

**CITY OF MOSES LAKE
GRANT NO. 1300124**

CUMULATIVE IMPACTS ANALYSIS
of City of Moses Lake's Shoreline Master Program

Prepared for:



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This report was funded in
part through a grant from
the Washington
Department of Ecology.

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The Watershed Company Reference
Number: 130419

October 15, 2013



Printed on 30% recycled paper.

Cite this document as:

The Watershed Company. 2013. Cumulative Impacts Analysis for the City of Moses Lake's Shoreline Master Program. Prepared for the City of Moses Lake, WA. October 15, 2013.

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CUMULATIVE IMPACTS ANALYSIS

CITY OF MOSES LAKE'S SHORELINE MASTER PROGRAM

1 INTRODUCTION

This Cumulative Impacts Analysis (CIA) assesses the proposed City of Moses Lake Shoreline Master Program (SMP) policies and regulations to assess if future development approved under the proposed SMP could achieve no net loss of ecological function. The baseline for this analysis is the current shoreline conditions documented in the *Shoreline Inventory and Characterization* (Geo-Ecology Research Group 2005). This CIA can help the City make adjustments where appropriate in its proposed SMP if there are potential gaps between maintaining and degrading ecological functions.

The State Master Program Approval/Amendment Procedures and Master Program Guidelines (Guidelines; WAC 173-26) require local shoreline master programs to regulate new development to "achieve no net loss of ecological function." The Guidelines (WAC 173-26-186(8)(d)) state that, "To ensure no net loss of ecological functions and protection of other shoreline functions and/or uses, master programs shall contain policies, programs, and regulations that address adverse cumulative impacts and fairly allocate the burden of addressing cumulative impacts."

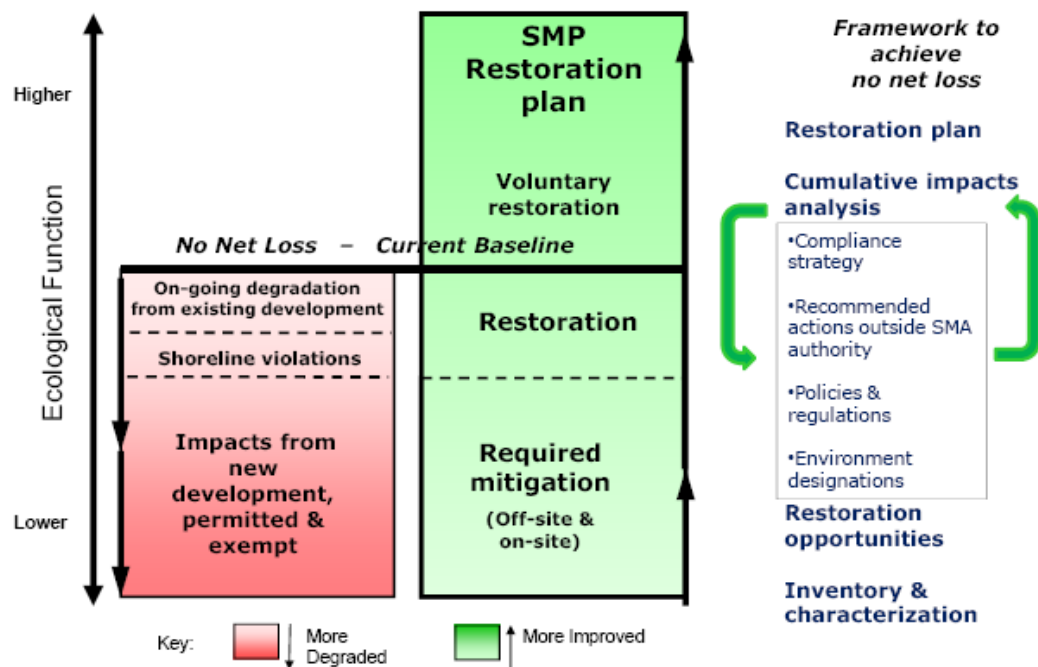
The Guidelines further elaborate on the concept of net loss as follows:

"When based on the inventory and analysis requirements and completed consistent with the specific provisions of these guidelines, the master program should ensure that development will be protective of ecological functions necessary to sustain existing shoreline natural resources and meet the standard. The concept of "net" as used herein, recognizes that any development has potential or actual, short-term or long-term impacts and that through application of appropriate development standards and employment of mitigation measures in accordance with the mitigation sequence, those impacts will be addressed in a manner necessary to assure that the end result will not diminish the shoreline resources and values as they currently exist. Where uses or development that impact ecological functions are necessary to achieve other objectives of RCW 90.58.020, master program provisions shall, to the greatest extent feasible,

protect existing ecological functions and avoid new impacts to habitat and ecological functions before implementing other measures designed to achieve no net loss of ecological functions.” [WAC 173-26-201(2)(c)]

In short, updated SMPs shall contain goals, policies and regulations that prevent degradation of ecological functions relative to the existing conditions as documented in that jurisdiction’s inventory and characterization report. For those projects that result in degradation of ecological functions, the required mitigation must return the resultant ecological function back to the baseline. This is illustrated in the figure below. The jurisdiction must be able to demonstrate that it has accomplished that goal through an analysis of cumulative impacts that might occur through implementation of the updated SMP. Evaluation of such cumulative impacts should consider:

- (i) current circumstances affecting the shoreline and relevant natural processes [Chapter 3 below and Shoreline Inventory and Characterization report];
- (ii) reasonably foreseeable future development and use of the shoreline [Section 3.1 below and Shoreline Inventory and Characterization report]; and
- (iii) beneficial effects of any established regulatory programs under other local, state, and federal laws.” [Section 5.6 below]



Source: Department of Ecology

The CIA assesses the policies and regulations in the draft SMP to determine whether no net loss of ecological function will be achieved as new development occurs. Despite SMP regulations that require avoidance, minimization, and mitigation for any unavoidable losses of function, some uses and developments cannot be fully mitigated. This could occur when mitigation is out-of-kind, meaning that it offsets a loss of function through an approach that is not directly comparable to the proposed impact. A loss of functions may also occur when impacts are sufficiently minor on an individual level, such that mitigation is not required, but are cumulatively significant. Unregulated activities (such as operation and maintenance of existing legal developments) may also degrade baseline conditions. Additionally, the City of Moses Lake's SMP applies only to activities in shoreline jurisdiction, yet activities upland of shoreline jurisdiction or upstream in the watershed may have offsite impacts on shoreline functions.

Together, these different project impacts may result in cumulative, incremental, and unavoidable degradation of the overall baseline condition unless additional restoration of ecological function is undertaken. Accordingly, the Shoreline Restoration Plan is intended to be a source of ecological improvements implemented voluntarily that may help bridge a gap between minor cumulative, incremental, and unavoidable damages and no net loss of shoreline ecological functions.

2 METHODOLOGY

This CIA was prepared consistent with direction provided in the Guidelines as described above. Existing conditions were first evaluated using the information, both textual and graphic, developed and presented in the *Shoreline Inventory and Characterization* (Geo-Ecology Research Group 2005). Future development along the City of Moses Lake's shoreline was approximated based on an updated assessment of vacant lands, which provide an opportunity for future development, and input from City planners on recent development trends and likely future development.

The effects of likely development were then evaluated in the context of SMP provisions, as well as other related plans, programs and regulations. For the purpose of evaluating impacts, areas with a likelihood of high densities of new development or redevelopment were evaluated in greatest detail. Cumulative impacts were analyzed quantitatively where possible. A qualitative approach was used where specific details regarding redevelopment likelihood or potential were not available at a level that could be assessed quantitatively or the analysis would be unnecessarily complex to reach a conclusion that could be derived more simply.

In order to compare the proposed residential buffer standards to existing conditions on the lakeshore, a random subsample of developed waterfront parcels was selected using a random number generator. For each reach and environment designation in the Shoreline Residential, Shoreline Residential – Resource Area, and Shoreline Residential - Special Resource Area designations, a minimum of 10 waterfront parcels or 10% of the total parcels were selected, whichever was greater. Using aerial imagery, the distance from the Ordinary High Water Mark (OHWM) to the nearest primary structure was measured, as well as the width of undisturbed vegetation from the OHWM. Undisturbed vegetation was considered to be riparian vegetation associated with the lake shoreline, wetland vegetation, or native shrub steppe vegetation. Maintained lawns and landscaping were not included in the measurement of undisturbed vegetation. The resulting measures were used for a comparison of existing conditions to the proposed residential buffer standards.

3 SUMMARY OF EXISTING CONDITIONS

The following summary of existing conditions (Table 3-1) is based on the Shoreline Inventory and Characterization (Geo-Ecology Research Group 2005), supplemented by more current knowledge of City staff and The Watershed Company. More detailed information on specific shoreline areas is provided in the Shoreline Inventory and Characterization.

The City's shoreline is primarily used for a range of residential and commercial uses. Shoreline functions range from highly impacted to relatively intact.

Moses Lake is a shallow, warm-water lake that was formed by ice age glaciers and floods. Surface waters from Crab Creek, the Rocky Coulee Wasteway, and Rocky Ford Creek contribute surface flow to the lake. The Rocky Coulee Wasteway enters Crab Creek approximately 1.5 miles above the creek mouth at Moses Lake, and the Wasteway contributes 85% of the total inflow to the lake. Surface discharge from the lake is controlled by two dams operated for irrigation management as part of the Columbia Basin Project. The mean depth of the lake is 18.5 feet, but the lake elevation fluctuates by approximately 5 feet on an annual basis as a result of dam operations. The lowest water levels occur in November, and the highest levels occur in April. Grette and Associates noted that the ongoing sedimentation of the lake has reduced the lake depth, particularly in the vicinity of Parker Horn and the Neppel Crossing, and that high sedimentation rates in the lake have the potential to reduce habitat diversity (2009).

Table 3-1. Existing conditions in the City of Moses Lake Shoreline

Reach	Environmental Character	Cultural Modifications	Proposed Shoreline Environment Designations
1	<ul style="list-style-type: none"> • Narrow band of emergent vegetation • No wetlands • 76% steep slopes • 65% overhanging vegetation • Steep nearshore gradient • 1-2.8 km fetch 	<ul style="list-style-type: none"> • 58% undeveloped • 30% Single Family Residential (SFR) • 12% Mining • 4% Impervious • Average setback: 112 ft • 3% shoreline armoring • 29 docks 	<ul style="list-style-type: none"> • Shoreline Residential – Resource Area • High Intensity (Gravel mining)
2	<ul style="list-style-type: none"> • 45% overhanging vegetation • Extensive emergent vegetation • 12% wetlands • Gradual nearshore gradient • 0.8-2.4 km fetch • Low soil erosion potential 	<ul style="list-style-type: none"> • 48% undeveloped • 51% SFR • 11% Impervious • Average setback: 110 ft • 5% shoreline armoring • 24 docks 	<ul style="list-style-type: none"> • Shoreline Residential - Resource Area • Water-oriented Parks & Public Facilities
3	<ul style="list-style-type: none"> • Narrow band of emergent vegetation • 1% wetlands • 20% steep slopes • 52% overhanging vegetation • Steep nearshore gradient • 0.8-1.7 km fetch • Low soil erosion potential 	<ul style="list-style-type: none"> • 29% undeveloped • 65% SFR • 16% Impervious • Average setback: 89 ft • 21% shoreline armoring • 40 docks 	<ul style="list-style-type: none"> • Shoreline Residential – Resource Area • Water-Oriented Parks & Public Facilities
4	<ul style="list-style-type: none"> • Extensive emergent vegetation • 16% wetlands • 5% steep slopes • 8% overhanging vegetation • Gradual nearshore gradient • 0.2-2.0 km fetch • Low soil erosion potential 	<ul style="list-style-type: none"> • 47% undeveloped • 50% SFR • 8% Impervious • Average setback: 94 ft • 11% shoreline armoring • 38 docks 	<ul style="list-style-type: none"> • Shoreline Residential – Resource Area • Shoreline Residential - Special Resource Area

Reach	Environmental Character	Cultural Modifications	Proposed Shoreline Environment Designations
5	<ul style="list-style-type: none"> • Limited emergent vegetation • 28% wetlands • 15% steep slopes • 4% overhanging vegetation • Gradual nearshore gradient • Low fetch • Low soil erosion potential 	<ul style="list-style-type: none"> • 44% undeveloped • 48% SFR • 6% Impervious • Average setback: 82 ft • 3% shoreline armoring • No docks 	<ul style="list-style-type: none"> • Shoreline Residential – Resource Area • Shoreline Residential - Special Resource Area
6	<ul style="list-style-type: none"> • Limited emergent vegetation • 28% wetlands • 13% steep slopes • 7% overhanging vegetation • Steep nearshore gradient • 0.4-1.8 km fetch • Low soil erosion potential 	<ul style="list-style-type: none"> • 43% parks/open lands • 39% SFR • 11% agricultural • 6% Impervious • Average setback: 112 ft • 5% shoreline armoring • 21 docks 	<ul style="list-style-type: none"> • Shoreline Residential – Resource Area • Water-Oriented Parks & Public Facilities
7	<ul style="list-style-type: none"> • Limited emergent vegetation • 0% wetlands • 66% steep slopes • 5% overhanging vegetation • Steep nearshore gradient • 0.4- 1.3 km fetch • Moderate soil erosion potential 	<ul style="list-style-type: none"> • 100% SFR • 20% Impervious • Average setback: 112 ft • 7% shoreline armoring • 18 docks 	Shoreline Residential – Resource Area
8	<ul style="list-style-type: none"> • Limited emergent vegetation • 5% wetlands • 4% steep slopes • 33% overhanging vegetation • Gradual nearshore gradient • 0.3- 0.8 km fetch • Moderate soil erosion potential 	<ul style="list-style-type: none"> • 100% SFR • 30% Impervious • Average setback: 89 ft • 62% shoreline armoring • 41 docks 	<ul style="list-style-type: none"> • Shoreline Residential • Shoreline Residential – Resource Area

