

Appendix A-1

Information Management

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Introduction

Information management includes documenting operational, research, planning, and policy activities; providing long-term access to records; and exchanging information within Washington Department of Natural Resources (DNR) and with external partners. The information used by DNR to manage state trust lands in the Olympic Experimental State Forest (OESF) falls into four broad categories: 1) records of land management activities such as timber harvests and road management; 2) research and monitoring information including study plans, data, reports, and publications; 3) spatial and non-spatial datasets that describe natural resources and ecological conditions; and 4) policies, plans, procedures, and guidelines.

Information management in the OESF is identified as one of the six management processes recommended for implementing integrated management and the experimental approach (DNR 1997, p. IV.85).

Information management is important because of two unique characteristics of the OESF. First, the greater management flexibility allowed at the stand and landscape level requires DNR to track ecological conditions at different spatial scales and document the rationale for site-specific management decisions. Second, research, monitoring, and adaptive management, as described in Chapter 4 of the OESF draft forest land plan, are critically dependent on effective information management: in order to “learn from doing” it is necessary to know what has been done and why. Information management directly supports all 1997 *Habitat Conservation Plan* (HCP) commitments for the OESF, which include planning from a landscape perspective; implementation, effectiveness, and validation monitoring; research; adaptive management; and communication outreach.

This appendix focuses on the information needs of research, monitoring and adaptive management in the OESF. Information needs for implementing the forest land plan and for future plan updates are still evolving. DNR’s goals are to bridge the gaps between existing information sources, such as DNR’s Planning and Tracking (P&T) database, the forest estate model, and HCP monitoring databases, and to leverage existing information systems to the extent possible. Meeting these goals will involve developing methods and tools that will organize, analyze, interpret, and distribute relevant information needed to implement and monitor implementation of the forest land plan. DNR will need to integrate a number of existing databases and software applications so that information can be queried in a way that is repeatable and automated.

Information Linkage Between Land Management and Research

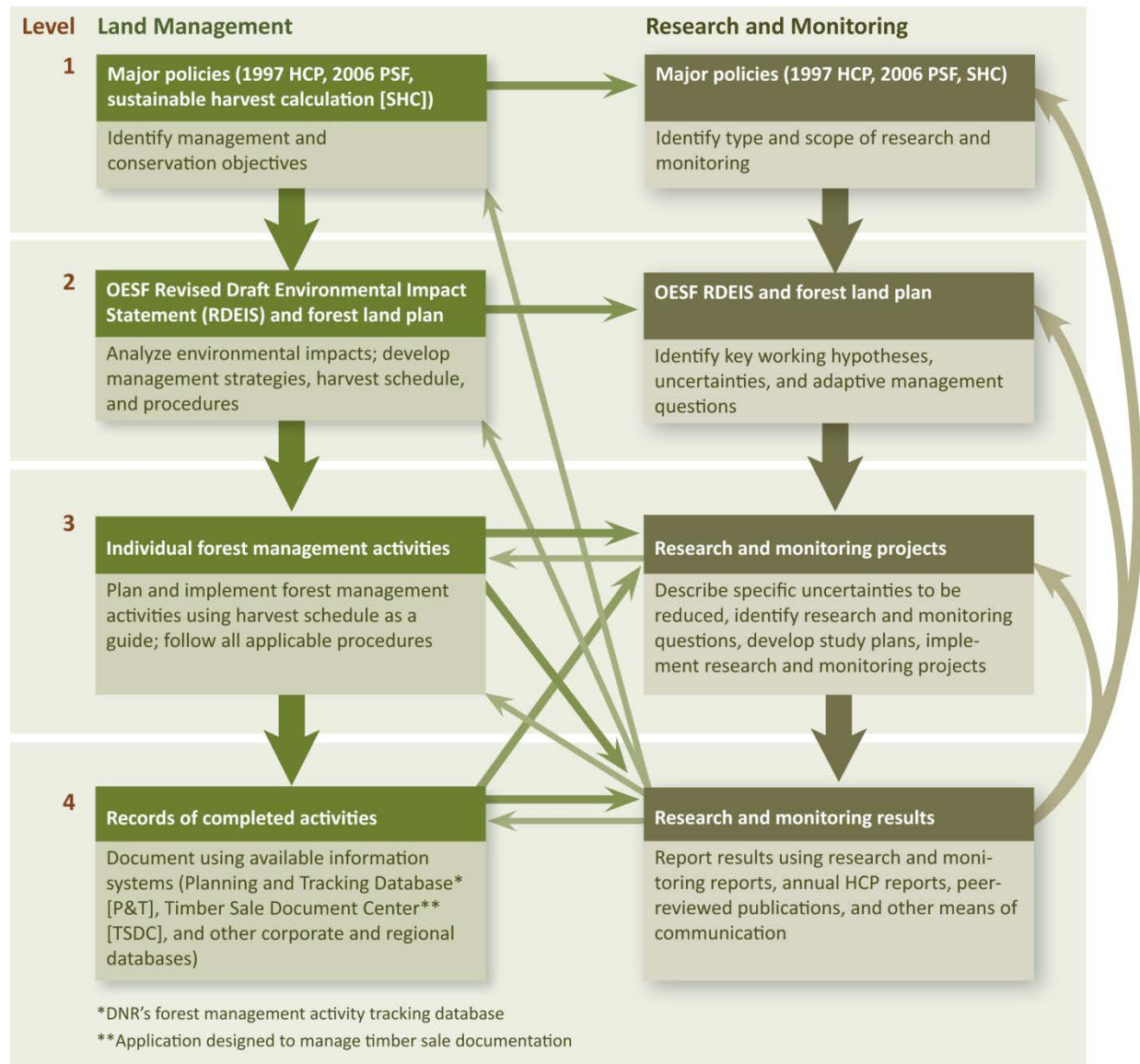
Management and research can exist as separate processes with their own information flow as depicted by the curved, brown arrows in Figure 1. Improving management in response to research and monitoring findings, i.e. practicing adaptive management, requires integrating management and research through information exchange. Information exchange is depicted by the green arrows in Figure 1.

At Level 1, the type and scope of OESF research and monitoring are identified in general terms in DNR policies such as the 1997 HCP and the 2006 *Policy for Sustainable Forest* (PSF). At Level 2, the uncertainties around input data, modeling, environmental analyses, and implementation of the proposed management actions are identified and explicitly stated (refer to Table A-46 in Chapter 4 for an example). These uncertainties become topics for future research, monitoring, and adaptive management.

Development of research questions, testable hypotheses, and research and monitoring study plans draws upon these uncertainties. The harvest schedule and procedures included in the draft OESF forest land plan

inform the design of research and monitoring studies. At Levels 3 and 4, information on planning and implementing forest management activities is used for 1997 HCP implementation, effectiveness, and validation monitoring and research. Through the process of adaptive management, the results of research and monitoring have the potential to change all levels of the land management process – from policy to conducting and reporting a timber sale.

Figure A1-1. Information Linkage Between Land Management and Research and Monitoring



Information Needs Related to Implementation of the OESF Draft Forest Land Plan and HCP Research and Monitoring

During the OESF forest land planning process, DNR identified information needs in the following broad categories:

- Forest land plan implementation
- Forest estate model reruns
- Monitoring of plan implementation
- Research and monitoring of habitat conditions and species response to management
- Adaptive management implementation
- Communication within DNR and with external parties

Table A1-1 shows specific information needs of the Research and Monitoring Program in relation to implementation and monitoring of the OESF forest land plan. The table identifies the format required for delivery of information and the parties responsible for meeting those information needs.

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Table A1-1. Information Needs for Adaptive Management and the Research and Monitoring Program

Information need	Why is the information needed?	Does data/information currently exist?	Current format	Required format	Responsible party
Harvest schedule produced by the forest estate model	Monitoring the implementation and effects of the FLP; Planning research and monitoring (R&M) projects	yes	Tabular database (known as the “activities” file) in Microsoft (MS) Access and Excel and spatial database (ArcGIS geo-database) by Remsoft polygon and decade	Enhanced P&T	Forest Informatics and Planning section
Forecast of forest conditions, northern spotted owl (NSO), and riparian habitat for the entire planning period	Comparison of projected and observed conditions; adaptive management (AM) decisions	yes	Tabular database (known as the “state of the forest” file) in MS Access and MS Excel) and spatial database (ArcGIS database) by Remsoft polygon and decade Riparian habitat is assessed as a post-process and resides in a tabular database (MS Access) by Remsoft polygon and decade	Tabular and spatial databases of riparian and NSO habitat type and stand development stage, and at a resolution of forest management unit (FMU) and decade	Forest Informatics and Planning section
Forest land plan (FLP) procedures for NSO, riparian, and response to natural disturbances	Monitoring of FLP implementation	yes	Procedures in DNR Forestry Handbook	Procedures in DNR Forestry Handbook	Forest Resources Division
Recommended riparian forested buffers for each Type 3 (T3) watershed	Monitoring the implementation and effects of the FLP; riparian validation monitoring	yes	Database in MS Excel at a resolution of T3 watershed and decade	Database in MS Excel at a resolution of T3 watershed and decade; expected to be updated through regular forest estate model reruns	Forest Informatics and Planning section

Information need	Why is the information needed?	Does data/ information currently exist?	Current format	Required format	Responsible party
Hydrologic maturity assessment	Monitoring the implementation and effects of the FLP; riparian validation monitoring	partially	2006 Olympic Natural Resource Center (ONRC) report (watershed analysis) or assessment of riparian conditions used in the RDEIS	Regularly updated reports in corporate databases	Forest Informatics and Planning section
Acreage of NSO habitat types per landscape	Monitoring the implementation and effects of the FLP; NSO validation monitoring	yes	Corporate NSO habitat GIS layer maintained by the HCP section	Corporate NSO habitat GIS layer linked to the FLP estate model updates	HCP and Scientific Consultation section
Windthrow probability model	Monitoring the implementation and effects of the FLP; AM decisions	yes	Spatial database (ArcGIS geodatabase) showing windthrow probability within outermost 25 meters of riparian interior core	Spatial database (ArcGIS geodatabase) showing windthrow probability within outermost 25 meters of riparian interior core	Forest Informatics and Planning section
Field reconnaissance data collected during timber sale layout and road management	Monitoring of FLP implementation; source of potential topics for R&M	yes	Field data on stream typing, stand conditions, geological assessments recorded by foresters and specialists as notes or personal database or GIS coverage	Shared database and GIS coverage	Olympic region
Records of professional judgment about timber sales' layout	Monitoring the implementation and effects of the FLP; source of potential topics for R&M; AM decisions	no	N/A	Written rationale for operational decisions such as excluding certain areas from mgmt. and configuration of interior and wind buffers, and description of the information sources used to make the decisions	Olympic region

Information need	Why is the information needed?	Does data/ information currently exist?	Current format	Required format	Responsible party
Comprehensive timber sale compliance notes	Monitoring the implementation and effects of the FLP	partially	TSDC	Written description of postharvest conditions, variations to the original prescription (e.g. moving a leave trees patch), violations, delays of the contract, etc.	Olympic region
Data on actual roads use	Monitoring the implementation and effects of the FLP	yes	Road use estimates in timber sale SEPA documents	Shared database on roads use related to timber harvest, road management, easements, and recreation	Olympic region
Records of management decisions regarding FLP implementation (planning meetings, memos, other region-division communication)	Monitoring of FLP implementation; AM decisions; HCP reporting	no	Emails, meeting notes, memos	Shared database	Forest Resources Division and Olympic region
Records of AM decisions for the OESF, including approved R&M priorities and decisions about management adjustments	Planning of R&M activities, sustaining of R&M projects, budget decisions, accountability, HCP reporting	no	N/A	Shared database	HCP and Scientific Consultation section
Remote sensing data for assessing ecological conditions	Monitoring the implementation and effects of the FLP; validation monitoring; research	partially	Orthophotos from National Agriculture Imagery Program (NAIP) biennial flights stewarded by DNR photogrammetry group, LiDAR coverage for small part of the OESF, GNN dataset stewarded by United States Forest Service (USFS)	Orthophotos from NAIP biennial flights stewarded by DNR photogrammetry group, LiDAR coverage for the entire OESF, gradient nearest neighbor (GNN) dataset stewarded by USFS	Photogrammetry section

Information need	Why is the information needed?	Does data/ information currently exist?	Current format	Required format	Responsible party
Records of natural disturbances	Monitoring the implementation and effects of the FLP; validation monitoring; research	partially	Bugs & Crud GIS coverage - corporate dataset of annual forest damage aerial detection surveys, landslide inventory	Spatially-explicit data on windthrow, landslides, and forest health issues	Forest Health section
Implementation monitoring data and reports	Effectiveness and validation monitoring; AM decisions	partially	HCP implementation monitoring reports	Shared implementation monitoring database; shared location for monitoring reports	Silviculture, Research and Monitoring section
Forest estate model documentation including assumptions, rules, description of input data, sensitivity analyses	Monitoring of FLP implementation; effectiveness and validation monitoring; research	yes	Appendix to the FLP	Document updated at each rerun of the estate model	Forest Informatics and Planning section
Documentation on research and monitoring activities and results	Effectiveness and validation monitoring; research; AM decisions; HCP reporting	partially	Study plans, peer reviews, field protocols, databases, reports, publications	Study plans, peer reviews, field protocols, databases, reports, publications	HCP and Scientific Consultation section
R&M project-specific databases	HCP effectiveness and validation monitoring; research	partially	Various databases (Access, Excel, R software, proprietary)	Databases can be in various formats; metadata are required	HCP and Scientific Consultation section
Repository of R&M programmatic documents (Memorandums of understanding (MOU), data sharing agreements, etc.)	Conducting research and monitoring	partially	MOUs, meeting notes, memos	PDFs organized in shared folder or database	HCP and Scientific Consultation Section

OESF Information Management Tasks and Responsible Parties

Information needs related to implementing and monitoring the OESF forest land plan, as identified in Table A1-1, may be further described in an information guidelines document accompanying the procedures for managing northern spotted owl habitat, riparian habitat, and for response to natural disturbances. As DNR implements this forest land plan, DNR will develop these guidelines and will specify the roles and responsibilities of the staff from Olympic region and the Forest Resources Division (FRD). In summary, the FRD will be responsible for providing the harvest schedule and other outcomes of the planning process in a format usable by the Olympic region staff to plan and implement timber sales and road management. The Olympic region will be responsible for recording information related to timber harvest operations including documenting professional judgment used in timber sales layout, collecting field reconnaissance data, and providing timber sales compliance notes. The FRD will work with the Olympic region to put in place information systems to capture this data.

HCP implementation monitoring reports for the period 2001 through 2011 found incomplete or inconsistent operational records and recommended improvements in how management activities are documented (refer to the “results and recommendations” sections of the reports located at http://www.dnr.wa.gov/ResearchScience/Topics/TrustLandsHCP/Pages/lm_hcp_implementation_monitoring.aspx). Implementation monitoring of the OESF forest land plan will rely, to a major extent, on complete and timely records of operational data (refer to Appendix A-4, Implementation Monitoring). The FRD will be responsible for collecting implementation monitoring data, analyzing them, and reporting on HCP compliance.

Reruns of the forest estate model will use data from completed operations and from ecological conditions updated through remote sensing and field reconnaissance. Model reruns and any necessary post processing will be conducted by the Forest Informatics and Planning section of the FRD. The format and location of this output is currently being discussed.

The FRD, and specifically the OESF Research and Monitoring Program, will be responsible for collecting and stewarding data on HCP effectiveness and validation monitoring, and research by external organizations conducted in the OESF.

References

DNR *see* Washington State Department of Natural Resources

Washington State Department of Natural Resources. 1997. Habitat Conservation Plan. WADNR, Olympia, WA.

Washington State Department of Natural Resources. 2006. Policy for Sustainable Forests. WADNR, Olympia, WA.

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Appendix A-2

Riparian Buffer Recommendations

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Introduction

This appendix shows the riparian buffer recommendation for state trust lands during the first decade of the analysis period for each Type 3 watershed under Options 1 and 2 as described in Chapter 2 of the draft Olympic Experimental State Forest (OESF) forest land plan. Because buffer width recommendations are based on watershed conditions, activities conducted during the first decade of the plan may affect the recommendations for following decades; therefore, recommendations are provided for the first decade only (Table A2-1).

For Option 1, Table A2-1 shows the number of acres of variable retention harvest that is allowed within a buffer. For Option 2, Table A2-1 shows the width of the recommended buffer. Refer to Chapter 2 of the draft OESF forest land plan (p. A-32) for a discussion about these two options.

Table A2-1. Riparian Buffer Recommendations for Options 1 and 2 for the First Decade of the Analysis Period

Type 3 Watershed	OPTION 1: Allowable variable retention harvest (acres) within interior-core buffer		OPTION 2: Adjusted width interior-core buffer ³ (feet)	
	Distance 0 to 75 feet	Distance greater than 75 feet ²	Stream types	
			Stream types 1 and 2	Stream types 3 and 4
12	3	1	150	88
16	1	8	131	85
27	0	0	150	100
30	0	0	150	100
31	0	0	150	100
34	0	0	150	100
45	0	0	150	100
50	0	0	150	100
52	0	0	150	100
65	0	0	150	100
69	2	0	147	100
73	0	0	150	100
74	0	0	150	100
77	0	0	150	100
84	0	0	150	100
85	1	1	150	87
86	5	14	141	83
88	0	0	150	83
89	6	7	150	75
95	0	0	150	100
96	0	0	150	87
97	0	0	150	100
102	0	0	150	100
104	0	0	150	100
105	6	4	150	93

Type 3 Watershed	OPTION 1: Allowable variable retention harvest (acres) within interior-core buffer		OPTION 2: Adjusted width interior-core buffer ³ (feet)	
	Distance 0 to 75 feet	Distance greater than 75 feet ²	Stream types 1 and 2	Stream types 3 and 4
107	0	0	150	100
110	0	1	150	88
116	0	0	150	100
117	1	4	150	83
119	4	2	150	88
122	1	0	150	91
124	0	1	138	100
130	0	0	150	100
131	0	0	150	100
132	0	0	150	100
133	7	4	150	92
134	0	0	150	100
135	0	0	150	100
136	0	0	150	96
137	0	0	150	100
138	3	2	150	95
139	0	0	150	100
145	1	0	150	98
146	0	0	150	100
148	0	0	150	100
150	4	1	150	96
151	0	0	150	83
152	0	0	150	100
153	0	1	150	92
155	0	0	150	100
157	0	1	150	99
158	5	3	150	88
160	1	3	150	95
161	0	0	150	100
163	0	0	150	100
164	0	0	150	99
165	5	4	150	94
166	0	0	150	100
167	2	1	150	94
168	0	0	150	100
169	0	0	150	100
170	0	1	144	100
171	0	0	150	100

Type 3 Watershed	OPTION 1: Allowable variable retention harvest (acres) within interior-core buffer		OPTION 2: Adjusted width interior-core buffer ³ (feet)	
	Distance 0 to 75 feet	Distance greater than 75 feet ²	Stream types 1 and 2	Stream types 3 and 4
172	0	0	150	100
174	0	0	150	100
179	0	2	139	100
180	0	0	150	100
183	0	0	150	100
184	0	0	150	100
186	0	0	150	100
187	0	0	150	100
188	0	0	150	100
192	0	0	150	100
193	0	0	150	100
194	0	0	150	100
195	0	2	147	100
196	0	0	150	100
197	0	0	150	100
200	2	1	150	88
203	0	0	150	94
205	1	1	150	96
207	0	0	150	100
212	0	0	150	0 ³
213	0	0	150	100
216	0	0	150	100
220	4	1	150	83
222	0	0	150	100
224	0	0	150	100
227	1	2	150	78
229	0	0	150	100
230	0	1	150	89
232	0	0	150	100
233	1	1	150	98
234	0	1	150	95
236	0	0	150	100
238	1	4	150	80
241	22	10	150	84
242	0	0	150	100
243	0	0	150	100
245	0	0	150	100
249	2	2	150	89

