

Implementation Monitoring Report: Management of wetlands at least 0.25 acre in size and associated wetland management zones

Executive Summary

The Riparian Conservation Strategy for the Five Westside Planning Units describes measures to protect wetlands. The strategy states the primary conservation objective as maintaining wetland hydrologic functions by maintaining a plant canopy, maintaining natural water flow, and ensuring stand regeneration.

We identified the implementation of management activities in wetlands and wetland management zones (WMZs) as a priority for monitoring because:

- Harvest activities in WMZs are identified as a high priority for implementation monitoring in Riparian Ecosystem Conservation Strategy Effectiveness Monitoring Introduction (Washington State Department of Natural Resources 2001), and
- The wetland component of the riparian strategy had not been systematically monitored previously.

The goals and objectives of this project were to:

- Determine the objective criteria for monitoring the implementation of management activities in wetland management zones, and use these criteria to develop methods to assess operational compliance through field reviews,
- Identify aspects of the guidance for wetland management, if any, that are unclear, conflicting, or difficult to implement consistently, and discuss how this has affected implementation on the ground, and
- Determine if HCP guidance was implemented as written.

We reviewed timber sales that implemented management activities in WMZs in western Washington HCP planning units, excluding the Olympic Experimental State Forest. Specifically, we reviewed all timber harvest and road construction activities to occur within WMZs on timber sales with a fiscal year 2013 closure date in NaturE, a revenue tracking database. In all, we reviewed 16 forest management units (FMUs) around 15 wetlands/wetland complexes on 14 timber sales.

Parameters measured in the field, where applicable and appropriate, included WMZ width, retained live basal area, wetland area, area of road construction mitigation, and rutting area and depth (if it exceeded contract stipulations). Rutting was monitored as a proxy for monitoring

changes to surface and subsurface flow. Additionally, we reviewed two WMZs where management was guided by consultation letters. At these WMZs, we determined whether the planned actions were implemented as written.

We found that only WMZs were managed; management of forested wetlands never occurred. Our results showed that all reviewed management activities within WMZs were implemented in ways that met or exceeded the HCP requirements, with the exception of two cases. In the first case, the WMZ adjacent to a wetland ≥ 0.25 and ≤ 1 acres in size was less than 100 feet wide at one measurement station out of a total of 20. The minimum WMZ width required by the HCP for this size of wetland is 100 feet¹. This WMZ had an average width of 132 feet and an average live basal area 15 percent greater than the minimum that must be maintained. In the second case, an FMU applied a Riparian Forest Restoration Strategy (RFRS) prescription for hardwood conversion instead of wetland guidance. Application of the RFRS in this case was inappropriate because the harvest did not maintain a sufficient WMZ width and resulted in the aggregation of nearly all the retained trees near the wetland with no trees retained in a majority of the WMZ. Rutting did not exceed contract stipulations.

Guidance concerning the conservation objective of maintaining hydrologic function was limited. While no excessive rutting was observed in the course of monitoring, there remains a risk of failing to maintain natural water flow around wetlands when managing WMZs. Improved training of staff about forest soils and additional guidance about compaction, displacement, puddling, and other measurable forms of disturbance may reduce risk when harvesting WMZs and wetlands.

Introduction

Wetland protection afforded by the State Trust Lands Habitat Conservation Plan (Washington State Department of Natural Resources, 1997) is designed to maintain wetland hydrologic functions. These functions include the ability of wetlands to augment stream flow during low-flow periods, enhance water quality, attenuate peak storm water flows, and act as a pathway for groundwater recharge. These functions are supported by maintaining a live-plant canopy over and around the wetland, and by maintaining natural hydrologic patterns. The HCP stipulates required wetland management zone (WMZ) widths around wetlands of at least 0.25 acres in size, as well as sets a level of basal area that must be maintained and perpetuated through time in WMZs. The HCP also includes guidance concerning salvage operations and road construction in wetlands and WMZs. Additional guidance concerning wetland management comes from

¹ WMZs may be narrower in some cases due to road building or salvage harvesting, but these did not occur in this WMZ.

Managing Wetlands (Washington State Department of Natural Resources 2000). This manual includes what it calls a “first approximation” of practices to guide implementation of the HCP. Our review of wetland management zones concerned implementation of guidance in these two documents plus implementation of the rutting clause from harvest contracts, if any.