Reach	Environmental Character	Cultural Modifications	Proposed Shoreline Environment Designations
9	<ul style="list-style-type: none"> • 8% wetlands • 13% steep slopes • 6% floodway • 0% overhanging vegetation • Steep nearshore gradient • 0.2- 0.8 km fetch • Low soil erosion potential 	<ul style="list-style-type: none"> • 49% Commercial • 25% Transportation/Utilities • 21% Single Family Residential • 6% Undeveloped • 44% Impervious • Average setback: 103 ft • 2% shoreline armoring • 1 dock 	<ul style="list-style-type: none"> • High Intensity – Resource Area • High Intensity
10	<ul style="list-style-type: none"> • 38% wetlands • 53% Floodway • 0% overhanging vegetation • 0.2-0.3 km fetch • Low soil erosion potential 	<ul style="list-style-type: none"> • 71% Undeveloped • 30% Commercial • 25% Impervious • No shoreline armoring • No docks 	Shoreline Residential - Special Resource Area
11	<ul style="list-style-type: none"> • 41% wetlands • 14% Floodway • 0% overhanging vegetation • 0.03-0.3 km fetch • Moderate erosion potential 	<ul style="list-style-type: none"> • 91% Commercial • 6% Undeveloped • No shoreline armoring • No docks 	Natural
12	<ul style="list-style-type: none"> • Extensive emergent vegetation • 22% wetlands • 0% overhanging vegetation • Gradual nearshore gradient • 0.2- 0.3 km fetch • Low soil erosion potential 	<ul style="list-style-type: none"> • 25% Transportation/Utilities • 22% Commercial • 21% SFR • 19% Undeveloped • 3% Classified parks/Open land • 21% Impervious • Average setback: 165 ft • No shoreline armoring • 1 dock 	<ul style="list-style-type: none"> • Natural • High Intensity – Resource Area • High Intensity

Reach	Environmental Character	Cultural Modifications	Proposed Shoreline Environment Designations
13	<ul style="list-style-type: none"> • 0.3% wetlands • 8% steep slopes • 0% overhanging vegetation • Steep nearshore gradient • 0.3- 0.9 km fetch • Low soil erosion potential 	<ul style="list-style-type: none"> • 38%Commercial • 36% Parks/Open Land • 18% Transportation/Utilities • 33% Impervious • Average setback: 134 ft • No shoreline armoring • 1 dock 	<ul style="list-style-type: none"> • Water-oriented Parks & Public Facilities • High Intensity
14	<ul style="list-style-type: none"> • Extensive emergent vegetation • 53% wetlands • 0% overhanging vegetation • 0.07- 2.3 km fetch • Low soil erosion potential 	<ul style="list-style-type: none"> • 76% Undeveloped • 19% SFR • 5% Impervious • Average setback: 120 ft • No shoreline armoring • No docks 	<ul style="list-style-type: none"> • Natural • Shoreline Residential – Resource Area
15	<ul style="list-style-type: none"> • Limited emergent vegetation • No wetlands • 33% steep slopes • 10% overhanging vegetation • Steep nearshore gradient • 0.3-3 km fetch • Low to moderate soil erosion potential 	<ul style="list-style-type: none"> • 43% SFR • 18.3% Lodging • 11% Multi Family Residential • 8% Undeveloped • 25% Impervious • Average setback: 101 ft • 42% shoreline armoring • 29 docks 	<ul style="list-style-type: none"> • Shoreline Residential • High Intensity
16	<ul style="list-style-type: none"> • Limited emergent vegetation • 2% overhanging vegetation • No wetlands • Steep nearshore gradient • 0.1-1.3 km fetch • Moderate soil erosion potential 	<ul style="list-style-type: none"> • 82% SFR • 4% Undeveloped • 25% Impervious • Average setback: 69 ft • 29% shoreline armoring • 46 docks 	<ul style="list-style-type: none"> • Shoreline Residential – Resource Area • High Intensity
17	<ul style="list-style-type: none"> • Extensive emergent vegetation • No wetlands • No overhanging vegetation • Steep nearshore gradient • 0.9-1.9 km fetch • Low soil erosion potential 	<ul style="list-style-type: none"> • 52% Recreation • 29% Agricultural • 16% Undeveloped • 0.05% Impervious • 0.7% shoreline armoring • 1 dock 	<ul style="list-style-type: none"> • Water-oriented Parks & Public Facilities • Shoreline Residential – Resource Area

Reach	Environmental Character	Cultural Modifications	Proposed Shoreline Environment Designations
18	<ul style="list-style-type: none"> • Limited emergent vegetation • No wetlands • No overhanging vegetation • Steep nearshore gradient • 1-1.5 km fetch • Low soil erosion potential 	<ul style="list-style-type: none"> • 49% SFR • 25% Transportation/Utilities • 13% Impervious • 10% Undeveloped • Average setback: 81 ft • 34% shoreline armoring • 9 docks 	<ul style="list-style-type: none"> • Shoreline Residential – Resource Area • High Intensity
19	<ul style="list-style-type: none"> • Extensive emergent vegetation • 7% wetlands • No overhanging vegetation • Moderate nearshore gradient • 0.2-0.8 km fetch • Low soil erosion potential 	<ul style="list-style-type: none"> • 80% SFR • 3% Undeveloped • 24% Impervious • Average setback: 78 ft • 43% shoreline armoring • 32 docks 	<ul style="list-style-type: none"> • Shoreline Residential • Shoreline Residential – Resource Area
20	<ul style="list-style-type: none"> • Extremely limited emergent vegetation • No wetlands • 6% steep slopes • No overhanging vegetation • Steep nearshore gradient • 0.4-0.7 km fetch • Low soil erosion potential 	<ul style="list-style-type: none"> • 28% SFR • 21% Parks/Open Land • 15% Undeveloped • 13% Residential/Multi Family • 10% Governmental services • 15% Impervious • Average setback: 84 ft • No shoreline armoring • 11 docks 	<ul style="list-style-type: none"> • High Intensity • Shoreline Residential – Resource Area • Water-oriented Parks & Public Facilities
21	<ul style="list-style-type: none"> • 78% wetlands • No overhanging vegetation • Moderate nearshore gradient • 0.4-2.6 km fetch • Low soil erosion potential 	<ul style="list-style-type: none"> • 46% SFR • 17% Parks/Open Land • 23% Undeveloped • 13% Impervious • Average setback: 113 ft • No shoreline armoring • 5 docks 	<ul style="list-style-type: none"> • Natural • Shoreline Residential – Resource Area • Shoreline Residential - Special Resource Area

Reach	Environmental Character	Cultural Modifications	Proposed Shoreline Environment Designations
22	<ul style="list-style-type: none"> • Extensive emergent vegetation • No overhanging vegetation • 46% wetlands • Steep shoreline gradient • 0.3-1.4 km fetch • Low soil erosion potential 	<ul style="list-style-type: none"> • 64% Undeveloped • 21% Transportation/Utilities • 11% Parks/Open land • 0.2% Impervious • Average setback: 61 ft • No shoreline armoring • 2 docks 	<ul style="list-style-type: none"> • High Intensity • Water-oriented Parks & Public Facilities • Natural
23	<ul style="list-style-type: none"> • Extensive emergent vegetation • 36% wetlands • 33% steep slopes • 14% overhanging vegetation • Steep shoreline gradient • 0.3-1.1 km fetch • 48% very high and 38% low soil erosion potential 	<ul style="list-style-type: none"> • 100% SFR • 14% Impervious • Average setback: 136 ft • No shoreline armoring • 20 docks 	<ul style="list-style-type: none"> • Shoreline Residential – Resource Area • Shoreline Residential - Special Resource Area • Natural
24	<ul style="list-style-type: none"> • Extensive emergent vegetation • 73% Wetlands • 3% steep slopes • 5% overhanging vegetation • Steep shoreline gradient • 0.9-1.6 km fetch • Low soil erosion potential 	<ul style="list-style-type: none"> • 48% SFR • 12% Impervious • 7.6% Agriculture • 33% Undeveloped • Average setback: 121 ft • No shoreline armoring • 7 docks 	<ul style="list-style-type: none"> • Water-oriented Parks & Public Facilities • Shoreline Residential - Special Resource Area
25	<ul style="list-style-type: none"> • Sand dunes • Limited emergent vegetation • 15% wetlands • 18% steep slopes • No overhanging vegetation • Moderate nearshore gradient • 0.6-2.7 km fetch • Low soil erosion potential 	<ul style="list-style-type: none"> • 100% Undeveloped • 0% Impervious • Average setback: NA • No armoring • No docks 	Shoreline Residential – Dunes Area

Reach	Environmental Character	Cultural Modifications	Proposed Shoreline Environment Designations
26	<ul style="list-style-type: none"> • Limited emergent vegetation • 7% wetlands • 3% steep slopes • 34% overhanging vegetation • Moderate nearshore gradient • 0.13 km fetch • Low soil erosion potential 	<ul style="list-style-type: none"> • 66% SFR • 20% Undeveloped • 16% Impervious • Average setback: 57 ft • 22% shoreline armoring • 83 docks 	<ul style="list-style-type: none"> • Shoreline Residential – Resource Area • High Intensity – Resource Area • High Intensity
27	<ul style="list-style-type: none"> • Extensive emergent vegetation • 2% wetlands • 20% steep slopes • 34% overhanging vegetation • Moderate nearshore gradient • 0.8-1.7 km fetch • Low soil erosion potential 	<ul style="list-style-type: none"> • 61% Undeveloped • 39% Parks/Open Land • 12% SFR • 0% Impervious¹ • Average setback: 110 ft • No shoreline armoring • 1 dock 	Water-oriented Parks & Public Facilities
28	<ul style="list-style-type: none"> • Limited emergent vegetation • 7% Wetlands • 27% steep slopes • 46% overhanging vegetation • Steep shoreline gradient • 1.1-1.8 km fetch • Low soil erosion potential 	<ul style="list-style-type: none"> • 63% SFR • 19% Multi Family Residential • 7% Undeveloped • 3% Parks/Open Land • 28% Impervious • Average setback: 58 ft • 61% shoreline armoring • 25 docks 	Shoreline Residential
29	<ul style="list-style-type: none"> • Extensive emergent vegetation • No wetlands • 43% steep slopes • 63% overhanging vegetation • Steep shoreline gradient • 0.9-4 km fetch • Low soil erosion potential 	<ul style="list-style-type: none"> • 54% SFR • 20% Agriculture • 8% Mining • 7% Undeveloped • 12% Impervious • Average setback: 72 ft • 18% shoreline armoring • 49 docks 	Shoreline Residential – Resource Area

Reach	Environmental Character	Cultural Modifications	Proposed Shoreline Environment Designations
30	<ul style="list-style-type: none"> • Extensive emergent vegetation • 8% Wetlands • 12% steep slopes • 57% overhanging vegetation • Steep shoreline gradient • 1.1-2.7 km fetch • Low soil erosion potential 	<ul style="list-style-type: none"> • 48% Undeveloped • 18% SFR • 18% recreation • 17% Commercial • 2% Impervious • Average setback: 125 ft • 9% shoreline armoring • 4 docks 	Shoreline Residential – Resource Area
31 ²	Approximately 10% wetlands	<ul style="list-style-type: none"> • Approximately 85% undeveloped • Approximately 15% agriculture • No shoreline armoring • No docks 	Shoreline Residential – Resource Area
32 ²	No wetlands	<ul style="list-style-type: none"> • 100% undeveloped • No shoreline armoring • No docks 	Shoreline Residential – Resource Area

¹ Data from shoreline analysis report is not consistent with actual conditions.

² Reaches 31 and 32 were not included in the City's *Shoreline Inventory and Characterization*. Data were generated by The Watershed Company

Groundwater enters Moses Lake primarily through the unconfined, high permeability flood deposits. These soils are typically resistant to erosion, and runoff is minimal. The high permeability rates limit subsurface filtration of nutrients and contaminants (Pitz 2003). Moses Lake is on the State's 303(d) list of impaired waterbodies as a result of high phosphorus levels. Maintaining existing functions is closely tied to maintaining water quality in the lake.

4 FUTURE DEVELOPMENT

4.1 Residential Growth

Residential use and associated population are expected to grow along the shoreline of the City and its unincorporated Urban Growth Area (UGA). The discussion below describes potential residential shoreline uses.

The City's shoreline is projected to see the majority of its population growth and additional single-family home development in areas designated Shoreline Residential – Resource Area. This designation makes up 54 percent of the total shoreline area, and 28 percent of the parcels are presently vacant (according to information provided in June 2013 by City planning staff). Although Shoreline Residential - Special Resource Area comprises a smaller total area, at 12 percent of total shoreline jurisdiction, this environment designation includes significant potential for future residential development since 62 percent of parcels within this designation are presently vacant. Relatively less development is anticipated in the Shoreline Residential designation, which comprises 7 percent of shoreline jurisdiction, and where the majority of existing parcels are already developed (9% vacant parcels). In the Shoreline Residential designation, redevelopment of existing developed parcels is more commonly anticipated.

Approximately 57 percent of the developed parcels within shoreline jurisdiction have a dock, and eight percent of the vacant shoreline parcels have a dock (Geo-Ecology Research Group 2005). Dock construction for existing and newly developed parcels is anticipated.

4.2 Commercial and Municipal Office Development

Commercial and municipal office development will be focused in the High Intensity and High Intensity - Resource Area designations. The majority of lands in the High Intensity environment are presently in use for transportation infrastructure, and these uses are not anticipated to change. One large area in the City's UGA is presently used as a mine, and following reclamation, this site could be more intensively developed. Elsewhere in the High Intensity

environment, commercial development and redevelopment along Parker Horn are anticipated.

In the High Intensity – Resource Area designation, 24 percent of existing parcels are presently vacant. These areas are expected to see a mix of new water-oriented commercial development, as well as parks and trails.

5 EFFECTS OF DEVELOPMENT WITH APPLICATION OF THE SMP

5.1 Environment Designations

5.1.1 Purpose and Distribution

The first line of protection of the City's shoreline is the environment designation assignments. According to the Guidelines (WAC 173-26-211), the assignment of environment designations must be based on the existing use pattern, the biological and physical character of the shoreline, and the goals and aspirations of the community as expressed through a comprehensive plan.

The assignment of environment designations can help minimize cumulative impacts by concentrating development activity in lower functioning areas or areas with more intensive existing development that are not likely to experience significant function degradation with incremental increases in new development or redevelopment.

Consistent with WAC Shoreline Master Program Guidelines, the City's environment designation system is based on the existing use pattern, the biological and physical character of the shoreline, and community interests. The *Shoreline Inventory and Characterization* report provided information on shoreline conditions and functions that informed the development of environment designations. The proposed environment designations, consistent with SMP Guidelines, include: High Intensity, High Intensity – Resource Area, Shoreline Residential, Shoreline Residential – Resource Area, Shoreline Residential - Special Resource Area, Shoreline Residential – Dunes Area, Water-Oriented Parks & Public Facilities, and Natural, listed in order by decreasing level of use. An Aquatic environment designation applies to the shoreline waterward of the OHWM. Criteria for each environment designation are provided in Table 5-1.

