

# Shoreline Restoration Plan Component of the Shoreline Master Program for the City of Lakewood

*Prepared for:*



City of Lakewood, WA  
Community Development Department  
6000 Main Street SW  
Lakewood, WA 98499

*Prepared by:*



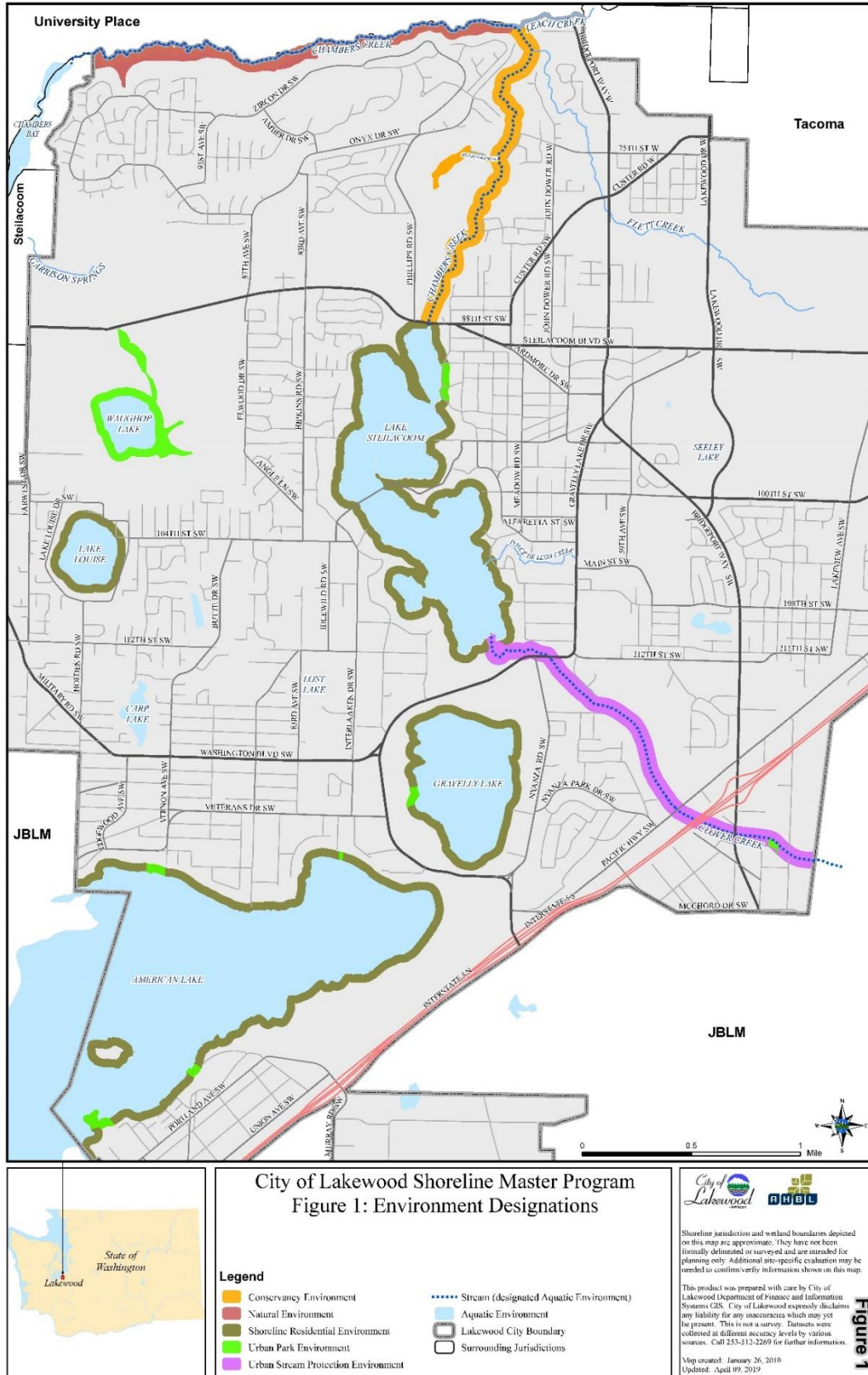
*This report was funded in part through grants from the Washington Department of Ecology:  
2009 Grant No. G1000045, 2018 No. SEASMP-1719-LakPWD-00060.*

***May 6, 2019 City Council adopted; September 9, 2019 ECY approved***

## Table of Contents

1. INTRODUCTION .....	4
2. SHORELINE ANALYSIS AND CHARACTERIZATION SUMMARY .....	5
2.1 Watershed Context and Shoreline Boundary .....	5
2.2 Biological Resources and Critical Areas .....	5
2.3 Summary of Ecological Functions .....	6
2.4 Summary of Degraded Shoreline Areas .....	12
3. RESTORATION GOALS AND OBJECTIVES .....	14
3.1 Comprehensive Plan .....	14
3.2 Restoration Policy Development .....	14
4. LIST OF EXISTING AND ONGOING PROJECTS AND PROGRAMS .....	16
4.1 Chambers-Clover Creek Watershed Planning Participation and Ongoing Efforts .....	16
4.2 Watershed-Wide Action Items to Support Implementation of Chambers-Clover Creek Watershed Action Plan .....	17
4.3 Comprehensive Plan Policies .....	20
4.4 Environmentally Sensitive Areas Regulations .....	20
4.5 Stormwater Management and Planning .....	20
4.6 Public Education .....	20
4.7 Other Lakewood Programs and Projects .....	211
5. LIST OF ADDITIONAL PROJECTS AND PROGRAMS TO ACHIEVE LOCAL RESTORATION GOALS .....	22
5.1 Recommended Projects .....	222
6. PROPOSED IMPLEMENTATION TARGETS AND MONITORING METHODS .....	27
Table 1. Implementation Schedule and Funding for Restoration Projects, Programs, and Plans .....	27
7. RESTORATION CONSTRAINTS AND PRIORITIES .....	29
7.1 Priority 1 – Continue Water Resource Inventory Area (WRIA) 12 Participation .....	29
7.2 Priority 2 – Improve Water Quality and Reduce Sediment and Pollutant Delivery .....	30
7.3 Priority 3 – Develop, Expand and Implement Public Education and Involvement Programs .....	300
7.4 Priority 4 – Create or Enhance Natural Shoreline Conditions along Clover Creek .....	31
7.5 Priority 5 – Implement Soft Shoreline Stabilization and Reduce In-water and Over-water Structures .....	31
7.6 Priority 6 – Improve Riparian Vegetation, Reduce Impervious Coverage .....	311
7.7 Priority 7 – Enhance Habitat as Part of Future Street End Park Improvements .....	32
7.8 Priority 8 – City Zoning, Regulatory, and Planning Policies .....	32
8. DEFINITIONS, ABBREVIATIONS, AND GLOSSARY OF TERMS .....	32
9. REFERENCES .....	48
FIGURE 1 Shoreline Master Program Environmental Designations .....	3
FIGURE 2 Shoreline Planning Segments .....	8

**Figure 1: Shoreline Master Program Environmental Designations**



# SHORELINE MASTER PROGRAM UPDATE

## SHORELINE RESTORATION PLAN

### 1. INTRODUCTION

A jurisdiction's Shoreline Master Program applies to activities in the jurisdiction's shoreline zone. Activities that have adverse effects on the ecological functions and values of the shoreline must provide mitigation for those impacts. By law, the proponent of that activity is not required to return the subject shoreline to a condition that is better than the baseline level at the time the activity takes place. How then can the shoreline be improved over time in areas where the baseline condition is severely, or even marginally, degraded?

Section 173-26-201(2)(f) WAC of the Shoreline Master Program Guidelines<sup>1</sup> says:

“master programs shall include goals and policies that provide for restoration of such impaired ecological functions. These master program provisions shall identify existing policies and programs that contribute to planned restoration goals and identify any additional policies and programs that local government will implement to achieve its goals. These master program elements regarding restoration should make real and meaningful use of established or funded nonregulatory policies and programs that contribute to restoration of ecological functions, and should appropriately consider the direct or indirect effects of other regulatory or nonregulatory programs under other local, state, and federal laws, as well as any restoration effects that may flow indirectly from shoreline development regulations and mitigation standards.”

However, degraded shorelines are not just a result of pre-Shoreline Master Program activities, but also of unregulated activities and exempt development. The new Guidelines also require that “[l]ocal master programs shall include regulations ensuring that exempt development in the aggregate will not cause a net loss of ecological functions of the shoreline.” While some actions within shoreline jurisdiction are exempt from a permit, the Shoreline Master Program should clearly state that those actions are not exempt from compliance with the Shoreline Management Act or the local Shoreline Master Program. Because the shoreline environment is also affected by activities taking place outside of a specific local master program's jurisdiction (e.g., outside of city limits, outside of the shoreline zone within the city), assembly of actions, programs and policies within the larger watershed that have the potential to impact shoreline ecological functions can be essential for understanding how the City fits into the larger context. The latter is critical when establishing realistic goals and objectives for dynamic and highly inter-connected environments.

As directed by the Guidelines, the following discussions provides a very brief summary of baseline shoreline conditions, lists restoration goals and objectives, and discusses existing or potential programs and projects that positively impact the shoreline environment. Finally, anticipated scheduling, funding, and monitoring of these various comprehensive restoration elements are provided. In total, implementation of the Shoreline Master Program (with mitigation of project-related impacts) in combination with this Restoration Plan (for restoration of lost ecological functions that occurred prior to a specific project) should result in a net improvement in the City of Lakewood's shoreline environment in the long term.

In addition to meeting the requirements of the Guidelines, this Restoration Plan is also intended to

---

<sup>1</sup> The Shoreline Master Program Guidelines were prepared by the Washington Department of Ecology and codified as WAC 173-26. The Guidelines translate the broad policies of the Shoreline Management Act (RCW 90.58.020) into standards for regulation of shoreline uses. See <http://www.ecy.wa.gov/programs/sea/sma/guidelines/index.html> for more background.

support the City's or other non-governmental organizations' applications for future grant funding to implement elements of this Restoration Plan.



Lakewood volunteers working in 2017 on shoreline restoration

## 2. SHORELINE ANALYSIS AND CHARACTERIZATION SUMMARY

### 2.1 Watershed Context and Shoreline Boundary

The City of Lakewood retained AHBL and Otak to conduct an inventory and characterization of the City's shorelines in 2009 and 2010. The purpose of the shoreline inventory was to facilitate the City's compliance with the State of Washington's Shoreline Management Act (SMA) and updated Shoreline Master Program Guidelines. The inventory describes existing physical and biological conditions in the shoreline zone within City limits, including recommendations for restoration of ecological functions where they are degraded. The full Shoreline Analysis Report characterizes shoreline function for each waterbody and describes the areas that fall within the shoreline jurisdiction of the City.