Type 3 Watershed	OPTION 1: Allowable variable retention harvest (acres) within interior-core buffer		OPTION 2: Adjusted width interior-core buffer ³ (feet)	
	Distance 0 to 75 feet	Distance greater than 75 feet ²	Stream types 1 and 2	Stream types 3 and 4
250	0	0	150	100
251	0	0	150	100
252	0	0	150	100
255	0	0	150	100
256	0	0	150	100
258	0	0	150	100
259	0	0	150	100
260	0	0	150	100
262	0	1	120	94
267	0	0	150	100
268	0	0	150	100
269	0	0	150	100
270	0	0	150	100
271	0	0	150	100
273	0	0	150	100
274	0	0	150	100
275	0	0	150	100
276	0	0	150	97
277	0	1	150	97
278	3	0	150	94
286	1	1	150	74
287	0	0	150	100
289	1	3	150	89
290	0	0	150	100
291	0	0	150	100
292	0	0	150	100
293	0	0	150	100
294	0	0	150	100
295	0	0	150	100
296	2	0	140	100
297	0	0	150	100
301	2	5	150	74
302	0	6	99	91
303	1	1	148	100
308	0	5	150	87
309	3	11	124	93
310	0	0	150	100
311	2	2	150	87

Type 3 Watershed	OPTION 1: Allowable variable retention harvest (acres) within interior-core buffer		OPTION 2: Adjusted width interior-core buffer ³ (feet)	
	Distance 0 to 75 feet	Distance greater than 75 feet ²	Stream types 1 and 2	Stream types 3 and 4
313	1	1	143	95
314	0	0	150	100
315	0	0	150	100
316	0	0	150	100
317	0	0	150	100
319	0	0	150	100
320	0	0	150	100
321	3	17	103	93
322	0	0	150	100
323	0	0	150	100
324	2	0	150	98
325	0	0	150	100
326	0	0	150	100
327	1	7	150	93
328	0	0	150	100
329	0	0	150	100
333	0	0	150	100
334	2	2	150	96
335	3	4	150	91
336	0	0	150	100
338	3	2	150	39 ³
339	0	0	150	100
341	0	0	150	100
343	0	0	150	100
344	1	0	150	99
345	1	1	150	98
346	0	0	150	100
347	6	6	150	84
348	0	0	150	100
349	0	0	150	100
350	0	0	150	100
352	0	0	150	100
353	0	0	150	100
354	0	0	150	100
356	0	0	150	100
357	2	3	150	92
358	0	0	150	100
360	0	0	150	100

Type 3 Watershed	OPTION 1: Allowable variable retention harvest (acres) within interior-core buffer		OPTION 2: Adjusted width interior-core buffer ³ (feet)	
	Distance 0 to 75 feet	Distance greater than 75 feet ²	Stream types 1 and 2	Stream types 3 and 4
361	0	0	150	100
362	0	0	150	100
363	0	0	150	100
365	0	0	150	100
370	0	0	150	100
371	0	2	150	88
372	0	0	150	100
374	0	0	150	100
377	0	0	150	100
378	3	0	150	92
379	0	0	150	100
380	1	2	148	100
381	0	0	150	100
382	0	0	150	100
383	1	1	150	95
385	0	0	150	100
387	0	0	150	100
388	0	0	150	100
389	0	0	150	100
390	0	0	150	99
391	0	0	150	100
393	0	0	150	100
395	2	2	142	88
396	0	0	150	100
397	0	6	139	100
399	0	0	150	100
401	1	0	150	94
402	0	0	150	100
403	0	0	150	100
405	4	5	97	97
408	0	0	150	100
411	0	0	150	100
413	0	0	150	100
414	13	13	141	85
416	0	0	150	100
417	0	0	150	100
418	0	1	150	95
419	2	2	150	79

Type 3 Watershed	OPTION 1: Allowable variable retention harvest (acres) within interior-core buffer		OPTION 2: Adjusted width interior-core buffer ³ (feet)	
	Distance 0 to 75 feet	Distance greater than 75 feet ²	Stream types 1 and 2	Stream types 3 and 4
421	0	0	150	100
422	0	0	150	100
424	2	1	150	66
430	0	0	150	100
431	0	0	150	100
433	6	15	150	82
434	0	0	150	100
435	0	0	150	100
436	0	0	150	100
439	9	5	150	91
440	0	0	150	100
441	1	1	150	99
442	2	1	150	96
443	0	0	150	100
444	0	0	150	100
445	0	0	150	100
446	0	0	150	100
447	0	0	150	100
448	0	0	150	100
450	0	0	150	100
452	0	0	150	100
453	0	0	150	100
454	0	0	150	100
455	0	0	150	100
456	1	0	150	0 ³
457	3	3	126	91
458	0	0	150	100
459	0	0	150	100
460	0	0	150	100
461	0	0	150	100
463	1	0	150	85
464	0	0	150	100
465	0	0	150	100
466	0	0	150	100
467	0	0	150	100
468	0	0	150	100
470	1	2	148	83
471	0	0	150	100

Type 3 Watershed	OPTION 1: Allowable variable retention harvest (acres) within interior-core buffer		OPTION 2: Adjusted width interior-core buffer ³ (feet)	
	Distance 0 to 75 feet	Distance greater than 75 feet ²	Stream types 1 and 2	Stream types 3 and 4
472	0	0	150	100
474	0	0	150	100
477	0	0	15 ³	100
478	4	3	150	82
479	0	0	150	100
480	0	0	150	100
481	0	0	150	100
482	0	1	141	100
483	0	0	150	100
484	0	0	150	100
487	4	0	150	82
488	2	2	114	89
489	0	0	150	100
490	7	11	150	85
491	0	0	150	100
492	0	0	150	100
493	0	0	150	100
494	3	0	150	96
496	0	0	150	100
497	2	2	150	93
498	3	3	150	98
499	0	0	150	100
500	0	0	150	100
501	0	0	150	100
503	0	0	150	100
504	1	1	150	100
505	0	0	150	100
506	2	0	150	94
508	1	0	150	100
509	2	1	150	92
510	2	6	143	92
512	0	0	150	100
513	2	10	139	100
514	1	4	148	99
515	0	0	150	100
517	0	0	150	100
518	3	2	150	82
519	0	0	150	100

Type 3 Watershed	OPTION 1: Allowable variable retention harvest (acres) within interior-core buffer		OPTION 2: Adjusted width interior-core buffer ³ (feet)	
	Distance 0 to 75 feet	Distance greater than 75 feet ²	Stream types 1 and 2	Stream types 3 and 4
520	1	2	150	98
521	0	0	150	100
522	0	0	150	100
523	1	1	150	99
524	0	0	150	100
525	0	0	150	100
526	0	0	150	100
527	0	0	150	100
528	0	0	150	100
530	8	21	128	89
534	1	1	150	99
538	0	0	150	100
539	0	0	150	100
540	0	0	150	100
541	0	0	150	100
542	0	0	150	100
543	1	1	150	99
544	0	0	150	100
545	0	0	150	100
546	0	2	150	98
547	0	0	150	100
548	0	0	150	100
550	3	2	150	82
551	0	0	150	100
552	0	0	150	100
553	0	3	148	94
555	0	0	150	100
557	0	0	148	100
558	0	0	145	100
559	0	0	150	100
561	0	0	150	100
562	17	21	141	91
563	1	2	149	100
564	6	2	150	85
565	24	16	121	91
566	0	2	150	99
567	0	1	150	98
568	3	2	140	91

Type 3 Watershed	OPTION 1: Allowable variable retention harvest (acres) within interior-core buffer		OPTION 2: Adjusted width interior-core buffer ³ (feet)	
	Distance 0 to 75 feet	Distance greater than 75 feet ²	Stream types 1 and 2	Stream types 3 and 4
569	0	8	150	90
570	0	0	150	100
571	0	1	150	99
572	0	0	150	100
573	0	0	150	100
574	0	0	150	100
575	0	0	150	100
576	0	1	150	99
577	1	4	150	96
578	0	0	150	100
579	0	0	150	100
580	0	0	150	100
581	0	0	150	100
582	0	0	150	100
583	2	2	124	97
584	0	0	150	100
585	2	1	150	94
586	4	9	150	87
587	0	5	150	90
588	0	0	150	100
589	0	0	150	100
590	0	0	150	100
591	1	0	150	97
592	0	0	150	100
593	1	1	150	95
594	0	0	150	100
595	0	0	150	100
596	0	0	150	100
597	0	0	150	100
598	0	0	150	100
599	0	0	150	100
600	0	0	150	100
601	2	1	150	94
602	2	0	150	79
603	6	4	150	83
604	0	0	150	100
605	0	0	150	100
606	3	1	150	96

Type 3 Watershed	OPTION 1: Allowable variable retention harvest (acres) within interior-core buffer		OPTION 2: Adjusted width interior-core buffer ³ (feet)	
	Distance 0 to 75 feet	Distance greater than 75 feet ²	Stream types 1 and 2	Stream types 3 and 4
607	0	0	150	100
608	1	1	150	98
609	18	13	146	88
610	0	0	150	100
611	0	0	150	100
612	0	0	150	100
613	0	0	150	100
614	0	0	150	100
615	0	0	150	100
616	0	0	150	100
617	0	0	150	100
618	0	0	150	100
619	0	3	150	90
620	0	0	150	100
621	0	1	150	96
622	5	3	121	86
623	0	4	150	86
624	0	0	150	100
625	0	0	150	100
627	0	0	150	100
628	0	0	150	100
629	0	0	150	100
630	3	4	150	95
631	0	0	150	100
632	0	0	150	100
633	0	0	150	100
635	0	0	150	100
636	0	0	150	100
637	0	0	150	100
638	0	0	150	100
639	0	0	150	100
640	19	9	138	88
641	1	0	150	72
642	0	2	150	97
643	0	2	150	99
644	0	0	150	100
645	15	6	150	78
647	0	0	150	100

Type 3 Watershed	OPTION 1: Allowable variable retention harvest (acres) within interior-core buffer		OPTION 2: Adjusted width interior-core buffer ³ (feet)	
	Distance 0 to 75 feet	Distance greater than 75 feet ²	Stream types 1 and 2	Stream types 3 and 4
648	0	2	150	98
649	0	0	150	100
650	0	0	150	100
651	5	4	150	93
653	0	0	150	100
654	0	0	150	100
656	0	0	150	100
658	5	2	150	90
659	0	0	150	100
660	0	5	126	98
662	0	0	150	100
663	0	0	150	100
664	2	1	150	96
666	0	0	150	100
667	0	0	150	100
668	4	5	141	90
669	1	0	150	99
670	0	0	150	100
671	0	0	150	100
672	0	0	150	100
673	0	0	150	100
674	0	0	150	100
675	0	0	150	100
676	6	6	148	94
677	8	12	148	92
679	0	0	150	100
680	0	1	150	94
681	0	0	150	100
682	0	0	150	100
683	1	1	150	85
684	0	0	150	100
685	4	2	150	95
686	0	0	150	100
687	0	0	150	100
688	0	0	150	100
689	0	0	114	100
690	0	0	150	100
692	12	7	150	75

Type 3 Watershed	OPTION 1: Allowable variable retention harvest (acres) within interior-core buffer		OPTION 2: Adjusted width interior-core buffer ³ (feet)	
	Distance 0 to 75 feet	Distance greater than 75 feet ²	Stream types 1 and 2	Stream types 3 and 4
693	0	0	150	100
694	0	0	150	100
695	3	2	150	76
696	0	0	150	100
697	0	0	150	100
698	0	1	150	97
699	0	0	150	100
700	0	0	150	100
701	0	0	150	100
702	0	0	150	100
703	0	0	150	100
704	0	0	150	100
705	0	0	150	100
706	2	1	150	96
707	0	0	150	100
708	1	0	150	99
709	1	0	149	100
710	5	7	146	92
711	0	1	149	100
712	3	1	150	90
713	0	2	150	91
714	0	0	150	100
715	0	0	150	100
716	0	0	150	100
717	0	0	150	100
718	3	3	150	89
719	0	0	150	100
720	11	9	150	79
721	2	1	150	98
722	0	0	150	100
723	0	1	150	96
724	0	0	150	100
725	1	1	150	94
726	0	0	150	100
727	8	16	141	89
728	1	1	150	63
729	0	0	150	100
730	3	2	150	95

Type 3 Watershed	OPTION 1: Allowable variable retention harvest (acres) within interior-core buffer		OPTION 2: Adjusted width interior-core buffer ³ (feet)	
	Distance 0 to 75 feet	Distance greater than 75 feet ²	Stream types 1 and 2	Stream types 3 and 4
731	0	0	150	100
732	0	0	150	100
733	0	0	150	100
734	0	0	150	100
735	0	0	150	100
736	0	0	150	100
737	0	0	150	100
738	0	1	150	94
739	0	0	150	100
740	0	0	150	100
741	0	0	150	100
742	0	0	150	100
743	0	1	150	95
744	3	2	150	97
745	0	0	150	99
746	11	14	138	94
747	0	0	150	100
748	9	5	150	94
749	0	0	150	100
750	0	0	150	100
751	0	0	150	100
752	3	2	150	90
753	0	0	150	100
754	1	1	150	90
755	2	1	150	74
756	0	0	150	100
757	0	0	150	100
758	2	1	150	98
759	3	3	150	88
760	0	0	150	100
761	1	0	150	83
762	0	1	150	90
763	1	1	150	93
764	0	0	150	100
765	0	0	150	100
766	0	0	150	100
767	0	0	150	100
768	0	0	150	100

Type 3 Watershed	OPTION 1: Allowable variable retention harvest (acres) within interior-core buffer		OPTION 2: Adjusted width interior-core buffer ³ (feet)	
	Distance 0 to 75 feet	Distance greater than 75 feet ²	Stream types 1 and 2	Stream types 3 and 4
769	0	0	150	100
770	0	0	150	100
771	0	0	150	100
772	0	0	150	100
773	0	0	150	100
774	0	0	150	100
775	1	10	138	100
776	0	0	150	100
777	0	0	150	100
778	5	2	150	95
779	0	0	150	100
780	4	1	150	95
781	12	10	150	83
782	0	0	150	100
783	3	1	150	92
784	0	1	150	99
785	0	0	150	100
786	2	0	150	99
787	0	0	150	100
788	0	0	150	100
789	0	0	150	100
790	1	0	150	99
791	0	1	145	100
792	3	3	150	85
793	0	0	150	100
795	1	0	150	96
796	0	0	150	100
797	0	0	150	100
798	0	0	150	100
799	0	2	150	95
800	0	2	150	82
801	0	0	150	100
802	1	1	150	97
804	0	2	150	94
805	2	2	150	92
806	2	0	150	98
807	0	0	150	100
808	0	0	150	100

Type 3 Watershed	OPTION 1: Allowable variable retention harvest (acres) within interior-core buffer		OPTION 2: Adjusted width interior-core buffer ³ (feet)	
	Distance 0 to 75 feet	Distance greater than 75 feet ²	Stream types 1 and 2	Stream types 3 and 4
809	0	0	150	100
810	9	4	150	92
811	0	0	150	100
812	0	0	150	100
815	0	0	150	100
818	0	0	150	100
819	0	0	150	100
820	1	0	150	99
823	0	0	150	100
829	0	0	150	100
830	0	0	150	100
832	0	0	150	100
833	11	6	150	82
834	0	0	150	100
836	2	3	123	100
837	5	5	150	91
838	0	0	150	100
839	0	0	150	100
840	0	0	150	100
841	0	0	150	100
842	0	0	150	100
844	0	0	150	100
845	2	0	150	97
846	0	0	150	100
847	0	0	150	100
849	7	10	131	100
852	2	3	109	95
856	0	2	150	91
858	0	0	150	100
860	0	8	116	98

¹150 feet for Type 1 and 2 streams, 100 feet for Type 3 and 4 streams (per 1997 *Habitat Conservation Plan*, p. IV.58). Distances measured horizontally from the outer edge of the 100-year floodplain.

²“Distance greater than 75 feet” refers to the interval from 75 to 150 feet for Type 1 and 2 streams, and from 75 to 100 feet for Type 3 and 4 streams.

³ Buffers widths of 0 feet, or a low number of feet, are an artifact of the data. These are areas where the amount of state trust lands in the riparian area is small (generally less than one acre), are rounded, or are GIS “slivers.”

Appendix A-3

Draft Procedures

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DRAFT



DRAFT Riparian Management in the Olympic Experimental State Forest Habitat Conservation Plan (HCP) Planning Unit

Cancels: This procedure replaces PR 14-004-160 dated May, 2000, and PR 14-004-110 dated May, 2000. Implement this procedure immediately.

Date:

Application: All riparian areas located within the Olympic Experimental State Forest Planning Unit.

DISCUSSION

The goal of the Habitat Conservation Plan (HCP) riparian strategy in the Olympic Experimental State Forest (OESF) planning unit is to protect, maintain, and restore habitat capable of supporting viable populations of salmonid species and other non-listed and candidate species dependent on in-stream and riparian environments (DNR 1997, p. 107). The stated goals of the OESF riparian conservation strategy are to:

- 1) maintain and aid restoration of the composition, structure, and function of aquatic, riparian, and associated wetland systems which support aquatic species, populations, and communities;
- 2) maintain and aid restoration of the physical integrity of stream channels and floodplains;
- 3) maintain and aid restoration of water to the quantity, quality, and timing with which these stream systems evolved (i.e., the natural disturbance regime of these systems);
- 4) maintain and aid restoration of the sediment regime in which these systems evolved, and
- 5) develop, use, and distribute information about aquatic, riparian, and associated wetland-ecosystem processes and on their maintenance and restoration in commercial forests.

The 1997 Habitat Conservation Plan did not state the explicit measures or evaluation criteria and indicators that describe the attainment of these goals. In other words, there is no "desired future condition" of a riparian forest or watershed that tells us when the goals have been met. Rather, the principal underlying these objectives is explained as the need to conserve "*habitat complexity afforded by natural disturbances regimes on the western Olympic Peninsula*" (HCP IV.107).

The 1997 HCP described a structured process for implementing the riparian conservation strategy to be developed as part of landscape planning. This procedure describes the implementation of this structured process.

With these goals as reference, the following landscape analysis process is conducted, using a forest estate model to provide a specific riparian management zone strategy for each Type-3 basin in the OESF.

- A) Descriptive criteria and indicators are developed and chosen to represent basin-level conditions consistent with restoration of riparian and watershed structure and function on DNR-managed lands in the OESF
 - a. Delineation of potential unstable slopes associated with riparian features
 - b. Restoration of the recruitment potential of large woody debris
 - c. Restoration of the forest cover to provide shade
 - d. Restoration of watershed conditions for hydrologic maturity and regulation of peak flow.
- B) Current information and data on riparian forests, and watershed and riparian conditions are collected and input into a forest estate model
- C) The riparian indicators are incorporated within a forest estate model that is used to provide information for planning silvicultural harvest activities that will result in the integration of commodity production and ecosystem values across the OESF
 - a. Avoidance of all areas that have been identified as deferred from harvest for management reasons, such as unstable slopes.
 - b. Non-declining yield of recruitment potential of large woody debris within each Type-3 basin
 - c. Non-declining yield of shade potential within each Type-3 basin
 - d. Attainment and maintenance of sufficient hydrologically mature forest within each Type-3 basin to avoid detections of changes in peak-flow events
- D) Protection of riparian forest from severe endemic windthrow
- E) The outputs of the forest estate model scenario runs are then converted into riparian buffers width recommendations for each stream type in each Type-3 basin, published in the Division's Forestry Handbook.