Monitoring Methods²

Guidance review

We reviewed available guidance for implementing management activities in wetlands and WMZs. We reviewed the guidance in order to 1) identify the criteria for assessing the implementation of wetland guidance (Table 1), 2) use this criteria to develop methods for monitoring the implementation of management activities in WMZs, and 3) identify areas of the guidance, if any, that are unclear, conflicting, or difficult to implement consistently.

Activity screening

We used DNR databases to identify wetlands ≥ 0.25 acres and WMZs associated with wetlands ≥ 0.25 acres and where harvest and/or road construction had occurred. We refined our query to identify only those units that were recorded as “closed” in fiscal year 2013 (July 1, 2012 – June 30, 2013) in NaturE, the DNR revenue tracking database. Our query found 14 forest management units (FMUs) around 13 wetlands and wetland complexes on 14 timber sales. Monitoring conducted field reviews of all these units. In addition, we found two FMUs adjacent to two wetlands where hardwood harvests following the Riparian Forest Restoration Strategy (RFRS; Washington State Department of Natural Resources 2006) were implemented. One of these harvests was a hardwood conversion while the other was an individual conifer release³. We included these in this assessment. In total, we reviewed 16 FMUs around 15 wetlands/wetland complexes on 14 timber sales.

Field data collection

We collected data, where applicable and appropriate, to assess basal area, WMZ width, ground disturbance, and/or mitigation for road construction in 14 WMZs. We measured basal area with variable radius plots taken at 100- or 200-foot intervals, depending on the length of the wetland edge. Given that there were no instances of harvest occurring within a forested wetland, all of our basal measurements were taken in WMZs. When a thinned WMZ was adjacent to a variable

² See supplemental materials for further detail regarding our methods

³ A hardwood conversion is a harvest activity in which most hardwood trees are removed from a stand to allow a conifer-dominated stand to develop toward the riparian desired future condition defined in the RFRS. An individual conifer release is a harvest activity in which hardwood trees competing with conifer trees are selectively removed to accelerate the establishment of a structurally diverse, conifer-dominated stand. See the RFRS for more information about these harvest activities. The HCP does not provide for hardwood conversion of WMZs at this time.

retention harvest (VRH), we measured WMZ widths at 50-foot intervals (WMZ width is defined as the shortest line distance between the wetland edge and the first harvested tree in the upland unit). We visually estimated the area of ground-based equipment tracks within 50 feet of non-forested wetlands. We also looked for rutting in excess of the level allowed in the contract for each sale. Rutting contract stipulations were reviewed as proxy for the HCP requirement to maintain natural water flow. Where roads were constructed in WMZs, we verified that mitigation occurred as stated in the timber sale documentation. We also noted what types of harvest prescription methods were used to implement harvest activities.

We reviewed the implementation of site-specific management plans that guided salvage operations in two WMZs. We monitored these plans in order to evaluate implementation of specific management commitments.

Data analysis

We used t-tests to determine the probability that the average WMZ width for each wetland equaled or exceeded the HCP requirements. Since multiple independent t-tests were used, we controlled for false discovery rate (see the supplemental materials for t-test hypotheses and an explanation of the false discovery rate). We pooled data across multiple FMUs when these units were associated with a single wetland.

Statistical analysis of the rate of implementation success was not necessary for this project because we reviewed all the WMZs in the population for fiscal year 2013.

Considerations

We identified three timber sales that exemplify some of the considerations that go into identifying areas to apply WMZ management and developing prescriptions. Two of these cases require resolving the difference between a WMZ and a riparian management zone (RMZ; management zones surrounding Type 1, 2, 3, and 4 streams). The other case involves prescription targets.

Table 1. Summary of HCP requirements for management in WMZs and variables assessed during field reviews.

Activity	Wetland size	Variable	HCP requirement
Upland variable retention harvest	≥ 0.25 and ≤ 1 acre	WMZ width	Minimum 100 feet wide
	> 1 acre	WMZ width	Average width is approximately equal to the 100-year site index of mature conifers in the adjoining stand or 100 feet, whichever is greater.
WMZ harvest	≥ 0.25	Live basal area	Maintain and perpetuate at least 120 square feet per acre
Road construction in WMZ	≥ 0.25	Mitigation acreage	On-site and in-kind equal acreage
Salvage	≥ 0.25	Location of operations	Allowed in areas that are not periodically flooded; harvest of live trees must be minimized to those necessary for access

Results

Guidance

We found there to be generally sufficient objective criteria available in the guidance to conduct implementation monitoring. However, guidance surrounding the conservation objective of maintaining hydrologic function could be improved. We successfully used the criteria in the HCP to develop methods for monitoring the implementation of management activities in wetlands (this report is the result; see methods section and supplemental for more information). We found that, in general, guidance is being implemented as written (see the following sections for further detail).

