ² (First Year of Funding ³)	Tot \$ ⁴	Priority ⁵	FFR ⁶									
<p>Mass wasting sediment delivered to streams</p> <p>Road-related mass wasting</p> <ul style="list-style-type: none"> Virtually none is triggered by new roads; favorable trend on old roads. <p>Timber Harvest-related mass wasting</p> <ul style="list-style-type: none"> No increase over natural background rates on a landscape scale on high risk sites. <p>Road erosion sediment delivered to streams</p> <ul style="list-style-type: none"> New roads: virtually none. <p>Ratio of road length delivering to streams to total stream length (miles/mile)</p> <p>Old road not to exceed:</p> <table> <tr> <td>Coast</td> <td>West of</td> <td>East of</td> </tr> <tr> <td>Spruce zone</td> <td>Cascade Crest</td> <td>Cascade Crest</td> </tr> <tr> <td>0.15-0.25</td> <td>0.15-0.25</td> <td>0.08-0.12</td> </tr> </table>	Coast	West of	East of	Spruce zone	Cascade Crest	Cascade Crest	0.15-0.25	0.15-0.25	0.08-0.12	S1. Develop road sediment targets and determine the effectiveness of road maintenance BMPs on a site-scale in meeting those targets. (00) “Develop road sediment targets” added to FFR	200	PR	Sch L-1 Sediment 1) a)
	Coast	West of	East of										
	Spruce zone	Cascade Crest	Cascade Crest										
	0.15-0.25	0.15-0.25	0.08-0.12										
	S2. Determine the effectiveness of road maintenance BMPs on a sub-basin scale in meeting road sediment targets. (02)	100		Not in FFR									
S3. Test the accuracy and lack of bias of the criteria for identifying unstable landforms in predicting areas with a high risk of instability. (00)	300	PR	Sch L-1 Sediment 1) b)										
S4. Test the effectiveness of the equipment exclusion zone on Type N streams at meeting targets for streambank disturbance. (00)	400	PR	Sch L-1 Sediment 1) c)										
S5. Identify the best available model to predict shallow-rapid landslides. (00)	200	PR	Sch L-1 Sediment 1) d)										

<p>Ratio of road sediment production delivered to streams to total stream length (Tons/year/mile)</p> <p>Old roads not to exceed:</p> <table border="0"> <tr> <td>Coast</td> <td>West of</td> <td>East of</td> </tr> <tr> <td>Spruce zone</td> <td>Cascade Crest</td> <td>Cascade Crest</td> </tr> <tr> <td>6-10</td> <td>2-6</td> <td>1-3</td> </tr> </table> <p>Streambank equipment limitation zone disturbance (caused by forest practices)</p> <ul style="list-style-type: none"> • Type S&F : No streambank disturbance outside of road crossings. • Type N: Less than or equal to 10% of the equipment limitation zone. <p>Fines in Gravel</p> <ul style="list-style-type: none"> • Less than 12% embedded fines (<0.85 mm). 	Coast	West of	East of	Spruce zone	Cascade Crest	Cascade Crest	6-10	2-6	1-3	<p>S6. Develop a screen for deep-seated landslides (needs to be done state-wide). (00)</p>	300	PR	Sch L-1 Sediment 1) e)
	Coast	West of	East of										
	Spruce zone	Cascade Crest	Cascade Crest										
	6-10	2-6	1-3										
<p>S7. Test the effectiveness of yarding corridor prescriptions at meeting targets for streambank disturbance, including the cumulative effects of allowable corridors. (01)</p>	120	PR	Sch L-1 Sediment 1) f)										
<p>S8. Test the effectiveness of mass wasting prescriptions in meeting mass wasting targets. (03)</p>	400	OR	Sch L-1 Sediment 2) a)										
<p>S9. Develop and validate mass wasting and road sediment targets by determining what levels of cumulative sediment inputs are harmful to the resource at the basin scale. (03)</p>	400	OR	Sch L-1 Sediment 2) b)										

Hydrology

Functional Objective: *Maintain surface and groundwater hydrologic regimes (magnitude, frequency, timing, and routing of stream flows) by disconnecting road drainage from the stream network, preventing increases in peak flows causing scour, and maintaining the **hydrologic** continuity of wetlands.*

Performance Target (measures in bold) ¹	Project ² (First Year of Funding ³)	Tot \$ ⁴	Priority ⁵	FFR ⁶
Road Runoff	H1. Test the effectiveness of the roads program at disconnecting road drainage from the stream network and the effect roads have on the hydrology of streams. FWS/WDFW priority. (00) “and the effect roads have on the hydrology of streams. FWS/WDFW priority” added to FFR	200	PR	Sch L-1 Hydrology 1) a)
Ratio of road length delivering to streams to total stream length (miles/mile) Old road not to exceed: Coast West of East of Spruce zone Cascade Crest Cascade Crest 0.15-0.25 0.15-0.25 0.08-0.12	H2. Test the effectiveness of prescriptions in meeting peak flow targets (rain-on-snow issue). (Includes validation of the model in the watershed analysis hydrology module used to predict forest-management related peak flows.) (01)	750	PR	Sch L-1 Hydrology 1) b)
Ratio of road sediment production delivered to streams to total stream length (Tons/year/mile) Old roads not to exceed: Coast West of East of Spruce zone Cascade Crest Cascade Crest 6-10 2-6 1-3	H3. Develop a process to accurately identify wetlands in the dry season, especially on the Eastside. (01)	100	PR	Sch L-1 Hydrology 1) d)
Peak Flows Westside: Do not cause significant increase in peak flow recurrence intervals resulting in scour that disturbs stream channel substrates providing actual or potential habitat for salmonids, attributable to forest management activities.	H4. Develop and validate the target for peak flows as sufficient to prevent increases in the frequency of peak flows causing extensive redd scour. (01)	200	PR	Sch L-1 Hydrology 1) e)
	H5. Investigate the role of groundwater influences on low flows, their relationship to forest practices, and develop targets if appropriate. Test the effectiveness of the prescriptions in meeting the targets. (02)	100	PR	Sch L-1 Hydrology 1) f)

Wetlands No net loss in the hydrologic functions of wetlands.	H6. Improve models of the effects of forest practices on stream flows. (02)	100	OR	Sch L-1 Hydrology 2) a)
	H7. Refine the demarcation between perennial and seasonal Type N streams. (02)	300	OR	Sch L-1 Hydrology 2) b)
	H8. Determine wetland size and function requiring mitigation sequencing to achieve targets. (03)	150	OR	Sch L-1 Hydrology 2) c)
	H9. Assess the hydrologic functions of forested wetlands, the effects of harvesting on stream flows and the effectiveness of prescriptions in meeting wetland targets. If needed, revise the classification system based on wetland function. (02)	100	OR	Sch L-1 Hydrology 2) d)