It is anticipated that this landscape analysis process will be updated, re-designed and re-run as new information, techniques and data becomes available. These re-runs may result in an update of the Type-3 basin riparian buffer recommendations

ACTION

- A) Verify the water-type information for all waters located within or adjacent to the boundary of the proposed activity. Record the designations and make



any mapping corrections of the stream in the OESF hydro data. Water typing will be conducted using either of the following two methods:

- a. Water type may be verified through consultation with fisheries biologists from DNR, tribes, or other agencies or verified by certified and/or trained personnel using the protocol specified in WAC 222-16-030, Washington Forest Practices Board Emergency Rules (stream typing), November 1996 and the Forest Practices Board Manual and reviewed through an approved Forest Practices review system.
 - b. Water type may be verified through physical parameters and qualities described in DNR State Land Water Typing System (see associated Task).
- B) Identify the Type-3 basin(s) in which the management activity is proposed. Look up the latest riparian management zone width recommendations in the Division's Forestry Handbook. For the interior core buffer, choose either:
- Option 1, interior-core buffer with small areas of variable retention harvest
OR
 - Option 2, adjusted-width interior-core buffer

Buffer streams accordingly in GIS and assess for wind throw.

- a. Document whether the potential risk for windthrow is severe using at least one of the following methods:
 - i. Employ remote reconnaissance techniques, such as using empirical evidence of recent windthrow events within the Type 3 basin from aerial photographs.
 - ii. Conduct field assessments.
 - iii. Use a predictive model to identify the wind-throw potential for the Type-3 basin(s) in which the proposed regeneration-type harvest activity is planned.
 - iv. Use a site specific predictive model to assess the windthrow potential of a specific timber sale polygon
- b. Determine whether there is a five percent or greater probability of severe endemic windthrow in any portion of the interior core buffer. Severe endemic windthrow is defined as 90 percent of the area experiencing 50 percent canopy loss. If the probability is five percent or higher, then either:
 - i. Apply an 80 foot exterior buffer to the interior core buffer; **or**
 - ii. Modify the timber sale boundary or leave tree pattern to reduce the probability of severe endemic windthrow

Record the interior core buffer recommendation chosen and the exterior buffer, if applicable, in Planning and Tracking.

- C) In the field identify and mark on the ground:
- a. For regeneration harvests¹ only: the outer edge of the riparian management zone. The interior-core buffer width initiates at the ordinary high water mark (otherwise termed bank-full width). Note the



*Draft OESF FLP Landscape Alternative - PR 14-004-160
Author's Work - Subject to Change Without Notice*

- interior-core buffer will encompass: equipment limitation zone, the 100-year flood plain and the channel migration zone.
- b. For thinning harvests. If the upland thinning prescription is applied in the riparian management zone then there is no need to delineate the riparian management zone in the field. Identify and tag in the field all areas that are to be excluded from management activities. If the riparian thinning prescription is different from upland thinning prescription, then the riparian management will be delineated per 3.a.
 - c. All potentially unstable slope areas within the harvest unit area will be identified-and delineated on the ground per Forest Practices Rules (WAC 222-16-050 (1)(d)(i).
- D) Based on the field work in point 3, create a spatial polygon representing the riparian forest management unit (FMU) in the Department's planning and tracking database. Develop the appropriate objectives and prescriptions for this FMU (see Point E).
- E) Develop and record the silvicultural prescription for the riparian management zone in the Department's planning and tracking database. The activities that are permitted in the riparian management zone include:
- a. Pre-commercial thinning
 - b. Variable density thinning
 - c. Variable retention harvest (under Option 1 only)
 - d. Selective harvest of hardwoods and/or removal of single hardwood trees.
 - e. Restoration efforts, including habitat-enhancement projects such as the creation of snags, dead down wood and in-stream large woody debris.
 - f. Research projects designed to improve the integration of revenue and ecological values.
 - g. Application of herbicides in accordance with WAC 222-38-020, Handling, storage, and application of pesticides.
 - h. Road crossings over streams. To minimize cumulative impacts associated with roads, DNR will design roads to take the most direct route over streams that is operationally feasible.
 - i. Road maintenance on existing roads and clearing of the existing road prism
- F) Information Management. Check that the following records are updated and completed:
- a. Riparian Management Zone FMU, spatial and tabular records
 - b. Mapped streams and types are entered into Local Shared OESF Hydro
 - c. Mapped roads into DNR Trans Layer



APPROVED BY: _____ Date: _____

Manager, Forest Resources Division

Washington Forest Practices Board, 2011 Watershed Analysis Manual, under Chapter 222-22 WAC, version 5.0, November 2011, Washington Department of Natural Resources, Forest Practices Division, Olympia; looseleaf.

http://www.dnr.wa.gov/ResearchScience/Topics/WatershedAnalysis/Pages/fp_watershed_analysis_manual.aspx

¹ A regeneration harvest activity is defined as an activity in which less than 20 percent of the pretreatment basal area is planned to be retained over 80 percent of the treatment area. Typical names for these types of activities are variable retention harvest, clear cuts, seed tree initial treatments. Establishment of the next commercial cohort could be attained through natural or planting regeneration techniques.

DRAFT Northern Spotted Owl Management (OESF)

Cancels: ---Northern Spotted Owl Management (Westside), October 2007
--Westside applications of [PR 14-004-120](#) Management Activities within Spotted Owl Nest Patches, Circles, Designated Nesting, Roosting, and Foraging and Dispersal Management Areas, September 2004
--HCP Implementation Memorandum #1, dated Jan 20, 1998
--Standard Practices Memorandum SPM 03-06 and SPM 03-07

Date:

Application: All forested state trust within the Olympic Experimental State Forest (OESF) HCP Planning Unit

DISCUSSION

DNR's HCP for state trust lands is a multi-species conservation strategy that covers the range of the northern spotted owl (NSO) within the state of Washington. The intent of the HCP NSO strategy is to provide habitat that makes a significant contribution to the demographic support, maintenance of species distribution, and facilitation of dispersal. For the OESF, the strategy is to restore a level of habitat capable of supporting reproducing northern spotted owls on DNR-managed lands in the OESF.

The 1997 *Habitat Conservation Plan* northern spotted owl strategy in the OESF is an "unzoned" approach to habitat conservation. Under this unzoned approach, all DNR-managed lands within the OESF have the potential to contribute to the northern spotted owl habitat conservation strategy. This approach is distinct from the strategies employed in other western Washington HCP planning units, where spotted owl habitat management units (SOMUs) have been delineated.

Under the OESF northern spotted owl strategy, DNR restores, then maintains, minimum thresholds of northern spotted owl habitat on all DNR-managed land in each of the 11 landscapes in the OESF. The location of habitat is expected to shift over time: areas in a landscape that develop into habitat in one decade may be harvested in a later decade as other areas in that landscape mature into habitat. This approach assumes that

there will be continued forest management while northern spotted owl habitat is restored and then maintained and enhanced.

The unzoned approach is experimental when compared to the zoned approach used in other HCP Planning Units because of the higher level of uncertainty in meeting habitat conservation and revenue production objectives. The 1997 HCP recognized that current scientific knowledge could not answer all of the questions about how to achieve integration of habitat conservation and revenue production effectively and economically. It was assumed that over time, research and monitoring would help answer those questions.

DNR uses innovative silvicultural techniques, such as variable density thinning, to expedite the attainment of the northern spotted owl conservation objectives. Harvests of available Young and Old Forest Habitat can provide opportunities to learn new silvicultural techniques for retaining old forest ecosystem functions, including functions associated with northern spotted owl habitat.

The current assumption is that forest stands receiving early treatments will develop the habitat elements necessary for northern spotted owls. These management practices are relatively new and studies are being done on their effectiveness (Harrington and others 2005, Carey and others 1999).

Landscape planning, using a forest estate model, is used to integrate DNR's objectives of revenue generation and ecosystem values on DNR-managed lands in the OESF. The forest estate model produces several outputs that are integral to the implementation of the OESF northern spotted owl strategy, including maps of northern spotted owl habitat and a harvest schedule. These products are used to guide where to place timber harvest activities, as well as where future habitat is predicted to develop.

The objective of the northern spotted owl Conservation Strategy is to have each landscape planning unit maintain or restore a minimum threshold proportion of potential habitat. Those minimum proportions are:

1. At least 20 percent Old Forest Habitat, and,
2. At least 40 percent Young Forest or better Habitat

In other words, each landscape planning unit should have at least a minimum of 20 percent Old Forest Habitat and 20 percent Young Forest Habitat, adding up to 40 percent of each landscape in functional northern spotted owl habitat. The restoration phase of the strategy is recognized as the time period between current conditions and when a landscape has 40

percent Young Forest or better habitat. The maintenance and enhancement phase of the strategy is defined as when a landscape maintains 40 percent Young Forest or better habitat and the percent of Old Forest increases to 20 percent or higher.

Habitat Definitions

Young Forest Habitat Definitions

Table 1. Sub-mature Habitat Description and Forest Estate Model Inventory Attributes

Sub-mature	
Description	Forest Estate Model Inventory Attributes
<ul style="list-style-type: none"> Forest community dominated by conifers, or in mixed conifer/hardwood forest, the community is composed of at least 30 percent conifers. At least 70 percent canopy closure Tree density of between 115 and 280 trees greater than 4 inches Trees over 85 feet tall At least three snags per acre that are at least 20 inches in diameter 	<ul style="list-style-type: none"> 30 and or more percent conifer trees per acre 115 to 280 trees per acre >4 inches DBH class Minimum top height of 40 largest trees >85 feet tall Curtis's Relative Density >= 48 At least 3 snags per acre >20 inches DBH and 16 feet tall At least 2,400 cubic feet per acre down wood

Table 2. Young Forest Marginal Habitat Description and Forest Estate Model Inventory Attribute

Young Forest Marginal	
Description	Forest Estate Model Inventory Attributes
<ul style="list-style-type: none"> Forest community dominated by conifers, or in mixed conifer/hardwood forest, the community is composed of at least 30 percent conifers. At least 70 percent canopy closure Tree density of between 115 and 280 trees greater than 4 inches Trees over 85 feet tall At least two snags per acre that are at least 20 inches in diameter or equal to 10 percent of the ground covered with 4 inch diameter or larger wood with 25 to 60 percent shrub cover. 	<ul style="list-style-type: none"> 30 percent or more conifer trees per acre 115 to 280 tree per acre >4" DBH class Minimum top height of 40 largest trees >85 feet tall Curtis's Relative Density >= 48 At least 2 snags per acre >20 inches DBH and 16 feet tall or at least 4,800 cubic feet per acre down wood

Old Forest Habitat Definitions

Table 3. High Quality Nesting Habitat Description and Forest Estate Model Inventory Attribute

High Quality Nesting	
Description	Forest Estate Model Inventory Attributes
<ul style="list-style-type: none"> At least 31 trees per acre are greater than or equal to 21 inches dbh with at least 15 trees, of those 31 trees, per acre greater than or equal to 31 inches DBH At least three trees have broken tops Canopy closure at least 70%. A minimum of 5 percent ground cover of large woody debris. 	<ul style="list-style-type: none"> At least 3 live trees per acre >21inches DBH with broken tops At least 16 trees per acre > 21 inches DBH At least an additional 15 trees per acre >31 inches DBH Minimum top height of 40 largest trees >85 feet tall Curtis's Relative Density >= 48 At least 2,400 cu feet per acre down wood

Table 4. Type A Habitat Description and Forest Estate Model Inventory Attribute

Type A Habitat	
Description	Forest Estate Model Inventory Attributes
<ul style="list-style-type: none"> • A multi-layered, multispecies canopy dominated by large (30 inches diameter or greater) overstory trees (• At least 70 percent canopy closure • A high incidence of large trees with various deformities such as large cavities, broken tops, and dwarf mistletoe infection. • At least two snags per acre that are at least 30 inches in diameter or larger. • Large accumulation of fallen trees and other woody debris on the ground. 	<ul style="list-style-type: none"> • At least 2 canopy layers with at least 2 species • At least 20% of trees per acre in minor species • Canopy typically dominated by 75 to 100 trees per acre >20 inch DBH • At least 2 live trees per acre >21 inches DBH with broken tops • Two or more snags per acre >30 inches DBH and 16 feet tall • At least 2,400 cubic feet per acre down wood • Curtis's Relative Density >= 48

Table 5. Type B Habitat Description and Forest Estate Model Inventory Attribute

Type B Habitat	
Description	Forest Estate Model Inventory Attributes
<ul style="list-style-type: none"> • Few canopy layers, multispecies canopy dominated by large (greater than 20 inches diameter) overstory trees (typically 75 to 100 trees) per acre, but can be fewer if large trees are present. • At least 70 percent canopy closure • Some trees with various deformities • Large (greater than 20 inches diameter) snags present • Large accumulation of fallen trees and other woody debris on the ground. 	<ul style="list-style-type: none"> • At least 2 canopy layers with at least 2 species • At least 20% of trees per acre in minor species • Canopy typically dominated by 15 to 75 trees per acre >30 inches DBH • Large trees with various deformities • At least 1 live trees per acre > 21 inches with broken top • At least 1 snag/ac >20" DBH and 16 feet tall • One or more snags per acre >20 inches DBH and 16 feet tall • At least 2,400 cubic feet per acre down wood • Curtis's Relative Density >= 48

Old Forest Habitat was also mapped by DNR Olympic Region biologists (pers. com. Scott Horton) from aerial photographs and field survey related to marbled murrelet surveys. The areas are also included as Old Forest Habitat, although they do not meet the inventory conditions listed above for High Quality, Type A and B habitat. The Mapped Old Forest Habitat layer is anticipated to be updated in the future to take advantage of higher quality aerial photographs and newer technology and tools.

Action

1. Determine the NSO habitat type using the DNR cooperate GIS data provided by the Forest Estate Model:
 - a. If Young Forest Habitat go to #1.A.
 - b. If Old Forest Habitat go to #1.B.

- c. If the area is non-habitat go to #1.C.
- A. Young Forest Habitat is only available for timber harvest activity when one of the following conditions are met:
- a. 40 percent of the landscape is in Young Forest or better habitat and will remain so after harvest *or*;
 - b. If landscape is below 40 percent Young Forest or better habitat the activity will maintain and improve structural components of forest stands through creation of elements such as down woody debris, snags, and larger diameter trees; *or*
 - c. It has been demonstrated, through forest estate modeling, that the proposed harvest activity will not change the decade the landscape meets the minimum habitat thresholds. Refer to Table A-5.
 - d. Roads can be built through Young Forest Habitat as long as the number of acres of habitat modified to build the road does not change the decade the landscape meets the minimum northern spotted owl habitat thresholds (refer to Table 6 for the projected decades minimum thresholds are met) *or*,
 - e. If road building in Young Forest Habitat changes the decade the landscape meets the minimum northern spotted owl habitat thresholds (refer to Table 6 for the projected decades minimum thresholds are met), then the amount of harvest between Forest Estate Model runs must not exceed one percent of the Young Forest Habitat (refer to Table 7). Because road building is a site-specific action it is evaluated separately through SEPA when it is proposed.

Table 6. Number of Decades Projected Until Northern Spotted Owl Habitat Threshold Are Met

Landscape	Decades to reach 20 percent Old Forest Habitat threshold	Decades to reach 40 percent Young Forest Habitat and better threshold
Clallam	5	1
Clearwater	0	5
Coppermine	7	6
Dickodochtedar	4	2
Goodman	0	3
Kalaloch	5	4
Queets	0	4
Reade Hill	0	1
Sekiu	6	5

Sol Duc	8	2
Willy Huel	0	6

Table 7. Road Construction Thresholds in Young Forest Habitat by Landscape Based on One Percent of the Young Forest Habitat Identified within the Forest Estate Model (The amount in this table will change with each Forest Estate Model run)

Landscape	Acres of Young Forest Habitat	One Percent of Young Forest (Rounded, so totals may not match)
Clallam	5,662	57
Clearwater	3,106	31
Coppermine	708	7
Dickodochtedar	5,059	51
Goodman	2,392	24
Kalaloch	1,957	20
Queets	1,579	16
Reade Hill	2,038	20
Sekiu	1,424	14
Sol Duc	4,683	47
Willy Huel	993	10

- B. Old Forest habitat is only available for timber harvest activities when the following conditions are met:
- a. The 2006 Sustainable Harvest Settlement Agreement has expired *and*,
 - b. At least 20 percent of the landscape is in Old Forest Habitat *and*,
 - c. At least 20 percent of the landscape is also in Young Forest habitat, adding up to the 40 percent habitat landscape threshold *and*,
 - d. The proposed activity does not bring the landscape below the 20 percent old forest threshold and the total habitat threshold of 40 percent Young Forest Habitat or better *and* ,
 - e. Not an old-growth stand as defined by Procedure 14-004-045 (Old-Growth Deferral and Protection (Westside)) *and*,
 - f. Not a marbled murrelet deferral based on current marbled murrelet strategies,
 - g. Building of new roads through Old Forest habitat is not permitted until habitat thresholds are met and maintained *or*,
 - h. New road construction, reconstruction or maintenance will be reviewed by the HCP and Scientific Consultation Section

of Forest Resources Division prior to commencing these activities. Provided no tree (i.e. tree > 6" dbh) felling occurs (including day-lighting), road maintenance may occur within Division review as long as all other aspects of this procedure are adhered to.

- C. Non-habitat areas are available for timber harvest activities. When a non-habitat area selected for harvest is forecast in the latest forest estate model projections as contributing towards the Old Forest and/or Young Forest Habitat landscape threshold targets during the restoration phase (see Table A-5 above), an effort will be made, when available, to pre-assess if the proposed harvest changes the length of the restoration phase.
2. For "Known nest sites", retain the restriction that timber harvest and road construction activities are prohibited within the best 70 acres (that may or may not be habitat) around the "known nest site" from March 1 through August 31 of each year.
 3. Develop and record an appropriate silvicultural prescription in Planning and Tracking.
 4. An annual report of the acres harvested by landscape planning unit, activity type, and northern spotted owl habitat type (see *Draft OESF Forest Land Plan*) will be generated as part of the HCP Implementation Monitoring.
 5. All variances from this procedure will be approved by the Region Manager and the Division Manager for Forest Resources.