### 2.2 Biological Resources and Critical Areas

As described in the Shoreline Analysis Report, the shoreline jurisdiction contains a variety of biological resources and environmentally critical areas, including wetlands, geologic hazards, aquifer recharge areas, wellhead protection zones, and critical fish habitat. Wetlands within the shoreline jurisdiction are primarily confined to the northern reaches of Chambers Creek and adjacent to Waughop Lake, with limited wetlands along Clover Creek. Frequently flooded areas are found along Chambers and Clover Creeks.

Steep slopes and geologically hazardous areas are scattered throughout the city, and each water body's associated jurisdiction contains a small amount of steep slope areas, with the exception of Clover Creek, which contains no documented geologic hazards.

The entire City of Lakewood lies within an aquifer recharge area. Portions of Clover Creek and the shoreline jurisdictions associated with American Lake, Lake Steilacoom, Gravelly Lake, Lake Louise, and Waughop Lake fall within a 1-year wellhead protection zone.

Steelhead of the Puget Sound Distinct Population Segment (DPS) (U.S. Federal Register, 11 May 2007) is the only federally listed salmonid species that occurs in the City of Lakewood. Steelhead presence is documented in Chambers Creek and their presence is assumed in Lake Steilacoom and Clover Creek

(StreamNet 2010). Additionally, Puget Sound-Strait of Georgia coho salmon (a PHS Species) also occur in the basin and are listed as a Species of Concern (U.S. Federal Register, 15 April 2004), indicating that they are under less active consideration for formal listing. Coho spawn in Chambers and Clover Creeks and their presence is documented in Lake Steilacoom (StreamNet 2010). Critical habitat for Puget Sound steelhead within the City of Lakewood was finalized in 2016 (Federal Register 2016). The Chambers Bay estuary fish ladder traps are used at certain times to capture upstream adult migrants, mainly Chinook, as part of a segregated hatchery and estuary fishery program. The fish ladders are left open during the remainder of the year to allow passage of other diadromous species (e.g., chum, coho, steelhead and cutthroat trout). Chinook salmon are usually not released upstream, but spawn are taken to Garrison Springs Hatchery for rearing. The Garrison Springs Hatchery is located in the City of Lakewood near Chambers Creek.

Washington Department of Fish and Wildlife (WDFW) mapping of Priority Habitat and Species (PHS) indicates the presence of a number of habitat areas in the shoreline jurisdiction, including the following:

- WDFW riparian zones and fish species along Chambers Creek, Clover Creek, and Lake Steilacoom.
- WDFW waterfowl concentration areas along Chambers Creek and within Lake Steilacoom, American Lake, Gravelly Lake, Lake Louise, and Waughop Lake.
- WDFW urban natural open space areas along Chambers Creek and surrounding American Lake and Waughop Lake.

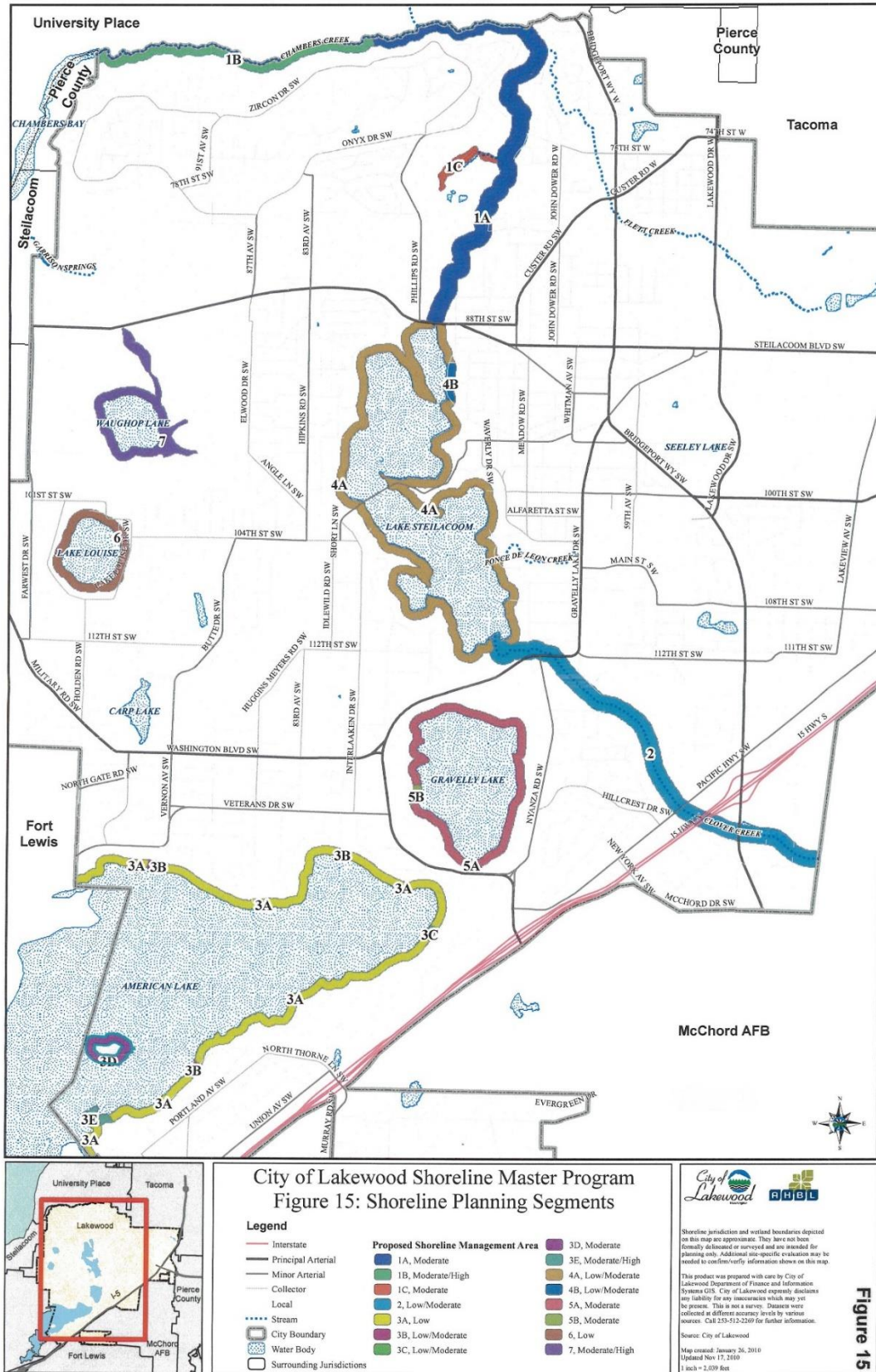
## 2.3 Summary of Ecological Functions

The following briefly summarizes the overall health of ecological functions within specific segments of the Shoreline Management Area.

Shoreline Planning Segments		
Segment	Approximate (feet)	Approximate Area (acres)
1—Chambers Creek	14,334	17.3
Segment 1A	8,055	11.8
Segment 1B—includes Chambers Creek Park	4,994	4.7
Segment 1C—Wetland at Game Reserve)	1,283	0.8
2—Clover Creek	7,089	9.4
3—American Lake	27,768	11.2
3A—Residential	21,802	9.2
3B—City Parks (American Lake North, Lakeland, and Harry Todd Parks)	985	0.4
3C—Tacoma Golf & Country Club	270	0.2
3D—Silcox Island	3,284	1.0
3E—Open space (south of Silcox island)	1,427	0.4
4—Lake Steilacoom	32,669	13.2
4A—Residential	31,745	12.8

Shoreline Planning Segments		
Segment	Approximate (feet)	Approximate Area (acres)
4B—Edgewater Park	924	0.4
5—Gravelly Lake	10,932	4.8
5A—Residential	10,462	4.6
5B—Lakewold Gardens	470	0.2
6—Lake Louise	4,975	2.4
7—Waughop Lake	4,670	3.5
<b>TOTAL</b>	<b>81,014 feet</b>	<b>61.6 acres</b>

## Figure 2: Shoreline Planning Segments





**Chambers Creek - Segment 1A - Overall segment rating = Moderate**

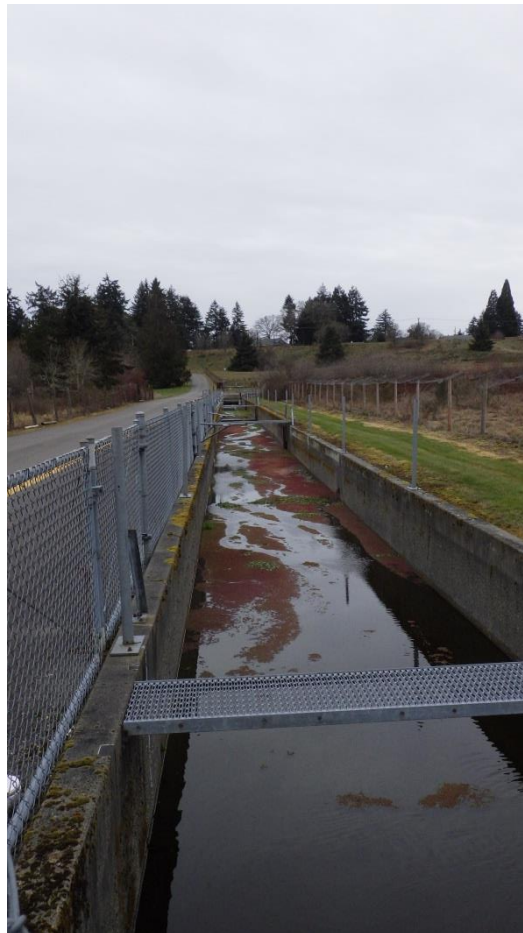
Segment 1A consists of low-density residential housing. Aerial photos indicate that a majority of the riparian buffer has been left intact, providing a largely forested area with some houses/buildings interspersed.

**Chambers Creek - Segment 1B - Overall segment rating = Moderate/High**

Segment 1B is the most natural condition segment in Lakewood's shoreline jurisdiction and has an intact riparian buffer that protects the stream banks from erosion as well as providing shade, habitat (in stream and on the banks), and water quality improvement.

**Chambers Creek - Segment 1C - Overall segment rating = Low/Moderate**

Segment 1C is associated with the wetland on the left (south) bank of Chambers Creek, adjacent to Segment 1A. Some of the functions that wetland are able to provide are ranked low simply because the wetland does not have the opportunity to provide the function. This includes organic matter recruitment because the wetland has little vegetation, most of which consists of emergent plants, this in turn effects the wetlands capability to maintain cool water temperatures. This wetland presents excellent opportunity for restoration, contingent on agreement with WDFW, who operates a hatchery in the area and currently maintains the area as wildlife habitat.