Table 5-1. Environment designation criteria

Environment Designation	Classification Criteria
High Intensity (H)	"High Intensity (H)" shorelines currently support or are planned for high-intensity uses, also including highway segments.
High Intensity – Resource Area (H-R)	Lands to be designated "High Intensity – Resource Area" have the potential for development that is compatible with ecological protection and restoration. The reaches designated "H-R" support and are planned for commercial and high-density residential uses.
Shoreline Residential (SR)	The reaches designated "SR" support and are planned for residential uses of various densities. These areas have more than half of the shoreline previously hardened with bulkheads, have many existing docks, have few undeveloped parcels, do not have wetlands, and have little to no existing emergent vegetation.
Shoreline Residential – Resource Area (SR-R)	Lands to be designated "Shoreline Residential – Resource Area" support and are planned for residential uses of various densities. Where zoning and comprehensive plan designations are in conflict (e.g., light industrial zoning and low density residential comprehensive plan designation), the SR-R shoreline environment was designated when consistent with the surrounding development.
Shoreline Residential—Special Resource Area (SR-S)	Lands to be designated "Shoreline Residential - Special Resource Area" demonstrate impairments to ecological function; they also retain important ecological functions and have high potential for ecological protection and restoration because they include relatively large tracts that have not been subdivided or include large wetland areas. They currently support or are planned for shoreline residential uses and are either relatively intact or, if impaired, have not been subdivided and retain extensive natural vegetation.
Shoreline Residential—Dunes Area (SR-D)	The area to be designated "Shoreline Residential – Dunes Area" has been found to be relatively intact as regards ecological function. It is part of a dunes ecosystem that performs important ecological functions. It is also planned for shoreline residential use. The area has high potential for planned development that combines limited residential use with ecological protection and restoration.
Water-Oriented Parks & Public Facilities (W)	Lands to be designated "Water-Oriented Parks & Public Facilities" demonstrate impairments to ecological function. They retain important ecological functions and have the potential for development that is compatible with ecological protection and restoration. Because many of the sites are owned and managed by the City, the potential for combining restoration with water-oriented uses is high.
Natural (N)	Lands to be designated "Natural" have been found to be relatively intact as regards ecological function. They perform important, irreplaceable functions that would be damaged by human activity and could not support new development or uses without significant adverse impacts to ecological functions. All islands are to be designated "Natural."
Aquatic (A)	Lands designated "Aquatic" are those areas waterward of the OHWM, including lakebed aquifer recharge areas.

As indicated in Figure 5-1 and 5-2, the majority of shoreline acreage and shoreline parcels fall in the Shoreline Residential - Resource Area designation. The Natural designation, which applies the most stringent standards among the upland designations, composes 11 percent of the overall area in shoreline

jurisdiction. Shoreline Residential - Special Resource Area and Shoreline Residential designations each compose approximately 7 percent of shoreline jurisdiction by area, and, because of the smaller lot sizes, 13 percent of shoreline parcels occur in the Shoreline Residential designation.

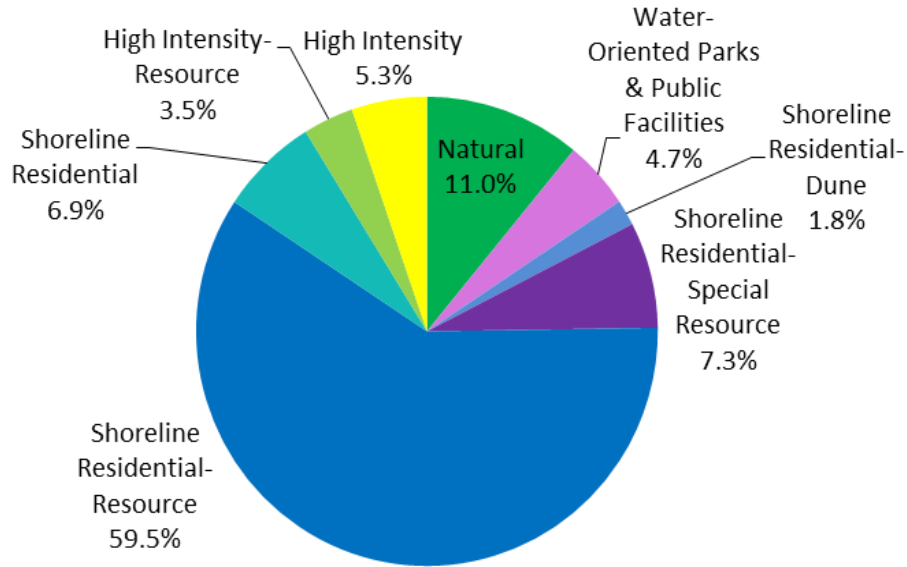


Figure 5-1. Distribution of Shoreline Environment Designations by Area

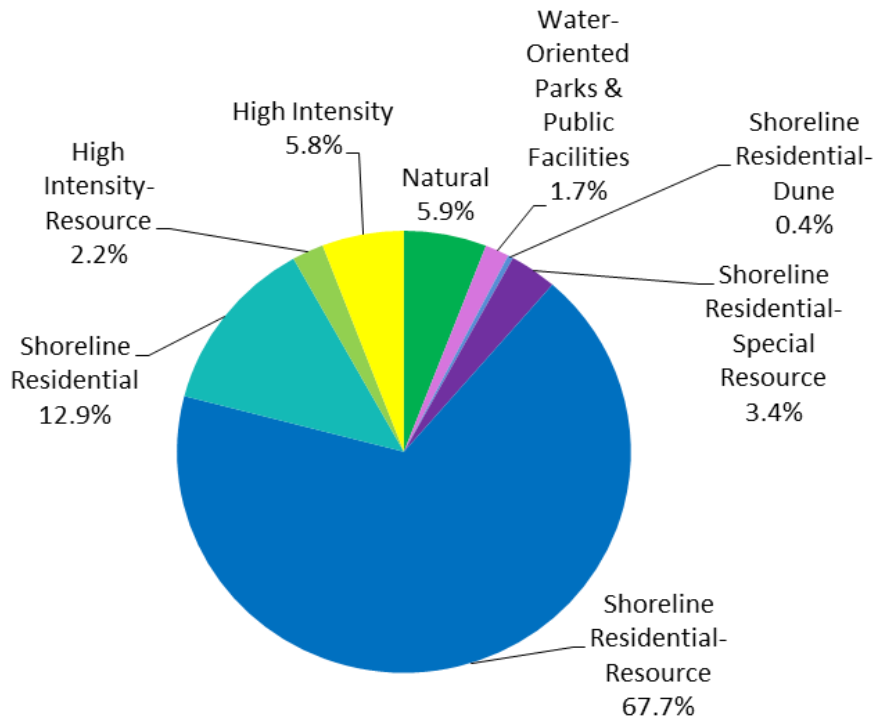


Figure 5-2. Distribution of Shoreline Environment Designations by Number of Parcels

5.1.2 Shoreline Environment Use & Activity Chart

The Use and Modification Matrix identifies the prohibited and allowed uses and modifications in each of the shoreline environments, and clearly shows a hierarchy of higher-impacting uses and modifications being allowed in the already highly-altered shoreline environments, with uses more limited in the less developed areas either through prohibition or a requirement for a Shoreline Conditional Use Permit. For example, uses in the Natural environment are either prohibited (e.g., residential, commercial, docks, and boating facilities) or require a Conditional Use Permit (e.g., public access, recreation, municipal uses). On the other hand, most uses are permitted in the High Intensity environment.

Through its allowed and prohibited uses, the City of Moses Lake's proposed SMP generally minimizes cumulative impacts by concentrating development activity in lower functioning areas that are not likely to experience significant function degradation with incremental increases in new development. Given the limited standards guiding the Planned Development (PD), which is allowed in the Shoreline Residential – Dunes Area designation, it is not possible to determine whether, how, and to what extent the sensitive shoreline dunes will be protected. In addition to concentrating uses in lower functioning areas, prohibited and permitted uses specific to environment designations are meant to limit potential conflicts between neighboring uses and ensure that uses are consistent with the comprehensive plan, zoning, and existing conditions.

5.1.3 Shoreline Environment Requirements

All uses and activities, including those considered exempt, must comply with the City's development standards which provide minimum buffers and limits on height, site coverage, and density for all types of development. Because the majority of the City's shorelines are in residential use, and because significant areas of vacant residential lands are likely to be developed on the City's shoreline in the foreseeable future, the most significant impact of these limits are related to the cumulative effects of residential uses. Specifically, buffer widths and impervious surface site coverage will affect cumulative impacts of residential development (See discussion in Section 6.1).

5.2 Effects of General Policies and Regulations

5.2.1 General Policies and Regulations

The SMP contains numerous general policies, with supporting regulations (SMP Chapter 6), intended to protect the ecological functions of the shoreline, prevent adverse cumulative impacts, and to satisfy the main objectives of the SMA. The General Policies and Regulations chapter applies to all activities, uses and modifications. Overall, the proposed general standards establish baseline

regulations to help maintain water quality and limit future shoreline stabilization (Table 5-2).

Table 5-2. Summary of general regulations that protect ecological functions.

Type of Standard	SMP Provision Providing Protection of Ecological Functions	Primary Function*			
		Hydrologic	Water Quality	Vegetation	Habitat
Environmental Impacts and Water Quality 6-50-030	Wastes, untreated effluent and hazardous materials shall not be discharged into any body of water or onto land. Use of storage facilities shall be suspended if leakage exists. (1)		X		
	Shoreline uses and modifications shall be located, designed, constructed, and maintained to minimize adverse impacts and ensure no net loss of shoreline ecological functions. (2)	X	X	X	X
	All uses and modifications must implement best management practices for surface water runoff. (3 & 4)		X		
	Clearing, grading, filling, and alteration of natural drainage features must be limited to the minimum extent possible.(5)		X	X	
	All uses and activities shall be designed to minimize or prevent the need for shoreline stabilization measures, flood protection works, filling, or substantial site re-grading. (6)	X			
	Only approved herbicides and pesticides shall be applied, and the preference is mechanical removal of weeds. (8 & 9)		X		
Parking 6-60-030	Parking is prohibited as a primary shoreline use. (1)		X		
	Surface water runoff shall be prevented from contaminating water bodies, using best available technology and BMPs. (2)		X		
Subdivision and Property Segregation 6-90-030	No lot shall be created where development would require structural shoreline stabilization or where development would not meet the minimum buffer standards. (1 & 2)	X	X	X	X
	A geotechnical analysis may be required where subdivision includes steep slopes, or where the standard buffer is less than 50 feet. (4)	X			

* An "X" indicates a direct relationship between an SMP provision and a shoreline ecosystem function. A blank cell indicates that the SMP provision either does not affect the function or, more likely, that the provision has a secondary or indirect effect on the function.

5.2.2 Critical Areas

Critical areas within shoreline jurisdiction are regulated under the proposed SMP. Critical areas include aquifer recharge areas, fish and wildlife habitat conservation areas (including shoreline buffers), frequently flooded areas, geologically hazardous areas, and wetlands.

General provisions applicable to all critical areas state that critical areas shall be left intact and maintained as open space, unless functions are otherwise mitigated (SMP 6-30-020-B(3)). Mitigation sequencing is identified for critical areas as a prioritized sequence of avoiding, minimizing, rectifying, reducing or eliminating through preservation and maintenance, compensating for, and monitoring impacts.

A discussion of the applicable regulations proposed for each type of critical area, and the anticipate outcome, is provided below.

Aquifer Recharge Areas

Aquifer recharge areas are areas that are vulnerable to contamination from intensive land uses, and because of the hydrologic connectivity between groundwater and lake waters, contamination of groundwater and aquifer storage will also affect water quality in the lake. Under the proposed SMP, when any use or activity is proposed in an area where runoff or infiltration is likely to recharge an aquifer, a site analysis will be used to ensure that proposed development will not degrade recharge areas (SMP 6-30-030-C(3)).

Developments must ensure that stormwater discharge does not degrade groundwater quality. Complete collection and disposal of stormwater may be required based on a site analysis or hydrogeologic assessment (SMP 6-30-030-C(2)).

Fish and Wildlife Habitat Conservation Areas

Fish and Wildlife Habitat Conservation Areas (FWHCAs) include all priority habitat and species areas, as well as shoreline buffer areas, discussed above (Section 5.1.3). A Habitat Assessment is required for any proposed development within FWHCAs or required buffers (SMP 6-30-040-C(4)). If, based on the Habitat Assessment and coordination with State and Federal agencies, the City determines that the proposed development is likely to result in a loss of fish and wildlife functions, a Habitat Management Plan must be prepared that minimizes and mitigates impacts. These standards ensure that priority species and their habitats will be considered, and direct impacts to these species will be addressed through minimization and mitigation measures.

Frequently Flooded Areas

Frequently flooded areas are regulated by Moses Lake Municipal Code 18.53, which prohibits new development or fill within the floodway unless an engineer demonstrates through hydrologic and hydraulic analysis that the proposed development will not result in a net rise in the base flood elevation. Within the City, the floodway occurs on shorelines designated Natural, High Intensity – Resource Area, and Shoreline Residential - Special Resource Area along Parker Horn at the mouth of Crab Creek.

Geologically Hazardous Areas

A geotechnical report is required for all development below, on or draining to an unstable or moderately unstable slope (defined as slopes over 15% with moderate to very high soil erodibility) (SMP 6-30-050-C(4)). Most of the steep slopes in the City and its UGA will not be regulated as Geologically Hazardous Areas, as slopes tend to be less than 50% and soils have low erosion potential. The proposed SMP prohibits uses or activities that will increase slope instability, erosion, sedimentation, or runoff from the site (SMP 6-30-050-C(5)), as well as removal of vegetation below any unstable or moderately unstable slopes. The provisions allow for upland steep slope stabilization only if other alternatives have been investigated and found less infeasible or more expensive than the proposed project (SMP 6-30-050-C(9)).

Wetland Buffers

Proposed wetland buffers in shoreline jurisdiction range from 25 feet to 150 feet depending on the wetland rating (as determined by Washington State Wetland Rating System for Eastern Washington (Ecology Publication 04-06-15, or as amended)) and the habitat functions of the wetland (SMP Table 6.1). Proposed buffers are contingent upon the implementation of several measures to minimize impacts on wetlands, and additional width is required for any developments not implementing minimization measures. The proposed buffers are consistent with Ecology's *Guidance for Small Cities Eastern Washington Version*, revised October 2012 for Category I and II wetlands. However, a buffer of 25 feet is proposed by the City for Category III and IV wetlands, rather than Ecology's recommendation of 60 to 120 feet for Category III wetlands, depending on habitat functions, and 40 feet for all Category IV wetlands. Buffer averaging is allowed provided specific criteria are met, including that averaging will not degrade functions, and the buffer width is not reduced to less than 75 percent of the standard buffer in any location or 75 feet for Category I and II, 50 feet for Category III, and 25 feet for Category IV wetlands [note: SMP inconsistency in the buffer averaging minimums with the proposed wetland buffers].