Approved by: signed: _____ **Date:** _____

Manager, Land Management Division

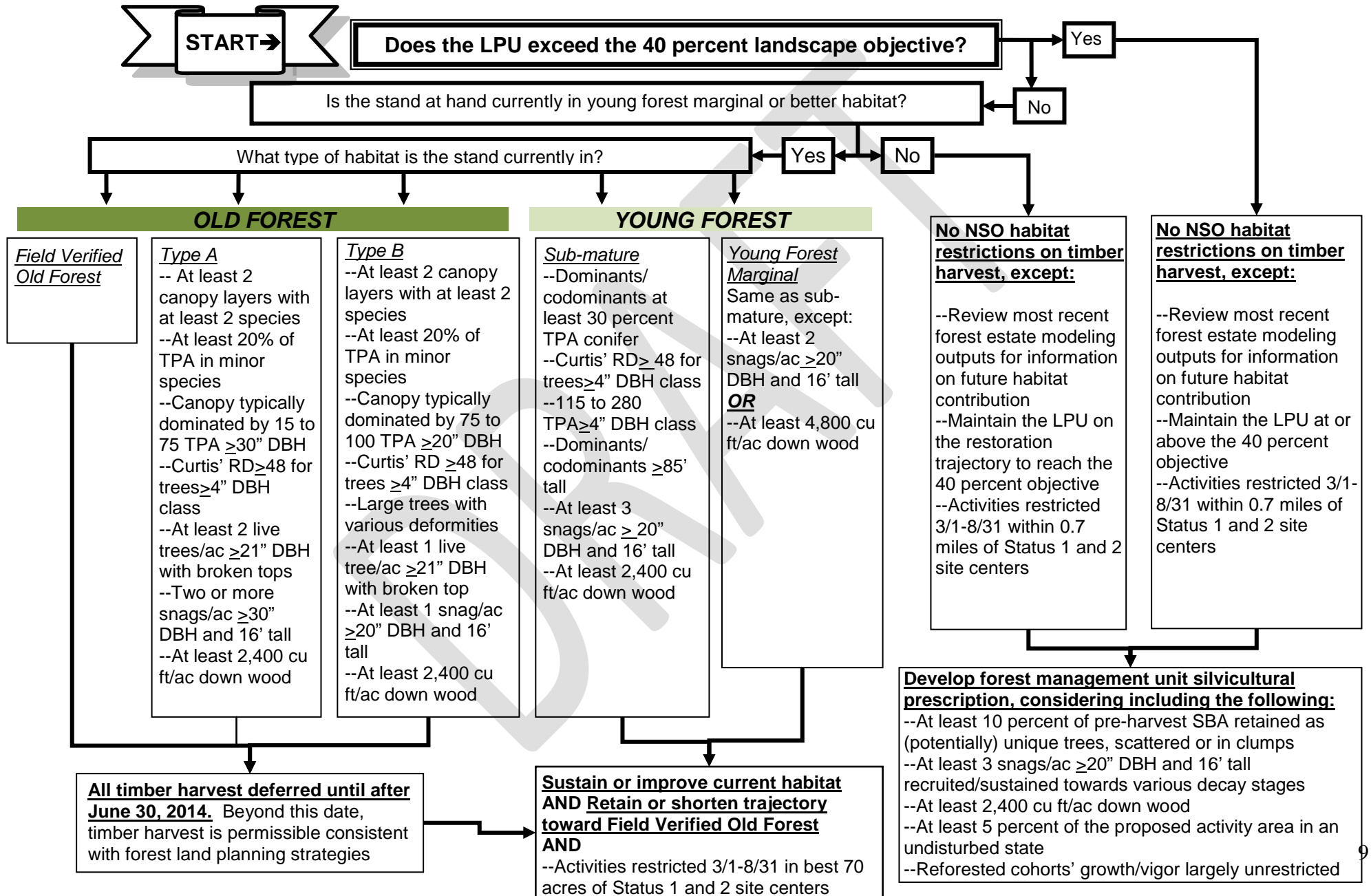
SEE ALSO

- PR 14-001-030 The Settlement Agreement
- OESF Forest Land Plan
- Management Area decision trees (attached):

- Olympic Experimental State Forest Northern Spotted Owl
Habitat: HCP + Settlement Agreement

Olympic Experimental State Forest Northern Spotted Owl Habitat: HCP + Settlement Agreement

Landscape Planning Unit Objective: Attain and sustain at least 40 percent of DNR-managed lands in each landscape planning unit in a Structural or Old Forest habitat condition, such that at least 20 percent of each landscape planning unit becomes sustained as Old Forest habitat.





March 7, 2013

TO: Sue Trettevik, Olympic Region Manager
FROM: Julie Sackett, Forest Resources Division Manager
SUBJECT: Marbled Murrelet Management within the Olympic Experimental State Forest

This Memorandum supersedes a November 1999 Procedure titled "Protecting Marbled Murrelet Habitat" as it relates to the Olympic Experimental State Forest (OESF). This Memorandum applies to HCP permitted activities within the OESF and directs implementation of the HCP Marbled Murrelet Interim Conservation Strategy (MMICS).

DISCUSSION

Development of the HCP Marbled Murrelet Long-Term Conservation Strategy (MMLTCS) is progressing. Until the MMLTCS is completed, DNR's management activities must follow the MMICS. This Memorandum provides detailed information for implementation of the MMICS. When the MMLTCS is completed and approved by U.S. Fish & Wildlife Service, guidance on implementing the MMLTCS will replace this Memorandum.

In September 2008, a report titled *Recommendations and Supporting Analysis of Conservation Opportunities for the Marbled Murrelet Long-Term Conservation Strategy* (Science Team Report) was prepared for DNR. The term and concept, "Science Team Additional Habitat" is derived from this report where marbled murrelet habitat is discussed.

Boundaries of Reclassified Habitat, Old Forest, Science Team Additional Habitat and Occupied Marbled Murrelet Sites (Occupied MM Sites) needed to implement this Memorandum are available spatially in ArcGIS and the State Uplands Viewing Tool under the main heading "State Lands - Marbled Murrelet - HCP Policy" with the layer titles; "Murrelet Habitat- OESF" (Source: SHARED_LM.MM_HABITAT_OESF).

IMPLEMENTATION

Action By:	Action:
Olympic Region	A. Defer from harvest <u>all</u> occupied MM sites, reclassified habitat, old forest and science team additional habitat within the OESF. These habitat types are delineated spatially in DNR's GIS (see above) and the occupied sites reflect delineation as identified by the Science Team Report.



- B. Occupied sites and unsurveyed old forest will be evaluated for the application of buffers and timing restrictions from adjacent management activities when appropriate. Survey status of old forest is available spatially on the *Murrelet Habitat - OESF* GIS layer by querying MM_SURVEYED_FLG equals "Y" or "N" ("N" means it has not been surveyed). Evaluate the application of a buffer for any proposed harvest activities within 328' of and timing restrictions for noise disturbing management activities within 0.25 miles of an occupied site or unsurveyed old forest. As an example, buffers may be in the form of a 328' managed buffer (thinned buffer as per WAC 222.16-080 (1)(h)(v) residual stand stem density levels) or a 165' no touch buffer. Examples of noise disturbing activities include but are not limited to: felling and bucking, cable and helicopter yarding, operation of heavy equipment and slash disposal or prescribed burning; this does not include log hauling. One factor (but not limited to) that may influence the need for a buffer is the role topography can play and its relation to the proposed management activity and location of the occupied site. All proposed management activities within 0.25 mile of an occupied site and unsurveyed old forest will be evaluated with input from the region biologist. All regeneration harvests within 328' of an occupied site or unsurveyed old forest will be reviewed by the HCP and Scientific Consultation Section of Forest Resources Division. All management activities within 0.25 miles of an occupied site or unsurveyed old forest that doesn't have a timing restriction will be reviewed by the HCP and Scientific Consultation Section. For all management activity proposals within 0.25 miles of an occupied site or unsurveyed old forest it is important to provide adequate information within SEPA to support buffer decisions.
- C. Within occupied sites, new road construction is not permitted. If road reconstruction or road abandonment is deemed necessary (safety related or to address adverse environmental conditions) and involves felling of trees (i.e. tree >6" dbh), review by the HCP and Scientific Consultation Section of FRCD is required. Provided no tree felling occurs (including day-lighting), road maintenance, road reconstruction or road abandonment may occur without Division review as long as all other aspects of this Memorandum are adhered to.
- D. Within old forest, reclassified habitat or Science Team Additional Habitat; new road construction, reconstruction or maintenance will be reviewed by the HCP and Scientific Consultation Section of FRCD prior to commencing these activities. Provided no tree (i.e. tree >6" dbh) felling occurs (including day-lighting), road maintenance, road reconstruction or road abandonment may occur without Division review as long as all other aspects of this Memorandum are adhered to.

	E. Reviews by the HCP and Scientific Consultation Section will require documentation by the region describing the proposal including background, the proposal itself, alternatives to the proposal considered; accompanied by maps and photos as appropriate. This documentation will be submitted to the HCP and Scientific Consultation section of the Forest Resources Division for review and concurrence and may involve consultation with the USFWS.
Olympic Region and Asset & Property Management Division	Activities related to non-timber resources (as defined within the HCP) must be compliant with the HCP, including the Interim MM Conservation Strategy and this Memorandum.

cc: Lenny Young, Department Supervisor, State Uplands
 Kyle Blum, Deputy Supervisor, State Uplands
 Darin Cramer, Division Manager, Marketing & Leasing Division
 Jed Herman, Division Manager, Asset Management & Public Use Division
 Clay Sprague, Assistant Division Manager, HCP & Scientific Consultation Section



DRAFT Response to Natural Disturbance in the Olympic Experimental State Forest Habitat Conservation Plan (HCP) Planning Unit

Date:

Application: The Olympic Experimental State Forest Planning Unit.

DISCUSSION

Natural Disturbance events such as windstorms, fires, insect outbreaks, and disease epidemics can result in forest stands that no longer retain characteristics to meet the stand objectives that were present before the disturbance. The 1997 *Habitat Conservation Plan* anticipated tree blow down in the OESF due to alignment of major river valleys with the prevailing wind directions, fully saturated soils during the winter months, and edge effects associated with openings adjacent to mature timber stands (1997 HCP, IV. 106). The 1997 *Habitat Conservation Plan* also states that *"although tree blow down is recognized as a significant problem for timber management on the western Olympic Peninsula, the exact relation between timber harvest and tree blow down is not well understood or documented (IV. 112)"*.

The scale of natural disturbance events varies, from small areas (micro scale) of just a few trees to large-scale disturbances over hundreds of acres. Often areas affected by natural disturbance can be salvage harvested, insuring that monetary value is not lost to the trust beneficiaries (RCW 79.15.210). Different approaches to salvage harvesting depend on the scale and severity of the disturbance. In addition, habitat designations (such as northern spotted owl habitat, riparian or wetland) may require different salvage harvest approaches.

The guiding principle in salvage harvesting is to attempt to retain as much of the pre-disturbance habitat components that is practical.

Northern Spotted Owl Habitat Vulnerability to Natural Disturbances

The OESF contains Old Forest and Young Forest northern spotted owl habitat that is managed by minimum habitat thresholds per landscape (Refer to the OESF Northern Spotted Owl Procedure).

The 1997 Habitat Conservation Plan discussed natural disturbance. It stated:

"In an unfragmented landscape with abundant suitable habitat, loss of habitat from natural disturbance is generally not a threat to population viability. Given the highly fragmented pattern and reduced amount of the remaining suitable habitat, loss of habitat from fire, windthrow, or insect and disease infestation can pose a significant threat to spotted owls in certain areas. The Recovery Team determined that natural disturbance is a severe threat in the eastern Washington Cascades, a moderate



Draft OESF FLP Landscape Alternative - PR #####

Author's Work - Subject to Change Without Notice

threat in the Olympic Peninsula, and a low threat in the western Washington Cascades (USDI 1992b) (1997 HCP, III. 15)."

"The Recovery Team (USDI 1992a) identified low population levels, poor population distribution, habitat loss, population isolation, and natural disturbances as major threats to owls on the Olympic Peninsula (1997 HCP, III. 18)."

The 1997 Habitat Conservation Plan addressed the issue of blow down "salvage operations" on page IV.10. It states:

"DNR's HCP conservation strategies include commitments to develop and maintain wildlife habitat... over time in designated amounts and areas (habitat thresholds per landscape). In general, such conservation commitments made in the HCP will take priority over other DNR management considerations. However, these conservation commitments may, in some cases, be inconsistent with activities DNR must consider under state statutes pertaining to salvage and forest health."

"For example, salvage operations might be considered by DNR for reasons such as windthrow, fire, disease, or insect infestations. In conducting salvage activities, DNR shall, to the extent practicable:

- 1. Minimize the harvest of live trees to those necessary to access and complete salvage activities;*
- 2. Maximize and clump the retention of large, safe, standing trees to provide future snags; and*
- 3. Consider opportunities to retain concentration of snags and/or coarse woody debris which may benefit species...."*

Riparian Vulnerability to Natural Disturbances

Riparian areas are protected by the OESF riparian procedure (refer to OESF Riparian Procedure). Even with this protection, some riparian areas may be affected by natural disturbance. In cases where it is deemed that riparian buffers no longer serve their intended purpose or if the natural disturbance jeopardizes riparian health, a salvage harvest may be permitted.

Wetland Vulnerability to Natural Disturbances

Wetlands are protected by the wetland procedure (PR-14-004-110). Even with this protection, some wetland buffers and wetland areas may encounter natural disturbance. In some cases, salvage harvest may be permitted as long as it adheres to the wetland procedure and the 1997 *Habitat Conservation Plan*:

"forest management in forested wetlands and in the buffers of non-forested wetlands will minimize entries into these areas and utilize practices that minimize disturbance, such as directional felling of timber away from wetlands, and using equipment that causes minimal soil disturbance... If ground disturbance caused by forest management activities alters the natural surface or sub-surface drainage of a wetland, then restoration of the natural drainage shall be required. Soil compaction and rutting usually preclude the use of ground-based equipment in wetland areas (HCP IV-70)."



ACTION

Safety regulations pre-empt all other requirements and should be addressed to maintain worker safety. All green tree and snag retention are subject to the safety standards of the Department of Labor and Industries (Chapter 296-54-WAC), the harvest unit should be designed to conserve legacy cohorts and meet habitat targets without jeopardizing forest worker safety once on the ground activity commences. When harvest activity commences, forest worker safety is the paramount priority.

Region staff will assess natural disturbance events to determine the scale and severity of the event and the appropriate response. The method of assessment may vary from a forester noticing a high value tree that has fallen next to a road that will likely be stolen if not salvaged to aerial surveys of a large affected area. Once natural disturbance is documented, the region determines if salvage harvesting is economically viable. This decision is based on the professional judgment of region staff.

There are four size categories of salvage harvests: micro, small, medium, and large. This procedure addresses only micro through medium size salvage harvests in detail. Large-scale events are defined here and a basic framework for response is included, but because of the large scale of these events, the response will be determined on a case-by-case basis.

Micro Scale Natural Disturbance

A micro scale natural disturbance is defined as an incidental disturbance involving one to three trees that is easily accessible and would be subject to theft if left in place (for example, a large western redcedar near a road). The authority to salvage harvest a micro scale natural disturbance falls under the provisions for direct sales according to RCW 79.15.050 and DNR Procedure 11-000-01: Direct Sales. A sale of valuable material worth less than \$25,000 may be sold to an applicant for cash at full-appraised value without notice or advertising. The Region Manager is responsible for ensuring that this sale method is used in accordance with accepted environmental review processes, provides current market prices for the products sold, and that the sale method provides the greatest benefit to the affected trust beneficiary. The Region Manager must sign these contracts on behalf of the State. Refer to Chart #-# for a flow chart of micro scale salvage sales.

Small Scale Natural Disturbance

Small-scale natural disturbance is defined as salvage harvest associated with natural disturbance of 1 to 20 acres (WAC 332-41-833 (i))¹ with an appraised value of less than \$250,000. These are considered a categorical exemption from the State Environmental Policy Act (SEPA). Refer to Attachment B for a flow chart of small-scale salvage harvests. A forester will conduct salvage assessments for small-scale disturbances. Refer to Attachment D for the assessment form.

In riparian areas, an effort should be made to retain all standing wood (living and snags), maintain a threshold amount of large, woody debris, and retain any structure within the

¹ WAC 332-41-833(i) refers to timber sales containing harvest units of less than 20 acres; part (ii) refers to thinning or salvage timber sales of any unit size that DNR appraises at less than \$250,000.



innermost 25 feet of the stream. Refer to the OESF Riparian Strategy for further guidance.

In northern spotted owl habitat, if the area is going to continue to be managed as habitat in the future, an effort should be made to retain all standing wood (living and snags) and maintain a threshold amount of large, woody debris. Refer to the OESF Northern Spotted Owl Procedure.

The amount of small-scale salvage harvesting in each landscape will be reported with the HCP Annual Report to the services.

Medium Scale Natural Disturbance

Medium scale natural disturbance is defined as salvage harvest associated with natural disturbance over 20 acres in size that does not change the region's harvest program for the year (does not change the volume goal for the year). Refer to Attachment C for a flow chart of medium scale salvage harvests. A region biologist will conduct salvage assessments for medium scale disturbances. Refer to Attachment D for the assessment form.

In riparian areas, an effort shall be made to retain all standing wood (live trees and snags), maintain a threshold amount of large woody debris, and retain any structure within the innermost 25 feet of the stream. Refer to the OESF Riparian Strategy for further guidance.

In northern spotted owl habitat, if the area is going to continue to be managed as habitat in the future, an effort should be made to retain all standing wood (living and snags) and maintain a threshold amount of large woody debris. Refer to the OESF Northern Spotted Owl Procedure.

The acres of medium-scale salvage harvest in northern spotted owl habitat must be tracked between forest estate model runs. The landscapes in the OESF have different harvest histories and so vary in how far along they are in the restoration phase. If a series of medium size salvage harvests take place within northern spotted owl habitat between forest estate model runs, the accumulation of salvage harvests could be similar to a large-scale disturbance event. Large-scale natural disturbances have the potential to alter the length of the restoration phase for northern spotted owl habitat. Accumulated salvage of northern spotted owl habitat over one percent of the total acreage of state lands in a landscape between model runs is considered the threshold between a medium and potentially large-scale event. Salvage harvest must be monitored to determine whether it will exceed one percent of the total acres of state trust lands in each landscape. Refer to Table 1 for the salvage threshold in northern spotted owl habitat acreages for each of the eleven landscapes in the OESF.

In landscapes where salvage harvest in northern spotted owl habitat exceeds one percent of state trust lands in a landscape (Table 1) between forest estate model runs, DNR will consult with the Services prior to proposing additional salvage harvest. The purpose is to keep the Services informed of DNR's response to natural disturbance events.

Table 1 Amount of Medium Size Salvage Harvest in Northern Spotted Owl Habitat between Forest Estate Model Runs

Landscape	Acres of	One percent of	Anticipated decade
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	state trust lands in Landscape	state trust lands in landscape in acres (Rounded)	of reaching restoration of minimum habitat thresholds for the Landscape Alternative
Clallam	17,275	173	Decade 5
Clearwater	55,202	552	Decade 5
Coppermine	19,245	192	Decade 7
Dickodohtedar	28,047	280	Decade 4
Goodman	23,800	238	Decade 3
Kalaloch	18,122	181	Decade 4
Queets	20,807	208	Decade 4
Reade Hill	8,480	85	Decade 1
Sekiu	10,015	100	Decade 6
Sol Duc	19,135	191	Decade 8
Willy Huel	37,427	374	Decade 6

The amount of road construction in northern spotted owl habitat also needs to be tracked. For details on harvest and road construction in northern spotted owl habitat refer to Procedure XXX: Northern Spotted Owl Management (OESF).

Each time the Forest Estate model for the OESF is re-run all activities (including salvage harvesting) that have taken place since the last run of the forest estate model will be incorporated. This will allow DNR to monitor that the anticipated decade for restoration of minimum thresholds for northern spotted owl habitat does not change.

The amount of medium scale salvage harvesting in each landscape will be reported with the HCP Annual Report to the services.