Spring-fed creek in concrete channel, Lakewood hatchery grounds (27 Feb. 2019)

**Clover Creek - Overall segment rating = Low/Moderate**

Clover Creek and its shorelines have been greatly compromised by past residential development. Approximately half of this segment in the City of Lakewood is bordered predominantly by single family homes and multi-family apartments and condominiums. There is also commercial development,

including the section that runs through a long culvert under I-5. The lower half of the segment located in the City has been built out with high-density residential housing.

**American Lake** – Segment 3A - Overall segment rating = Low

The residential segment of American Lake ranks low for overall functions. The high level of shoreline modification has the largest, overarching impact on the functions of the lake and shoreline. The shoreline modifications impede wave attenuation, organic matter recruitment, the ability of the shoreline to remove toxins, and have compromised the functions provided by shallow groundwater.

**American Lake** – Segment 3B/C - Overall segment rating = Low/Moderate

While the parks are in a more natural condition than the residential segment, they have still been altered and have moderate amount of impervious surface, some shoreline modification, and compacted soils, all of which compromised the ability to provide necessary shoreline functions.

**American Lake** – Segment 3D - Overall segment rating = Moderate

Although Silcox Island has been moderately built out with residential structures and has some shoreline modification, the island has mostly retained its forested canopy and has not had as much modification to the soil structure on the island.

**American Lake** – Segment 3E - Overall segment rating = Moderate/High

The forested peninsula south of Silcox Island has been left in a natural condition for many decades. It has a forested canopy that provides special habitat niches both in the canopy and on the lake edge. Because the lake has such a high amount of development, this parcel provides a high quality area among an otherwise developed area.

**Lake Steilacoom** – Segment 4A - Overall segment rating = Low/Moderate

The residential area of Lake Steilacoom is similar to that of the other lakes in Lakewood with high-density residential housing surrounding the lakeshore. Like American Lake, the shoreline has been extensively armored, reducing the ability of the shoreline to perform many shoreline functions.



Pierce County public GIS image of lower Clover Creek and Steilacoom Lake

**Lake Steilacoom** – Segment 4B - Overall segment rating = Low/Moderate

Edgewater Park is a small portion of the overall size of Lake Steilacoom and represents the same overall functions and scores. It does have the opportunity to provide organic matter and it could be enhanced by the City to remove invasive Himalayan blackberry, English ivy, and yellow flag iris. Replacement of non-native invasive species with native trees and shrubs would be beneficial..

**Gravelly Lake** – Segment 5A/B - Overall segment rating = Moderate

The residential segment of Gravelly Lake is fully developed with residential housing and armored shorelines, reducing the functions the shoreline is able to provide similar to the other constructed shorelines. Segment 5B was included in the functions with 5A because it is also built out, but is managed as a 10-acre garden open to the public. Therefore, the functions are the same or similar, but its land use is different from the rest of the lake.

**Lake Louise** – Segment 6 - Overall segment rating = Low

Lake Louise is surrounded by single-family housing, boat docks, and armored shoreline. The functions performed by an intact shoreline have almost completely been modified or heavily compromised on Lake Louise. Lake Louise also suffers from water quality issues associated with excessive nutrients causing toxic algae blooms.

**Waughop Lake** – Segment 7 - Overall segment rating = Moderate/High

Waughop Lake has an intact shoreline and is able to provide nearly all of the functions of a normally functioning shoreline. The lake quality has suffered due to historic use of the lake as a dumping ground for animal waste, as well as urban development. Due to the risk to human health, water quality improvement for Waughop Lake should be a primary focus for the City of Lakewood.

## **2.4 Summary of Degraded Shoreline Areas**

Based on the evaluation of shoreline ecological functions summarized in Section 2.3, the following areas have been identified as being degraded, and restoration efforts in these locations should be prioritized.

**Chambers Creek** – The undeveloped canyon area is under threat from invasive plants, particularly English ivy. Steps should be taken to curb and remove these invasive species before the problem becomes more extensive and difficult to eradicate. Similar issues occur in upstream reaches.



Ivy-covered trees, Chambers Creek canyon area (14 June 2018)

**Clover Creek** – Degraded areas along this stream start at the boundary with JBLM and include the commercially developed areas adjacent to I-5 and areas of residential development along the lower half of the reach. Re-establishment of native riparian buffers along with installation of LWD where feasible should be the highest priority for restoration in this stream. Reconnecting the stream with remnant wetlands, including removal of concrete flow control structures, is highly recommended.

**American Lake** – Most of the shoreline of American Lake is considered degraded, due to the high level of residential development and associated shoreline modification. As described in Section 2.3, widespread armoring has impeded wave attenuation and organic matter recruitment functions, and encouraging property owners to transition from bulkheads to softer forms of shoreline stabilization should be the primary focus in this area, as well as restoration of shoreline buffer areas.

**Lake Steilacoom** – The residential portions of the Lake Steilacoom shoreline have been extensively armored. Similar to American Lake, the presence of this armoring has degraded ecological function, reduced shade and overhanging vegetation, and impeded wave attenuation and organic matter recruitment, including LWD. Encouraging transition to softer, non-structural forms of shoreline stabilization (i.e., natives trees and shrubs) should be the primary focus of restoration efforts in this reach. Enhancement of riparian buffer areas should also be a high priority.

**Lake Louise** – Residential development and shoreline armoring has degraded natural shoreline function along essentially all of the Lake Louise shoreline. Similar to Lake Steilacoom and American Lake, removal of hard armoring and transition to non-structural methods of shoreline stabilization should be of primary concern, as well as reduction of upland impervious surface and re-establishment of natural riparian buffers.

## 3. RESTORATION GOALS AND OBJECTIVES

### 3.1 Comprehensive Plan

The following goals and policies relating to shoreline and other natural features are presented in the City of Lakewood's Comprehensive Plan and they serve as the foundation of the City's restoration strategy.

1. Provide for the protection, conservation, and enhancement of habitat areas for fish and wildlife. (Goal LU-56)
2. Integrate environmental considerations into all planning efforts and comply with all state and federally mandated environmental legislation. (Policy LU-56.1)
3. Identify endangered or threatened species occurring within the City and preserve their habitat. (Policy LU-56.2)
4. Provide for identification and protection of wildlife habitats with an emphasis on protection of wildlife corridors and linking remaining habitat pockets within the City. (Policy LU-56.3)
5. Promote the restoration of riparian (streamside) areas to preserve and enhance their natural function of providing fish and wildlife habitat and protecting water quality. (Policy LU-56.4)
6. Preserve and protect native vegetation in riparian habitats and integrate suitable native vegetation in residential and commercial landscapes. (Policy LU-56.5)
7. Identify specific programs of stream restoration for Chambers, Clover, and Flett creeks. (Policy LU-56.6)
8. Identify the potential for restoring additional stretches of Ponce de Leon Creek. (Policy LU-56.7)
9. Provide fish and wildlife habitat of sufficient diversity and abundance to sustain existing indigenous fish and wildlife populations. (Policy LU-56.8)

### 3.2 Restoration Policy Development

Based on this policy guidance and the policy guidance provided by the Chambers-Clover Creek Watershed Council (CCWC) through the efforts described in Section 4 of this Restoration Plan, the City has developed the following restoration policies, in no particular order.

#### System-Wide Restoration Policies

1. Improve the water quality of all water bodies within the shoreline management area by managing the quality and quantity of stormwater in contributing systems and implementing Low Impact Development (LID) techniques to the maximum feasible extent, consistent at a minimum with the City's NPDES Phase II Stormwater Permit and the latest Washington Department of Ecology Stormwater Management Manual for Western Washington.
2. Reclaim and restore to the greatest extent feasible areas which are biologically and aesthetically degraded while maintaining appropriate use of the shoreline.

3. Increase quality, width and diversity of native vegetation in protected corridors adjacent to lake and stream habitats to provide safe migration pathways for fish and wildlife, food, nest sites, shade, perches, and organic debris. Strive to control non-indigenous plants or weeds that are proven harmful to native vegetation or habitats.
4. Continue to work collaboratively with other jurisdictions and stakeholders to implement the Chambers-Clover Creek Watershed Action Agenda and the WRIA 12 Plan.
5. Seek funding where possible for various restoration actions and programs from local sources and by working with other WRIA 12 jurisdictions, the CCWC, and other stakeholders to seek federal, state, grant and other funding opportunities.
6. Develop a public education plan to inform private property owners about the effects of land management practices and other unregulated activities (such as vegetation removal, pesticide/herbicide use, car washing) on fish and wildlife habitats.
7. Where feasible, protect, enhance, and encourage the restoration of lake areas and wetlands throughout the contributing basin where functions have been lost or compromised.
8. Seek opportunities to enhance and restore connections between lake, stream and wetland habitats.

#### **SMA Restoration Policies**

1. Target Waughop Lake (Fort Steilacoom Park) and Edgewater Park for restoration of shoreline natural resources (e.g., native plants) and functions while ensuring continued public access to the shoreline.
2. Protect natural areas and continue to identify and implement shoreline restoration projects and measures to address persistent water quality issues at Fort Steilacoom Park that negatively impact beneficial uses of the lake, while ensuring continued public access.
3. Target American Lake North Park and Harry Todd Park for limited habitat enhancements that are designed and sited to be compatible with the heavy active recreation use at these parks. Opportunities include planting of native vegetation where appropriate.
4. Target Springbrook Park and adjacent open spaces, and Chambers Creek Canyon Park for the use of environmentally friendly materials and design and vegetation enhancement (i.e., removal of invasive species and planting new native plants) during the future planned development of trails and recreational facilities.
5. Encourage restoration of aquatic and riparian habitat along Clover Creek through incentives for private property owners and continued stormwater management improvements and City capital improvement projects.
6. Collaborate with Pierce County, the City of University Place and community partners for restoration activities that would remove invasive plant species, improve habitat and other ecological functions within Chambers Creek Canyon Park.
7. Improve the ecological functions of lake shorelines by removing bulkheads and replacing these features to the extent feasible with erosion-resistant native trees and shrubs (e.g., Indian plum, red osier dogwood) to improve aquatic habitat conditions, while preserving property.

8. Improve the ecological functions of streams and related habitat with stream bank stabilization using native vegetation. Preserve and restore native vegetation along lake shorelines to the greatest extent feasible.
9. Improve habitat conditions by increasing large woody debris recruitment potential through plantings of trees along the lake shore, particularly conifers. Where a safety hazard will not be created, encourage the installation of large woody debris to meet short- term needs.
10. Target single family residential properties with incentives, outreach and information for homeowners who are willing to voluntarily remove bulkheads, plant native vegetation and encourage large woody debris recruitment.
11. Decrease the amount and impact of overwater and in-water structures within SMP lakes through minimization of structure size and use of more environmentally friendly materials, including grated decking.
12. Monitor and control aquatic invasive species in American Lake, Gravelly Lake, Lake Louise, and Waughop Lake, and continue to participate in lake-wide efforts at Lake Steilacoom to reduce populations of non-native aquatic vegetation.