Field assessments

Field results show that all HCP requirements were met or exceeded on nearly every reviewed wetland (Table 2).

The average measured WMZ of the six wetlands > 1 acre in size and adjacent to upland variable retention harvests ranged from 95 to 138 percent of the minimum required width. No documentation was found for any WMZ that stated that a width other than the minimum required was applied. Variability in the width of two WMZs that averages less than 100 percent of the required width was such that the result was not statistically significant.

Two of three WMZs between wetlands ≥ 0.25 and ≤ 1 acre in size and adjacent to upland variable retention harvests met or exceed the minimum required width of 100 feet at all measurement stations. Adjacent to one wetland, the WMZ was shorter than the required 100 feet at one measurement station out of 20 total stations. This WMZ had an average width of 132 feet and an average live basal area of 138 square feet per acre. No documentation was found for any WMZ that stated that a width other than the minimum required was applied.

At one of the two wetlands managed under a consultation letter, we found all work was completed. At the other, we found that all projects had been completed except planting, which is planned to occur after a biomass sale in which slash piles will be removed.

Rutting

We found no instances where rutting exceeded the stipulations outlined in the contract, where available (Table 2). No documentation of operations suspended due to excessive rutting was found.

Table 2. Summary of rutting stipulations in the timber sale contracts for the units reviewed.

Summary of rutting stipulation	Number of contracts
No rutting limit	5
Rutting > 4 inches deep may not cover >10 % of a side skid trails	4
When rutting is > 4 inches deep the contract administrator may suspend operations and require mitigation	3
Rutting > 6 inches deep may not cover >10 % of a side skid trails	1

Prescriptions

Table 3 describes the different types of prescriptions DNR used while implementing management activities in WMZs.

Table 3. Summary of WMZ harvest prescriptions in the timber sale contracts for the units reviewed.

Type of prescription	Number of contracts
Mark to take	6
Salvage	2
Diameter range limits – with species preferences	2
Mark to leave	1
Diameter range limit – harvest all trees	1
Basal area target with characteristics of desired retained trees	1

Table 4. Results of field reviews of WMZs not including a WMZ salvage operation implemented following a site-specific management plan.

#	Planning unit	Wetland size	Wetland type	Upland harvest	# of WMZ width meas. /# of BA plots*	WMZ widths					BA plots		% area of machine use w/in 50 ft.
						Avg.	Min. required width (ft.)**	% of min width	# of meas. less than 100 ft.	Range (coefficient of variation)	Avg. BA	% of allowable minimum	
1	Columbia	≥ 0.25 and ≤ 1.0 acre	Forested	VRH	3/3	134	100	134%	0	110 - 149 (16%)	167	139%	NA
2	North Puget	≥ 0.25 and ≤ 1.0 acre	Forested	VRH	19/9	132	100	132%	1	76 - 165 (17%)	138	115%	NA
3	North Puget	≥ 0.25 and ≤ 1.0 acre	Non-forested	VDT	-/5	-	-	N/A	0	-	160	133%	5 - 10%
4	North Puget	≥ 0.25 and ≤ 1.0 acre	Forested	VRH	6/ measured all trees	116	100	116%	0	100 - 163 (20%)	125 (actual, not average)		NA
5	North Puget	≥ 0.25 and ≤ 1.0 acre	Forested and non-forested	VRH	8/4	110	100	110%	0	101 - 122 (7%)	195	163%	0%
6	South Coast	≥ 0.25 and ≤ 1.0 acre	Forested	VRH	4/3	139	100	139%	0	138 - 141 (1%)	147	122%	NA
7	South Coast	≥ 0.25 and ≤ 1.0 acre	Forested and non-forested complex	VRH	17/16	138	100	138%	0	112 - 169 (12%)	151	126%	0%
8	Columbia	> 1 acre	Forested and non-forested	VDT	-/16	-	-	N/A	N/A	-	233	194%	< 5%
9	Columbia	> 1 acre	Riparian/upland managed under wetland procedure by biologist's direction	VRH	-/5	-	-	N/A	N/A	-	200	167%	NA
10	North Puget	> 1 acre	Forested	VRH	9/5	128	135	95%	N/A	111 - 146 (9%)	156	130%	NA
11	North Puget	> 1 acre	Forested	VRH	8/4	134	135	99%	N/A	115 - 175 (16%)	205	171%	NA
12	South Coast	> 1 acre	Forested	VRH	23/13	240	189	127%	N/A	176 - 313 (13%)	142	118%	NA
13	South Puget	> 1 acre	Forested	VRH	33/12	220	160	138%	N/A	117 - 347 (20%)	133	111%	
14	Straits	> 1 acre	Forested and non-forested	VRH	9/5	186	156	119%	N/A	127 - 259 (22%)	252	210%	NA