Large Scale Natural Disturbance

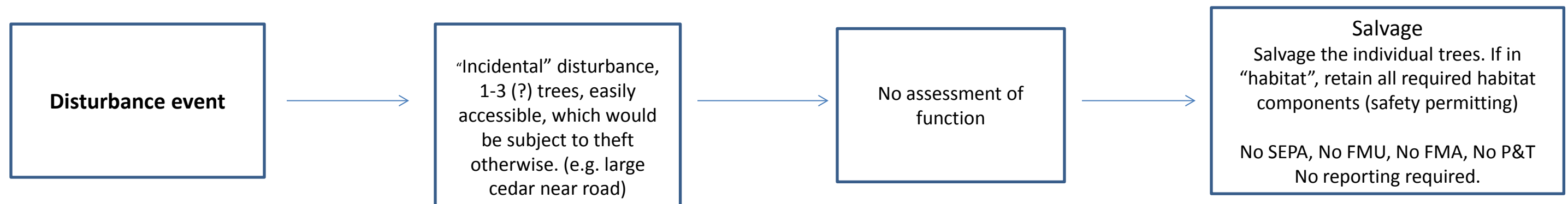
Large-scale events are impacting greater than one percent of the total acres in a landscape. These types of events are likely to affect multiple habitat types, including habitat for listed species and riparian habitat. Because large-scale natural disturbance events are likely to have significant impacts to the landscapes they occur in, planning for salvage harvesting would be conducted following an interdisciplinary team approach and in consultation with other state and federal agencies and affected Tribes. Agencies consulted would include the Washington Department of Fish and Wildlife, the U.S. Fish and Wildlife Service, the National Oceanic and Atmospheric Administration, and DNR's Forest Practices Division.

APPROVED BY: _____ Date: _____

, Manager

Forest Resources and Conservation Division

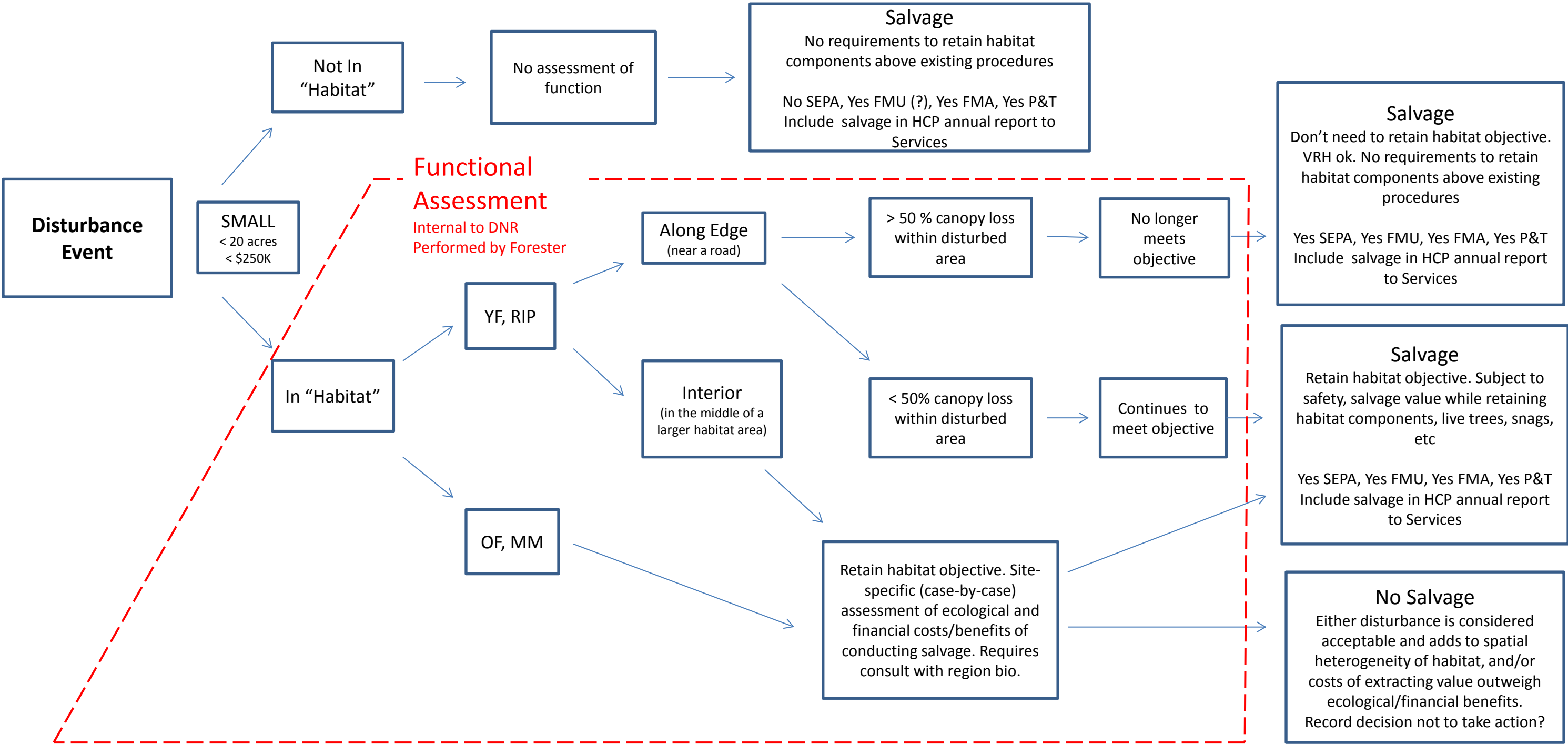
Attachment A: Draft Micro Scale Disturbance Events



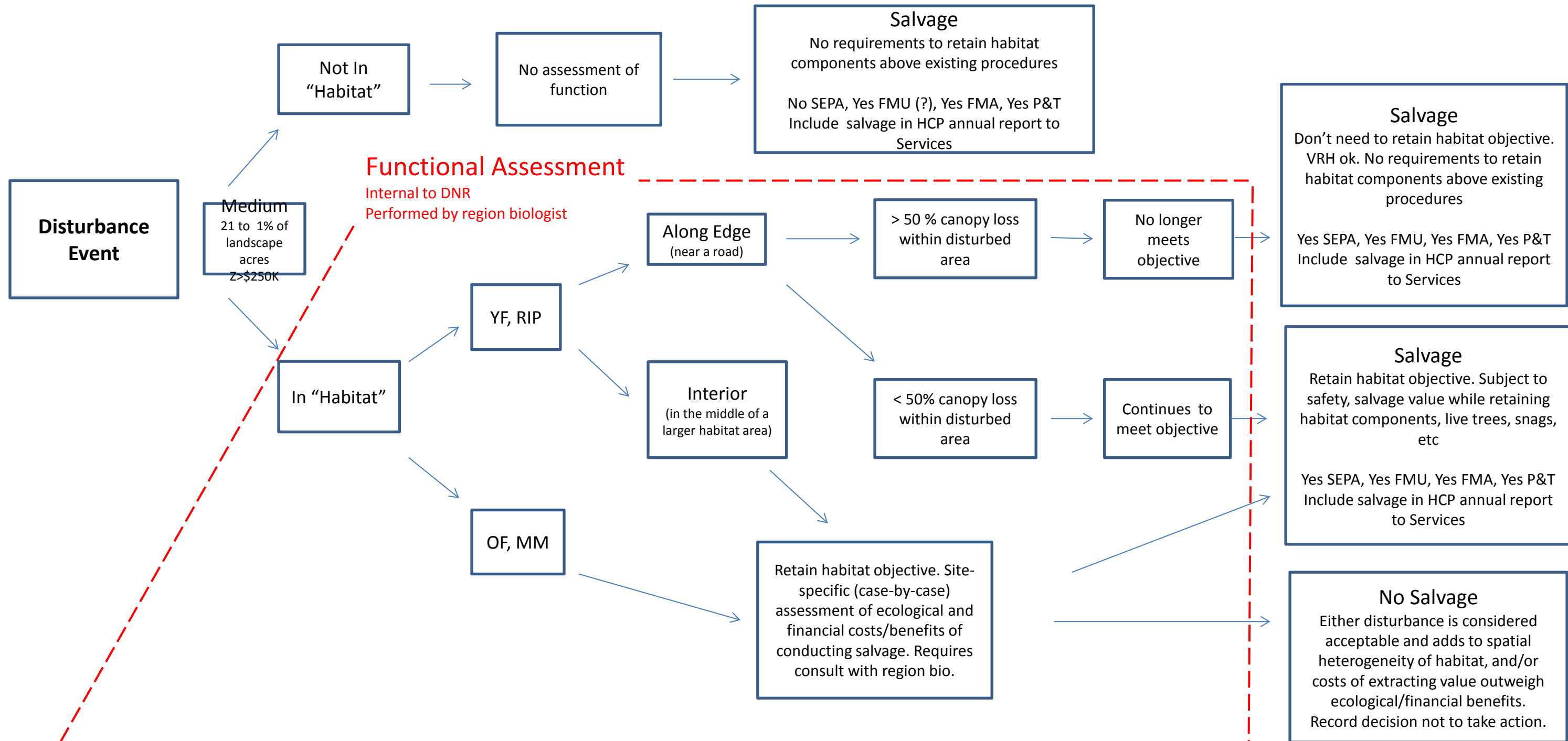
Direct sales according to RCW 79.15.050, a sale of valuable material worth less than \$20,000 may be sold to an applicant for cash at full appraised value without notice or advertising. The Board of Natural Resources must, by resolution, establish the value amount of a direct sale not to exceed twenty thousand dollars in appraised sale value, and establish procedures to ensure that competitive market prices and accountability are guaranteed.

If the disturbance event occurs in an old growth stand, the trees should be left as large woody debris unless they are not in a suitable location i.e. fell in a road, or if region staff determine the risk of theft is high. If old growth blowdown is removed, prior notification to the Board of Natural Resources is required as described in PR 14-004-045.

Attachment B: Draft Small Scale Natural Disturbance



Attachment C: Draft Medium Scale Natural Disturbance



Attachment D: Salvage Sale Assessment in Habitat

The purpose of this salvage assessment is to document salvage sales and collect data as part of the OESF information management commitment. The guiding principle is to attempt to retain as much habitat components that is practical.

Why is the salvage sale proposed?

- 1) Which habitats types were/are found within the salvage activity?
 - a) Young Forest Habitat
 - b) Riparian
 - c) Wetland (forested, open, bog)
 - d) Old Forest habitat
 - e) Marbled murrelet habitat
 - f) Other, please describe.
- 2) What was the severity of the disturbance area?
 - a) > 50% canopy loss
 - b) < 50 % canopy loss
 - c) How was canopy loss assessed? (visual, measurements, fly-over, other means)
- 3) Describe the location, size, and severity pattern of the disturbed area. Describe existing roads and other relevant features. Include a map.

Does the salvage sale retain or revise habitat objectives?

- 4) Describe the remaining stand characteristics within the salvage sale for each habitat type?
- 5) Which habitat components should be retained in the salvage sale? (for example remaining lives trees, snags, down wood, undisturbed patches) Identify areas on the maps.
- 6) Will the salvage sale change the stand objectives? If yes, please provide rationale and the new stand objectives?

DRAFT Wetland Procedure for the Olympic Experimental State Forest

Discussion

This procedure defines management of wetlands in the OESF that are in, or are associated with, forest ecosystems. The Policy for Sustainable Forests wetland policy is “*no net loss of acreage and function of wetlands, as defined by state Forest Practices Rules*” (PSF p. 38). The objective is to protect wetland plant and wildlife species, water quality, soils, and plant communities. To accomplish the objective, DNR will identify wetlands and ensure that management activities within and adjacent to them are conducted in a manner that adequately protects the wetland ecosystem function.

Wetlands serve many vital landscape functions, including protection and improvement of water quality; storm-water retention; flood-peak attenuation; seasonal stream flow augmentation, nutrient supply to downstream ecosystems; and habitat for the majority of native wildlife species, either seasonally or for some part of their lifecycle. Wetland losses through development and other forms of management have increased the ecological value of remaining wetlands, and DNR is committed through policy to protecting this remaining wetland acreage and function statewide.

Policy Context

There are three sources of policy guiding the management of wetlands: Policy for Sustainable Forests, the 1997 Habitat Conservation Plan, and Washington Forest Practices Rules.

Policy for Sustainable Forests: The PFSF states that: “*Statewide, the department will allow no net loss of acreage and function of wetlands, as defined by state Forest Practices Rules*” (PSF p. 38).

Trust Lands Habitat Conservation Plan: *The primary conservation objective for wetland protection under the HCP in the OESF is to maintain and aid natural restoration of wetland hydrologic processes and functions. This will be achieved through:*

1. *Retaining plant canopies and root systems that maintain adequate water transpiration and uptake processes;*
2. *Minimizing disturbance to natural surface and subsurface flow regimes; and*
3. *Ensuring stand regeneration.* (HCP IV-119).

Under the HCP, wetlands are protected based on their size, not Forest Practices wetland type.

The HCP allows management of wetlands and their Wetland Management Zones, and requires mitigation for impacts to wetland functions or acreage due to road-building (HCP IV-70).

Washington Forest Practices Rules:

The Forest Practices Rules direct management of Type A, B and Forested Wetlands ([WAC 222-30-020, p 30-2 through 30-4](#)). Forest Practices direction includes the use of Wetland Management Zones (areas located around the perimeter of a wetland where trees are left to provide protection from disturbance), equipment and yarding restrictions and leave-tree requirements. In most cases, protection provided by the

Forest Practices rules for wetlands is well exceeded by HCP requirements and the specific guidance provided by this procedure. Follow the Forest Practices Rules if they are not exceeded through this procedure. [Chapter 22-16-010 WAC General Definitions p. 16-18](#) provides the definition of wetlands used by the HCP, the Policy for Sustainable Forests, and for the purposes of this procedure. Refer to the end of this procedure for Forest Practices definitions of wetlands.

PROCEDURE

Wetland Identification

Wetlands are defined by the Forest Practices wetland definition (see Appendix) using three criteria: wetland hydrology, wetland soils and wetland plants. During some seasons or circumstances, one or more of these parameters may be difficult to observe (e.g. in winter, soils may be flooded and inaccessible, and plants may not be present; in summer, soils may be dry and evidence of hydrology scarce or non-existent, or one or more parameters may be disturbed to the extent that positive identification cannot be made).

Office Screening

1. To identify areas for field screening, use the NRCS hydric soils layer and USFWS National Wetland Inventory (on QDL and SUVT) to identify areas with mapped wetlands or hydric soils. Bear in mind that wetlands are often present where there are no mapped hydric soils or wetlands.
2. Use LiDAR where available to identify topography that could concentrate surface water or indicate possible discharge of groundwater. Such areas include old slumps and landslides, depressions, channels and concave slopes.
3. Use color infrared (IR) photos to identify hardwood areas, or areas of different or stunted vegetation.

Field Screening

1. Plan field work in suspected wetland areas for spring, when all wetland criteria are most likely to be visible. If wetland identification must be done in circumstances when all three wetland criteria cannot be confirmed, either request specialist assistance or err on the side of protection of sensitive sites.
2. Walk the sale area, visiting any locations that were identified during field screening as possible wetland areas, including stream channels and headwaters.
3. Delineate any wetlands you discover using Forest Practices Board Manual guidance on wetland delineation (see Appendix, #1, substituting field criteria from the 2010 Regional Supplement to the Corps of Engineers Wetland Delineation Manual for Western Mountains, Valleys and Coast Region (Appendix #2). These field criteria increase ease of wetland identification during the dry season. Obtain specialist help when required.
4. Use the Westside Wetland SharePoint site resources to help with identification of wetland plants, soils and hydrology. <http://sharepoint/sites/frc/teams/WestsideWetlands/default.aspx>
5. If two criteria are confirmed but you are not sure if the feature is a wetland, consult with a specialist.

6. If only one criterion is observed due to seasonal conditions or site disturbance, consult with a specialist.

Layout of Wetland Management Zones

1. For protection of wetlands (except bogs) under a quarter of an acre in size, see Recommended Practices below.
2. For wetlands that are between 0.25 and 5 acres and bogs 0.1 to 5 acres apply a Wetland Management Zone that is two-thirds of the site potential conifer tree height of the adjacent riparian forest. Use the Site Index for site adapted (vigorously growing) species.
3. For wetlands greater than 5 acres apply a buffer that is equal to the site potential conifer tree height of the adjacent riparian forest to all wetlands (including bogs) that are greater than 5 acres. Use the Site Index for site adapted (vigorously growing) species.

Management in Wetland Management Zones and Wetlands

- 1) Ensure that management activities within Wetland Management Zones are in compliance with any existing commitments.
- 2) Within forested wetlands and forested Wetland Management Zone areas maintain and perpetuate a stand that is wind-firm and has a minimum basal area of 120 square feet per acre. In most cases, due to mortality and blow down, more than the minimal basal area of 120 square feet per acre should be left.
- 3) Within forested Wetland Management Zones associated with non-forested wetlands and bogs :
 - a) Leave an interior no-harvest buffer around the bogs and non-forested wetlands. Forest Practices states “Tractors, wheeled skidders, or other ground based harvesting systems shall not be used within the minimum Wetland Management Zone width without written approval of the department”. Measure the distance from the beginning of the forested area where crown closure changes from 30% or greater to less than 30%. The distance is based on the Forest Practices wetland type. The 1997 *Habitat Conservation Plan* also requires a 50 foot no harvest zone for non-forested wetlands (IV 120). Refer to Table 1 for minimum equipment limitation within interior buffers.
 - b) Maintain wind-firm stands. Tools for evaluating windfirmness include evidence of recent windthrow in similar type wetlands and/or wetland buffers or use of a predictive model such as Mitchell and Lanquaye-Opoku 2007, used to estimate the likelihood for severe endemic windthrow.
 - c) Leave trees that are representative of the dominant and co-dominant species prior to harvest.
- 4) Salvage harvesting must adhere to equipment limitation zone (also referred as the Minimum Wetland Management Zone Width within Forest Practices, defined by WAC 222-30-020).

Table 1. Wetland Management with in the OESF

Wetland Type	Wetland Size	Buffer Width and Management	Inner Buffer	Thinning
Forested Wetland	0.25 - 5 acre	2/3 site potential tree height, may be thinned	N/A	≥ 120 ft ² basal area
Forested Wetland	> 5 acre	site potential tree height, may be thinned	N/A	≥ 120 ft ² basal area

Non-forested	0.25 - 5 acre	2/3 site potential tree height, may be thinned	50' no harvest	≥ 120 ft ² basal area
Non-forested	> 5 acre	site potential tree height, may be thinned	50' no harvest	≥ 120 ft ² basal area
Small bog	0.1 - 5 acre	2/3 site potential tree height, no harvest	N/A	N/A
Bog	> 5 acre	site potential tree height, no harvest	N/A	N/A

Additional Recommendations

While not required by the HCP, the following practices are recommended for use to provide protection for wetland functions where soil conditions warrant, in keeping with DNR's policy of No Net Loss:

1. Keep ground equipment 50 feet from wetland edge (Refer to Table 1).
2. Clump leave-trees around wetlands smaller than ¼ acre, to protect sensitive soils and maintain evapotranspiration capability, paying special attention to headwater areas. *These trees count toward your upland leave-tree total.*
3. Avoid placement of roads within the Wetland Management Zones of bogs. Where road building occurs near bogs, design, install, monitor and maintain sediment barriers to protect the bog from any introduction of nutrients.
4. Series of smaller wetlands will be protected if they function collectively as a larger wetland (HCP IV. 120).

