

## **Appendix A: Tables**

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Table A-1. Habitat relationships studies and surveys of reclassified habitat carried out as part of Washington State Department of Natural Resources' interim marbled murrelet conservation strategy.

HCP planning unit	Year habitat relationships study completed	Years surveys of reclassified habitat carried out	Acres reclassified habitat surveyed (% of reclassified habitat in planning unit)	Number of occupied sites identified <sup>1</sup>	Acres of occupied habitat conserved pending adoption of a long-term murrelet conservation strategy	Additional acres conserved pending adoption of a long-term murrelet conservation strategy
Columbia + South Coast <sup>2</sup>	1999	1998-2001	27,000 (100%)	103	8700	1100 <sup>3</sup>
North Puget	2000	2001-2008	17,500 (51%)	45	3900	16,500 <sup>4,5</sup>
OESF	2002	1996-2002	39,300 (72%)	375	25,900	15,200 <sup>4</sup>
South Puget	not attempted	n/a	n/a	3	600 <sup>6</sup>	100
Straits	2000	2000-2003	15,600 (100%)	66	3900	0
total	2002	1996-2008	99,400	592	42,400	32,900

<sup>1</sup> Includes both occupied sites identified by DNR and occupied sites identified through surveys conducted by WDFW and other parties, as well as confirmed observations of murrelet nests, chicks, eggs, and eggshells.

<sup>2</sup> Columbia and South Coast planning units were combined for surveys of reclassified habitat.

<sup>3</sup> An additional 1100 acres of suitable habitat was conserved pending adoption of a long-term marbled murrelet conservation strategy based on field assessments by DNR biologists that confirmed habitat suitability.

<sup>4</sup> This figure represents unsurveyed reclassified habitat.

<sup>5</sup> This figure does not include 6200 additional acres of forestland that were conserved pending field assessments by DNR biologists to determine habitat suitability.

<sup>6</sup> These acres were determined to be occupied through radar surveys not part of the Interim Strategy.

Table A-2. Peer-reviewed literature from research supported by Washington Department of Natural Resources as part of its interim marbled murrelet conservation strategy, 1997 through 2017.

- Bradley, R. W., and J. M. Marzluff. 2003. Rodents as nest predators: influences on predatory behavior and consequences to nesting birds. *Auk* 120:1180-1187.
- Horton, S. P. 2008. Ecology and conservation of marbled murrelets on the western Olympic Peninsula: temporal and spatial variation in inland activity and implications for forest management. Ph.D. Diss., Univ. Wash., Seattle. 155 p.
- Luginbuhl, J. M., J. M. Marzluff, J. E. Bradley, M. G. Raphael, and D. E. Varland. 2001. Corvid survey techniques and the relationship between corvid relative abundance and nest predation. *J. Field Ornithol.* 72:556-572.
- Marzluff, J. M., J. J. Millspaugh, P. Hurvitz, and M. S. Handcock. 2004. Relating resources to a probabilistic measure of space use: forest fragments and Steller's jays. *Ecology* 85:1411-1427.
- Neatherlin, E. A. and J. M. Marzluff. 2004. Responses of American crow populations to campgrounds in remote native forest landscapes. *J. Wildl. Manage.* 68:708–718.
- Raphael, M. G., D. Evans Mack, J. M. Marzluff, and J. M. Luginbuhl. 2002. Effects of forest fragmentation on populations of the marbled murrelet. *Stud. Avian Biol.* 25:221–235.
- Vigallon, S. M., and J. M. Marzluff. 2005. Is nest predation by Steller's jays (*Cyanocitta stelleri*) incidental or the result of a specialized search strategy? *Auk* 122:36–49.
- Walters, C. J., and R. Hilborn. 1978. Ecological optimization and adaptive management. *Annu. Rev. Ecol. Systematics* 9:157–188.

Table A-3. Acres of marbled murrelet habitat conserved under Washington State Department of Natural Resources' marbled murrelet long-term conservation strategy.

Conservation Component	Acres of Habitat Conserved		
	Murrelet Only (see Section 6.3.1)	Multiple Conservation Objectives (see Section 6.3.2)	Total
Occupied sites (see Section 6.3.1.1)	9,000	50,000	59,000
Occupied site buffers (see Section 6.3.1.2)	16,000	17,000	33,000
Special habitat areas (see Section 6.3.1.4)	18,000	40,000	58,000
Other LTFC (see Section 6.3.2)	n/a	*	*
Total	43,000	567,000	610,000

\* Acreage cannot be determined because occupied sites and occupied site buffers overlap special habitat areas.

Table A-4. Marbled murrelet-specific restrictions and conditions on management and recreation activities within conservation components of Washington State Department of Natural Resources' marbled murrelet long-term conservation strategy.