* measurement /number of basal area plots

** horizontal distance

Considerations

Resolving RMZ and WMZs

The HCP distinguishes between wetland and riparian areas. The RFRS provides guidance for the management of RMZs and “riparian associated wetlands (periodically inundated areas of Type 1, 2, and 3 Waters)” while other wetlands are “managed according to existing HCP strategies” (Washington State Department of Natural Resources 2006, pg. 36). The term “riparian associated wetlands” lacks clarity, which can result in confusion as to when the RFRS applies. We assumed that the RFRS was not applicable to wetlands we reviewed.

Nonetheless, conifer thinning prescriptions from the RFRS are applied to WMZs at times. While this is acceptable, land managers are usually aware that by applying the RFRS they are applying the more restrictive guidance in terms of required retention of pre-existing forest structure and creation of new structures (downed wood and snags). This is the case when applying the RFRS prescriptions for conifer-dominated stands; the relative density target in RFRS prescriptions meets the wetland basal area target for nearly all stands where commercial harvest activities may take place (it is possible for a commercial thinning in a stand with a low quadratic mean diameter to not meet the RFRS specifications). The RFRS prescriptions for management activities that can occur in hardwood-dominated harvest units are not equally restrictive in terms of required basal area retention as compared to the wetland management guidance. Application of the individual conifer release prescription would require retaining a basal area of 120 square feet per acre in addition to meeting the RFRS requirements. Hardwood conversion, in most cases, cannot be effectively applied to WMZs due to the low residual basal area and poor distribution of retained trees associated with the prescription process⁴.

We found two units where the distinction between wetland and riparian areas was ambiguous. In the first case, a DNR biologist mapped Type 3 and Type 5 channels in a meadow adjacent to the timber sale. The biologist also found ditches in the meadow, but was concerned that some ditches were not found due to thick herbaceous cover. The biologist consulted with the Washington Department of Fish and Wildlife (WDFW) regarding fish use in the ditches. WDFW noted that fish may use the ditches in high-water periods. The biologist recommended that a 100-year site index buffer, meaning WMZ, be applied to the meadow, and described the buffer as a “RMZ/WMZ buffer.” However, as RMZs and WMZs have different management requirements,

⁴ By defining a WMZ width, the HCP implies that retained trees should be present throughout the WMZ. While it is acceptable to have areas of low or zero retained basal area and other areas with basal areas well above 120 square feet per acre, intentionally aggregating nearly all the basal area near the wetland edge does not satisfy the requirement of a WMZ of a particular size.

the forester was left to determine the applicable prescriptions. Ultimately, a 2-acre area was identified as a WMZ and thinned down to 200 square feet per acre of basal area.

In the second case, the RFRS prescription for hardwood conversion was applied to an FMU in a WMZ protecting a forested wetland greater than 1 acre in size. As described in the timber sale’s Aquatic Resources Addendum to the Forest Practices Application, the rationale for this was, “the agency’s riparian forest restoration strategy is being applied to these WMZ buffers because they overlap with the Type 3 RMZs.” As a result, most of the trees in the FMU were removed and the unit was subsequently planted with conifer (Figs. 1 and 2). Based on the map provided as part of the timber sale packet, at least part of the FMU was not in the Type 3 RMZ. Under the interpretation that this wetland is a “riparian associated wetland” this activity is acceptable. If the wetland is not a “riparian associated wetland” this activity is unacceptable. Without more clearly defining what constitutes a “riparian associated wetland,” this harvest cannot be evaluated objectively.