#### 4. LIST OF EXISTING AND ONGOING PROJECTS AND PROGRAMS

The following series of existing projects and programs are generally organized from the larger watershed scale to the City-scale, including City projects and programs with support of non-profit organizations that are active in the City of Lakewood area.

##### **4.1 Chambers-Clover Creek Watershed Planning Participation and Ongoing Efforts**

The Chambers-Clover Creek Watershed has been the focus of coordinated watershed planning efforts for roughly 20 years. The Chambers-Clover Creek Watershed Action Plan was completed in 1997 and it contained 56 actions. The Watershed Action Plan identified which jurisdictions, state agencies and other organizations would be responsible for implementation and the estimated costs of the proposed actions. Lakewood incorporated at the end of the planning process in 1996 and was not significantly involved in the creation of the Watershed Action Plan. The Watershed Action Plan was also the genesis of the CCWC. While the primary function of the group is to help facilitate the implementation of the watershed action plans, the members of the CCWC are also dedicated to improving fish habitat and fostering a sense of stewardship among watershed residents. CCWC members include representatives from local governments, tribes, businesses, elected officials, environmental agencies, non-profit groups, and private citizens.

The CCWC action plan is updated periodically and their website can be checked for the most recent version. Restoration of coho salmon stocks are a priority in WRIA 12 because the watershed was historically highly suited to coho salmon, along with chum, steelhead and cutthroat trout, and because Chinook do not presently use the freshwater habitat of WRIA 12. Coho are still present in the watershed, though at relatively low numbers. Recent analysis (Moberg 2001) indicates coho salmon would make an excellent indicator species for formulating priority actions to address salmonid conservation and recovery needs in WRIA 12.



Another key target for restoration is the late chum salmon run in Chambers Creek, with some use also being documented in smaller tributaries, such as Flett Creek. This chum run is unusual in the south Sound and represents an important pool of genes for the recovery of Puget Sound chum salmon.

The importance of the sequence of stream and pond habitat for coho salmon should not be underestimated. Productivity of this habitat can be inferred from observations elsewhere in Western Washington (Peterson 1982, Bustard and Narver 1975). In the context of Clover Creek-Steilacoom Lake, coho that spawn in Clover Creek can move down into the lake during late summer low water and may have better over-winter survival before smolting in the spring. Enhancement of habitat (e.g., LWD addition along the shoreline) in Steilacoom Lake, however, is the key issue that would need to be addressed.

The City of Lakewood is one of six cities and towns that are members of the CCWC. The lead agency is Pierce County's Public Works department that has responsibility for surface water planning in the Chambers-Clover Creek Watershed (WRIA 12). The CCWC provides local agencies and citizens with an opportunity to coordinate their planning efforts for the benefit of the watershed. In 2018, the CCWC published its *Watershed Action Agenda – 2018-2023* (<https://www.co.pierce.wa.us/DocumentCenter/View/76631/2018-23-Action-Agenda>). The Action Agenda establishes the following three strategies that are designed to meet the goals and objectives of the watershed council. Within each strategy are recent or ongoing actions in Lakewood that implement the strategies.

1. Enhance watershed-based communication, coordination and education.
2. Promote watershed stewardship
3. Support watershed protective policies and regulations that protect the aquifer and salmonids.

#### **4.2 Watershed-Wide Action Items to Support Implementation of Chambers-Clover Creek Watershed Action Plan**

1. The City of Lakewood evaluates effects on ground and surface water during compliance inspections. If businesses are found to be out of compliance with development regulations with regard to ground and surface water practices, City inspectors provide an explanation of why current practices need to be corrected.
2. The City has adopted a Stormwater Education and Outreach Plan per the conditions of its Phase II NPDES permit. The objective of the plan is to educate public employees, businesses, and the general public about illegal discharges and their potential negative effects on water quality. The plan establishes groups of target audiences and identifies the specific topics and distribution formats most applicable to each, as well as measurable goals to determine if outreach efforts are having a positive effect on reduction of illicit discharge. The plan also contains a timeline for outreach efforts to each of the audience groups.
3. The Tahoma Audubon Society initiated a project in 2018 which contacted about 500 landowners near Clover Creek. The landowners were provided information about best creek side management practices and invited them to attend a seminar on various topics. The project is scheduled to be conducted again in 2019.
4. Phase II NPDES Permit approved in 2012, See above, and Section 4.4 for additional details.

5. While most new developments are infiltrating their stormwater on site, there are numerous existing stormwater outfalls that discharge into Chambers Creek and Clover Creek, some of which are in the City. The City's Stormwater Management Plan includes a map showing all outfall areas. It is inferred from Pierce County water quality documents that Lake Louise likely has existing stormwater discharges directed into it although there are no natural surface drainages into the lake. American Lake has some existing direct discharges of stormwater into the south end of lake.
6. In addition, the City has taken the following actions to maintain and retrofit existing stormwater facilities:
  - Since incorporation, the City has retrofitted 13 outfalls that discharge to lakes and creeks within Lakewood;
  - The City has replaced approximately 500 obsolete stormwater dry wells with improved infiltration systems. The City plans to continue this effort until all remaining dry-wells have been replaced;
  - As part of the ongoing improvements to Pacific Highway, specifically the segment from Gravelly Lake Drive to Bridgeport Way, the City implemented various LID techniques to reduce the amount of runoff entering Clover Creek;
  - Nearly all of the City's planned public work capital projects include a stormwater management component. As roads are improved and public facilities are constructed, existing stormwater systems are upgraded, and new systems are designed to meet current standards.
7. Sanitary sewer serves the vast majority of the City. An area of approximately 40 acres located just north of Lake Louise and southwest of Lake Waughop, but outside the proposed SMA of either lake, contains 93 single-family residences that rely on on-site sewage disposal systems. Residences in the Tillicum and Woodbrook portions of the City, south of American Lake, also currently rely on on-site sewage disposal systems, but will soon have public sanitary sewer service provided by Pierce County. The City of Lakewood is working to transition properties that use on-site sewage disposal systems to sanitary sewer service, and all development within the City must connect to sanitary sewer if such is available. LMC 12A.15.040 requires existing development to connect to sanitary sewer within 90 days after the City has provided notice that service is available. New development shall connect to sanitary sewer in order to qualify for a certificate of occupancy (LMC 12A.15.060).
8. The City has ongoing public works improvement programs that offer potential benefits to lakes, including outfall retrofits, drywell retrofits, and sanitary sewer installation in Tillicum and American Lake Gardens.
9. In past years, the City has implemented several projects to remove barriers to fish passage on Clover Creek, Flett Creek, and Leach Creek, making additional upstream habitat available for fish and wildlife, including salmon. In addition, local stormwater management projects indirectly contribute to salmon recovery by reducing pollution in ground and surface water that may eventually flow to Puget Sound and increase habitat diversity.
10. A team comprised of Forterra, Pierce County, the Puyallup Tribe, and SPSSEG are currently working on a feasibility study to remove the Chambers Creek dam and other armoring to restore Chambers Bay.
11. The Puyallup Tribe is looking at options for habitat restoration along the lower 4 miles from Kobayashi Park to the Dam.

12. The Stewardship Committee worked with Lakewood's Parks department in 2018 (Parks Appreciation Day) on restoring 200 feet of creek bank along Clover Creek beside Springbrook Park. Volunteers removed blackberries, ivy and scotch broom. Surplus native plants were salvaged from a rain garden in Puyallup and re-planted on the creek side. The goal is to create a demonstration site showing various native trees, shrubs, and plants where people can visit to see which plants would be good for their yards.
13. Volunteers from the South Puget Sound Flyfishers kept three fish ladders free of debris in the fall of 2018 to allow Coho salmon to pass upstream. Other volunteers check on fish passages on McChord Field, Steilacoom Lake, and at the dam at Chambers Bay.
14. City of Lakewood adopted 2012 DOE Stormwater Manual, with 2014 amendments, and has also adopted the 2015 Pierce County Stormwater Management and Site Development Manual, which covers LID. City Public Works staff review development applications to ensure compliance with all adopted stormwater regulation. Specifically, the City requires TESC BMPs, and the municipal code requires developers to retain stormwater on-site to the maximum extent feasible (LMC 12A.11.044). Lakewood is fortunate to have soils suitable for infiltration throughout most of the city. Since the NPDES Permit was issued, all new developments are infiltrating their stormwater on site or in a few cases discharging to City infiltration systems. Also unique to Lakewood, much of the City's infrastructure infiltrates and does not discharge to surface waters. The City has not defined goals or metrics to identify, promote or measure LID use. The City has not determined schedules for requiring of implementing additional LID techniques on a broader scale.
15. The City employs one full-time stormwater compliance inspector whose duties include inspections of businesses and properties for compliance with Lakewood's stormwater management regulations. The inspector works closely with inspectors from other City departments (building, code enforcement, community service officers) on enforcement efforts that require multiple disciplines.
16. City staff also remains informed of changes in regulations at the state and federal level that may impact local regulatory requirements.
17. The City has participated in the Benthic Index of Biotic Integrity (BIBI) sampling program with Pierce County. The BIBI program consists of surveys of water bodies to evaluate water body health based on the prevalence of various indicator species.
18. The City also financially supports the Pierce Conservation District Stream Team in its efforts to sample and analyze water from several lakes in Lakewood. This is a long-term, ongoing project, and several more years of data will be necessary before it can be determined if there are any measurable trends in water quality.

In addition to the watershed action planning process, the Chambers-Clover Creek Watershed has also been the focus of a number of other major planning efforts. A Salmon Habitat Protection and Restoration Strategy for the watershed (WRIA 12) was completed in 2018, a requirement of the federal listing of Puget Sound Chinook as threatened under the Endangered Species Act. The Washington State Department of Ecology continues to develop water cleanup plans for impaired water bodies, as well as administer Clean Water Act implementation programs, such as NPDES permitting. Pierce County completed the Clover Creek Basin Plan in 2003, which focuses on water quality, flooding, and habitat issues in unincorporated areas. Additionally, a comprehensive watershed management plan for WRIA 12 was completed in 2004. However, this plan was not approved by all stakeholders.

### **4.3 Comprehensive Plan Policies**

The City's comprehensive plan defines goals and policies addressing protection of the environment and shorelines in its Land Use Element. Topics addressed include environmentally critical areas, fish and wildlife habitat, water quality, air quality, wetland protection, and flood management. Many of the goals and policies applicable to the shoreline environment were used as the basis for the restoration objectives discussed in Section 3. Comprehensive Plan Policies are implemented through the City's Municipal Code, Capital Improvement Program and other mechanisms.