Ecology's guidance is based on a review of best available science for Eastern Washington, as documented in *Wetlands in Washington State Volume 1: A Synthesis of the Science*, a report prepared jointly by a consulting firm, Washington Department of Fish and Wildlife, and Washington Department of Ecology (Sheldon et al. 2005). WAC 365-195-900 requires that "Counties and cities must include the 'best available science' when developing policies and development regulations to protect the functions and values of critical areas..." and the Guidelines state that "unless there is more current or specific information available, the [Department of Ecology's] technical assistance materials shall constitute an element of scientific and technical information... the use of which is required by the [Shoreline Management] Act." The City could base its wetland

buffers on other sources of information or more specific local information, but that information would need to be evaluated objectively against the merits of Ecology's material.

The City's *Shoreline Inventory and Characterization* report (Geo-Ecology Research Group 2005) was reviewed, but specific information about conditions and widths of existing wetland buffers was not located in that document. The report included the following general recommendation:

"...Provide for reasonable buffers around wetlands in order to provide a local habitat for wetland plant and animal communities, and to reduce or minimize intrusions from humans and domestic animals. Stewardship strategies should be implemented for the long term management of wetlands. Maintain the natural value of wetlands to control and filter storm water runoff...."

It is anticipated that as a result of development within the City and around its lake-fringe wetlands, most of the remaining wetlands within the City's shoreline are Category III or IV. This supposition is supported by data from 23 delineations and wetland ratings: 2 are Category II, 16 are Category III, and 5 are Category IV (Table 5-3).

Table 5-3. Summary of conditions and ratings in identified shoreline jurisdiction wetlands.

Wetland ID #	Wetland Category	Habitat Points	Environment Designation	Proposed Wetland Buffer / Ecology Required Buffer (ft)	Approximate Average Functioning Buffer Width (ft) ¹
1	3	19	SR-SR	25 / 60	100
2	4	14	SR-R	25 / 40	0
3	3	14	SR	25 / 60	13
4	3	23	Hi-R	25 / 90	100
5	2	24	N	90 / 90	100
6	4	13	SR-R	25 / 40	60
7	4	13	SR	25 / 40	42
8	4	16	SR	25 / 40	80
9	3	19	HI	25 / 60	30
10	3	17	WO-P & SR-R	25 / 60	93
11	2	Not available	N	Not available	50
12	3	20	SR-R	25 / 60	68
13	3	18	N	25 / 60	15
14	3	22	SR-SR	25 / 90	117
15	3	21	SR-R	25 / 90	26
16	3	14	N	25 / 60	40
17	3	16	N	25 / 60	100
18	3	29	SR-R	25 / 120	75
19	3	20	SR-R	25 / 60	10

Wetland ID #	Wetland Category	Habitat Points	Environment Designation	Proposed Wetland Buffer / Ecology Required Buffer (ft)	Approximate Average Functioning Buffer Width (ft) ¹
20	3	18	SR-R	25 / 60	0
21	4	8	SR-R	25 / 40	80
22	3	18	SR-R	25 / 60	20
23	3	20	WO-P	25 / 60	500

¹ "Functioning buffer width" was approximated using Google Earth measurements and then subjectively averaged across each wetland. Lawns and landscaping were not considered part of the functioning buffer, although a presumption of native vegetation or pristine condition was not required to be considered "functioning."

The GIS wetland delineation files were imported into Google Earth, and measurements of each wetland's approximate functioning buffer width were taken. The average of the existing buffer widths was approximately 82 feet for Category III wetlands and 52 feet for Category IV wetlands. This sample of Moses Lake wetland conditions demonstrates that the existing Category III and IV wetland buffers are substantially greater than what is proposed in the SMP. Thus, the proposed wetland buffers for Category III and IV wetlands would result in a net loss of shoreline functions based both on the existing conditions and the synthesis of the science. Functions that may be lost as a result of the proposed wetland buffers include mammal, amphibian, and avian dispersal and foraging areas and water quality filtration.

Wetland Mitigation Ratios

The proposed SMP requires a 1:1 mitigation ratio for wetland buffer impacts, with no variations based on wetland category or type or based on mitigation type. This ratio could result in significant losses of wetland function because wetland mitigation is not consistently designed, constructed, maintained or monitored successfully and because there are invariably temporal losses of wetland function as the mitigation wetland may take decades or longer to reach the same level of function as the impacted wetland.

5.3 Effects of Shoreline Use Provisions

The SMP contains numerous shoreline use policies and supporting regulations (see SMP Chapter 7) intended to protect the ecological functions of the shoreline and prevent adverse cumulative impacts. These regulations are summarized below, including an indication of how potential activities may impact ecological functions and which function or functions the regulations helps to protect. It should be noted that an "X" in the following tables indicates a direct relationship between an SMP provision and a shoreline ecosystem function. A blank cell

indicates that the SMP provision either does not affect the function or has an indirect effect on the function.

5.3.1 Agriculture

The City's shoreline includes limited areas of ongoing agricultural uses. The SMP does not apply to ongoing agriculture, and new agricultural uses are prohibited within the City's shoreline (7-10-030(1)).

5.3.2 Aquaculture

Aquacultural facilities have the potential to affect water quality and fish and wildlife resources. New aquaculture facilities are not anticipated in the City's shoreline environment. Under the proposed SMP, a Shoreline Conditional Use Permit would be required for any new aquaculture facility (7-20-030(1)). To issue such a permit, the City would confer with Ecology and the Washington Department of Fish and Wildlife (WDFW) (7-20-030(3)), and the proposed project would need to demonstrate no net loss on an individual basis.

5.3.3 Boating Facilities and Docks

Boating facilities include marinas, boat ramps, boat houses, and boat lifts. Docks are frequently associated with boating facilities, as well as single-family residential development. Boating facilities and docks have the potential for a variety of incremental impacts on the ecological functions of the Lake (Table 5-3). The most significant potential cumulative impact of docks on Moses Lake is the effect on emergent vegetation. Docks tend to shade and displace emergent vegetation, which filters upland sediment and contaminants and provides significant aquatic habitat for waterfowl, amphibians, and fish species, and helps to attenuate wave energy along the shoreline. Although docks may provide localized cover for warm-water fish species, they result in a net loss of functions compared to the diverse functions of emergent vegetation.

As noted in Section 4.1, above, approximately 57 percent of the developed parcels with a Residential environment designation have a dock, and eight percent of the vacant shoreline parcels have a dock (Geo-Ecology Research Group 2005). The proposed SMP allows one dock per single-family residence, including single-family parcels that will be created through subdivision in the future. Therefore, the potential exists for significant proliferation of docks in the foreseeable future as existing developed parcels, newly developed parcels, and newly created parcels develop individual docks.

The SMP generally addresses boating facilities and docks by implementing measures to avoid, minimize and mitigate effects on sediment transport, water quality, and shoreline habitat (Table 5-4). The SMP requires a Shoreline Conditional Use Permit for any new marinas, and through state agency review,

these developments would be required to assure certain water quality parameters are met.

Minimization measures required in the SMP include standards that limit the width of the first 10 feet waterward of the OHWM to 4 feet, while allowing for wider nearshore widths, only if grated or translucent decking is employed to reduce shading impacts on emergent vegetation. Dock standards provide maximum area and length criteria, but allow flexibility in the dock length to minimize impacts to emergent vegetation. Mitigation sequencing is required at a ratio of 1:1 for any unavoidable impacts associated with new or expanded docks. Despite such mitigation, on a cumulative basis, the proliferation of docks within the City may result in the loss and/or fragmentation of emergent and riparian habitats over time, representing a net loss of ecological function.

Several existing docks in the City run parallel to the lake shoreline. These dock configurations tend to have a disproportionately significant impact on shoreline vegetation and habitat. The proposed SMP includes a provision that allows replacement of existing docks with similar new docks, provided there is no loss of function on an individual basis (SMP 7-50-030-A-7). This provision is acceptable to maintain functions on an individual basis, but it does not help to minimize the cumulative net effect of docks on a City-wide basis.

Table 5-3. Summary of potential impacts from boating facilities.

Functions	Potential Impacts to Functions
Hydrologic	Potential interference with movement of sediments, altering substrate composition
Water Quality	Water quality impacts associated with construction of in- and over-water structures (e.g., spills, harmful materials use) and related uses of new boating facilities and docks (e.g., boat maintenance and operation)
Vegetative/Habitat	Reduction in riparian and emergent vegetation associated with boating facility and dock development

Table 5-4. Summary of key boating facility regulations that protect ecological functions.

Type of Standard	SMP Provision Providing Protection of Ecological Functions	Primary Function*			
		Hydrologic	Water Quality	Vegetation	Habitat
Environment Designation Table 9.2	Boat launch ramps and marinas are prohibited in the SR-S, SR-D, and N EDs. Boat ramps and marinas are allowed only as conditional uses in all other EDs.	X	X	X	X

Type of Standard	SMP Provision Providing Protection of Ecological Functions	Primary Function*			
		Hydrologic	Water Quality	Vegetation	Habitat
Boating Facilities 7-30-030	Boating facilities shall mitigate for adverse development impacts on-site. (1)	X	X	X	X
	Dredging wetlands, shorelines, or shorelands to accommodate new or expanded boating facilities is prohibited. (2)	X	X	X	X
	Marinas are allowed only as a conditional use, the City will request technical input from Washington Departments of Ecology, Fish and Wildlife, and Health. (5)	X	X	X	X
	New commercial and public boating facilities may only be permitted if existing facilities are inadequate to meet public demand. (7)	X	X	X	X
	Marinas and launch ramps shall locate on stable shorelines where no or a minimal amount of shoreline stabilization will be necessary and where water depths are adequate. (8)	X	X		X
	Marina and boat launch design shall minimize interference with geohydraulic processes and disruption of existing shoreforms. (9)	X			X
	Overwater boat houses are prohibited. (13)		X		
	Overwater structures shall be no larger than needed (14)				X
Docks-General 7-50-030-A	Maintenance and repair using treated materials must use only approved chemicals and must be cured prior to placement in or over water. No over-water applications of preservative treatment or other chemical compounds shall be permitted. Docks may be painted provided brush application is used and best management practices are followed. (5)		X		
	Bulk storage of gasoline, oil, and other petroleum products is prohibited on docks. (6)		X		
Docks-Mitigation 7-50-030-A-9	New or expanded overwater and in-water structures shall first be designed to avoid and minimize impacts, prior to pursuing mitigation. (a)	X	X	X	X
	Mitigation proposals shall provide mitigation at 1:1 area ratio to impacts along the shoreline. The City will consult with other state and federal permit agencies for any additional specific mitigation requirements during project review. (b)	X	X	X	X
Docks-Design and Construction 7-50-030-B	Floating docks shall include stops to keep the floats off the bottom of the lake at low water level. (3)		X	X	X
	Docks with feet or plates that rest on the lakebed are preferred over those requiring excavation and footings. (6)		X	X	X

Type of Standard	SMP Provision Providing Protection of Ecological Functions	Primary Function*			
		Hydrologic	Water Quality	Vegetation	Habitat
Docks- Joint Use Recreational 7-50-030-C	Multi-family residence moorage facilities shall be limited to a single, joint-use moorage facility, provided that the City may authorize more than one joint-use dock for reasons of safety, security, or impact to the shoreline environment; and if the additional facility or facilities will have no net impact on shoreline ecological resources. (1)	X	X	X	X
	In Shoreline Environments designated as “High Intensity—Resource”, “Shoreline Residential—Dunes”, “Shoreline Residential—Special Resource”, and “Shoreline Residential—Resource”, the maximum size of a dock shall be the minimum necessary for moorage of one boat for each residence served, and the dock shall be configured to cause minimal disturbance to shoreline resources. (3)	X	X	X	X
Docks- Residential 7-50-030-D	Dock length and area standards apply, except that a longer dock may be approved if needed to maintain existing beneficial emergent vegetation. The extra length needed shall be limited to 4' in width. (2)(a)			X	X
	Docks wider than 4' in the first 10' waterward of the OHWM are allowed, provided that the extra width shall be made of material such as grating that allows a minimum of 40% light transmission. (2)(b)			X	X

* An “X” indicates a direct relationship between an SMP provision and a shoreline ecosystem function. A blank cell indicates that the SMP provision either does not affect the function or, more likely, that the provision has a secondary or indirect effect on the function.

5.3.4 Commercial/ Industrial/ Municipal Office Uses

Environment designation standards in the proposed SMP limit where and what type of commercial, industrial, and municipal uses may be developed. These standards help avoid potential use conflicts and appropriately locate high intensity development in shoreline areas with higher levels of existing alterations. The proposed SMP includes provisions requiring commercial and municipal uses to ensure that these facilities do not result in a net loss of shoreline ecological functions (Table 5-6). New industrial uses are expressly prohibited in the shoreline area.

Fifty-foot shoreline buffers apply to water-related and water-enjoyment commercial uses, and buffers for non-water-oriented commercial uses range from 50 to 150 feet, depending on the environment designation. Buffers for water-related and water-enjoyment municipal uses range from 25 to 75 feet, and for non-water-oriented uses buffers range from 50 to 100 feet, depending on

environment designation. Standards for shoreline uses and modifications elsewhere in the proposed SMP also apply to commercial and municipal development, including clearing and grading, boating facilities, and dredge and fill, among others.

Given the limited areas of potential commercial and municipal development, and the permitting standards, which include buffer standards that are generally consistent with or more protective than existing development conditions, and standards to ensure no net loss of functions on an individual project basis, commercial, industrial, and municipal development are not expected to result in a loss of shoreline functions.

Table 5-5. Summary of potential impacts from commercial, municipal and industrial development.

Functions	Potential Impacts to Functions
Hydrologic	Increase in stormwater runoff and discharge in association with more impervious surfaces
	Disruption of shoreline wetlands
Water Quality	Increase in contaminants associated with the creation and use of new impervious surfaces (e.g. metals, petroleum hydrocarbons)
	Water quality contamination from use and storage of toxic substances
	Greater potential for increased erosion, bank instability, and turbidity associated with vegetation clearing
Vegetative/ Habitat	Reduced shoreline habitat complexity and increased water temperatures
	Loss of or disturbance to riparian habitat during upland development
	Lighting effects on both fish and wildlife in nearshore areas

Table 5-6. Summary of key commercial and industrial use regulations that protect ecological functions.