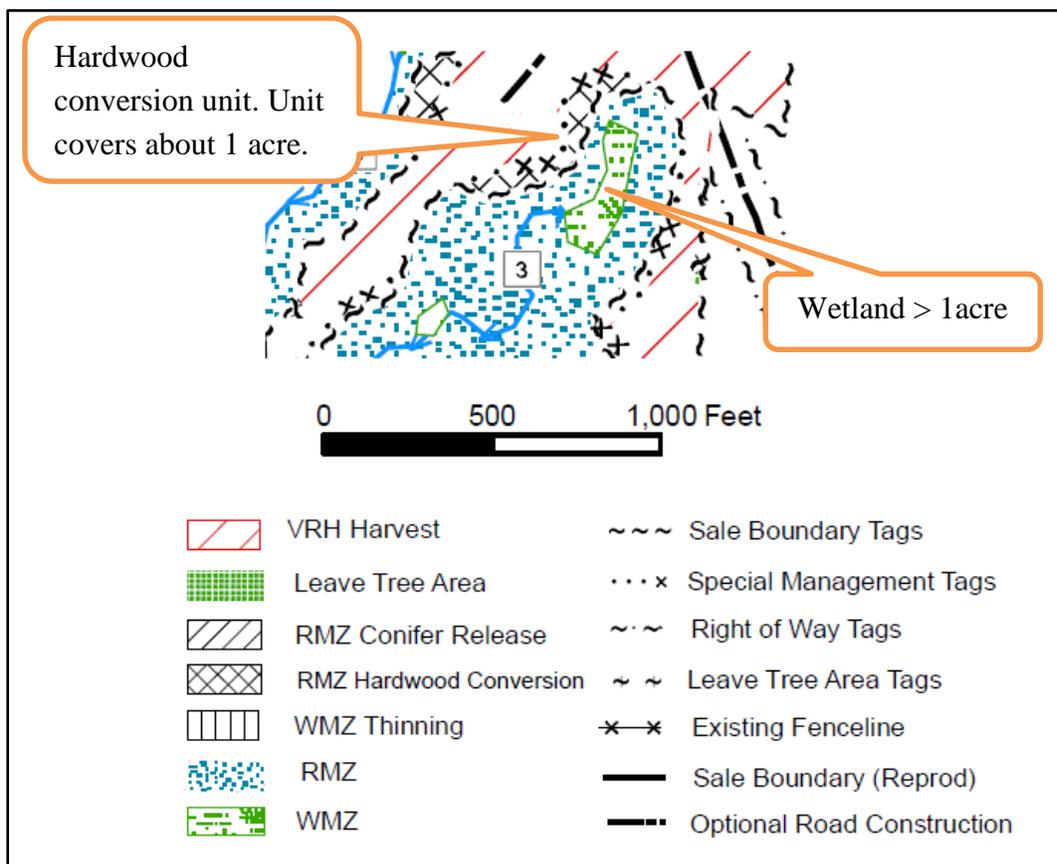


Figure 1. Portion of the timber sale map for the unit where a hardwood conversion activity was adjacent to a wetland.