Appendix

1. Forest Practices Board Manual Guidelines for Wetland Delineation
http://www.dnr.wa.gov/Publications/fp_board_manual_section08.pdf
2. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys and Coast Region (Version 2.0, May, 2010):
http://www.usace.army.mil/Portals/2/docs/civilworks/regulatory/reg_supp/west_mt_finalsupp.pdf
3. Summary of Forest Practices Equipment Limitation Zones:
[WAC 222-30-021 \(2a Equipment Limitation Zones\)](#)

PROCEDURE***Department of Natural Resources***

DATE Month, 2013

PR - - CONDUCTING ADAPTIVE MANAGEMENT IN THE OLYMPIC
EXPERIMENTAL STATE FOREST

APPLICATION State trust lands within the Olympic Experimental State Forest

DISCUSSION

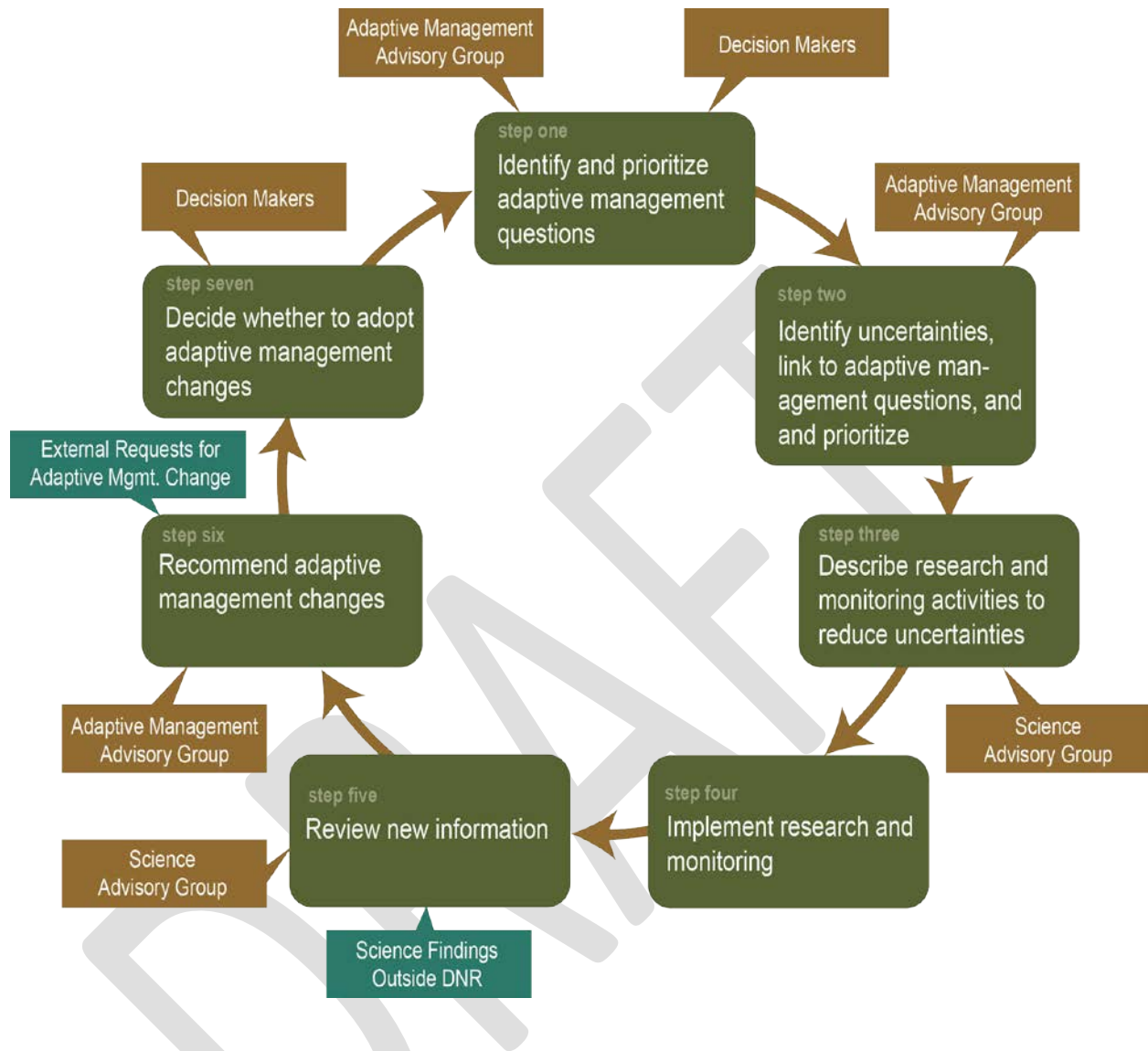
The 1997 *Habitat Conservation Plan* requires DNR to “demonstrate a process by which land management activities in the Experimental Forest can respond to new information” (DNR 1997 p. I.15). New information is expected to reduce uncertainties (incomplete knowledge) about ecological systems and to increase the effectiveness of integrating revenue production and habitat conservation in the Olympic Experimental State Forest (OESF). Research and monitoring activities are recognized as the main source of new information. Adaptive management is the process through which DNR identifies priority information needs, collects new information, and uses that information to make management adjustments. Key adaptive management questions and their associated uncertainties were identified during the development of the OESF Draft Forest Land Plan (DNR 2013).

The purpose of this procedure is to define a structured decision-making process for adapting land management in the OESF to new information.

The adaptive management process is illustrated in Figure 1 as a cycle of seven sequential steps. The cycle starts with identifying and prioritizing adaptive management questions using the prioritization criteria in Chapter 4 of the draft OESF Forest Land Plan (DNR 2013). At the second step of the process, key uncertainties are identified and prioritized using the initial list and prioritization criteria in Chapter 4 of the draft OESF Forest Land Plan (DNR 2013). High priority uncertainties are reduced through research and monitoring activities (Step 3). New scientific information, developed by DNR or externally, is reviewed at Step 5 of the cycle and is considered for management adjustments. Requests from external parties for adaptive management changes in the OESF are considered at Step 6 of the cycle and may trigger scientific review.

The parties responsible for the adaptive management process in the OESF, and their roles are described later in this procedure.

Figure 1. Adaptive Management Process and Responsible Parties



Information that Can Lead to Adaptive Management Changes

- DNR research and monitoring results
- DNR operational data
- Results from cooperative research and monitoring projects
- Science findings outside DNR
- Expert judgment, if supported by reliable information

Changes Resulting From the Adaptive Management Process

- Update or amendment to a policy or planning document (for example, 1997 *Habitat Conservation Plan*, OESF Forest Land Plan)
- New or updated procedures (for example, Forestry Handbook procedures)
- Change in operational guidelines
- New or updated training in natural resource management
- Organizational change

Roles and Responsibilities

Decision makers

Decision makers vary depending on the type and impact of the change:

- The Board of Natural Resources is responsible for policy changes, such as updates to the Policy for Sustainable Forests and major 1997 *Habitat Conservation Plan* amendments.
- Executive Management is responsible for budget allocations, approvals, and changes to the OESF Draft Forest Land Plan, and minor amendments to the 1997 *Habitat Conservation Plan*.
- The Forest Resources and Conservation Division Manager is responsible for changes to Forestry Handbook procedures.
- The Olympic Region Manager is responsible for operational changes, maintenance of regional records, and training of region staff.
- Program managers are responsible for program implementation and training.

Decision makers have two main roles:

- 1) Take action upon receiving a recommendation for an adaptive management change. The action could be one of the following:
 - Direct a specific adaptive management change which may result in SEPA action.
 - Make an informed decision not to change current management practices.
 - Request more information.

When a change is made, the Forest Resources and Conservation Division Manager notifies staff (division and region) and modifies the procedure in the Forestry Handbook.

- 2) After considering the recommendations of the Adaptive Management Advisory Group, determine the priority management questions, and the priority uncertainties to be addressed by research and monitoring. These determinations should consider both the budget allotment and the decision space within which to act upon the anticipated new information. The list of priority uncertainties and associated research and monitoring questions helps define the scope of research and monitoring projects. The decision

makers may do one of the following:

- Direct the OESF Research and Monitoring Manager to coordinate suggested research and monitoring activities and notify the OESF Research and Monitoring Manager how DNR will fund these projects.
- Make an informed decision to not address the uncertainties at this time and document the rationale for such decision.
- Request more information.

Adaptive Management Advisory Group

Members of the Adaptive Management Advisory Group include:

- Forest Resources Division assistant managers of HCP and Scientific consultation, Informatics and Planning, and Silviculture and Monitoring sections, who ensure that research and monitoring questions correspond to key management needs and that the recommended adaptive management changes are economically feasible and in agreement with the agency's multiple obligations.
- The Olympic Region State Lands Assistant and Coast District Manager, who ensure that the research and monitoring questions reflect key operational needs and that the recommended change is operationally feasible.
- The OESF Research and Monitoring Manager, who convenes and chairs the group and facilitates the discussions.
- A scientist involved in the study that prompted the adaptive management change or, if this scientist is not available, a DNR scientist with expertise on the subject. The scientist ensures the study results are interpreted correctly.

The Adaptive Management Advisory Group has the following responsibilities:

(1) Recommend adaptive management changes to the decision makers.

- Review new information presented by the OESF Research and Monitoring Manager.
- Review external requests for adaptive management changes and seek scientific review on those requests, if necessary.
- Provide opinions on whether an adaptive management change is warranted.
- Recommend the type of adaptive management change.

The decision whether to recommend an adaptive management change is made by a majority; no consensus is needed. If any member of the group disagrees with the recommendation, his or her opinion will be recorded and provided to the decision makers.

- 2) Recommend priority adaptive management questions to the decision makers. Identify high priority uncertainties and potential research and monitoring activities to reduce them. The prioritization criteria and process are described in Chapter 4 of the draft OESF Forest Land Plan (DNR 2013). Request the necessary funding from the decision makers.

Science Advisory Group

Membership in this group will not be permanent; participating experts will be carefully selected for each project based on their professional credentials in a particular subject area.

Members of the Science Advisory Group include:

- Three scientific experts on the subject being reviewed. The areas of expertise include, but are not limited to forest ecology, silviculture, wildlife biology, fish biology, geology, hydrology, biometry and experimental design, and statistics.
- The OESF Research and Monitoring Manager, who convenes and chairs the Science Advisory Group and facilitates the scientific review process.

The Science Advisory Group has the following responsibilities:

- Advise DNR on approaches to reducing priority uncertainties.
- Review and, in some cases, develop study plans.
- Review the progress of DNR research and monitoring projects.
- Review DNR research and monitoring results.
- Review external scientific information and provide an opinion on its merit for a potential adaptive management change.

OESF Research and Monitoring Manager

The OESF Research and Monitoring Manager has the following responsibilities:

- Convene and chair the Adaptive Management Advisory Group.
- Facilitate the discussions of the Adaptive Management Advisory Group.
- Submit the Adaptive Management Advisory Group's recommendations for adaptive management changes to decision makers.
- Convene and chair the Science Advisory Group.
- Facilitate the discussions of the Science Advisory Group.
- Identify priority adaptive management questions, associated uncertainties, and suggested research and monitoring activities, and submit them to the Adaptive Management Advisory Group.

- Bring new information (DNR and external) to the attention of the Adaptive Management Advisory Group.
- Submit the Adaptive Management Advisory Group's recommendations for research and monitoring activities to decision makers.
- Seek external funding and collaboration to obtain new information.

ACTION

1. The Forest Resources Division Manager fills the OESF Research and Monitoring Manager position and approves the appointments and charter for the Adaptive Management Advisory Group. The Forest Resources Division Manager seeks funding from Executive Management for the OESF research and monitoring program.
2. The Adaptive Management Advisory Group is convened by the OESF Research and Monitoring Manager at least once a year. This group reviews current and emerging management issues and associated uncertainties and identifies potential research and monitoring activities to reduce those uncertainties. This group reviews the progress of ongoing OESF research and monitoring projects and develops adaptive management recommendations based on the projects' findings and on science findings outside DNR. This group considers requests for adaptive management changes submitted by external organizations and may seek scientific review on those requests. The group prepares a report for decision makers with recommendations for adaptive management changes. The report briefly describes the data upon which a recommendation is based, explains the rationale for the recommended change, and suggests implementation options, if any.
3. Other organizations may request DNR to make adaptive management changes in the OESF based on new scientific information. Such requests must include data and analyses substantiating the request. The request should be directed to the Adaptive Management Advisory Group.
4. The Science Advisory Group is convened by the OESF Research and Monitoring Manager at least once a year. The group reviews the priority research and monitoring uncertainties approved by decision makers and the approaches suggested for reducing the uncertainties. The group reviews proposed, ongoing, and completed research and monitoring projects conducted in, or related to, the OESF. The group develops a brief report (or meeting notes) of its findings and recommendations to the Adaptive Management Advisory Group.
5. Decision makers for State Lands consider the findings and recommendations of the Adaptive Management Advisory Group. Decision makers produce a brief report (or meeting notes) of

their decisions regarding proposed adaptive management changes and research and monitoring priorities and their funding.

6. After a decision is made for adaptive management changes, the Forest Resources Division Manager notifies affected DNR staff and modifies Forestry Handbook procedures (if necessary).

Timelines for Each Step of the Adaptive Management Process

1. For adaptive management changes:

- When new information is brought to the attention of the OESF Research and Monitoring Manager, he or she informs the Adaptive Management Advisory Group within two months by submitting a written report.
- The Adaptive Management Advisory Group reviews new information within three months of receiving the OESF Research and Monitoring Manager's report.
- The OESF Research and Monitoring Manager prepares and submits a recommendation report to decision makers within one month of the Adaptive Management Advisory Group recommendations.
- Decision makers provide a decision within six months of receiving recommendations for smaller management adjustments (for example, changes requiring the attention of the Forest Resources Division Manager or the Olympic Region Manager). and within nine months of receiving recommendations for larger changes (for example, changes requiring the attention of the Deputy Supervisor for Uplands or the Board of Natural Resources).

2. For prioritization of adaptive management questions, uncertainties and approval of research and monitoring projects:

- The OESF Research and Monitoring Manager brings key adaptive management questions and associated uncertainties to the attention of the Adaptive Management Advisory Group as they are identified, or at least once a year.
- The Adaptive Management Advisory Group reviews and prioritizes uncertainties or suggests new ones within two months.
- The OESF Research and Monitoring Manager submits a recommendation report to decision makers within one month of the Adaptive Management Advisory Group opinion.
- Decision makers make a decision on recommended priority adaptive management questions, uncertainties, and the research and monitoring activities to reduce them within

three months for projects requiring small budget allocations and within six months for projects requiring budget allocations beyond those planned for the biennium.

Bibliography

Washington State Department of Natural Resources. 2013. Draft Forest Land Plan for the Olympic Experimental State Forest. Washington State Department of Natural Resources, Olympia, Washington.

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Appendix A-4

Implementation Monitoring

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Introduction

The 1997 *Habitat Conservation Plan* (HCP) requires DNR to monitor land management activities and the condition of natural resources “to determine whether the HCP conservation strategies are implemented as written” (DNR 1997, p. V.1). A few specifics about the scope, resolution, and methods of implementation monitoring are provided in the 1997 HCP (DNR 1997, p.V.2):

“Implementation monitoring will document the types, amounts, and locations of forest management activities carried out on DNR-managed lands in each HCP planning unit...”

“Activities in areas addressed by the HCP will be described in sufficient detail to document compliance with the requirements of the conservation strategies.”

“Implementation monitoring will also periodically describe the changes in landscape-level habitat conditions in areas managed to provide spotted owl and murrelet habitat. Such monitoring will be primarily accomplished through DNR’s planning and tracking, and geographic information systems. Statistically valid sampling of management activities will be conducted to evaluate the reliability of the information stored in these databases.”

In addition to demonstrating compliance with the 1997 HCP, data from 1997 HCP implementation monitoring in the OESF is needed for the following:

- 1997 HCP effectiveness monitoring, validation monitoring, and research; information about and assessments of completed activities will be used to characterize baseline ecological conditions, consider the effects of ongoing operations, and conduct retrospective studies such as evaluating the effectiveness of exterior buffers.
- Adaptive management; findings of non-compliance and their causes will be used to continuously improve management.
- Re-runs of the forest estate model; updates on completed activities and resulting ecological conditions will improve the model input data.
- Communication with DNR stakeholders and research partners.
- Reports of other DNR programs such as Sustainable Forestry Initiative (SFI) certification.

Implementation Monitoring Objective and Monitoring Questions

The objective of 1997 HCP implementation monitoring is to determine whether the implementation of the conservation strategies is substantially compliant with requirements of the 1997 HCP. The draft OESF forest land plan translates general direction in existing policy documents, such as the 1997 HCP, into more specific and tangible goals, objectives, strategies, and implementation procedures for operational decision making. After the OESF forest land plan has been finalized and adopted, the conservation strategies under its guidance will be implemented and assessed for 1997 HCP compliance.

The focus of 1997 HCP implementation monitoring is primarily on timber harvest activities and associated road construction and maintenance. However, other management activities that have a potential to affect the outcome of the conservation strategies are also subject to monitoring. These activities include silvicultural activities such as site preparation, vegetation management and pre-commercial thinning, and also leases and other public uses.

In the OESF, 1997 HCP implementation monitoring will answer the following questions:

1. Are management activities planned according to the requirements of the 1997 HCP and the procedures and guidelines in the OESF forest land plan?

Since the adoption of the 1997 HCP, DNR has developed a number of procedures and guidelines that interpret the requirements of the 1997 HCP and specify compliant management actions and resulting ecological conditions. The OESF forest land plan will incorporate some of these procedures (for example, procedure PR 14-006-090, *Management of Forest Stand Cohorts [Westside]*); updated procedures for riparian areas, northern spotted owls, and wetlands; and a new procedure for response to natural disturbances [copies can be found in Appendix A-3]. Also, the management of state trust lands is directed by the forest practices rules (Washington Forest Practices Board 2002) under the following circumstances: 1) the 1997 HCP requires compliance with Washington forest practice rules, or 2) the forest practice rules do not allow DNR to substitute 1997 HCP procedures. All of the regulatory documents mentioned here will be used to determine compliance.

2. Are management activities implemented as planned?

To answer this question, DNR must assess the compliance of operations with timber sale prescriptions and road management plans. Two operational steps are analyzed for compliance: 1) marking of the management activity on the ground, and 2) execution of the management activity by DNR staff, contractor, purchaser, or lessee.

3. Are the stand-level habitat conditions that result immediately from management substantially compliant with the requirements of the 1997 HCP and the procedures and guidelines in the OESF forest land plan?

Examples of specific requirements include the number of leave trees per acre, basal area of wetlands buffers, and extent of the roads' right-of-way.

4. Do landscape-level habitat conditions conform to the conditions projected in the OESF forest land plan?

In addition to reporting and assessing the outcomes of individual activities, 1997 HCP implementation monitoring tracks and reports landscape-level habitat conditions. Projections of when each landscape will attain minimum thresholds for northern spotted owl habitat (Young and Old Forest Habitat) are reported by decade and landscape in Chapter 3 of the draft OESF forest land plan. For the riparian conservation strategy, interior-core buffer recommendations per Type 3 watershed for the first decade are provided in Appendix A-2.

If answers to these four questions determine non-compliance, DNR will analyze the cause. This information will be used to determine the necessary management adjustments including change in management guidance and staff training.