### **4.4 Environmentally Sensitive Areas Regulations**

The City of Lakewood's critical areas and natural resource lands regulations are found in Lakewood Municipal Code Title 14 – Environmental Protection. The City completed its last critical areas regulations update in 2015, consistent with the requirements of the GMA. The regulations are based on “best available science,” and they provide protection to critical areas in the City. The regulations categorize streams based on the Department of Natural Resources classification system and dictate buffers ranging from 35 feet to 150 feet. Wetland buffers range between 40 and 225 feet and are classified according to Lakewood Municipal Code 14.162.080. Management of the City's environmentally sensitive areas using these regulations should help insure that ecological functions and values are not degraded, and impacts to critical areas are mitigated. The City's critical areas regulations are adopted by reference into the Shoreline Master Program, with certain modifications and deletions based on the SMP Guidelines, to regulate critical areas found within the shoreline zone.

### **4.5 Stormwater Management and Planning**

The Lakewood Department of Public Works Surface Water Management Division is responsible for maintaining the City's stormwater infrastructure. In 2012, Ecology approved the City's National Pollution Discharge Elimination System (NPDES) Phase II permit. The NPDES Phase II permit is required to cover the City's stormwater discharges into regulated lakes and streams. Under the conditions of the permit, the City must protect and improve water quality through public education and outreach, detection and elimination of illicit non-stormwater discharges (e.g., spills, illegal dumping, and wastewater), management and regulation of construction site runoff, management and regulation of runoff from new development and redevelopment, and pollution prevention and maintenance for municipal operations. The policies and regulations of the proposed SMP and this Restoration Plan are intended to support the City's ongoing NPDES Phase II Permit compliance efforts.

### **4.6 Public Education**

The City of Lakewood's Comprehensive Plan identifies policy statements based on goals associated with the Land Use and Utilities elements (excerpted below). These items help guide City staff and local citizen groups in developing mechanisms to educate the public and broaden the interest in protecting and enhancing local environmental resources.

Policy LU-61.9: Work cooperatively with local water districts to maximize protection of wellheads and aquifers. Support ongoing efforts to:

- Educate citizens and employers about Lakewood's dependence on groundwater;
- Establish and maintain public awareness signs delineating the boundaries and key access points to the Lakewood Water District's wellhead protection areas;

- Maintain groundwater monitoring programs;
- Implement a well decommissioning program for all unused wells;
- Coordinate planning and review of drainage, detention, and treatment programs within wellhead protection areas.

Additionally, Strategy 1 in the *Watershed Action Agenda: Priorities for Focus within the Chambers-Clover Creek Watershed 2018-2023*, developed by the CCWC is “Enhance watershed-based communication, coordination, and education.” This agenda includes various goals and objectives related to this strategy.

- Develop and relay education and outreach messages that connect people to this watershed.
- Promote understanding of ground and surface waters as one integrated resource.
- Serve as a reliable source of current information about the watershed.
- Increase CCWC contact list to cover all the riparian owners along the regulated lakes and tributaries in the watershed.
- Establish and maintain current, comprehensive online access to information about the watershed through the CCWC website.
- Build relationships with existing outreach event partners, schools and watershed communication outlets and provide supplies and materials at five local events annually.

The City has been a member of the CCWC since its inception and actively implements all six of the public outreach components. Additional details about CCWC public education, outreach, and stewardship programs may be found at <https://www.co.pierce.wa.us/DocumentCenter/View/76631/2018-23-Action-Agenda>

Public education and involvement will be a priority in the City. Opportunities for restoration exist on public property in the City, but are limited along the majority of the City’s shorelines because it is under private ownership. Therefore, in order to achieve the goals and objectives set forth in this Restoration Plan, the City should focus on fostering restoration on private land.

Providing education opportunities and involving the public is important to success. This could possibly entail the development of a long-term Public Education and Outreach Plan to gain public support. Voluntary restoration efforts on private property would also benefit from public outreach and education. This could include local workshops and mailers to educate shoreline property owners and other shoreline users on maintaining healthy shoreline environments, promoting enhancement and restoration opportunities, and use of low impact development techniques.

## **4.7 Other Lakewood Programs and Projects**

### **Illegal Discharge Detection and Elimination Program**

The City’s Phase II NPDES Permit requires the implementation of an Illegal Discharge Detection and Elimination (IDDE) program to help meet the requirements of the Clean Water Act. The City’s latest IDDE plan, completed in July 2011, contains policies for finding and eliminating discharges of pollutants not allowed under the terms of the NPDES permit. The IDDE Plan contains an inventory of all known outfall locations and establishes a schedule for inspecting outfalls greater than 24 inches in diameter to

detect illicit discharges.

The IDDE Plan also contains protocols for spill prevention and response that are designed to ensure that spills of hazardous substances within the city are properly identified, reported, contained, and cleaned up.

### **Carwash Public Education**

The City has established Best Management Practices (BMPs) for charity car washes, which can be a source of pollutants in the stormwater stream. The City requires that charity car washes obtain a free permit and that such car washes be located on a pervious surface (grass, gravel) or on an impervious surface that drains to a stormwater infiltration system, rather than the general stormwater network. Other guidelines and BMPs are published on fact sheets publicly available from the City.

### **Automotive Industry BMPs**

In addition to public education for car washes, the City also publishes fact sheets containing good practices for auto-oriented businesses, such as car dealerships and automotive repair shops. Such practices include fixing oil leaks, preventing wash water from vehicles or car parts from entering the storm drain, proper disposal of hazardous waste, and covering outdoor storage areas to prevent potentially toxic runoff from flowing into the storm drain.

### **Safe Pet Waste Disposal BMPs**

The City publishes fact sheets on pet waste disposal to educate the public on the importance of managing this contributor to poor water quality. The fact sheets explain that pet waste often contains pathogens that can cause disease in humans and other animals, and stormwater flows can transmit these pathogens to streams and lakes. Residents are encouraged to scoop up after their pets often and place the waste in the garbage. Placing pet waste in the municipal yard waste collection bins is highly discouraged because the pet waste then contaminates any compost that is made from the collected yard waste. Flushing pet waste down the toilet in areas using septic systems is also discouraged, as septic systems are often not designed to handle pet waste, which differs in composition from human waste, and septic systems may become overloaded and cause groundwater pollution.

## **5. LIST OF ADDITIONAL PROJECTS AND PROGRAMS TO ACHIEVE LOCAL RESTORATION GOALS**

The following series of additional projects and programs are generally organized from the larger watershed scale to the City-scale, including City projects and programs and finally non-profit organizations that are active in the Lakewood area.

### **5.1 Recommended Projects**

The following is partially developed from an initial list of opportunities identified within the *Shoreline Analysis Report*. The list of potential projects is intended to contribute to improvement of impaired functions.

General: Many shoreline properties have the potential for improvement of ecological functions through: 1) reduction or modification of shoreline armoring, 2) reduction of overwater cover and in-water structures (grated pier decking, pier size reduction, pile size and quantity reduction, moorage cover

removal), 3) reductions in upland impervious surface coverage, 4) improvements to vegetation within the shoreline setback or buffer, 5) improvement to existing flooding conditions, especially along Chambers Creek and Clover Creek, 6) improvements to habitat diversity, and/or 7) improvements to upland vegetation and soils to provide additional habitat and mitigate stormwater impacts. These opportunities generally apply to private residential properties, public parks, share recreational lots, private recreation uses, public street-ends, and utility corridors.

#### Segment 1: Chambers Creek

While a significant portion of the creek shoreline runs through properties containing private residences, Chambers Creek Park (i.e. Chambers Creek Properties owned and administered by Pierce County) occupies a large portion of the creek's northern reach, providing a direct opportunity to preserve and enhance the existing riparian zone on public lands. Enhancement of degraded areas could be achieved using the Washington Conservation Corps. In addition, along much of the southern reach, homes are located considerable distance from the creek, which is largely confined to a ravine. Forested and largely intact riparian areas provide valuable ecological functions as documented in the Shoreline Inventory and Analysis Report.

Protecting existing high quality habitat along Chambers Creek is the highest priority. Implementation and enforcement of critical area regulations and the City's NPDES stormwater program are cornerstones of the City's efforts to protect habitat along Chambers Creek and improve water quality. Interagency coordination with Pierce County and University Place, particularly for Chambers Creek Park, as well as WDFW (which has a fish hatchery and significant management role for fish in the basin) should be emphasized in refining the management strategy for the northern reach. Limited opportunities may also exist for property acquisition. Additional outreach to homeowners and habitat enhancement efforts in the park and on private properties with willing homeowners can help ensure that the highest quality fish and wildlife habitat in the City is protected and enhanced.

#### Segment 2: Clover Creek

Because the majority of Clover Creek shoreline is in private ownership, the primary opportunities for restoration and enhancement occur on private property. Enhancement of the area could be achieved by 1) educating private property owners on what an ecologically appropriate riparian zone should look like, 2) encouraging private property owners to remove existing bank modifications, such as rip-rap and concrete walls, replacing them with vegetation planting of native trees and shrubs. Homeowner education programs could also be established to discourage the use of chemicals on lawn areas and landscaping that may adversely affect water quality. As in the case of Chambers Creek, the City could use the Washington Conservation Corps to restore its own properties, such as planting native plants and removing invasive species in Springbrook Park. The City expects that implementation of the NPDES Phase II Stormwater Program and the incentive-based setback regulations included in the SMP, which encourages enhancement of the creek shoreline and vegetation, will help improve conditions along Clover Creek.

Two volunteers surveyed a section of Clover Creek between JBLM and I-5 in August 2017. A detailed report was prepared discussing the conditions of the stream and recommended restoration projects. The data was intended to be used to update Lakewood's Restoration Component of its Shoreline Master Program.

In addition, the City previously identified a fish blockage approximately 600 feet upstream of Lake Steilacoom. Removal of this blockage occurred in 2015.



Dense blackberry and ivy growth on City of Lakewood property near Springbrook Park (28 April 2018)

### Segment 3: American Lake

As noted in the Chambers-Clover Creek Watershed Action Plan and other sources, phosphorus and other pollutants from improperly functioning on-site sewage systems (OSS) is a concern in the watershed overall as well as in the immediate vicinity of American Lake. The City should set a time frame for the required conversion of existing OSS in the Tillicum and American Lake Garden Tract neighborhoods to sanitary sewer and explore additional means to accomplish this goal. In the meantime, the City should work with the Tacoma-Pierce County Health Department (TPCHD) to identify problem OSS, work with property owners to educate them about the need to maintain their systems and support TPCHD to ensure the enforcement of existing regulations.

Most of the habitat enhancement potential for American Lake is concentrated on privately owned parcels because of the high degree of private ownership surrounding the lake. Restoration on private property could be achieved by encouraging private property owners to remove existing bank modifications and implement shoreline enhancement projects, such as native vegetation planting. The replacement of bulkheads and other forms of hard armoring with bioengineered solutions should be especially encouraged. Replacement of deteriorating piers should also be a high priority. Homeowner education programs could also be established to discourage the use of chemicals on lawn areas and landscaping that may adversely affect water quality.