- cells shaded **red** indicate activities that are not allowed under any circumstances
- cells shaded **yellow** indicate activities limited by murrelet-specific restrictions or conditions
- cells shaded **green** indicate activities not limited by murrelet-specific restrictions or conditions
- **all activities are subject to any other (i.e., non-murrelet) applicable restrictions or conditions**

Activity	Conservation Component			
	Occupied Sites	Occupied Site Buffers	Special Habitat Areas	Other LTFC <sup>1</sup>
<u>Management Activities</u>				
variable-retention timber harvest	not allowed			
tailholds, guylines, and rigging (harvest-related infrastructure)	a) must install outside of the nesting season <sup>2</sup> <u>AND</u> b) avoid impacts to platform trees when possible	avoid impacts to platform trees when possible		allowed
yarding corridors	a) allowed when no other route is feasible <u>AND</u> b) if in habitat, must consult with USFWS to minimize impacts	allowed when no other route is feasible		
salvage, recovery, and post-salvage reforestation or regeneration (including silvicultural treatments)	a) must not diminish the quality or amount of habitat <u>AND</u> b) must follow a site-specific restoration plan prepared with input from a DNR biologist <u>AND</u> c1) must take place outside of the nesting season <sup>2</sup> when feasible <u>OR</u> c2) must follow daily timing restrictions <sup>3</sup> if carried out during the nesting season <sup>2</sup> <u>AND</u> d) must consult with USFWS if standing platform trees will be removed			
thinning and related silviculture	not allowed	a) allowed in non-habitat <u>AND</u> b) must follow a specific management objective to enhance or maintain security forest with a windfirm canopy	a) allowed in non-habitat <u>AND</u> b) must be within a northern spotted owl habitat management area	

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Activity	Conservation Component			
	Occupied Sites	Occupied Site Buffers	Special Habitat Areas	Other LTFC <sup>1</sup>
forest health treatments	a) must follow a site-specific management prescription <u>AND</u> b) must follow daily timing restrictions <sup>3</sup> during the nesting season <sup>2</sup> <u>AND</u> c) prescribed burning must take place outside of the nesting season <sup>2</sup>		a) must follow a site-specific management prescription <u>AND</u> b) must follow daily timing restrictions <sup>3</sup> during the nesting season <sup>2</sup> <u>AND</u> c) within 1320 feet (¼ mile) of occupied sites, prescribed burning must take place outside of the nesting season <sup>2</sup>	
new road construction, new landings, waste area construction, existing pit expansion	a) allowed when no other route is feasible <u>AND</u> b) if in habitat, must consult with USFWS to minimize impacts			allowed
road reconstruction or maintenance	a) must meet Washington State Forest Practices road standards <u>AND</u> b) must follow daily timing restrictions <sup>3</sup> during the nesting season <sup>2</sup>	a) must meet Washington State Forest Practices road standards <u>AND</u> b) must follow daily timing restrictions <sup>3</sup> during the nesting season <sup>2</sup> within 328 feet of occupied sites		
road decommissioning or abandonment	must follow daily timing restrictions <sup>3</sup> during the nesting season <sup>2</sup>	allowed		
blasting	allowed outside of the nesting season <sup>2</sup>			within 1320 feet (¼ mile) of occupied sites, must take place outside of the nesting season <sup>2</sup>

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Activity	Conservation Component			
	Occupied Sites	Occupied Site Buffers	Special Habitat Areas	Other LTFC <sup>1</sup>
crushing, pile-driving	must take place outside of the nesting season <sup>2</sup> if feasible <u>OR</u> follow daily timing restrictions <sup>3</sup> during the nesting season <sup>2</sup>		within 361 feet of occupied sites, must take place outside of the nesting season <sup>2</sup> if feasible <u>OR</u> follow daily timing restrictions <sup>3</sup> during the nesting season <sup>2</sup>	
DNR-operated or DNR-contracted aircraft - Boeing CH-47	not allowed within 795 feet--distance or altitude--during the nesting season <sup>2</sup>	allowed		
DNR-operated or DNR-contracted aircraft - Boeing 107/CH-46, Sikorsky S-64	not allowed within 450 feet--distance or altitude during the nesting season <sup>2</sup>			
DNR-operated or DNR-contracted aircraft - small helicopters and fixed-wing aircraft	not allowed within 330 feet--distance or altitude--during the nesting season <sup>2</sup>			
non-invasive research	allowed			
research involving prolonged audiovisual disturbance or heavy equipment	allowed outside of the nesting season <sup>2</sup>			if in habitat or future habitat, must take place outside of the nesting season <sup>2</sup>
cutting of trees for research purposes	not allowed unless approved by both DNR and USFWS			not allowed in habitat or future habitat unless approved by both DNR and USFWS