Past 1997 HCP Implementation Monitoring in the OESF

Between 1997 and 2001, 1997 HCP implementation monitoring in the OESF was conducted by DNR's Olympic region. In 2001, DNR shifted implementation monitoring for the OESF and all other HCP planning units to DNR's Forest Resources Division.¹ This shift ensured a standardized approach and a systematic, consistent process for reporting HCP compliance to the Federal Services (United States Fish and Wildlife Service [USFWS] and NOAA Fisheries). The following discussion applies to monitoring conducted from 2001 to 2012.

Rather than monitor all 1997 HCP conservation strategies that were implemented in a given year, DNR monitored selected conservation strategies only. DNR chose this approach to a) focus limited resources on obtaining a larger sample and b) improve statistical inference regarding compliance. DNR selected the strategies to be monitored every year in close coordination with the Federal Services.

DNR did not conduct field implementation monitoring of silvicultural activities such as planting and pre-commercial thinning or non-timber management activities such as leasing and public use. These activities were tracked in DNR's corporate databases and reported by type, acreage, and HCP planning unit in the annual HCP report to the Federal Services. Instead, DNR mainly monitored timber harvest activities and associated road construction and maintenance.

When selecting a sample of activities for monitoring, DNR considered both the OESF and other HCP planning units. Sample size and the methods for sample selection varied by strategy and by activity type (for example, thinning or regeneration harvest).

Using an HCP checklist, DNR identified which conservation strategies were implemented on a timber sale. To determine which protection measures were required for the activity being monitored, DNR used 1997 HCP procedures and guidelines as the primary source of information.

To determine compliance, DNR conducted an office audit of the timber sale's jacket, reviewed DNR databases such as Planning and Tracking (P&T), and conducted field sampling of all or part of the office-reviewed timber sales. DNR used the forest practices rules under the following circumstances: 1) the 1997 HCP requires compliance with forest practice rules, or 2) the forest practice rules do not allow DNR to substitute HCP procedures. Evaluation criteria specific to each strategy were identified using the above references.

Table A4-1 summarizes 1997 HCP implementation monitoring efforts in the OESF between 2001 and 2012 and provides the amount of timber harvest in the OESF (by number and acres of sales). This information was compiled from DNR's annual HCP reports and HCP implementation monitoring reports. In this table, DNR did not include the pilot project for 1997 HCP implementation and effectiveness monitoring of unstable slopes (Hanell 2003).

Table A4-1. Implementation Monitoring Efforts and Amount of Timber Harvest in the OESF in FY 2001 through FY 2011

Fiscal year monitored	1997 HCP strategy or strategy components monitored in the OESF	Methods	Number of timber sales monitored in the OESF	Number of timber sales completed in the OESF	Harvested acres in the OESF
2001	Pilot implementation monitoring only in North Puget and South Puget HCP Units		0	8	830
2002	Riparian management zone	Office audit and field review	1 (25 stream segments)	17	1076
	Northern spotted owl	Office audit and field review	15		
2003	Leave trees	Office audit and field review	0	2	644
	Wetlands	Office audit and field review	2 (25 wetlands)		
	Exterior (wind) buffers	Office audit and field review	0		
2004	Hydrologic maturity in rain-on-snow zone	Office audit	0	1	102
	Northern spotted owl	Office audit and field review	0		
2005	Riparian management zone	Office audit and field review	1 (2 stream segments)	2	237
2006	Riparian strategy for the OESF	Office audit and field review	11 (162 stream segments)	16	1009
	Uncommon habitats	Office audit and field review	1		
2007	Implementation monitoring data not reported		0	6	938
2008	Leave trees	Office audit and field review	0	13	646
	Wetlands	Office audit and field review	0		
2009-2011	Hydrologic maturity in rain-on-snow zone	Office audit	0	37	3236
	Roads	Office audit	1*		
	Northern spotted owl	Office audit	0		
2012	Riparian forest restoration strategy	Office audit and field review	0	7	839

*One Road Management and Abandonment project

Source: Annual HCP reports and annual HCP implementation monitoring reports

Some elements of the 1997 HCP conservation strategies were not monitored in the OESF, even though at the time, DNR was monitoring those elements elsewhere. Examples include leave trees, hydrologic maturity in the rain-on-snow zone, and marbled murrelet habitat. Other elements of the 1997 HCP conservation strategies were monitored with a small sample over only a few years. For example, riparian

buffers (interior-core and exterior) were only monitored in three of the twelve reported years and in two of those years, only 1 timber sale was monitored per year.

For most of the reported period, DNR's Forest Resources Division had a higher level of staff and operational funding for implementation monitoring than it does in the current biennium (FY13-15). This leads to the conclusion that, if DNR's approach to monitoring does not change with the implementation of the forest land plan in the OESF, and/or if staffing and resources remain static, implementation monitoring efforts in the OESF are unlikely to increase in the near future.

New Implementation Monitoring Approach in the OESF

The updated procedure for riparian areas (refer to Appendix A-3) call for site-specific management and tracking of ecological conditions per Type 3 watershed. The higher specificity of the updated riparian and northern spotted procedures require increased implementation monitoring efforts in order to prove to the Federal Services that DNR is compliant with the 1997 HCP. The previous level of, and approach to, implementation monitoring in the OESF (refer to Table A4-1) may not be able to respond to these new demands.

As will be explained in the following sections, DNR is considering several changes to its approach to implementation monitoring in the OESF. In summary, DNR intends to 1) rely on improved information management for office audit of all completed timber harvest activities in the OESF, 2) consider increased use of remote sensing technology to analyze a sample of implemented conservation strategies, and 3) conduct limited field sampling to verify available information or obtain information not available remotely. To the extent possible, priorities for OESF implementation monitoring will be driven by the adaptive management questions identified in Chapter 4 of the draft OESF forest land plan. Monitoring results will be considered for potential adaptive management changes through the process described in Chapter 4 and the new adaptive management procedure (refer to Appendix A-3).

Improved Information Management

The 1997 HCP implementation monitoring reports for the period 2001 through 2011 found incomplete or inconsistent operational records and recommended improvements in how management activities are documented (refer to the "Results and Recommendations" sections of the reports at http://www.dnr.wa.gov/ResearchScience/Topics/TrustLandsHCP/Pages/lm_hcp_implementation_monitoring.aspx). Records of why and how management decisions were made are critical to determining the reason for non-compliance and identifying areas of future improvements.

DNR is currently developing improvements in how information is managed for the OESF (refer to Appendix A-1). DNR will leverage existing information systems such as P&T, which will continue to be the primary information source of operational records; include new information systems such as the regularly updated forest estate model; and integrate a number of existing databases and software applications so that information can be queried in a repeatable and automated way.

Increased Use of Remote Sensing Data

Use of remote sensing for evaluating 1997 HCP compliance can considerably increase the efficiency of HCP implementation monitoring by increasing the sample size and reducing the field sampling effort.

Primary information sources of remote sensing may vary over time as new technologies are developed. Currently, primary sources are aerial photography and LiDAR. DNR obtains aerial photography through the National Agriculture Imagery Program (NAIP). The entire State of Washington is photographed every two years during the agricultural growing season. DNR has received data from the last three cycles (last six years); the last dataset is from 2011. Datasets include 2D photos (orthorectified using the 10-m Digital Elevation Model), 3D photos, and infrared imagery. Currently, the resolution of the photos is 1m. NAIP is expected to continue photographing every two years (or more often) for the foreseeable future.

Orthophotos for state trust lands are stewarded by DNR's photogrammetry laboratory. State-of-the-art software applications such as SOCET SET may be used as available.

Another important source of remote sensing data is LiDAR. Currently, only 58,468 acres (22 percent) of the OESF are covered by LiDAR, mainly in the Clallam, Reade Hill, Goodman, and Dichodochtedar landscapes. DNR has recently secured funding for LiDAR coverage of the OESF and intends to fly the area in the near future.

DNR may explore the feasibility of using satellite imagery for 1997 HCP implementation monitoring. In the past, satellite data were used mainly for planning purposes. For example, gradient nearest neighbor [GNN] data based on satellite imagery and Forest Inventory and Analysis (FIA) plots were used to assess forest conditions outside state trust lands in the OESF. Satellite imagery and associated GIS products are available to DNR through various federal programs. The frequency of their updates varies.

The focus and intensity of remote sensing and field sampling will be driven by the risk and uncertainty associated with implementation of the OESF forest land plan. For example, there is uncertainty that the exterior buffers will be implemented and documented correctly because both the guidance provided (riparian procedure) and the windthrow probability model are new. By contrast, the uncertainty around correctly implementing the leave tree strategy is relatively low.

The proportion of monitoring conducted through remote sensing and through field sampling depends on the applicability of the available technology. For example, monitoring the width of the applied interior-core buffers requires identification of the 100-year flood plain, which may be difficult using remote sensing.

Use of Separate Sampling Designs

For 1997 HCP implementation monitoring in the OESF, DNR will typically follow sampling designs for all three monitoring components (office review, remote sensing, and field sampling) that are separate from those used in other HCP planning units. The main reason is that most conservation strategies for the OESF (for example, northern spotted owls, riparian, and multispecies) are different than those used in other HCP planning units. Exceptions include DNR's strategies for leave trees and for uncommon habitats, which are consistent across all HCP planning units.

Under most circumstances, monitoring data for the OESF will be analyzed separately from the other HCP planning units. Results likely will be reported as a separate section of the annual HCP implementation monitoring report.

DNRs' implementation monitoring program is responsible for all state trust lands and has limited resources. Therefore, DNR must prioritize. Given current staffing levels, field and remote sensing monitoring in the OESF may occur infrequently.

Testing new methods for implementation monitoring, such as emerging remote sensing technologies, in the OESF may be explored. Such testing is consistent with the OESF's role as a testing ground for innovation.

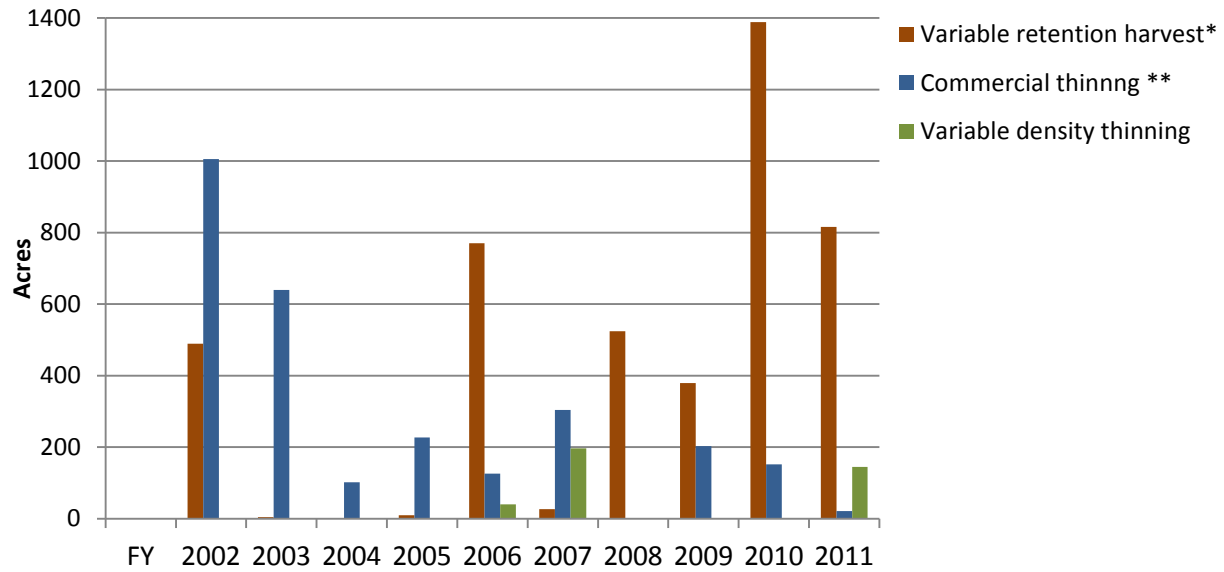
OFFICE REVIEW OF ALL TIMBER SALES COMPLETED IN THE OESF PER FISCAL YEAR

For the first several years of forest land plan implementation, DNR intends to conduct annual office review of the implementation of the riparian, northern spotted owl, and multispecies conservation strategies for all timber sales completed in the OESF during a fiscal year. The rationale is that the procedures for these conservation strategies have been updated, and the anticipated information systems used to implement them are new. If the office audit shows satisfactory level of compliance, the monitoring effort will be decreased. Implementation monitoring for marbled murrelet conservation will be considered after the long-term Marbled Murrelet Conservation Strategy is completed.

Office reviews will check whether a timber sale's prescription follows these updated procedures and whether the timber sale is well documented. DNR is currently considering how to monitor the deviation of timber sale boundaries from the boundaries suggested by the harvest schedule.

In order to assess the anticipated workload for implementation monitoring office review, DNR compared the projected number of acres to be harvested per decade in the OESF (presented in Table 3-8 in the RDEIS) with the amount of harvest in the previous 10 years (Chart A4-1). The projected amount is based solely on the output of DNR's forest estate model and does not reflect the constraint of DNR's budget for timber harvests. When a financial constraint is applied, DNR believes the number of acres harvested will be lower than shown in Table 3-8. DNR feels the adjusted number of acres will represent a feasible workload for office review.

Chart A4.1 Type and Amount of Timber Harvest Activities Completed in the OESF in FY 2002 through FY 2011



Source: DNR annual HCP reports

* Labeled as regeneration harvest prior to 2010

** Labeled as small-wood thinning and late-rotation (older-stand) thinning prior to 2010

Strategy-Based Sampling Design

The sample selection for remote sensing and field monitoring will continue to use elements of 1997 HCP conservation strategies (for example, interior-core buffers) instead of timber sales as sampling units. Table A4-2 illustrates the difference between an activity-based and a strategy-based approach to implementation monitoring and their elements.

The strategy-based approach provides for statistically valid sampling “to determine whether the HCP conservation strategies are implemented as written” (DNR 1997). By contrast, the activity-based approach focuses on the level of compliance of a timber sale unit, which may have one or more implemented conservation strategies. In the past, since conservation strategies are unevenly represented across a timber sale’s units, the activity-based approach has resulted in violation of statistical assumptions and difficulties in determining compliance with a 1997 HCP conservation strategy or its elements (refer to the 2002 Implementation Monitoring Pilot Project at http://www.dnr.wa.gov/ResearchScience/Topics/TrustLandsHCP/Pages/lm_hcp_implementation_monitoring.aspx).

Sampling design, monitoring indicators, and compliance thresholds will depend on which element (interior-core buffer, exterior buffer, a stand’s habitat condition) of the conservation strategy is being

monitored, and will be developed as part of each implementation monitoring project. These items will be described in annual implementation monitoring reports.

Table A4-2. Difference between an Activity-Based Approach and a Strategy-Based Approach to Implementation Monitoring

	Activity-based approach	Strategy-based approach
Main Monitoring Question	Are timber sales compliant with the 1997 HCP?	Are the HCP conservation strategies implemented as written?
Target population	All timber sales on state lands in the OESF completed during the monitored year	All HCP conservation strategies implemented during the monitored year <i>Current HCP checklist identifies 18 strategies or strategy elements for the OESF.</i>
Sampling unit	A timber sale (or timber sale unit) completed during the monitored year	Ecological feature addressed by the HCP conservation strategy that was subject to management during the monitored year. For example, an interior-core buffer on a stream segment and a stand’s habitat condition.
Sampling frame	All timber sales documented as “completed” in P&T*	<i>Example for riparian conservation strategy:</i> All interior-core buffers on all segments of streams Type 1-4 within all timber sales documented as “completed” in P&T
Sample selection	A subset of all completed timber sales (or timber sale units) documented as “completed” in P&T	<i>Example for riparian conservation strategy:</i> A subset of all stream segments across all timber sales documented as “completed” in P&T
Compliance criteria	Number of timber sales (or timber sale units) that meet 1997 HCP requirements	<i>Example for riparian conservation strategy:</i> Number of stream segments (or miles of streams) that meet HCP requirements

* Currently, P&T is the main source of operational records.

Reporting

OESF implementation monitoring reports will be included as a section of the annual HCP implementation monitoring or HCP annual report. The elements of the report, such as acres and types of all timber harvest activities by landscape, or recommendations for improvement of forest land plan implementation, are currently being discussed.

Organization and funding

Implementation monitoring in the OESF will be conducted by the Forest Resources Division as a joint effort of the Implementation Monitoring Program and the OESF Research and Monitoring Program. Olympic Region staff, specifically the implementation manager for the OESF forest land plan, will assist with providing data on planned and completed operations.

Currently, there is no OESF-dedicated implementation monitoring staff or funding. Beyond the annual office audit of completed timber sales, OESF implementation monitoring will be conducted as staff and funding are available, and if identified as a monitoring priority. Over time, DNR will evaluate monitoring cost and resources and make potential organizational changes or requests for additional funding.

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¹ Formerly Land Management Division

Appendix A-5

Riparian Validation Monitoring – A Conceptual Framework

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DRAFT

Introduction

Washington Department of Natural Resources' (DNR) 1997 *Habitat Conservation Plan* (HCP) commitment for validation monitoring is to “evaluate cause-and-effect relationships between habitat conditions resulting from implementation of the conservation strategies and the animal populations these strategies are intended to benefit” (DNR 1997, p. V.2). Validation monitoring will occur within the OESF only and will document the responses of northern spotted owl, marbled murrelet, and salmonid populations.

Objectives

Through riparian validation monitoring in the OESF, DNR will seek to achieve the following objectives:

- Evaluate cause-and-effect relationships between salmonid habitat conditions resulting from implementation of the 1997 HCP habitat conservation strategies and the salmonid populations these strategies are intended to benefit.
- Test hypotheses about causal links between OESF riparian management, habitat conditions, and salmonid populations in order to evaluate the assumptions that underlie the riparian conservation strategy.
- Provide reliable information for the adaptive management process.

DNR's Past Efforts in Riparian Validation Monitoring

Until now, DNR's efforts in riparian validation monitored have included planning only. For example, DNR published a draft riparian validation monitoring plan in 2001 (Dominguez and Beauchamp 2001). This plan described the scope and challenges of riparian validation monitoring and included a phased approach to implementation.

In 2008, DNR renewed its efforts by launching an assessment phase for riparian validation monitoring, which consisted of three workshops attended by DNR staff and the Federal Services (United States Fish and Wildlife Services [USFWS] and NOAA Fisheries) (Teply 2008, unpublished). In these workshops, participants identified primary and secondary species of interest for riparian validation monitoring. Participants also identified the life stages of these species that are most likely to contribute to changes in their populations, and most likely to be affected by forest management. In addition, participants explored various spatial scales of the species' life history and DNR's forest management and suggested practical spatial units for validation monitoring.

Monitoring Strategy

An effective riparian validation monitoring will 1) identify the points in the life cycles of salmonid species of interest that are most influential on the performance of their populations, 2) seek to establish mechanistic relationships between environmental conditions and key populations processes, and 3) identify how key population processes are influenced by forest management (S. Horton 2008, pers. comm.). Validation monitoring is challenging because of the complexity introduced by insufficient

knowledge of species-habitat relationships, large spatial scales, variability in habitat conditions and life history metrics, influences of past management, and other factors.

Effective and efficient validation monitoring necessitates a phased approach. The three suggested phases are the **assessment**, **pilot study**, and **full implementation** phases. In the assessment phase, DNR identifies the species to be monitored, the appropriate spatial scale at which to monitor them, and the candidate watersheds. In the pilot phase, DNR conducts exploratory analyses of species' habitat use, assesses variability of habitat indicators, refines monitoring protocols, and develops statistical models of management effects on species. These models will be the basis for formulating testable hypotheses. In the full implementation phase, DNR evaluates how implementing the riparian conservation strategy affects salmonid populations in the OESF. The main activities in each phase are listed in the following section.