Restoration activities could also occur at City parks, focusing on the removal of bulkheads and the reestablishment of native vegetation where feasible. New facilities constructed at City shoreline parks should employ LID practices and green building techniques. Areas where native vegetation cover is still extensive should be protected.

The City expects that implementation of the NPDES Phase II Stormwater Program and the incentive-based setback regulations included in the SMP, which encourages enhancement of the lake shoreline and vegetation, will help improve conditions along American Lake, as well as on other lakes in the City. A long-range goal for the City's Surface Water Management Division is the preparation of management



plans for the City's lakes, including American Lake. While American Lake currently has an aquatic vegetation management plan in place, the plan is narrowly focused. A new lake management plan would address a broad range of topics with bearing on the health of the lake, including water quality and upland vegetation enhancement.

#### Segment 4: Lake Steilacoom

Most of the restoration potential for Lake Steilacoom is concentrated on privately owned parcels because of the high degree of private ownership surrounding the lake. Restoration on private property could be achieved by encouraging private property owners to remove existing bank modifications and implement shoreline enhancement projects, such as native vegetation planting or installing engineered LWD. The replacement of bulkheads and other forms of hard armoring with bioengineered solutions should be especially encouraged. Replacement of deteriorating piers should also be a high priority. Because steelhead, an ESA listed fish species, are known to occur in Lake Steilacoom, dock and pier standards require light transmission through deck materials to limit impacts on salmonids. Homeowner education programs could also be established to discourage the use of chemicals on lawn areas and landscaping that may adversely affect water quality.

Restoration activities could also occur at Edgewater Park, and the city should consider acquiring additional property on Lake Steilacoom for public access (i.e., parking). The City can use these projects as an example to private landowners in how to setback and restore shoreline areas. New facilities constructed at City shoreline parks should employ LID practices and green building techniques. Areas where native vegetation cover is still extensive should be protected.

A long-range goal for the City's Surface Water Management Division is the preparation of management plans for the City's lakes, including Lake Steilacoom. The lake management plan would address a broad range of topics with bearing on the health of the lake, including water quality, aquatic vegetation management, and upland vegetation enhancement.

#### Segment 5: Gravelly Lake

Gravelly Lake is surrounded by private parcels, and restoration opportunities are therefore restricted to private property. Restoration on private property could be achieved by encouraging private property owners to remove existing bank modifications and implement shoreline enhancement projects, such as native vegetation planting. The replacement of bulkheads and other forms of hard armoring with bioengineered solutions should be especially encouraged.

Replacement of deteriorating piers should also be a high priority. Homeowner education programs could also be established to discourage the use of chemicals on lawn areas and landscaping that may adversely affect water quality.

While privately owned, Lakewold Gardens is open to the public and provides an opportunity for further shoreline restoration. The City should work with Lakewold Gardens to explore possibilities for expanded public access at this location, as well as implementation of restoration measures, such as bulkhead removal and reduce use of chemicals and fertilizers that may adversely affect water quality in Gravelly Lake.

#### Segment 6: Lake Louise

Lake Louise is surrounded by private parcels, and with the exception of the public boat launch at the restoration opportunities are therefore restricted to private property. Restoration on private property

could be achieved by encouraging private property owners to remove existing bank modifications and implement shoreline enhancement projects, such as native vegetation planting. The replacement of bulkheads and other forms of hard armoring with bioengineered solutions should be especially encouraged. Replacement of deteriorating piers should also be a high priority. Homeowner education programs could also be established to discourage the use of chemicals on lawn areas and landscaping that may adversely affect water quality.



**Invasive Himalayan blackberry and ivy at Edgewater Park**

### Segment 7: Waughop Lake

Waughop Lake is located entirely within Fort Steilacoom Park, so restoration efforts could be undertaken by the City of Lakewood. Due to poor water quality and potential risks to human health, water quality improvement should be the highest priority for restoration projects at Waughop Lake. The practice of stocking the lake with game fish has been discontinued., Taking steps to reduce the amount of pet waste that washes into the lake, such as increased provision of waste bags and trash containers along the park trails, is recommended.

As noted in the Chambers-Clover Creek Watershed Action Plan and other sources, phosphorus and other pollutants from improperly functioning on-site sewage systems (OSS) is a concern in the watershed overall as well as in the vicinity of Waughop Lake. In 2019, the City is continuing the conversion of existing OSS in the area to sanitary sewer. In the meantime, the City should work with the Tacoma-Pierce County Health Department to identify problem OSS, work with property owners to educate them about the need to maintain their systems and support TPCHD to ensure the enforcement of existing regulations.

A long-range goal for the City's Surface Water Management Division is the preparation of management plans for the City's lakes, including Waughop Lake. The lake management plan would address a broad range of topics with bearing on the health of the lake, including water quality, aquatic vegetation management, and upland vegetation enhancement. Improving water quality would be a primary focus for Waughop Lake.

Educational signage regarding the lake and surrounding wetlands would help fulfill the public outreach and education goals of this restoration plan, and enhancements to the wetlands and associated buffers would provide improvements to water quality and fish and wildlife habitat.

## 6. PROPOSED IMPLEMENTATION TARGETS AND MONITORING METHODS

As previously noted, the vast majority of the City’s shoreline zone is occupied by single-family residences, with small areas of vacant property and two parks. Therefore, other than watershed level programs, such as NPDES Phase II Stormwater Permit compliance, the largest potential for directly improving shoreline ecological function generally lies in promoting restoration and healthy practices on private property and the lot scale. The City of Lakewood can continue improvement of shoreline ecological functions along the shoreline through a more comprehensive watershed approach, which combines the both public education programs and lakefront and streamside improvements.

The following table (Table 1) outlines a possible schedule and funding sources for implementation of a variety of efforts that could improve shoreline ecological function, and are described in previous sections of this report.

**Table 1. Implementation Schedule and Funding for Restoration Projects, Programs, and Plans.**

<b>Restoration Project/Program</b>	<b>Schedule</b>	<b>Funding Source or Commitment</b>
4.1 Chambers-Clover Watershed Council Participation	Ongoing	The City plays an active role on the Chambers-Clover Watershed Council. The City sends a staff representative to a monthly CCWC meeting, and the City’s Surface Water Division Manager serves as the CCWC chair. City of Lakewood staff commit approximately 4-5 hours per month to CCWC activities.
4.2 Comprehensive Plan Policies	Last updated 2014	The City commits substantial staff time to the review of projects and programs to ensure consistency and compliances with the goals and policies of the Comprehensive Plan. The City last updated its Comprehensive Plan in 2014, and the next update is mandated by the Growth Management Act to occur before the end of 2023.
4.3 Critical Areas Regulations	Updated 2009	The City commits substantial staff time to the review of projects and programs to ensure consistency and compliances with the goals and policies of the Critical Areas Regulations.

<b>Restoration Project/Program</b>	<b>Schedule</b>	<b>Funding Source or Commitment</b>
4.4 Stormwater Management and Planning	Ongoing	The City adopted a Stormwater Management Program in 2018. The City prepares annual updates to its Stormwater Management Program, pursuant to the conditions of its NPDES permit. The Stormwater Management Program is funded by a stormwater utility fee paid for by Lakewood property owners.
4.5 Public Education/Outreach	Ongoing	<p>The City has an active Stormwater Public Education and Outreach Plan. The plan is updated annually in accordance with NPDES permit requirements.</p> <p>As part of this effort, the City could develop a long- term Public Education and Outreach Plan to gain public support for voluntary restoration efforts on private property.</p>
5.1 Recommended Improvements	As funds and opportunity allow	Projects identified in this section will be implemented when funding is obtained, either through grants or through partnerships with other agencies or non-profit groups, or as required by critical areas regulations or the Shoreline Master Program during project-level review by the City. Projects that directly benefit salmon habitat may be eligible to receive funding from the Washington State Salmon Recovery Funding Board. \$28 million dollars of project funding was announced by the SRFB for Fiscal Year 2011.

The City is required to monitor development under the Shoreline Master Program to ensure no net loss. We recommend that City planning staff track all land use and development activity, including exemptions, within shoreline jurisdiction, and incorporate actions and programs of the Parks and Recreation and Public Works departments as well. We recommend that a report be assembled that provides basic project information, including location, permit type issued, project description, impacts, mitigation (if any), and monitoring outcomes as appropriate. Examples of data categories might include square feet of non-native vegetation removed, square feet of native vegetation planted or maintained, reductions in chemical usage to maintain turf, linear feet of eroding shoreline stabilized through plantings, linear feet of shoreline armoring removed, number of fish passage barriers eliminated or stream miles opened to anadromous fish. The report could also update Tables 1 and 2 above, and outline implementation of various programs and restoration actions (by the City or other groups) that relate to watershed health.

The staff report could be assembled to coincide with Comprehensive Plan updates and could be used, in light of the goals and objectives of the Shoreline Master Program, to determine whether implementation of the Shoreline Master Program is meeting the basic goal of no net loss of ecological functions relative to the baseline condition established in the Shoreline Analysis Report (Otak/AHBL 2010). In the long term, the City should be able to demonstrate a net improvement in the City of

Lakewood's shoreline environment.

Based on the results of this future assessment program, the City may make recommendations for future changes to the Shoreline Master Program.

## 7. RESTORATION CONSTRAINTS AND PRIORITIES

The process of prioritizing actions that are geared toward restoration of Lakewood's shoreline area involves balancing ecological goals with a variety of constraints. General constraints related to potential restoration of shoreline functions include:

1. Persistent water quality problems that are a result of nonpoint pollution within the entire watershed, including areas outside of the City of Lakewood.
2. Persistent problems with base flows in Clover Creek.
3. An extensively developed shoreline area throughout the SMA with predominantly private land ownership (a portion of Chambers Creek being the exception).
4. Heavy use of public parks and demand for parking, public access, active recreation and water dependent facilities that have the potential to conflict with shoreline habitat restoration.

The goals in Section 3 and constraints were used to develop a hierarchy of restoration actions to rank different types of projects or programs associated with shoreline restoration. Programmatic actions, like providing public education and outreach programs to local residents, tend to receive relatively high priority opposed to restoration actions involving private landowners. Other factors that influenced the hierarchy are based on scientific recommendations specific to WRIA 12, potential funding sources, and the projected level of public benefit.