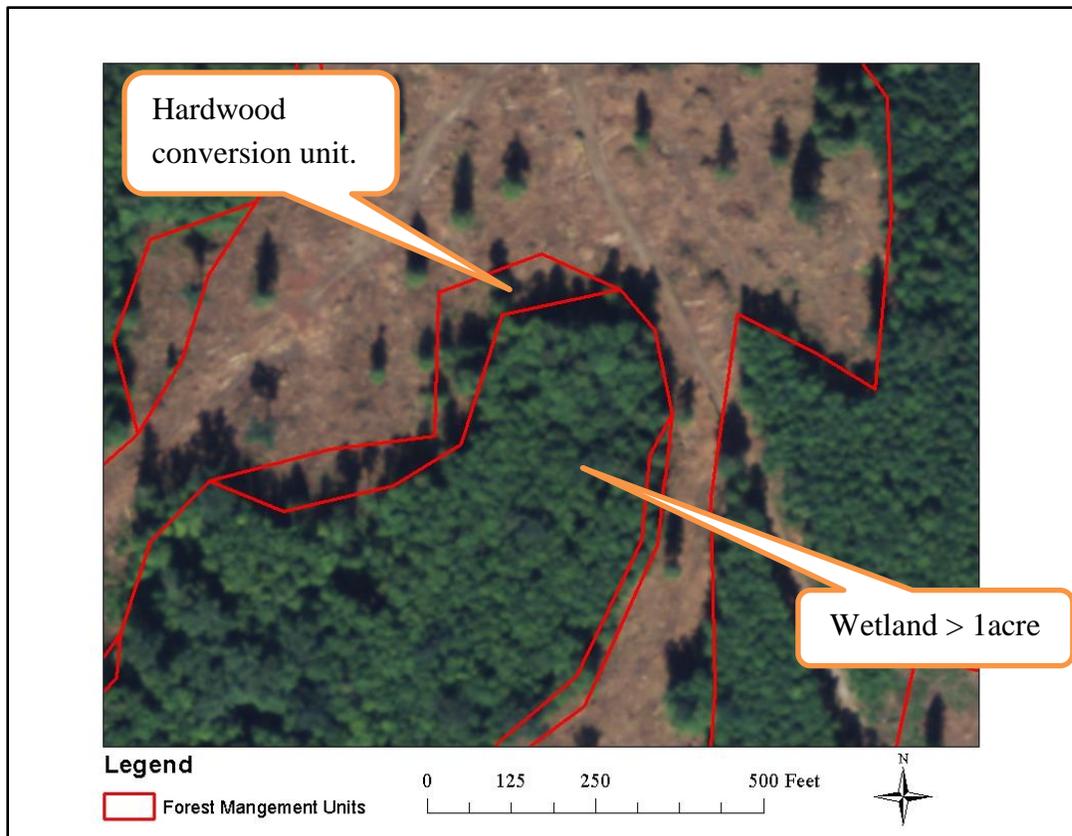


Figure 2. Post-harvest aerial image of the hardwood conversion unit adjacent to a wetland.

Windthrow in WMZs and the need to “perpetuate” 120 square feet of basal area per acre

The HCP requires that a minimum of 120 square feet per acre of live tree basal area be maintained indefinitely following management activities. One WMZ exemplified the need to factor in post-harvest windthrow when developing WMZ thinning prescriptions (Wetland 4 in Table 4). The residual basal area target for this FMU, as stated in DNR’s computerized Planning & Tracking system, was 150 square feet per acre. Immediately after harvest the basal area was 147 square feet per acre. Post-harvest windthrow had since reduced the live basal area to 125 square feet per acre by July 2013 (there was approximately 14 months between the conclusion of harvest and the time we reviewed the site). By prescribing the retention of 150 square feet of basal area per acre, the forester was able to maintain 120 square feet of basal area per acre in the WMZ, even after windthrow occurred⁵ (Table 5). The practice of developing prescriptions that result in a windfirm stand is necessary to meet the HCP requirement that a wind-firm stand be perpetuated through time.

⁵ However, future windthrow may result in the basal area falling below the 120 square feet per acre threshold.

Table 5. Basal area of Wetland 4 immediately post-harvest and in July 2013.

	Immediate post-harvest BA/acre¹	July 2013 standing BA/acre	% windthrow since harvest
Total BA	147	125	15%
western hemlock	123	104	15%
fir	19	16	18%
red cedar	0	0	0%
cottonwood	5	5	0%

¹ includes current standing live BA/acre plus BA from post-harvest windthrow

Recommendations

Foresters are provided little guidance as to how to implement the conservation objective of maintaining hydrologic function. This objective includes the requirement of “maintaining natural water flow (e.g., no channelization of surface or subsurface water flow).” We believe that foresters identify areas that are susceptible to water channelization and avoid harvest activities in them. Where harvest does take place, direction is written into contracts and provided by contract administrators. In the sales we reviewed, rutting was covered only in one contract clause (H-017). Other ground disturbances that could impact natural water flow were not included in the contracts we reviewed. We did not observe any instances of severe rutting during the 2013 field season. Nonetheless, there remains a risk of failing to maintain natural water flow around wetlands when managing WMZs.

Training foresters to better understand forest soils and providing guidance to better manage soils in WMZs would reduce this risk. Guidance could consider minimum standards for compaction, displacement, puddling and/or other measurable forms of disturbance. Standards could be variable depending on site conditions including topography and susceptibility of the soil to disturbance, among others.

Future wetland monitoring

We started a pre-sale review program of WMZ harvest activities in August 2013. As part of this effort, field visits will be made to one to three wetlands per region during the region browser review period, the pre-sale phase where timber sale documentation is reviewed by region staff. Data collection in these WMZs will follow the same methods as post-sale monitoring but with minor changes because a harvest has not occurred. Some of the WMZs will be re-visited

following harvest to evaluate the aspects of the wetlands guidance that cannot be evaluated pre-harvest, such as rutting and post-harvest basal area.

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