Type of Standard	SMP Provision Providing Protection of Ecological Functions	Primary Function*			
		Hydrologic	Water Quality	Vegetation	Habitat
Environment Designation Table 9.2	Commercial uses are prohibited in the SR-S, SR-D, W, and N EDs. Commercial uses are either a conditional use or prohibited in the H-R, SR, and SR-R designations. Commercial uses are a conditional use or permitted in the H designation.	X	X	X	X
	Municipal uses are only permitted in the H and W designations. Municipal uses are a conditional use in the SR and N designations. Municipal uses are prohibited in the H-R, SR-R, SR-	X	X	X	X

Type of Standard	SMP Provision Providing Protection of Ecological Functions	Primary Function*			
		Hydrologic	Water Quality	Vegetation	Habitat
	S, and SR-D designations.				
	New industrial uses are prohibited in shoreline areas.	X	X	X	X
Commercial Standards 7-40-030	Non-water-oriented uses shall not be allowed unless they are part of a mixed-use project that includes water-dependent uses or are in a location where navigability is severely restricted and they provide a significant public benefit such as public access and ecological restoration; or the site is physically separated from the shoreline by another property or public right-of-way.		X		X
	The City shall require provisions to ensure that the development will not result in loss of shoreline functions. (2)(d)	X	X	X	X
	Over-water construction for non-water-oriented commercial developments is prohibited. (4)	X	X	X	X
	Parking as a primary use is prohibited in shoreline jurisdiction. Accessory parking facilities shall be located landward of the required setback and landward of the primary use to the greatest extent feasible. (5)		X		
	Commercial developments shall be landscaped to visually enhance the shoreline area and contribute to shoreline functions, using primarily native, self-sustaining vegetation. (8)			X	
	Drainage and surface runoff from commercial areas shall be controlled so that pollutants will not be carried into waterbodies.(9)		X		
Municipal Office Standards 7-80-030	The City shall require provisions to ensure that the development will not result in loss of shoreline functions. (2)(d)	X	X	X	X
	Drainage and surface runoff from municipal uses shall be controlled so that pollutants will not be carried into waterbodies. (6)		X		

* An "X" indicates a direct relationship between an SMP provision and a shoreline ecosystem function. A blank cell indicates that the SMP provision either does not affect the function or, more likely, that the provision has a secondary or indirect effect on the function.

5.3.5 Mining

Mining has potential to significantly impact erosion processes, water quality, and nearshore habitat (Table 5-7). Mining operations are prohibited in all shoreline environment designations, except the High Intensity environment. Any proposals for new mineral extraction would require a Shoreline Conditional Use

Permit, which requires that the project demonstrate no net loss on an individual and cumulative basis, and requires review and approval from Ecology.

Only one mine is active within shoreline jurisdiction in the City's UGA, and new mining operations are not anticipated. Because new mining operations are not anticipated to occur in shoreline jurisdiction in the foreseeable future, and because each mining application will be required to demonstrate no net loss on an individual project basis, no net loss of shoreline ecosystem functions is expected from mining uses.

Table 5-7. Summary of potential impacts from mining.

Functions	Potential Impacts to Functions
Hydrologic	Alteration in hydrologic and sediment processes potentially leading to erosion and sediment deposition in the lake
Water Quality	Reduction in water quality from turbidity and material disposal
Vegetative/ Habitat	Reduction in riparian and emergent vegetation

Table 5-8. Summary of key mining regulations that protect ecological functions.

Type of Standard	SMP Provision Providing Protection of Ecological Functions	Primary Function*			
		Hydrologic	Water Quality	Vegetation	Habitat
Environment Designation Table 9.2	Mining is prohibited in shoreline jurisdiction, except in the High Intensity designation, where it is a conditional use.	X	X	X	X
Mining- General 7-70-030	Mining shall be conducted in strict conformance with the Washington State Surface Mining Reclamation Act, Chapter 78.44 RCW. (1)	X	X	X	X
	Mining operations shall be sited, designed, conducted, and completed (including reclamation) to ensure no net loss of shoreline ecological functions. (5)	X	X	X	X
	Mining operations shall comply with all local, state, and federal water quality standards and pollution control laws. Operations shall use effective techniques to prevent or minimize surface water runoff, erosion and sedimentation; prevent reduction of natural flows; protect all shoreline areas from acidic or toxic materials; and maintain the natural drainage courses of all streams. Surface water runoff shall be impounded as necessary to prevent accelerated runoff and erosion. (6)	X	X	X	X

Type of Standard	SMP Provision Providing Protection of Ecological Functions	Primary Function*			
		Hydrologic	Water Quality	Vegetation	Habitat
	If substantial evidence indicates that mining operations are causing, or continued operation would cause, significant and adverse impacts to water quality, habitat, or any shoreline ecological function, the City shall terminate the shoreline permit for mining or impose further conditions on the mining operation to ensure no net loss of shoreline ecological functions. (10)	X	X	X	X
	All mining impacts shall be mitigated, and shoreline enhancement shall be encouraged. Preference shall be given to mining proposals that result in the creation, restoration, or enhancement of habitat for priority species. (11)	X	X	X	X

* An "X" indicates a direct relationship between an SMP provision and a shoreline ecosystem function. A blank cell indicates that the SMP provision either does not affect the function or, more likely, that the provision has a secondary or indirect effect on the function.

5.3.6 Recreational Uses

Shorelines in the City of Moses Lake offer abundant recreational opportunities. The potential impacts of recreational uses generally depend on the type and intensity of the use (Table 5-9). Most recreational uses are anticipated to occur in the Water-Oriented Parks & Public Facilities designation. The proposed SMP includes a provision that recreational uses maintain, and, when feasible, enhance or restore shoreline features and functions (Table 5-10). Specific standards for shoreline uses and modifications also apply to recreational development, including clearing and grading, boating facilities, and dredge and fill, among others. Given the limited area of anticipated new recreational uses and the standards that ensure that functions are maintained or improved, no net loss of functions is anticipated from recreational uses.

Table 5-9. Summary of potential impacts from recreational development.

Functions	Potential Impacts to Functions
Hydrologic	Increase in stormwater runoff and discharge in association with more impervious surfaces
Water Quality	Increase in contaminants associated with the creation of new impervious surfaces (e.g. metals, petroleum hydrocarbons)
	Increase in pesticide and fertilizer use
	Greater potential for increased erosion, bank instability, and turbidity associated with vegetation clearing

Functions	Potential Impacts to Functions
Vegetative/ Habitat	Reduced shoreline habitat complexity and increased water temperatures
	Loss of or disturbance to riparian habitat during upland development
	Lighting effects on both fish and wildlife in nearshore areas

Table 5-10. Summary of key recreational use regulations that protect ecological functions.

Type of Standard	SMP Provision Providing Protection of Ecological Functions	Primary Function*			
		Hydrologic	Water Quality	Vegetation	Habitat
Recreation- General 7-90-030	Shoreline recreational developments shall maintain, and, when feasible, enhance or restore desirable shoreline features including those that contribute to shoreline ecological functions and processes, scenic vistas, and aesthetic values. Removal of healthy native vegetation to enhance views shall be discouraged. (3)	X	X	X	X
	No recreational buildings or structures shall be built over water, other than water-dependent and/or public access structures such as piers, docks, bridges, boardwalks, or viewing platforms. (5)	X	X	X	X
	Each development proposal shall include a landscape plan that uses primarily native, self-sustaining vegetation. Campsites, selected view points, or other permitted structures or facilities shall be located so as to not require damage or destruction of native vegetation. (6)			X	
	In addition to required buffers, chemical-free buffer strips may be required at the discretion of the City. (7)		X		
	Recreational uses shall include adequate provisions for water supply, sewage, garbage disposal, and fire protection. (9)		X		
	Trails and paths on steep slopes shall be located, designed, and maintained to protect bank stability. (11)	X	X		

* An "X" indicates a direct relationship between an SMP provision and a shoreline ecosystem function. A blank cell indicates that the SMP provision either does not affect the function or, more likely, that the provision has a secondary or indirect effect on the function.

5.3.7 Residential Uses

The following tables (Tables 5-11 and 5-12) briefly describe the potential impacts of residential development and the SMP provisions that help avoid, minimize, or mitigate adverse impacts to ecological functions. Many shoreline modifications may be considered accessory to residential development, and these modifications

are addressed separately. A more detailed description of residential development and the anticipated effects of the SMP is provided in Section 6.1, below.

Table 5-11. Summary of potential impacts from residential development.

Functions	Potential Impacts to Functions
Hydrologic	Increase in stormwater runoff and discharge in association with more impervious surfaces
Water Quality	Increase in contaminants (e.g. metals, petroleum hydrocarbons) and decrease in infiltration potential associated with the use and creation of new impervious surfaces
	Water quality contamination from failed septic systems
	Increase in pesticide and fertilizer use
	Greater potential for increased erosion, bank instability, and turbidity associated with vegetation clearing
Vegetative/Habitat	Reduced shoreline habitat complexity and increased water temperatures
	Loss or disturbance of riparian habitat during upland development

Table 5-12. Summary of key residential use regulations that protect ecological functions.

Type of Standard	SMP Provision Providing Protection of Ecological Functions	Primary Function*			
		Hydrologic	Water Quality	Vegetation	Habitat
Environment Designation Table 9.2	Residential uses are prohibited in the W and N designations.	X	X	X	X
Residential-General 7-100-030	Residential uses shall not be approved where flood control, shoreline protection measures, or bulkheading will be required to create residential lots or site area. Residential uses shall be designed so that structural shoreline stabilization, including bulkheads, is not likely to be required to protect property and will not be required in the future. (1)	X		X	
	If wetlands, steep slopes, other critical areas, or other unique or fragile features are located on a development site, development shall be located so as to avoid the sensitive areas. Cluster or similar design of residential units may be used in order to achieve this. (2)			X	X
	During construction, shoreline vegetation shall be preserved and erosion controlled. (4)	X	X	X	
	Best management practices shall be applied in designing and developing surface and stormwater facilities. (7)		X		

Type of Standard	SMP Provision Providing Protection of Ecological Functions	Primary Function*			
		Hydrologic	Water Quality	Vegetation	Habitat
	New fences established parallel to the shoreline shall be set back a minimum of 25' from the OHWM and shall require native vegetative plantings within that 25' if lawn or weeds currently exist within the area. The setback may be reduced if the applicant is participating in a shoreline public access plan or if there is intervening ownership (e.g. railroad, conservancy trail, etc.) The applicant shall submit a planting plan along with the fence permit. (16)(c)			X	

* An "X" indicates a direct relationship between an SMP provision and a shoreline ecosystem function. A blank cell indicates that the SMP provision either does not affect the function or, more likely, that the provision has a secondary or indirect effect on the function.

5.3.8 Transportation Facilities

Roads and bridges are common features along the City's shoreline. Roads tend to impair habitat and hydrologic connectivity, and stormwater runoff can have a substantial impact on water quality conditions (Table 5-13). The majority of anticipated transportation-related work involves maintenance and repair of the existing network of transportation infrastructure. The proposed SMP establishes standards to guide ongoing maintenance of the existing transportation infrastructure, as well as development of new infrastructure. Proposed SMP standards require that new highways and railroads are constructed outside of shoreline jurisdiction where feasible (Table 5-14). Where routing a road or railroad outside of jurisdiction is not possible, the SMP provides design standards to avoid and minimize potential impacts. Although the SMP does not explicitly require mitigation for transportation uses, mitigation would be required for impacts resulting from clearing and grading, dredging or fill, shoreline stabilization, or vegetation removal, any of which might be related to development of transportation infrastructure. In summary, no net loss of shoreline functions is anticipated to result from the maintenance or development of transportation uses.

Table 5-13. Summary of potential impacts from transportation facilities.

Functions	Potential Impacts to Functions
Hydrologic	Increase in stormwater runoff and discharge in association with more impervious surfaces
	Potential for crossings to limit passage of flood flows

Functions	Potential Impacts to Functions
Water Quality	Increase in contaminants associated with the creation of new impervious surfaces (e.g. metals, petroleum hydrocarbons)
Vegetative/ Habitat	Greater potential for increased erosion, bank instability, and turbidity associated with vegetation clearing
	Fish passage impacts associated with stream crossings

Table 5-14. Summary of key transportation facility regulations that protect ecological functions.

Location in SMP	SMP Provision Providing Protection of Ecological Functions	Primary Function*			
		Hydrologic	Water Quality	Vegetation	Habitat
Environment Designation Table 9.2	Transportation facilities are a conditional use, except in the H and SR designations, where they are permitted.		X		X
Transportation Facilities-General 7-110-030	Use existing corridors, unless expansion of the existing corridor would result in net loss of shoreline ecological functions. (1)			X	X
	Transportation and primary utility facilities shall make joint use of rights-of-way and consolidate crossings. (2)	X	X	X	X
	Facilities shall be sited and designed to avoid geologically hazardous areas and to minimize cuts and fills.(3 & 4)	X		X	X
	Landfill for transportation facilities is prohibited in water bodies and wetlands, except when it is the only feasible alternative (6)	X			
	Major highways and railways shall be located outside of shoreline areas if feasible. Water crossings shall use the shortest route feasible. (7)	X	X	X	X
	New facilities shall be located and designed to prevent or minimize the need for shoreline stabilization, landfill, or substantial grading. All bridges must be built to allow the passage of debris and 3 feet of freeboard above the 100-year flood level. (8)	X		X	X
	Shoreline areas disturbed by construction and maintenance shall be restored to their pre-project condition. (10)		X	X	
	Except for water crossings, all roads and railroads shall be adequately set back from the water and shall provide buffer areas of compatible, self-sustaining vegetation. Removal of healthy native vegetation is discouraged. (17)				
	Waste materials from both construction and maintenance activities shall be deposited where re-entry and erosion into waterbodies or wetlands is prevented. (18)		X		
Water Crossings	Waterway crossings shall be designed and maintained to cause minimal disturbance to banks. (11)	X			X

Location in SMP	SMP Provision Providing Protection of Ecological Functions	Primary Function*			
		Hydrologic	Water Quality	Vegetation	Habitat
	Crossings of sensitive areas shall be designed and maintained to cause no net loss of shoreline functions. (12)				X
	Roads and railroads shall be located to minimize the need for routing surface waters into and through culverts. (13)				X
	State and local stormwater regulations apply. (14)	X	X		
	Except where a water crossing is necessary, roads, railroads, and other transportation facilities shall be located landward of shoreline wetlands and other FWHCAs. (16)				

* An "X" indicates a direct relationship between an SMP provision and a shoreline ecosystem function. A blank cell indicates that the SMP provision either does not affect the function or, more likely, that the provision has a secondary or indirect effect on the function.