Although restoration project/program scheduling is summarized in the previous section (Table 2), the actual order of implementation may not always correspond with the priority level assigned to that project/program. This discrepancy is caused by a variety of obstacles that interfere with efforts to implement projects in the exact order of their perceived priority. Some projects, such as those associated with riparian planting, are relatively inexpensive and easy to permit, and should be implemented over the short and intermediate term despite the perception of lower priority than projects involving extensive shoreline restoration or large-scale capital improvement projects. Straightforward projects with available funding should be initiated immediately for the worthwhile benefits they provide and to preserve a sense of momentum while permitting, design, site access authorization, and funding for the larger, more complicated, and projects that are more expensive are under way.

### 7.1 Priority 1 – Continue Water Resource Inventory Area (WRIA) 12 Participation

Of basic importance is the continuation of ongoing, programmatic, basin-wide programs and initiatives such as Watershed Action Agenda and the WRIA 12 watershed restoration efforts. The City should continue to work collaboratively with other jurisdictions and stakeholders in WRIA 12 through the CCWC to implement the actions called for in the related plan. This process provides an opportunity for the City to keep in touch with its role on a basin-wide scale and to influence habitat conditions beyond its borders, which in turn come back to influence water quality and quantity and habitat issues within the City.

## **7.2 Priority 2 – Improve Water Quality and Reduce Sediment and Pollutant Delivery**

Maintaining and improving water quality throughout the Chambers-Clover Creek Watershed is considered a high priority for the City of Lakewood. The water quality in the City's streams and lakes directly influences recreational uses such as swimming and boating, as well as fish and wildlife habitat. Water from the surrounding basin flows into Clover Creek, flows into Lake Steilacoom and then flows north through Chambers Creek to the Puget Sound. The remaining lakes in the City are isolated from these surface flows, but receive stormwater inputs and are connected via groundwater.

The City received its final National Pollutant Discharge Elimination System (NPDES) Phase II permit in January 2012 from Ecology. The NPDES Phase II permit is required to cover the City's stormwater discharges into regulated lakes and streams. Under the conditions of the permit, the City must protect and improve water quality through public education and outreach, detection and elimination of illicit non-stormwater discharges (e.g., spills, illegal dumping, and wastewater), management and regulation of construction site runoff, management and regulation of runoff from new development and redevelopment, and pollution prevention and maintenance for municipal operations.

The City has adopted Ecology's 2012 Stormwater Manual for Western Washington, and the city existing standards as well as the proposed standards in the SMP require the use of LID techniques to the maximum extent feasible.

Development activities within the watershed have led to higher peak flows, excessive sediment loading, and gravel scouring. Implementation of the City's stormwater program is expected to help address these issues to some extent, but again, these impacts occur as a result of development within the entire basin. Loss of flow in the central section of the mainstem Clover Creek within the City creates a passage barrier as well as loss of habitat area. Poor water quality has led to fish kills in the past, which are typically the result of "first flush" events on holding coho. Chambers Creek, Lake Steilacoom, and Clover creek are the highest priority SMA fish habitat areas in the City. Although they are not SMA waters, Ponce de Leon, Flett, and Leach Creeks are critical steelhead habitat and are a priority as well, now that critical steelhead has been established.

As noted in the Chambers-Clover Creek Watershed Action Plan and other sources, phosphorus and other pollutants from improperly functioning on-site sewage systems (OSS) is a concern in the watershed overall as well as in the immediate vicinity of American Lake and Waughop Lake. [Current study rejects previous sentence.] The City should set a time frame for the required conversion of remaining neighborhoods to sanitary sewer and explore additional means to accomplish this goal. In the mean time, the City should work with the TPCHD to identify problem OSS, work with property owners to educate them about the need to maintain their systems and support TPCHD to ensure the enforcement of existing regulations.

## **7.3 Priority 3 – Develop, Expand and Implement Public Education and Involvement Programs**

Public education and involvement should be a high priority in the City of Lakewood due to the extent of residential development in the shoreline jurisdiction. Opportunities for restoration outside of residential property are limited to City parks and right-of-way. Therefore, in order to achieve the goals and objectives set forth in this Restoration Plan, most of the restoration projects would need to occur on private property. Thus, providing education opportunities and involving the public are keys to success.

These could entail coordinating the development of a long-term Public Education and Outreach Plan to gain public support. This could include local workshops to educate shoreline property owners and other shoreline users on maintaining healthy shoreline environments. A more direct and practical way, however, of promoting enhancement and restoration opportunities is to prepare materials specifically targeted to landowners explaining how best to manage their shoreline properties.

#### **7.4 Priority 4 –Create or Enhance Natural Shoreline Conditions along Clover Creek**

As noted in the Chambers-Clover Watershed Action Plan, the Watershed Action Agenda and the WRIA 12 Plan, the principal impacts to habitat along Clover Creek have been caused by dredging and rerouting of stream channels, ditching or burying the stream, elimination of wetlands and estuarine habitat, riparian forest removal, as well as non-point water quality pollution, industrial discharges, fish passage barriers and removal of large wood from channels. Recommended projects are listed in Section 5.1. Master restoration plans should be developed to reduce negative impacts and unintended consequences.

Areas of WRIA 12 that would provide the benefit to coho salmon are located upstream of Steilacoom Lake and include Clover Creek in the City up to Spanaway Creek, the upper reaches of the Clover main stem, any perennial reaches of North Fork Clover Creek and Spanaway and Morey creeks. Some of these areas are located outside of the City. The principal factors that provide the greatest benefit to coho salmon are generally sediment load, substrate quality, perennial flow, habitat types (e.g. pool frequency and backwater pools), water quality, and removal of fish passage obstructions. Restoration of flow to the lower sections of Clover Creek, from Lake Steilacoom upstream to above the north fork confluence is necessary to achieve the benefits of habitat restoration.

#### **7.5 Priority 5 – Implement Soft Shoreline Stabilization and Reduce In-water and Over-water Structures**

The majority of lake shoreline is armored at or below the ordinary high water mark. (Otak/AHBL 2010) Therefore restoration opportunities are limited. However, the City does have an opportunity to enhance the Edgewater Park shoreline on Steilacoom Lake through the use of native vegetation and LWD. Emphasis should also be given to future project proposals that involve or have the potential to restore shoreline areas to more natural conditions, and the City should continue to develop incentives for property owners to remove existing armoring or replace with softer stabilization systems.

Reduction of in- and over-water cover by piers, docks, and other boat-related structures is one mechanism to improve shoreline ecological functions. Pier and docks are extensive along lakes in the City, with approximately 80 percent of all residential parcels having a pier or dock. The WDFW already regulates the size and materials for in- and over-water structures throughout the State and generally recommends finding ways to reduce both the size and density of these structures. Although no specific private project sites to reduce in-water and over-water structures within residential areas are identified here, future project proposals involving reductions in the size and/or quantity of such structures should be emphasized. Such future private projects may involve joint-use pier proposals or pier reconstruction and may be allowed an expedited permit process or promoted through project incentives.

#### **7.6 Priority 6 – Improve Riparian Vegetation, Reduce Impervious Coverage**

Similar to the priority listed above to improve water quality and reduce sediment and pollutant delivery, improved riparian vegetation and reduction in impervious surfaces are emphasized

throughout the WRIA 12 Salmon Habitat Plan. Watershed-wide programmatic actions described in the Salmon Habitat Plan include many references to improving vegetative conditions and reducing impervious surface coverage. The use of LID will support the City's restoration efforts by supporting the retention and planting of native vegetation, reducing impervious surfaces, and localizing stormwater management. The SMP's policies regarding Vegetation Conservation provide greater protection to mature trees and native vegetation than the current Tree Preservation regulations.

## **7.7 Priority 7 – Enhance Habitat as Part of Future Street End Park Improvements**

The street end parks provide opportunities for habitat restoration and public education, particularly at Westlake Avenue, Edgewater Park, Lake City Boulevard, Wadsworth Street, and Melody Lane. Development and restoration of these areas, including enhancement of native riparian vegetation could provide recreational space and give park visitors the opportunity to see habitat restoration in progress.

## **7.8 Priority 8 – City Zoning, Regulatory, and Planning Policies**

City Zoning, Regulatory, and Planning Policies are listed as being of lower priority in this case simply because they were recently reviewed and updated in 2009. The City's Critical Areas regulations were also reviewed at this time and updated to be consistent with the Best Available Science for critical areas, including those within the shoreline zone. The City will update the Comprehensive Plan to include the revised policy direction in the updated SMP and should consider additional efforts to forward restoration priorities as part of future major Comprehensive Plan updates.

# **8. DEFINITIONS, ABBREVIATIONS, AND GLOSSARY OF TERMS**

*THE FOLLOWING WORDS AND PHRASES ARE INCLUDED WITHIN THE LAKEWOOD SMP AND ARE PROVIDED FOR PURPOSES OF INTERPRETING THIS RESTORATION PLAN.*

**Accessory use or accessory structure** - Any subordinate use, structure, or building or portion of a building located on the same lot as the main use or building to which it is subordinate.

**Accretion** - The growth of a beach by the addition of material transported by wind and/or water, including, but not limited to, shore forms such as barrier beaches, points, spits, and hooks.

**Act** - The Shoreline Management Act (See Chapter 90.58 RCW).

**Adjacent lands or properties** - Lands adjacent to the shorelines of the state (outside of shoreline jurisdiction). The SMA directs local governments to develop land use controls (i.e. zoning, comprehensive planning) for such lands consistent with the policies of the SMA, related rules and the local SMP (see RCW 90.58.340).

**Agriculture** - Agricultural uses, practices and activities. In all cases, the use of agriculture related terms shall be consistent with the specific meanings provided in WAC 173-26-020. Accessory agricultural uses may consist of garden plots, livestock pens, barns, or other structures supporting incidental agriculture on the property.

**Anadromous fish** - Fish species, such as salmon, which are born in fresh water, spend a large part of their lives in the sea, and return to freshwater rivers and streams to procreate.



**Appurtenance** - A structure or development which is necessarily connected to the use and enjoyment of a single-family residence and is located landward of the OHWM and also of the perimeter of any wetland. Typically includes a garage, deck, driveway, utilities, fences, installation of a septic tank, and drainfield and grading which does not exceed two hundred fifty cubic yards (250) (except to construct a conventional drainfield) and which does not involve placement of fill in any wetland or waterward of the OHWM (see WAC 173-27-040(2)(g)).

**Aquaculture** - The commercial cultivation of fish, shellfish, and/or other aquatic animals or plants including the incidental preparation of these products for human use.

**Archaeological** - Having to do with the scientific study of material remains of past human life and activities.

**Associated wetlands** - Those wetlands that are in proximity to and either influence, or are influenced by tidal waters or a lake or stream subject to the SMA. (See WAC 173-27-030(1)).

**Average grade level** - The average of the natural or existing topography of the portion of the lot, parcel, or tract of real property which will be directly under the proposed building or structure; provided that in case of structures to be built over water, average grade level shall be the elevation of OHWM. Calculation of the average grade level shall be made by averaging the elevations at the center of all exterior walls of the proposed building or structure (See WAC 173-27-030(3)).