Assessment Phase

- Identify species of interest and their life stages for validation monitoring.
- Evaluate the feasibility of monitoring at multiple spatial scales.
- Develop (or adopt) a conceptual model of the species' responses to habitat conditions resulting from implementation of the riparian conservation strategy.
- Using the preceding information, formulate preliminary hypotheses.
- Characterize biophysical conditions in candidate watersheds and the population status of candidate salmonid species.
- Select similar watersheds for paired-watershed experimental design with treatment and control.
- Develop a study plan for the pilot monitoring study.

Some of these assessments have already been completed as part of the 2008 validation monitoring workshops (Teply 2008, unpublished) and development of the Revised Draft Environmental Impact Statement (RDEIS) for the OESF forest land plan.

Pilot Study

- Document baseline habitat conditions in selected watersheds.
- Assess the degree of variation in habitat and fish response variables and determine the appropriate metrics.
- Determine the historic range of variability for habitat and fish variables.
- Develop parsimonious statistical models about cause and effect relationships and formulate testable hypotheses for long-term monitoring as watersheds are characterized and species-habitat relationships are further understood via the pilot study.
- Develop a study plan for the full implementation phase.

Full Implementation

- Conduct habitat and fish sampling in paired watersheds identified during the assessment and pilot study phases. The number of treatments, control, and replicates will be determined during the pilot study and largely will be affected by funding and by which watersheds are available.
- Analyze cause-and-effect relationships between forest management, habitat conditions, and salmonid population performance. Most likely, the information-theoretic approach (Burnham and Anderson 2002) will be used, in which data are fitted to previously-developed statistical models and the best model is selected based on established information criteria. Conservation strategies will be considered valid if habitat and population metrics remain within the expected range of variability as defined during the pilot study.

Validation monitoring will be conducted under an adaptive monitoring strategy (Ringold and others 1996). Through the adaptive management process, watershed and reach-level objectives and monitoring priorities will be refined as work proceeds on the ground. Rapidly developing new technology, such as remote sensing and telemetry, is expected to change monitoring design, protocols, and data analyses over time.

Link to Status and Trends Monitoring of Riparian and Aquatic Habitat in the OESF

In-stream and riparian habitat conditions are links between the implementation of the riparian conservation strategy (management activities) and salmonid populations. DNR developed a study plan on the status and trends of riparian and aquatic habitat in the OESF and started implementing it in July, 2012. The project is funded by DNR and is scheduled to continue for at least 10 years. Multiple abiotic indicators, such as stream water temperature, pools, and large woody debris, are being sampled in 50 Type 3 watersheds across the OESF. Status and trends monitoring will not directly assess the effects of management on salmonid habitat; however, it will provide information on baseline habitat conditions and changes in those conditions across the OESF over time. To the extent possible, field installations and data from riparian status and trends monitoring will be used in future riparian validation monitoring efforts.

In the study plan for this project, DNR conceptually linked status and trends monitoring to riparian validation monitoring by describing how the habitat attributes identified for sampling under riparian status and trends monitoring affect the life history of salmonids in the OESF. There are several widely used models of limiting habitat factors for salmonids (for example Ecosystem Diagnosis and Treatment (EDT) and the Shiraz Model); these models could utilize habitat monitoring data from the OESF. In addition, the outputs of these models could be used to develop testable hypotheses concerning management effects.

Link to Future Effectiveness Monitoring Studies

In the 1997 HCP, it was envisioned that effectiveness monitoring studies would test hypotheses around achieving desired future conditions through active management. Examples of effectiveness monitoring studies related to the riparian conservation strategy are assessing silvicultural management techniques to

restore structurally complex riparian forests, and assessing management techniques to reduce the negative impacts of windthrow on riparian buffers. Effectiveness monitoring studies can be experimental or observational, and prospective or retrospective. Given the complexity of natural systems, purely experimental studies will be difficult to conduct (Hilborn and Mangel 1997). Most likely, a combination of investigation approaches will be used.

Effectiveness monitoring studies provide information on the first link in the mechanistic relationship (forest management - habitat conditions - species conservation). Validation monitoring is tasked with proving the cause and effect relationship between all three elements of this relationship. For this reason, at least some of the riparian effectiveness monitoring studies should be developed and implemented in a way that allows them to be included later in validation monitoring.

Information Sources

A number of salmonid monitoring studies have been carried out in the Pacific Northwest. These studies can provide valuable information for designing and implementing effective riparian validation monitoring in the OESF. Following are some examples:

- Intensively Monitored Watersheds in Washington (http://wdfw.wa.gov/conservation/research/projects/watershed_monitoring/)
- Oregon Plan Monitoring Program for Coastal Basins (<http://oregonstate.edu/dept/ODFW/freshwater/inventory/orplan/overview.htm>)
- Fish population monitoring routinely conducted on the western Olympic Peninsula by fishery co-managers (WDFW and tribes)

Study Design

The study design of riparian validation monitoring will be developed during the pilot phase and largely will be determined by which watersheds are available and the level of funding committed to the project. Below is an outline of the type, scope, response variables, and spatial and temporal scales of the study.

Experimental Type Investigation

The study will be designed as an experiment with replicated treatment(s) and control. However, given the complexity of the natural system (for example, large spatial scales; multiple, interrelated processes; long-term responses; and spatial and temporal variability of habitat and fish response indicators [Reeves 1994]), the study design is unlikely to meet all requirements of a purely experimental design. Recent and well-recognized guidance about designing research of complex natural systems will be considered (for example, Anderson 2008, Burnham and Anderson 2002, Hilborn and Mangel 1997). Straightforward analytical methods that are well supported by statistical theory are available to 1) identify the hypotheses (models) that are best supported by the data to rank and assign weights to individual parameters or interactions, and 2) to make inference from multiple hypotheses based on the level of support they receive from the data (Burnham and Anderson 2002, Hobbs and Hilborn 2006).

The riparian conservation strategy, as described in the 1997 HCP and implemented through the OESF forest land plan, will serve as the replicated treatment. The riparian conservation strategy includes application of interior-core and exterior buffers, protection of unstable slopes and wetlands, and road management through road maintenance and abandonment plans (refer to Chapter 2 of the draft forest land plan). Although upland management activities influence salmonid habitat conditions, the primary focus of evaluating habitat changes and responses of the salmonid population will be on management activities in riparian areas.

Unmanipulated watersheds will be used as control sites. Watersheds on state trust lands within the OESF or on adjacent federal lands may be selected. Access to stream segments in these watersheds will affect which control sites are selected.

Response Variables

Response variables will include both the physical and biological variables that are critical for riparian and in-stream habitat. Examples include stream water temperature, large woody debris, and forest cover, and salmonid population variables such as productivity and abundance.

In the 2008 validation monitoring workshops (Teply 2008, unpublished), participants proposed coho salmon as the principal species of interest for riparian validation monitoring, and resident cutthroat trout as a secondary species of interest. Monitoring will focus on life stages that are most affected by forest management and least affected by marine conditions and downstream fisheries. Participants suggested monitoring the following life stages: upstream migration, egg incubation, summer rearing, and overwintering.

Spatial Scale

Riparian validation monitoring will be conducted in predominantly DNR-managed watersheds. In the 2008 validation monitoring workshops, participants proposed 7th-code watersheds (sub-basins) as the landscape units for monitoring. Over half of the state trust lands-dominated sub-basins in the OESF are between 20 and 1,600 acres in size. Paired, similar watersheds—control and treatment—will be selected and replicated. Their size and location will be determined after the assessment phase.

Temporal Scale

Temporal and spatial variation of salmonid populations can be very high and significant enough to mask the changes caused by management (Reeves 1994). The impacts of forest management activities must be examined for a long period to overcome the noisiness of the data. The full implementation phase is expected to continue throughout the life of the 1997 HCP.

Reporting

Assessment Phase

Discussion papers on the following topics are the key deliverables of the assessment phase:

- The habitat relationships of coho salmon that influence their population dynamics the most, and that are most influenced by forest management;
- The spatial (and if appropriate, temporal) scale at which habitat relationships of coho salmon can be quantified;
- The spatial (and if appropriate, temporal) scale at which the influences of forest management on habitat relationships of coho salmon can be quantified;
- The conceptual model(s) on the mechanistic relationship (riparian management - coho salmon habitat - coho population dynamics); and, based on these models, preliminary hypotheses that DNR can consider for riparian validation monitoring; and
- A description of the watersheds identified as potential monitoring sites.

All discussion papers will be developed and reviewed internally with the Federal Services and, as appropriate, potential external research partners.

Pilot Study

A peer-reviewed study plan will be prepared prior to launching the pilot study.

Key deliverables from the pilot study include an establishment report, annual progress reports, and a final report. These reports will include the following:

- A description of baseline conditions in selected watersheds;
- Assessment of intra-annual and inter-annual variability of indicators for habitat conditions and fish response, and a description of their historic range of variability;
- Recommended metrics and monitoring protocols; and
- Statistical model(s) of the mechanistic relationship (riparian management - coho salmon habitat - coho population dynamics) and, based on these models, specific testable hypotheses that DNR will consider for riparian validation monitoring.

These reports likely will be developed with research collaborators and likely will be reviewed by the Federal Services and by scientific advisory groups or individual experts.

Estimated Timelines

The estimated time to complete the remaining assessments described in the assessment phase is approximately one year. The estimated duration of the pilot study is five years after the assessment phase is completed. The full implementation phase will continue through the life of the 1997 HCP.

Estimated Project Staff

DNR will conduct riparian validation monitoring in collaboration with external research organizations such as United States Forest Service Pacific Northwest Research Station and the University of

Washington. At least one of the principal investigators will be from DNR. DNR staff will manage the project. Refer to Table A5-1 for a list of the estimated staff needed for the first two phases of the project.

Table A5-1. Estimated Staff Needs in Staff Months

Staff and main tasks	Assessment phase (1 year)	Pilot study (5 years)
Fish biologist (Development of study plan, data analyses, changes in monitoring design over time, supervision of field crews)	12	60
Scientific oversight (Peer reviews, advisory group, consultations)	6	10
GIS support (Watersheds screening, development of GIS coverages, spatial analyses, data maintenance)	3	10
Field crews (Field reconnaissance, field sampling, and continuous maintenance of field installations; documentation of field measurement procedures, organizing field crews)	2	50
Data steward (Data management and analyses)	1	5
Project manager (Coordination, communication, oversight, reporting)	3	30
TOTAL (Months of FTE)	27	165

Preliminary Budget Estimate

A preliminary budget estimate was developed for the assessment and pilot study phases only (refer to Table A5-2). The estimate is based on the staff required to complete the first two phases (assessment phase and pilot study). These phases will be the most intensive effort on an annual-cost basis because during these phases, the direct links between habitat and salmonids are hypothesized and examined (Dominguez and Beauchamp 2001).

An estimated 192 staff months are required for the assessment and pilot phases of the project, which together are expected to take approximately six years. With fully-loaded expenses per FTE, including salary, benefits, goods and services, travel, and equipment, the total preliminary budget estimate for these two phases is \$1,478,000. DNR will seek collaboration with and funding from external organizations to cover the majority of this cost.

Potential Risks Associated with the Project

- Insufficient and/or inconsistent funding,
- A study design that does not provide enough statistical power to identify cause and effect relationships,
- Inability to find sites that meet the requirements of the monitoring design,
- Natural disturbances that damage installations,

- Compounding effects of marine and estuarine habitat conditions,
- Staff turnover and institutional memory loss, and
- Poor data management.

Risk analysis and suggested solutions will be included in the study plan.

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Appendix A-6

Mapping Northern Spotted Owl Habitat in the OESF: Two Approaches

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DRAFT

Introduction

This appendix describes DNR’s current and proposed approaches for assessing and mapping the extent of northern spotted owl habitat under the proposed Olympic Experiment State Forest (OESF) forest land plan. DNR’s current approach is to assess and map northern spotted owl habitat as was done for the implementation of the 2006 Settlement Agreement. DNR’s proposed approach is to assess and map northern spotted owl habitat uses methods developed for the Landscape Alternative in the OESF Revised Draft Environmental Impact Statement (RDEIS). Both approaches use similar data and modeling techniques and produce mapped outputs. The significance differences between the approaches are as follows:

- Estimates of standing dead trees (snags) and down woody debris in the proposed approach are modeled from the sample year to a future date. Under the current approach, only sample year data is considered.
- Estimates of future habitat are produced under the proposed approach only
- Areas in road rights-of-way are excluded in the proposed approach.
- Updates to habitat estimates occur more frequently under the proposed approach.

To compare these approaches, it is important to understand the following terms: *data sources*, *methods*, and *outputs*. Data sources are the data and information used to make the assessment or estimate of the extent of northern spotted owl habitat. Typical data sources are forest inventory sample data and aerial photography. Methods are the processes and workflows used that take the input data and transform it into information that depicts northern spotted owl habitat. Typical methods include modeling procedures and techniques and forest stand structure definitions that combine to equal a habitat. Outputs include results of the methods and how frequently updates are conducted. Typical outputs are maps and databases.

Table A-6.1. Comparison of Inputs, Methods, and Outputs Under Current and Proposed Approaches

		Current approach	Proposed approach
Input data	Forest inventory sample data	Washington Department of Natural Resources’ (DNR) sample forest inventory and for Old Forest Habitat only, aerial photographic interpretation and field reconnaissance	DNR’s sample forest inventory and for Old Forest Habitat only, aerial photographic interpretation and field reconnaissance
Methods	Habitat definitions	Per procedure PR 14-004-120 <i>Northern Spotted Owl Management (Westside)</i>	Per procedure PR 14-004-120 <i>Northern Spotted Owl Management (Westside)</i>
	Live trees	Growth and mortality of live trees are modeled from sample year up to 2009 using the Forest Vegetation Simulator (FVS) within the Forest Resource Inventory System (FRIS) refresh procedures.	Growth and mortality of live trees are modeled from sample year up to 2109 using FVS within FRIS refresh procedures.

		Current approach	Proposed approach
	Stand dead trees (snags) and down woody debris	Sample year statistics	Tree mortality is modeled from sample year to 2109 using FVS and is added to sample data for snags and down woody debris. Modeled mortality is allocated to snags or down woody debris pools using database routines. Snag fall rates and down woody debris decay rates are employed in database routines. Routines for mortality allocation, fall rates, and decay are based on published algorithms from the FVS Fires and Fuel extension. All of these processes are within the yield table generation processes for the OESF forest estate model.
	GIS processes	Includes all forested land	Based on 2009 large data overlay; includes forested lands with deductions for road rights-of-way
Outputs	Products	Maps and geo-database for year of the assessment	Maps and geo-databases for all ten periods of the model projections
	Frequency	Ad hoc inventory refreshes and timber harvest activities	Every two years with model re-runs that update model input data with inventory projections and timber harvest activities

Table A6-2. 2009 Estimate of Northern Spotted Owl Habitat in the OESF Using the Current Approach

Landscape	Acres in landscape	Acres of northern spotted owl habitat	Acres of Old Forest Habitat	Acres of Young Forest Habitat
Clallam	18,040	2,354	-	2,354
Clearwater	57,467	16,953	14,855	2,098
Coppermine	20,455	3,829	2,982	847
Dickodochtedar	29,429	6,869	2,431	4,438
Goodman	24,861	6,362	4,179	2,183
Kalaloch	19,049	4,219	2,358	1,861
Queets	22,048	5,825	4,842	983
Reade Hill	8,869	2,825	1,283	1,541
Sekiu	10,701	390	-	390
Sol Duc	20,064	2,584	207	2,378
Willy Huel	39,366	9,845	7,365	2,480

Table A6-3. 2009 Estimate of Northern Spotted Owl Habitat in the OESF Using the Proposed Approach

Landscape	Acres in landscape	Acres of northern spotted owl habitat	Acres of Old Forest Habitat	Acres of Young Forest Habitat
Clallam	17,276	5,976	314	5,662
Clearwater	55,203	17,206	14,101	3,106
Coppermine	19,246	3,815	3,107	708
Dickodochtedar	28,047	7,629	2,570	5,059
Goodman	23,799	7,214	4,822	2,392
Kalaloch	18,122	4,428	2,472	1,957
Queets	20,807	6,758	5,179	1,579
Reade Hill	8,479	3,971	1,933	2,038
Sekiu	10,014	1,499	75	1,424
Sol Duc	19,146	5,325	643	4,683
Willy Huel	37,428	8,513	7,520	993

Table A6-4. Comparison of Proposed to Current Approach in Forest Area (Acres), by Landscape

Landscape	Proposed approach forested acres	Current approach forested acres	Difference between landscapes, proposed approach
Clallam	17,276	18,040	- 764
Clearwater	55,203	57,467	- 2,264
Coppermine	19,246	20,455	- 1,209
Dickodochtedar	28,047	29,429	- 1,382
Goodman	23,799	24,861	- 1,062
Kalaloch	18,122	19,049	- 927
Queets	20,807	22,048	- 1,241
Reade Hill	8,479	8,869	- 390
Sekiu	10,014	10,701	- 687
Sol Duc	19,146	20,064	- 918
Willy Huel	37,428	39,366	- 1,938
TOTAL	257,567	270,349	-12,782

Table A6-5. Tabulated Comparison of Estimates of Northern Spotted Owl Habitat Using the Current and Proposed Approaches

Landscape	Difference in amount of Young Forest Habitat between proposed and current approaches (proposed – current acres)	Difference in amount of Old Forest Habitat between proposed and current approaches	Total Difference in amount of northern spotted owl habitat between proposed and current approaches
Clallam	+ 3,307	+ 314	+ 3,622
Clearwater	+ 1,008	- 755	+ 254
Coppermine	- 139	+ 125	- 15
Dickodochtedar	+ 621	+ 140	+ 760
Goodman	+ 209	+ 643	+ 852

Kalaloch	+ 96	+ 113	+ 209
Queets	+ 596	+ 337	+ 933
Reade Hill	+ 497	+ 650	+ 1,146
Sekiu	+ 1,034	+ 75	+ 1,110
Sol Duc	+ 2,305	+ 436	+ 2,741
Willy Huel	- 1,487	+ 155	- 1,333
Total	+ 8,047	+ 2,233	+ 10,279

Table A6-6. Comparison of Landscape Percentages of Northern Spotted Owl Habitat Based on Current and Proposed Approaches

Landscape	Percent of Young and Old Forest Habitat using current approach	Percent of Young and Old Forest Habitat using proposed approach	Difference between proposed and current approaches	1997 Habitat Conservation Plan Decade 2 predictions for Young and Old Forest Habitat
Clallam	13%	35%	22%	45%
Clearwater	30%	31%	2%	29%
Coppermine	19%	20%	1%	23%
Dickodochtedar	23%	27%	4%	32%
Goodman	26%	30%	5%	27%
Kalaloch	22%	24%	2%	28%
Queets	26%	32%	6%	33%
Reade Hill	32%	47%	15%	51%
Sekiu	4%	15%	11%	31%
Sol Duc	13%	28%	15%	69%
Willy Huel	25%	23%	-2%	33%

The following map illustrates the differences between the current and proposed approaches in the amount of northern spotted owl habitat in a portion of the Clallam Landscape.

Map A6-1. Differences Between Current and Proposed Approaches in Amount of Northern Spotted Owl Habitat in a Portion of the Clallam Landscape