5.3.9 Utilities

The following section addresses primary utility facilities. Utilities can have a substantial impact on water quality conditions, affecting public and ecological health (Table 5-15). The proposed SMP requires that primary utilities ensure no net loss of functions (Table 5-16). Primary utility facilities may be developed to supply existing undeveloped areas with utilities; however, these are not expected to be a common new development in the City's shoreline, and since no net loss of functions will be demonstrated on an individual project basis, primary utility facilities are not anticipated to result in a net loss of functions at a cumulative level.

Table 5-15. Summary of potential impacts from utilities.

Functions	Potential Impacts to Functions
Hydrologic	Where utilities require shoreline armoring, associated hydrologic impacts are likely
	Erosion at stormwater outfall locations can alter sediment transport processes
Water Quality	Potential for contaminant spill or leakage
	Unfiltered stormwater or sewage discharge into shoreline waterbodies will degrade water quality conditions.
Vegetative/Habitat	Greater potential for increased erosion, bank instability, and turbidity associated with vegetation clearing

Table 5-16. Summary of key utility infrastructure regulations that protect ecological functions.

Location in SMP	SMP Provision Providing Protection of Ecological Functions	Primary Function*			
		Hydrologic	Water Quality	Vegetation	Habitat
Environment Designation Table 9.2	All primary utilities are prohibited in the SR-S, SR-D, and N designations.	X	X	X	X
Utilities-General 7-120-030	Primary utility facilities and transmission lines shall be located, designed, constructed, operated, and maintained to cause no net loss of shoreline ecological functions. Utility lines associated with primary utilities shall use existing rights-of-way, corridors, and/or water crossings whenever possible and shall avoid duplication and construction of new or parallel corridors in shoreline areas. Proposals for new corridors or water crossings must fully substantiate the infeasibility of existing routes. Primary utility facilities and lines shall be located outside of shoreline areas where feasible. (1)	X	X	X	X
	Primary utilities shall be located and designed so as to avoid or minimize the use of any structural or artificial shore defense or flood protection works. (3)	X			
	All underwater pipelines transporting liquids intrinsically harmful to aquatic life or potentially injurious to water quality are prohibited, unless no other feasible alternative exists. In those limited instances in which underwater pipelines are permitted as a conditional use, automatic shut-off valves shall be provided on both sides of the water body, and the applicant shall use all appropriate technology to detect and prevent leaks and ruptures of the pipelines. (7)		X		
	Construction of primary utilities under water or in wetlands shall be timed to minimize impacts on fish and wildlife. (8)				X
	Clearing of vegetation for the installation or maintenance of primary utilities shall be the minimum necessary to accommodate the proposed utility installation. (10)			X	
	Shoreline areas disturbed by construction and maintenance shall be restored to their pre-project condition. (11)			X	X

* An "X" indicates a direct relationship between an SMP provision and a shoreline ecosystem function. A blank cell indicates that the SMP provision either does not affect the function or, more likely, that the provision has a secondary or indirect effect on the function.

5.4 Effects of Shoreline Modification Provisions

5.4.1 General

General provisions require shoreline modifications to result in no net loss of shoreline ecological functions (SMP 8-5-030 (2)). By allowing shoreline

modifications for non-water-dependent uses only where ecological functions are improved (SMP 8-5-030(5)), the proposed standards provide an incentive for restoring shoreline ecological functions. Additionally, the proposed SMP requires mitigation sequencing for all shoreline modifications, which includes a prioritized order for: avoiding, minimizing, mitigating, and monitoring impacts on ecological functions (SMP 8-5-030(6)). This provision is particularly significant to ensuring that shoreline modifications will not adversely affect shoreline functions.

5.4.2 Clearing and Grading

Clearing of vegetation and grading are commonly associated with development projects. Potential impacts from clearing and grading are summarized below in Table 5-17. The proposed SMP requires measures to minimize the clearing and grading areas, and to stabilize soils during and following the completion of construction activities (Table 5-18). As such, clearing and grading is not expected to result in a loss of shoreline functions.

Table 5-17. Summary of potential impacts from clearing and grading.

Functions	Potential Impacts to Functions
Hydrologic	Alteration of existing water runoff patterns due to topographical alterations
	Alterations in the stormwater retention timing and infiltration due to the loss of vegetation
Water Quality	Short-term and long-term increases in turbidity related to vegetation removal and soil disturbance
	Reduced biofiltration of stormwater resulting from vegetation removal
Vegetative/Habitat	Loss of functions due to removal or disturbance

Table 5-18. Summary of key clearing and grading regulations that protect ecological functions.

Type of Standard	SMP Provision Providing Protection of Ecological Functions	Primary Function*			
		Hydrologic	Water Quality	Vegetation	Habitat
Clearing and Grading-General 8-10-030	All clearing and grading activities shall be limited to the minimum necessary for the intended development. (1)	X		X	X
	A clearing and grading plan shall be required for all development within shoreline jurisdiction, whether a shoreline permit is required or the project is exempt from a shoreline substantial development permit. (2)(a)	X		X	X
	Immediately upon completion of the construction or maintenance activity, remaining cleared areas shall be restored to their pre-project			X	X

Type of Standard	SMP Provision Providing Protection of Ecological Functions	Primary Function*			
		Hydrologic	Water Quality	Vegetation	Habitat
	condition, using compatible, self-sustaining vegetation. (4 & 5)				
	All shoreline development and activity shall use effective measures to minimize increases in surface water runoff and sedimentation that may result from clearing and grading activity. (7)		X		
	Soil stabilization associated with clearing and grading shall, whenever feasible, use bioengineering or other soft stabilization techniques. (8)	X			

* An "X" indicates a direct relationship between an SMP provision and a shoreline ecosystem function. A blank cell indicates that the SMP provision either does not affect the function or, more likely, that the provision has a secondary or indirect effect on the function.

5.4.3 Dredging and Fill

Dredging can have significant effects on sediment transport, short-term effects on water quality, and can alter littoral habitats (Table 5-19). In Moses Lake, sedimentation of the lake has been identified as a potential ecological concern that could result in a simplification in aquatic habitats (Grette 2009). Dredging has been proposed in specific areas to maintain navigation and diversity in aquatic habitat types (e.g., open water, submerged aquatic vegetation, and emergent vegetation), and the proposed SMP makes specific allowances for dredging activities that are in accordance with the jointly-developed Sediment Management Plan. Implementation of the Plan is expected to maintain or enhance aquatic habitat over time. The proposed SMP requires physical, chemical, and biological evaluation of the impacts of proposed dredging, as well as avoidance, minimization, and mitigation of the impacts from dredge disposal and fill, to help ensure that no net loss of functions is achieved on a project-by-project basis (Table 5-20).

Table 5-19. Summary of potential impacts from dredging and dredge disposal.

Functions	Potential Impacts to Functions
Hydrologic	Alteration of hydrologic and sediment processes
Water Quality	Reduction in water quality from turbidity and in water dredge material disposal
Vegetative/ Habitat	Disruption of benthic community and submerged aquatic vegetation

Table 5-20. Summary of key dredge and dredge disposal regulations that protect ecological functions.

Type of Standard	SMP Provision Providing Protection of Ecological Functions	Primary Function*			
		Hydrologic	Water Quality	Vegetation	Habitat
Dredging Standards 8-15-030	Dredging shall only be permitted as part of the implementation of the Sediment Management element of the Restoration Plan. (1)	X	X		X
	Dredging and dredge material disposal shall only be permitted where it is demonstrated that the proposed actions will not: a. Result in significant and/or on-going damage to water quality, fish, or other biological elements; b. Adversely alter natural drainage and circulation patterns, or significantly reduce flood storage capacities; c. Affect slope stability; or d. Otherwise damage shoreline or aquatic resources. (2)	X	X		X
	Proposals for dredging and dredge disposal shall include all feasible mitigation measures to protect fish and wildlife habitat and minimize adverse impacts such as turbidity; release of nutrients, heavy metals, sulfides, organic materials, or toxic substances; dissolved oxygen depletion; or disruption of food chains. (3)		X		X
	Any impacts of dredging that cannot be avoided shall be mitigated in a manner that assures no net loss of shoreline ecological functions. (6)	X	X		X
Dredge Disposal Standards 8-15-040	Disposal of dredged materials shall be accomplished at approved contained upland sites. (1)		X		X
	Depositing dredge materials in water areas shall be allowed only by conditional use permit, and only for improving fish and wildlife habitat as part of the sediment management element of the Restoration Plan in Chapter 11 of this Shoreline Master Program. (2)				X
	Land disposal sites shall be replanted as soon as feasible. (3)			X	X
	Where permitted, dredging shall be the minimum necessary to accommodate the proposed use. (5)	X	X		X
Fill Standards 8-20-030	Pier or pile support shall be utilized whenever feasible in preference to filling. Fills for approved road development in floodways or wetlands shall be permitted only if pile or pier supports are proven infeasible. (3)	X			
	Fills are prohibited in floodplains except where it is demonstrated that the project will not increase flood hazard or other damage to life or property. Fills are prohibited in floodways, except when approved by conditional use permit. (4)	X			X

Type of Standard	SMP Provision Providing Protection of Ecological Functions	Primary Function*			
		Hydrologic	Water Quality	Vegetation	Habitat
	Fills shall be permitted only when it is demonstrated that the proposed action will not: a. Result in significant damage to water quality or fish and wildlife habitat; b. Adversely affect natural drainage and circulation patterns or significantly reduce flood water capacities; c. Affect slope stability; or d. Otherwise damage shoreline or aquatic resources. (5)	X	X		X
Fill Design and Construction 8-20-040	Where permitted, fill shall be the minimum necessary to accommodate the proposed use (1)	X	X	X	X
	Fills shall be designed, constructed, and maintained to prevent, minimize, and control all material movement, erosion, and sedimentation from the affected area. (2)	X			
	Use of polluted dredge spoils, solid waste, and sanitary landfill materials is prohibited. (3)		X		
	Fills shall not be permitted in aquifer recharge areas if they would have the effect of preventing percolation of the water. (4)	X			
	The timing of fill construction shall be regulated to result in no net loss of shoreline ecological functions, including water quality and aquatic life. (5)				X
	Fill on dry land shall not result in substantial changes to patterns of surface water drainage from the project site and onto adjacent properties; within shoreline areas; into aquatic areas; or onto steep slopes or other erosion hazard areas. (6)	X			

* An "X" indicates a direct relationship between an SMP provision and a shoreline ecosystem function. A blank cell indicates that the SMP provision either does not affect the function or, more likely, that the provision has a secondary or indirect effect on the function.

5.4.4 Shoreline Stabilization

Shoreline stabilization structures are common features on the City's shoreline. Shoreline stabilization measures have potentially significant impacts on sediment transport processes, which in turn affects littoral habitat functions on-site and in adjacent shoreline areas (Table 5-21). Through its strict permitting criteria, the proposed SMP substantially limits the development of new shoreline stabilization structures. Although new shoreline stabilization measures would be expected to be permitted relatively infrequently, repair and replacement of existing structures are expected to occur more commonly. The proposed SMP ensures that new and replacement structures evaluate and implement the stabilization approach with the least potential for impacts to shoreline functions (Table 5-22). Because replacement stabilization requires an evaluation and use of

the least impacting alternative, the proposed SMP standards may result in a reduction or softening of existing stabilization measures. Mitigation for impacts for unavoidable impacts from new or replacement stabilization measures would be required through mitigation sequencing, as described in Section 5.4.1.

In addition to stabilization to protect primary structures, the proposed SMP makes a specific stabilization allowance for dock support along the shoreline (SMP 8-30-070(3)). Although the SMP sets maximum width allowances for dock-supporting stabilization, the allowance means that dock impacts may inherently incorporate impacts associated with shoreline stabilization as well. This is particularly a concern given the high number of new docks that may be anticipated (refer to discussion in 5.3.3).

Table 5-21. Summary of potential impacts from shoreline stabilization.

Functions	Potential Impacts to Functions
Hydrologic	Increase in wave energy at the shoreline resulting in increased nearshore turbulence and erosion of nearby shorelines
	Disruption of shoreline wetlands
Water Quality	Water quality impacts associated with construction
	Removal of shoreline vegetation increases erosion and water temperatures
Vegetative/Habitat	Reduction in emergent vegetation

Table 5-22. Summary of key shoreline stabilization regulations that protect ecological functions.

Location in SMP	SMP Provision Providing Protection of Ecological Functions	Primary Function*			
		Hydrologic	Water Quality	Vegetation	Habitat
Shoreline Stabilization - General 8-30-030	New structural stabilization measures, bulkheads are allowed to protect an existing or approved use only when a geotechnical analysis documents that the primary structure is in danger. Structural stabilization may also be approved for the restoration of ecological functions. (1)	X	X	X	X
	Shoreline stabilization shall not be allowed for new uses if it would cause a net loss of shoreline ecological functions. (3)	X	X	X	X
	Creation of new lots that will require shoreline stabilization in order for development to occur shall not be allowed. (4)	X	X	X	X
	New uses in areas above unstable slopes and moderately unstable slopes shall be set back sufficiently to ensure that shoreline stabilization will not be needed during the life of the structure, as demonstrated by a geotechnical analysis. (5)	X	X	X	X

Location in SMP	SMP Provision Providing Protection of Ecological Functions	Primary Function*			
		Hydrologic	Water Quality	Vegetation	Habitat
	Where stabilization is necessary, the size of the stabilization measures shall be limited to the minimum necessary. (6)	X	X	X	X
	Shoreline stabilization shall be designed to restore, as much as possible, the ecological functions of the shoreline. (7)	X			X
	Where stabilization is necessary to alleviate erosion caused by removal of vegetation, vegetative stabilization measures shall be the only stabilization measures allowed. (8)			X	
	Enlarged and replacement structures shall meet the standards of new structures. (9)	X	X	X	X
	Hard armoring may be permitted where a geotechnical analysis identifies an imminent threat to a primary structure within 3 years, if the threat is expected to occur further in the future, soft shoreline armoring may be permitted. (12)	X		X	X
Bulkheads and Rip Rap 8-30-070	New or enlarged or replacement bulkheads for an existing principal structure or use, including residences, shall not be allowed unless a geotechnical analysis documents that the principal structure is in danger. The geotechnical analysis shall demonstrate that the stabilization measure chosen is the softest means feasible. (2)	X	X	X	X

* An "X" indicates a direct relationship between an SMP provision and a shoreline ecosystem function. A blank cell indicates that the SMP provision either does not affect the function or, more likely, that the provision has a secondary or indirect effect on the function.