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Activity	Conservation Component			
	Occupied Sites	Occupied Site Buffers	Special Habitat Areas	Other LTFC <sup>1</sup>
fire suppression activities (including air operations)	follow Minimum Impact Suppression Tactics as defined in National Wildfire Coordinating Group 2003			
other management activities	management activities not listed in this table are subject to all applicable terms and conditions of the HCP and the IA			
<b>Recreation Activities</b>				
existing facilities, trails, and recreation leases	allowed			
new or expanded facilities, trails, and recreation leases	a) evaluate for impacts on murrelets and habitat <u>AND</u> b) consult with USFWS if potential impacts are identified			
conversion of existing non-motorized trails to motorized use	not allowed			
decommission or abandon illegal trails	allowed			
maintenance or improvements within the footprint of existing facilities, trails, trailheads, and recreation leases (including upgrades to address health, safety, or	allowed outside nesting season <sup>2</sup> <u>OR</u> follow daily timing restrictions <sup>3</sup> if during nesting season <sup>2</sup>			



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Activity	Conservation Component			
	Occupied Sites	Occupied Site Buffers	Special Habitat Areas	Other LTFC <sup>1</sup>
environmental damage concerns)				

<sup>1</sup> Other long-term forest cover (Other LTFC) includes areas managed under the HCP northern spotted owl conservation strategy, riparian areas managed under the HCP riparian conservation strategy, uncommon habitats and special habitat features protected under the HCP multi-species conservation strategy, all remaining old-growth forest, genetic resources and special habitat features protected under DNR's Policy for Sustainable Forests (DNR 2006), Natural Area Preserves and Natural Resource Conservation Areas, and inoperable or inaccessible areas.

<sup>2</sup> "Nesting season" means April 1 through September 23 (USFWS 2013).

<sup>3</sup> "Daily timing restrictions" means that activities may not be carried out during "Daily peak activity" as defined in WAC 222-16-010: "One hour before official sunrise to two hours after official sunrise and one hour before official sunset to one hour after official sunset."

Table A-5. Projected changes in acres of marbled murrelet habitat within strategic locations emphasized in Washington State Department of Natural Resources' marbled murrelet long-term conservation strategy, 2018-2067.

Strategic Location	Acres of Murrelet Habitat		
	2018	2067 (projected)	Change
Southwest Washington	27,000	39,000	+ 12,000
OESF and DNR-managed HCP lands along the Strait of Juan de Fuca	76,000	75,000	0
North Puget Sound	62,000	74,000	+ 12,000
Total	165,000	188,000	+ 23,000

Table A-6. Marbled murrelet special habitat areas designated as part of Washington State Department of Natural Resources' marbled murrelet long-term conservation strategy.

Name	Category (Acres <sup>1</sup> )						Percent Habitat at End of HCP's 70-year Term <sup>2</sup>
	Occupied Site	Habitat	Future Habitat	Security Forest + Future Security Forest	Non-forested	Total	
1. Sumas	0	1300	400	400	*	2,100	80
2. Cornell Ck.	0	1100	100	*	*	1,200	99
3. Middle Fk.	300	900	600	700	*	2,500	72
4. Lk. Whatcom	*	100	500	100	0	700	81
5. Lk. Shannon E	0	400	0	400	*	800	47
6. Lk. Shannon W	0	300	0	200	*	400	62
7. Lk. Shannon S	400	400	0	300	100	1,100	66
8. Deer Ck.	300	500	200	100	*	1,100	86
9. Frailey W	0	500	0	*	0	500	100
10. Frailey E	100	200	*	*	*	300	84
11. Hazel	100	200	100	100	0	500	77
12. Pilchuck R.	100	1,000	400	400	*	1,900	79
13. Marsh	100	200	0	*	0	300	95
14. Clallam W	200	100	*	100	0	400	76
15. Clallam E	100	3,200	500	500	*	4,300	88
16. N Crescent W	300	1,100	900	100	0	2,400	94
17. N Crescent E	900	400	200	300	0	1,900	83
18. Reade Hill	1,500	1,400	0	1,300	*	4,200	68

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Name	Category (Acres <sup>1</sup> )						Percent Habitat at End of HCP's 70-year Term <sup>2</sup>
	Occupied Site	Habitat	Future Habitat	Security Forest + Future Security Forest	Non-forested	Total	
19. Hoh	0	700	0	200	0	900	76
20. Queets	3,600	800	100	2,900	*	7,400	61
21. Moclips	100	400	*	*	0	500	96
22. Browning	400	500	200	700	0	1,800	63
23. Radar Bear N	2,400	600	*	400	*	3,400	89
24. Radar Bear S	300	400	1,900	500	*	3,100	83
25. Salmon Ck. S	1,000	800	200	1,700	*	3,700	55
26. Salmon Ck. N	400	400	1000	800	0	2,500	67
27. Skamokawa N	400	300	0	800	*	1,500	48
28. Skamokawa S	1,000	2,200	700	1,700	0	5,700	70
29. Elochoman	200	400	600	200	0	1,400	88
Total <sup>3</sup>	14,100	20,600	8,500	15,000	300	58,600	74

<sup>1</sup> Category acreages are rounded to the nearest 100 acres. Cells marked with an asterisk (\*) contain less than 50 acres.

<sup>2</sup> (Occupied site acres + habitat acres + future habitat acres) divided by total acres.

<sup>3</sup> Totals may not match category sums due to rounding.