5.4.5 Vegetation Conservation

Shoreline vegetation provides a variety of functions, including habitat for mammals, amphibians, and birds, as well as littoral habitat cover for fish (Table 5-23). Shoreline vegetation is also important for maintaining sediment and slope stability and preventing additional sedimentation of the lake. The proposed SMP prohibits significant disturbance within the shoreline buffer and establishes limitations on vegetation removal that will result in soil erosion or destabilization (Table 5-24). The SMP generally protects emergent vegetation, but it does allow for limited removal of emergent plants for lake access, such as immediately adjacent to a dock. Mitigation sequencing would apply to avoid, minimize, and mitigate for the effect of such clearing (described in Section 5.4.1).

Table 5-23. Summary of potential impacts from shoreline vegetation removal.

Functions	Potential Impacts to Functions
Hydrologic	Reduces soil stabilization and increase erosion.
Water	Removal of shoreline vegetation increases sedimentation.

Functions	Potential Impacts to Functions
Quality	
Vegetative/ Habitat	Loss of shoreline habitat associated with reduced vegetative cover.

Table 5-24. Summary of key shoreline stabilization regulations that protect ecological functions.

Location in SMP	SMP Provision Providing Protection of Ecological Functions	Primary Function*			
		Hydrologic	Water Quality	Vegetation	Habitat
Vegetation- General 8-35-030	Restoration of disturbed or degraded shorelines shall use plant materials approved by the City, with a diversity and type similar to or better than that which originally occurred on the site. (2)			X	
	Stabilization of erosion-prone surfaces along shorelines shall utilize vegetative, non-structural means wherever possible. (3)	X		X	
	Vegetation removal that would likely result in significant soil erosion or the need for structural shoreline stabilization is prohibited. (4)	X		X	
	Removal of noxious weeds in environmentally sensitive areas shall be timed and carried out in a manner that minimizes any disruption of wildlife or habitat. (6)			X	X
	Within the required shoreline buffer, no disturbance is allowed, except removal of noxious weeds, planting of beneficial species, and creating a path less than 4' wide. (7)	X		X	X
	Permits issued for projects in ecologically degraded areas shall include a condition that appropriate shoreline vegetation shall be planted or enhanced, to contribute to the restoration of ecological processes and functions. (8)			X	X
	Emergent plants shall be preserved to the greatest extent possible and shall not be removed, uprooted, trimmed, or burned. Limited removal of emergent plants may be allowed for access, such as immediately adjacent to a dock. (9)			X	

* An "X" indicates a direct relationship between an SMP provision and a shoreline ecosystem function. A blank cell indicates that the SMP provision either does not affect the function or, more likely, that the provision has a secondary or indirect effect on the function.

5.5 Shoreline Protection and Restoration

As discussed above, one of the key objectives that the SMP must address is "no net loss of ecological functions necessary to sustain shoreline natural resources" (Ecology 2011). Although the implementation of restoration actions to restore historic functions is not required by SMP provisions, the Guidelines state that

“master programs shall include goals, policies and actions for restoration of impaired shoreline ecological functions. These master program provisions should be designed to achieve overall improvements in shoreline ecological functions over time, when compared to the status upon adoption of the master program” (WAC 173-26-201(2)(f)). Pursuant to that direction, Chapter 11 of the SMP identifies opportunities for voluntary restoration, enhancement, and protection actions.

The Restoration Plan represents a long-term vision for restoration that will be implemented over time, resulting in a gradual improvement over the existing conditions. Although the SMP is intended to achieve no net loss of ecological functions through regulatory standards alone, practically, an incremental loss of shoreline functions at a cumulative level may occur through minor, exempt development; illegal development; failed mitigation efforts; or a temporal lag between the loss of existing functions and the realization of mitigated functions. The Restoration Plan, and the voluntary actions described therein, can be an important component in making up that difference in ecological function.

The City identified restoration and protection opportunities for each reach in the *Shoreline Inventory and Characterization* report (Geo-Ecology Research Group 2005). The *Shoreline Restoration Plan* carries these options forward, identifying a number of opportunities for restoration in the City and the unincorporated UGA, and identifies ongoing City programs and activities, non-governmental organization programs and activities, and other recommended actions consistent with a variety of watershed-level efforts.

Major *Shoreline Restoration Plan* components that contribute to improvement in ecological functions are summarized below:

- Projects to restore ecological functions. Projects include, among others:
 - Stormwater treatment facilities and stormwater retrofits
 - Developing vegetated buffers around parking areas on public lands and revegetating areas prone to severe soil erosion
 - Moving parking areas out of shoreline jurisdiction
 - Developing demonstration sites for soft shoreline armoring
 - Restore emergent vegetation on public lands
- Using programmatic approaches, incentive-based systems, and education and outreach to protect intact shoreline functions.
- Teaming with key partners in program and project implementation.
- Identifying and applying to available funding sources to implement projects.

In addition, the Moses Lake Irrigation and Rehabilitation District obtained permits and in 2011 began dredging excess sediment (~50,000 cubic yards

annually) that had been entering the system from a variety of sources. The accumulated sediments were interfering with fishing and other water-dependent recreation activities and boating facility use, and were adversely impacting water quality. The Washington Department of Ecology reportedly acknowledged the net environmental benefit in its project approval letter. Dredge work is ongoing, as are MLIRD efforts to educate waterfront property owners about the importance of shoreline vegetation and good land use practices.

5.6 Other Programs

5.6.1 Effects of Current City Regulations and Programs

Critical Areas Regulations

Critical Areas Regulations under Title 19 of the Moses Lake Municipal Code (MLMC) apply to designated critical areas outside of shoreline jurisdiction. Wetland buffer widths range from 5 to 100 feet, depending on the wetland classification.

Zoning Code

Title 18 of the MLMC provides zoning standards that direct uses, building bulk, scale, and location, and other design considerations throughout the City. Moses Lake and all lands up to 1,050 feet in elevation are included in the Conservation and Reclamation Zone. Within that zone, dock length is limited to 25 feet in length and 200 square feet in area. Exceeding those limits triggers a land use Conditional Use Permit.

Stormwater Management

The City of Moses Lake supports a dedicated stormwater utility, which funds the maintenance and improvement of the system, as well as the requirements of the Stormwater Management Program (SWMP). The SWMP includes implementing the requirements of the City's Phase II Municipal Stormwater Discharge Permit, issued by the Washington State Department of Ecology. The requirements of the permit are to:

- Reduce the discharge of pollutants to the maximum extent practicable;
- Meet all known, available, and reasonable methods of prevention, control and treatment standards (AKART); and
- Protect water quality.

As required, the City has developed a SWMP that includes the following six components:

- Public Education and Outreach
- Public Involvement and Participation

- Illicit Discharge Detection and Elimination
- Construction Site Stormwater Runoff Control
- Post Construction Stormwater Management for New Development and Redevelopment
- Pollution Prevention and Operation and Maintenance for Municipal Operations

The SWMP also addresses reporting and record-keeping.

The SWMP establishes standard stormwater runoff control for construction sites and post-construction standards for new development and redevelopment. These standards only apply to developments that disturb over an acre of land, and smaller areas if they are a part of a planned development.

5.6.2 State Agencies/Regulations

Aside from the Shoreline Management Act, State regulations most pertinent to development in the City's shoreline include the State Hydraulic Code, the Growth Management Act, State Environmental Policy Act (SEPA), tribal agreements and case law, and Water Resources Act. A variety of agencies (e.g., Washington Department of Ecology, Washington Department of Fish and Wildlife, Washington Department of Natural Resources) are involved in implementing these regulations or managing state-owned lands. The Department of Ecology reviews all shoreline projects that require a shoreline permit, but has specific regulatory authority over Shoreline Conditional Use Permits and Shoreline Variances. Other agency reviews of shoreline developments are typically triggered by in- or over-water work, discharges of fill or pollutants into the water, or substantial land clearing.

Depending on the nature of the proposed development, State regulations can play an important role in the design and implementation of a shoreline project, ensuring that impacts to shoreline functions and values are avoided, minimized, and/or mitigated. During the comprehensive SMP update, the City has considered other State regulations to ensure consistency as appropriate and feasible with the goal of streamlining the shoreline permitting process. A summary of some of the key State regulations and/or State agency responsibilities follows.

Washington Department of Natural Resources

Washington Department of Natural Resources (WDNR) is charged with protecting and managing use of State-owned aquatic lands. Projects on state-owned aquatic lands may be required to obtain an Aquatic Use Authorization from WDNR and enter into a lease agreement. Certain project activities, such as

single-family or two-party joint-use residential piers, on State-owned aquatic lands are exempt from these requirements.

WDNR is also responsible for administering the Surface Mining Act, a reclamation law that requires a permit for each mine that: 1) results in more than 3 acres of mine-related disturbance, or 2) has a high wall that is both higher than 30 feet and steeper than 45 degrees.

Washington Department of Ecology

The Washington Department of Ecology may review and condition a variety of project types, including any project that needs a permit from the U.S. Army Corps of Engineers (see below), any project that requires a Shoreline Conditional Use Permit or Shoreline Variance, and any project that disturbs more than 1 acre of land. Project types that may trigger Ecology involvement include pier and shoreline modification proposals and wetland or stream modification proposals, among others. Ecology's three primary goals are to: 1) prevent pollution, 2) clean up pollution, and 3) support sustainable communities and natural resources (<http://www.ecy.wa.gov/about.html>). Their authority comes from the State Shoreline Management Act, Section 401 of the Federal Clean Water Act, the Water Pollution Control Act, the State Environmental Policy Act, the Growth Management Act, and various RCWs and WACs of the State of Washington.

Washington Department of Fish and Wildlife

Chapter 77.55 RCW (the Hydraulic Code) gives the Washington Department of Fish and Wildlife (WDFW) the authority to review, condition, and approve or deny "any construction activity that will use, divert, obstruct, or change the bed or flow of State waters." Practically speaking, these activities include, but are not limited to, installation or modification of piers, shoreline stabilization measures, culverts, and bridges. These types of projects must obtain a Hydraulic Project Approval from WDFW, which will contain conditions intended to prevent damage to fish and other aquatic life, and their habitats. In some cases, the project may be denied if significant impacts would occur that could not be adequately mitigated.

5.6.3 Federal Agencies/Regulations

The Federal regulation most pertinent to development in the City's shoreline is the Clean Water Act. Other relevant federal laws include the National Environmental Policy Act, Clean Air Act, and the Migratory Bird Treaty Act. Federal agency review would be triggered by discharges of fill or pollutants into the water. Depending on the nature of the proposed development, federal regulations can play an important role in the design and implementation of a shoreline project, ensuring that impacts to shoreline functions and values are

avoided, minimized, and/or mitigated. A summary of some of the key federal regulations and/or agency responsibilities follows.

Clean Water Act, Section 404

Section 404 of the federal Clean Water Act provides the Corps, under the oversight of the U.S. Environmental Protection Agency, with authority to regulate “discharge of dredged or fill material into waters of the United States, including wetlands” (http://www.epa.gov/owow/wetlands/pdf/reg_authority_pr.pdf). The extent of the Corps’ authority and the definition of fill have been the subject of considerable legal activity. However, it generally means that the Corps must review and approve many activities in shoreline waterbodies, and other streams and wetlands. These activities may include wetland fills, stream and wetland restoration, and culvert installation or replacement, among others. Similar to SEPA requirements, the Corps is interested in avoidance, minimization, restoration, and compensation of impacts.

Section 303(d) of the Clean Water Act requires the state to develop a list of waters that do not meet water quality standards. A Total Maximum Daily Load, or TMDL, must be developed for impaired waters. Because Moses Lake is on the 303(d) list for elevated phosphorus levels, a TMDL will need to be prepared. Ecology completed background study on phosphorus sources in groundwater in 2003 (Pitz 2003). Further TMDL development has not been pursued recently.

National Pollutant Discharge Elimination System (NPDES)

As a component of the Clean Water Act, in Washington State, the Department of Ecology has been delegated the responsibility by the U.S. Environmental Protection Agency for managing implementation of the NPDES program. The City is engaged in compliance with the NPDES Phase II Municipal Stormwater General Permit requirements that address stormwater system discharges to surface waters.

6 SUMMARY OF POTENTIAL CUMULATIVE IMPACTS

WAC 173-26-186(8)(d) directs local master programs to evaluate and consider cumulative impacts of “reasonably foreseeable future development on shoreline ecological functions.” The most commonly anticipated changes in shoreline uses in Moses Lake are related to residential development and redevelopment. Common activities may include upland development, the development of overwater structures, and shoreline stabilization. As directed by the WAC, the

policies and regulations in the proposed SMP are designed to ensure that cumulative impacts do not result in a net loss of ecological functions.

Where the location, timing, and impacts of less common uses and development projects are less predictable, WAC 173-26-201(3(d)(iii) provides guidance that “for those projects and uses with unanticipatable or uncommon impacts that cannot be reasonably identified at the time of master program development, the master program policies and regulations should use the permitting or conditional use permitting processes to ensure that all impacts are addressed and that there is no net loss of ecological function of the shoreline after mitigation.” In addition to regulations that avoid, minimize, and mitigate for potential impacts from these less common developments, the proposed SMP includes specific regulations that require these types of developments to demonstrate on an individual basis that proposed projects will not result in a loss of ecological functions.

6.1 Upland Residential Development

Residential development is the most commonly anticipated change in shoreline use in the City of Moses Lake and its UGA. Residential development and developments accessory to these uses, including utility and transportation infrastructure, generally involve impacts to shoreline functions, which typically result from the replacement of pervious, vegetated areas with impervious surfaces and/or a landscape management regime that includes chemical treatments of lawn and landscaping. These actions have multiple potential effects on shoreline ecological functions, including:

- Potential contamination of surface water and groundwater from chemical and nutrient applications or heavy metals.
- Reduction in ability of site to improve quality of waters passing through the untreated vegetation and healthy soils.
- Increase in surface water runoff due to reduced infiltration area and increased impervious surfaces, which can lead to soil erosion and subsequent in-water sediment deposition.
- Elimination of shrub-steppe habitat adjacent to riparian areas. This transition zone is expected to be significant to species that rely on access to both habitats.

6.1.1 Vegetated Buffers

The conservation of emergent, riparian, and undisturbed shrub-steppe vegetation is critical to the habitat and stability of the Moses Lake shoreline. Emergent vegetation typically grows near or below the OHWM, and emergent vegetation would be protected under the proposed 25-foot residential shoreline buffer. Emergent vegetation waterward of the OHWM is also to be protected,

except that limited areas may be removed to accommodate shoreline uses, including adjacent to docks (SMP 8-35-030(9)). In addition to immediate functions of stabilization and vegetation at the aquatic interface, the vegetative transition from aquatic-to-riparian-to-shrub-steppe provides necessary habitat corridors and connectivity for sensitive mammals, birds, and amphibians.

A comparison of the proposed buffer to existing conditions (Table 6-1) reveals that the proposed buffer may exceed the necessary standard to maintain functions in the Shoreline Residential designation where the shoreline is predominantly developed, and the existing mean width of undisturbed vegetation is 11 feet.

Table 6-1. Summary of widths of residential shoreline structural setbacks and undisturbed shoreline vegetation by environment designation and shoreline analysis reach in the City limits.

Shoreline Designation Analysis Reach	# Lots Sampled	Structural Setback Width (ft)			Undisturbed Vegetation Width (ft)			% Vacant by Parcel	% Vacant by Area	Notes
		Mean	Max	Min	Mean	Max	Min			
Shoreline Residential										
8	10	71	95	46	5	26	0	15%	14%	
15	10	58	96	20	15	54	0	12%	9%	
19	10	83	148	35	12	75	0	0%	0%	
28	10	46	87	17	14	29	4	8%	9%	
ED Summary	40	64	148	17	11	75	0	9%	8%	
Shoreline Residential – Resource Area										
4	10	120	230	35	9	27	0	20%	18%	
7	10	172	245	96	119	225	20	21%	19%	
8	9	130	172	96	19	65	0	10%	12%	
14	1	28	28	28	20	20	20	67%	66%	
16	10	81	115	48	38	70	0	49%	68%	
17	1	105	105	105	12	12	12	19%	24%	
18	10	73	112	42	15	104	0	0%	0%	
19	10	168	377	17	96	313	0	24%	16%	
20	10	64	88	42	6	30	0	16%	18%	
21	10	66	100	25	14	84	0	16%	32%	
26	15	65	139	21	27	55	0	50%	33%	
ED Summary	96	97	377	21	34	313	0	27%	28%	
Shoreline Residential - Special Resource Area										
4	4	No residential structures			117	132	99	100%	100%	Likely to develop
10	2	No residential structures			200	200	200	100%	100%	Appears to be natural condition

Shoreline Designation Analysis Reach	# Lots Sampled	Structural Setback Width (ft)			Undisturbed Vegetation Width (ft)			% Vacant by Parcel	% Vacant by Area	Notes
		Mean	Max	Min	Mean	Max	Min			
										for most of jurisdiction
21	9	223	622	35	180	550	35	58%	67%	
ED Summary	15	223	622	35	166	550	35	86%	89%	

Table 6-2. Summary of widths of residential shoreline structural setbacks and undisturbed shoreline vegetation by environment designation and shoreline analysis reach in the Urban Growth Area.

Shoreline Designation Analysis Reach	# Lots Sampled	Structural Setback Width (ft)			Undisturbed Vegetation Width (ft)			% Vacant by Parcel	% Vacant by Area	Notes
		Mean	Max	Min	Mean	Max	Min			
Shoreline Residential – Resource Area										
1	10	110	142	80	45	119	0	36%	64%	UGA- Development may be limited by lack of existing water and sewer utilities.
2	17	135	246	56	27	215	0	43%	42%	UGA
3	13	139	290	44	34	265	0	18%	17%	UGA
5	8	96	250	20	71	250	0	44%	25%	UGA- Development may be limited by wetlands and street access, as well as lack of utilities.
6	10	82	115	45	26	111	0	31%	52%	
23	20	315	721	77	162	542	0	11%	7%	UGA
24	9	147	215	60	15	39	5	21%	21%	UGA
29	10	92	150	39	48	89	0	27%	23%	UGA
30	3	89	185	0	82	200	0	29%	33%	UGA- Development may be limited by lack of existing water and sewer utilities.
31	3	No residential structures			126	200	89	100%	100%	
32	1	No residential structures			200	200	200	100%	100%	
ED Summary	196	129	721	0	76	542	0	42%	44%	

Shoreline Designation Analysis Reach	# Lots Sampled	Structural Setback Width (ft)			Undisturbed Vegetation Width (ft)			% Vacant by Parcel	% Vacant by Area	Notes
		Mean	Max	Min	Mean	Max	Min			
Shoreline Residential - Special Resource Area										
5	1	266	266	266	200	200	200	63%	100%	UGA - Development may be limited by wetlands
24	1	No residential structures			Vegetation in natural state, ~1,000 feet			100%	100%	UGA - Development may be limited by wetlands
ED Summary	2	266	266	266	200	200	200	82%	100%	

On the other hand, in the Shoreline Residential - Resource Area and Shoreline Residential - Special Resource Area designations, the proposed 25-foot buffer width is generally not sufficient to ensure that vegetative functions will be maintained throughout the areas as residential development continues. The mean width of undisturbed vegetation on developed parcels is variable by reach in the Shoreline Residential - Resource Area designation, where mean widths range from 5 to 20 feet in some reaches (e.g., Shoreline Analysis Reaches 4, 8, 18, 20, 21, and 24), and from 96 to 162 feet in other reaches (e.g., Shoreline Analysis Reaches 7, 19, and 23) (Tables 6-1 and 6-2). Similarly, in the Shoreline Residential - Special Resource Area designation, the mean width of undisturbed vegetation is 166 feet on the few developed lots in City limits and more than 200 feet in the UGA. Reaches associated with broader areas of undisturbed vegetation on developed lots generally have steep slopes or wetlands that may discourage development closer to the water.

In addition to developed lots, vegetation is typically undisturbed on undeveloped shoreline lots. Therefore, those designations and reaches with a greater proportion of undeveloped lots, as indicated in Table 6-1, tend to have more intact vegetation that could be adversely affected by future development, particularly if buffer widths are limited.

A buffer is not specified in the Shoreline Residential - Dunes Area environment, where only planned developments are allowed. The City's Zoning Code (MLMC 18.67.050)(B)) states that the planned development district shall be compatible with adjacent land uses and shall not adversely affect the character of the area in which it is located. This could be interpreted to mean that sensitive ecological functions at the site would need to be maintained, but it does not provide sufficient specificity to ensure that the development would not result in a net loss of functions.

Residential buffers are not established for the Water-Oriented Parks & Public Facilities or the Natural designation because residential development is prohibited in these designations.

6.1.2 Water Quality

The amount of space between the shoreline and a structure is one quick evaluation of the likely effect of impervious surfaces on shoreline water quality. Additionally, the coverage of impervious surfaces, particularly pollutant generating surfaces, such as roads and driveways, is an indicator of the effect of development on water quality functions. Therefore, structural setbacks and impervious surface standards are possible approaches to helping maintain water quality, and typically, they are the most economical approaches to implement.

The proposed SMP does not include a structural setback beyond the 25-foot buffer area. Impervious surface standards limit the total lot coverage to 25 to 60 percent of total area, depending on the environment designation. No quantifiable analysis of existing impervious surface standards was completed, but these standards seem generally consistent with existing development intensity throughout shoreline jurisdiction.

Because the soils in Moses Lake are typically highly permeable, and subsurface filtration of contaminants is not a reliable option for ensuring water quality improvements (Pitz 2003), other, potentially more costly alternatives, such as collection and treatment of runoff and sewage treatment improvements, are likely the most effective measures to ensure water quality is maintained despite increasing residential development. As municipal-scale water quality improvement measures continue to be implemented through the SWMP (Section 5.6.1 of this CIA), and if water quality regulations (SMP 6-50-030) and vegetated buffer areas are maintained through the SMP in a manner supportive of no net loss, water quality conditions throughout the City would likely be conserved.

6.1.3 Views

A regulatory setback standard can also be integral to avoiding use conflicts associated with shoreline views for neighboring properties. In the proposed SMP, no setbacks are required for residential development beyond the proposed 25-foot shoreline buffer. In areas where existing development patterns are characterized by residential structures set back significantly farther from the shoreline, new adjacent development situated 25 feet from the shoreline would be likely to cause significant use conflicts resulting from blockage of views. The SMP does not include standards to ensure that residential views for existing property owners are maintained as new residential development occurs.

6.2 Upland Development outside of Shoreline Jurisdiction

Although SMP regulations only apply within shoreline jurisdiction, development outside of shoreline jurisdiction may influence shoreline ecological functions. The potential impacts of development outside of shoreline jurisdiction tend to be more indirect than impacts within shoreline jurisdiction; nevertheless, their potential effects can be significant, and include the following:

- Reduced infiltration potential on hillslopes and in headwater areas increases surface flows and reduces groundwater storage.
- Increased impervious surfaces and waste facilities increases the potential for water quality degradation from excess nutrients, bacteria, heavy metals, and other toxic compound to the shoreline waterbody.
- Elimination of upland wildlife corridors.

Because SMP provisions do not apply to upland areas, other local regulations, including zoning codes, critical areas regulations, floodplain regulations, and stormwater regulations, as well as applicable state and federal regulations will guide development in those areas. Despite these regulations and the spatial separation from the shoreline, developments near shoreline jurisdiction may have impacts to shoreline functions. For those areas where extensive development is anticipated in the study area, but outside of shoreline jurisdiction, particular attention should be paid during review of those projects under other regulations to ensure that the upland impacts are fully mitigated and no net loss of functions is achieved.

7 NET EFFECT ON ECOLOGICAL FUNCTION

Altogether, the provisions in the existing SMP are not sufficient to ensure the conservation of existing shoreline functions in the City of Moses Lake. This analysis is meant to inform the City of potential future shoreline impacts, the importance of specific proposed SMP provisions in helping to meet the standard of no net loss of shoreline ecological functions, and identify areas where the SMP does not meet the standard of no net loss of shoreline functions.

This Cumulative Impacts Analysis indicates that future growth along the City's shorelines will be predominantly characterized by residential development in the Shoreline Residential - Resource Area environment designation. As 28 percent of the parcels in this designation are vacant, there is significant land capacity to accommodate additional growth. This residential growth can be expected to result in vegetative clearing, an increase in impervious surfaces, and an increase in the density and number of docks.

The City of Moses Lake's proposed SMP includes many provisions that help maintain shoreline ecological functions and avoid land use conflicts. However, proposed standards relating to specific shoreline uses and modifications and sensitive ecological resources in the City's shoreline are not sufficient to ensure no net loss of ecological functions on a City-wide basis. Table 7-1 provides a synopsis of components of the SMP that help achieve no net loss of shoreline functions, and Table 7-2 identifies those components that allow for a cumulative loss of functions.

Table 7-1. Features of the proposed SMP that help maintain shoreline ecological functions

Category	Measures that Help Achieve No Net Loss of Functions
Environment Designations (SMP Ch. 9)	The <i>Shoreline Characterization Report</i> guided the assignment of environment designations. These designations were refined based on input from the City and local constituents.
Development Standards (SMP Table 9.3)	Buffers for water-dependent and non-water-dependent uses are appropriately differentiated.
General Policies and Regulations (SMP Ch. 6)	<ul style="list-style-type: none"> • General regulations provide standards that help to minimize effects of development on water quality, minimize clearing and grading, and minimize the future need for shoreline stabilization. • Shoreline critical areas regulations generally support maintenance of aquifer recharge areas, frequently flooded areas, and geologically hazardous areas.
Shoreline Use Provisions (SMP Ch. 7)	<ul style="list-style-type: none"> • Use regulations prohibit uses that are incompatible with the existing land use and ecological conditions, and emphasize appropriate location and design. • Dock provisions emphasize mitigation sequencing to avoid, minimize, and mitigate for impacts.
Shoreline Modification Provisions (SMP Ch. 8)	<ul style="list-style-type: none"> • Regulations emphasize avoiding, minimizing, and mitigating impacts. • Vegetation conservation standards require that vegetation will be maintained in buffers, and that areas of degraded vegetation will be enhanced where development occurs.
Shoreline Restoration Plan (SMP Ch. 11)	The Restoration Plan establishes clear priorities and identifies resources to enable coordinated restoration of the City's shoreline.

Table 7-2. Summary of features of the proposed SMP that allow for a net loss of shoreline ecological functions

Category	Measures that Allow a Net Loss of Functions
Environment Designations (SMP Ch. 9)	The Shoreline Residential- Dunes Area allows for planned development, which does not have <i>specific</i> performance standards that ensure that this sensitive and unique habitat would be protected.
Development Standards (SMP Table 9.3)	Residential shoreline buffers are inconsistent with existing conditions, and are not sufficient to maintain ecological functions.
General Policies and Regulations (SMP Ch. 6)	<ul style="list-style-type: none"> • Proposed buffers for Category III and IV wetlands are not supported by the regional review of best available science. Sufficient information has not been presented to support the proposed buffers. • Proposed wetland mitigation ratios allow for a temporal loss of wetland functions.

Category	Measures that Allow a Net Loss of Functions
Shoreline Use Provisions (SMP Ch. 7)	<ul style="list-style-type: none"> • The SMP does not effectively limit the proliferation of docks and associated shoreline habitat fragmentation.

Suggested recommendations to help the City maintain a cumulative no net loss of functions are provided to the City in a separate report. If those areas identified in Table 7-2 are addressed, the City's SMP would be expected to result in no net loss of shoreline ecological functions.

8 REFERENCES

- City of Moses Lake. 2011. Stormwater Management Program. Stormwater Division.
- Central Washington University, Geo-Ecology Research Group. 2005. City of Moses Lake Shoreline Inventory and Characterization Report.
- Grette and Associates. 2009. Moses Lake Sediment Management Plan. Prepared for Moses Lake Irrigation and Rehabilitation District. September 21, 2009.
- Pitz, C. 2003. Moses Lake Total Maximum Daily Load Groundwater Study. Washington Department of Ecology. Publication No. 03-03-005
- Sheldon, D., T. Hruby, P. Johnson, K. Harper, A. McMillan, T. Granger, S. Stanley, and E. Stockdale. March 2005. Wetlands in Washington State - Volume 1: A Synthesis of the Science. Washington State Department of Ecology. Publication #05-06-006. Olympia, WA.