**Baseline** - The existing shoreline condition, in terms of both ecological function and shoreline use, established at the time this SMP is approved.

**Beach** - The zone of unconsolidated material that is moved by waves, wind and tidal currents, extending landward to the coastline.

**Beach enhancement/restoration** - Process of restoring a beach to a state that more closely resembles a natural beach, using beach feeding, vegetation, drift sills and other nonintrusive means as applicable.

**Beach feeding** - Landfill deposited on land or in the water to be distributed by natural water processes for the purpose of supplementing beach material.

**Benthic organism or Benthos** - Living organisms that live in or on the bottom layer of aquatic systems, at the interface of the sediment (or substrate) and overlying water column. Benthos commonly refers to an assemblage of insects, worms, algae, plants and bacteria.

**Berm** - A linear mound or series of mounds of sand and/or gravel generally paralleling the water at or landward of the OHWM. A linear mound may be used to screen an adjacent activity, such as a parking lot, from transmitting excess noise and glare.

**Best Management Practices (BMPs)** - Methods of improving water quality that can have a great effect when applied by numerous individuals. BMPs encompass a variety of behavioral, procedural, and structural measures that reduce the amount of contaminants in stormwater runoff and in receiving waters.

**Bioengineering** - see Soil bioengineering.

**Biofiltration system** - A stormwater or other drainage treatment system that utilizes the ability of plant life to screen out and metabolize sediment and pollutants. Typically, biofiltration systems are designed to include grassy swales, retention ponds and other vegetative features.

**Biota** - The animals and plants that live in a particular location or region.

**BMPs** - see Best Management Practices.

**Boat launch or ramp** - Graded slopes, slabs, pads, planks, or rails used for launching boats by means of a trailer, hand, or mechanical device.

**Boat lift** - A mechanical device that can hoist vessels out of the water for storage, usually located along a pier.

**Boat lift canopy** - A translucent canopy or awning that is attached to the boat lift to shield the boat from sun and precipitation.

**Boathouse** - A structure designed for storage of vessels located over water or on shorelands. Boathouses do not include "houseboats" or "floating homes."

**Boating facility** - A public or private moorage structure serving more than four (4) residences.

**Breakwater** - An offshore structure generally built parallel to the shore that may or may not be connected to land, built to protect a harbor, moorage, or navigational activity from wave and wind action by creating a still-water area along the shore and to protect the shoreline from wave-caused erosion.

**Bulkhead** - A vertical or nearly vertical erosion protection structure placed parallel to the shoreline at or near the OHWM, consisting of concrete, timber, steel, rock, or other permanent material not readily subject to erosion.

**CERCLA** - Comprehensive Environmental Response, Compensation, and Liability Act ("Superfund"); 1986 amendments are known as Superfund Amendments and Reauthorization Act or "SARA."

**Channel Migration Zone (CMZ)** - The area within which a river channel is likely to move over a period of time, also referred to as the meander belt. Unless otherwise demonstrated through scientific and technical information, areas separated from the active river channel by legally existing artificial channel constraints that limit channel movement within incorporated municipalities and urban growth areas and all areas separated from the active channel by a legally existing artificial structure(s) that is likely to restrain channel migration, including transportation facilities, built above or constructed to remain intact through the one hundred-year flood should not be considered within the CMZ.

**Chapter 90.58 RCW** - The Shoreline Management Act of 1971.

**City** - The City of Lakewood.

**Clearing** - The destruction or removal of vegetation ground cover, shrubs and trees including, but not limited to, root material removal and/or topsoil removal.

**CMZ** - see Channel Migration Zone.

**Commercial** - Uses and facilities that are involved in wholesale or retail trade or business activities.

**Community Pier / Dock** - Joint use moorage serving more than four (4) residences that is tied to specific parcels by covenant or deed. Community piers are distinguished from marinas in that they do not offer moorage space for lease or sale.

**Comprehensive Plan** - Comprehensive plan means the document adopted by the city council, including all attachments, that outlines the City's goals and policies relating to growth management, and prepared in accordance with Chapter 36.70A RCW.

**Conditional Use** - A use, development, or substantial development that is classified as a conditional use or is not classified within the SMP. (See WAC 173-27-030(4)).

**Conservation Easement** - A legal agreement that the property owner enters into to restrict uses of the land. Such restrictions can include, but are not limited to, passive recreation uses such as trails or scientific uses and fences or other barriers to protect habitat. The easement is recorded on a property deed, runs with the land, and is legally binding on all present and future owners of the property, therefore, providing permanent or long-term protection.

**Covered moorage** - Boat moorage, without solid walls, that has a solid roof to protect the vessel and is attached to the dock itself or the substrate of the lake. See moorage cover.

**Cumulative impact** - The impact on the environment resulting from the incremental impact of past, present, and reasonably foreseeable future actions taken together regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

**CUP** - see Conditional Use Permit.

**Degrade** - To scale down in desirability or salability, to impair in respect to some physical property or to reduce in structure or function.

**Development** - The construction or exterior alteration of structures; dredging; drilling; dumping; filling; removal of any sand, gravel, or minerals; bulkheading; driving of piling; placing of obstructions; or any permanent or temporary project which interferes with the normal public use of the waters overlying lands subject to the SMA at any state of water level (See RCW 90.58.030(3a)).

**DFW** - the Washington State Department of Fish and Wildlife.

**DNR** - the Washington State Department of Natural Resources.

**Dock** - A floating moorage structure.

**Dredge spoil or Dredge material** - The material removed by dredging.

**Dredging** - Excavation or displacement of the bottom or shoreline of a water body by mechanical or hydraulic machines to maintain channel depths or berths for navigational purposes or to cleanup polluted sediments.

**Dwelling unit** - A single unit providing complete, independent living facilities for one or more persons, not to exceed one family, and includes permanent provisions for living, sleeping, eating, cooking and sanitation.

**EIS** - Environmental Impact Statement.

**Ecological functions** - The work performed or the role played by the physical, chemical, and biological processes that contribute to the maintenance of the aquatic and terrestrial environments that constitute the shoreline's natural ecosystem.

**Ecology** - The Washington State Department of Ecology.

**Ecosystem-wide processes** - The suite of naturally occurring physical and geologic processes of erosion, transport, and deposition; and specific chemical processes that shape landforms within a specific shoreline ecosystem and determine both the types of habitat and the associated ecological functions.

**EII** - Terminal section of a pier which typically extends perpendicular to the pier walkway. These sections can be either on fixed-piles or floating docks and are typically wider than the pier walkway.

**Emergency** - An unanticipated and imminent threat to public health, safety, or the environment which requires immediate action within a time too short to allow full compliance with the SMP. Emergency construction is construed narrowly as that which is necessary to protect property from the elements (See RCW 90.58.030(3eiii) and WAC 173-27-040(2d)).

**Endangered Species Act (ESA)** - A federal law intended to protect any fish or wildlife species that are threatened with extinction throughout all or a significant portion of its range. (See 16 U.S.C. § 1531 et seq.).

**Enhancement** - Alteration of an existing resource to improve or increase its characteristics and processes without degrading other existing functions. Enhancements are to be distinguished from resource creation or restoration projects.

**Environmental impacts** - The effects or consequences of actions on the natural and built environments, including effects upon the elements of the environment listed in the State Environmental Policy Act. (See WAC 197-11-600 and WAC 197-11-444).

**Environmentally Sensitive Areas Ordinance 03-1037, City of Lakewood** - This ordinance provides the goals, policies, and implementing regulations for protecting the designated critical areas of the City. The ordinance addresses environmentally sensitive area development controls; measures important for protecting and preserving these resources; preventing or mitigating cumulative adverse environmental impacts to critical areas; and serves to alert the public to the development limitations of critical areas.

**Environments or Shoreline Environment** - Designations given to specific shoreline areas based on the existing development pattern, the biophysical capabilities and limitations, and the goals and aspirations of local citizenry, as part of an SMP.

**Erosion** - The wearing away of land by of natural forces.

**Excavated moorage slip** - A boat mooring location that is man-made in that it requires dredging or excavation of excess sediment to afford access. Such slips may often involve dredging of the lake bottom waterward of the OHWM, or may include excavating a segment of the existing shoreline to enable moorage of a boat.

**Excavation** - The artificial movement of earth materials.

**Exemption** - Specific developments exempt from the definition of substantial developments and the Substantial Development Permit process of the SMA. An activity that is exempt from the substantial development provisions of the SMA must still be carried out in compliance with policies and standards of the Act and the local SMP. CUPs and/or Variances may also still be required even though the activity does not need a Substantial Development Permit (See WAC 172-27-040). For a complete list of exemptions, see Chapter 7.

**Fair market value** - The open market bid price for conducting the work, using the equipment and facilities, and purchasing the goods, services and materials necessary to accomplish a development, normally the cost of hiring a contractor to undertake the development from start to finish, including the cost of labor, materials, equipment and facility usage, transportation and contractor overhead and profit. The fair market value of the development shall include the fair market value of any donated, contributed or found labor, equipment or materials (See WAC 173-27-030(8)).

**Feasible** - An action, such as a development project, mitigation, or preservation requirement, that meets all of the following conditions:

- (a) The action can be accomplished with technologies and methods that have been used in the past in similar circumstances, or studies or tests have demonstrated in similar circumstances that such approaches are currently available and likely to achieve the intended results;
- (b) The action provides a reasonable likelihood of achieving its intended purpose; and
- (c) The action does not physically preclude achieving the project's primary intended legal use.

In cases where certain actions are required unless they are infeasible, the burden of proving infeasibility is on the applicant. In determining an action's infeasibility, the reviewing agency may weigh the action's relative public costs and public benefits, considered in the short- and long-term time frames.

**Fill** - The addition of soil, sand, rock, gravel, sediment, earth retaining structure, or other material to an area waterward of the OHWM, in wetland, or on shorelands in a manner that raises the elevation or creates dry land.

**Finger pier or fingers** - A narrow extension to a fixed-pile pier, usually extending perpendicular to the pier walkway along with an ell to form an enclosed area for boat moorage.

**Float** - A floating structure that is moored, anchored, or otherwise secured in the water offshore and that may be associated with a fixed-pile pier, or may be a standalone structure, such as platforms used for swimming and diving.

**Floating dock** - A fixed structure floating upon a water body for the majority of its length and connected to shore.

**Floating home** - A structure designed and operated substantially as a permanently based over water residence, typically served by permanent utilities and semi-permanent anchorage/moorage facilities. Floating homes are not vessels and lack adequate self-propulsion and steering equipment to operate as a vessel.

**Floodplain** - The land area susceptible to inundation with a one percent (1%) chance of being equaled or exceeded in any given year (synonymous with 100-year floodplain). The limits of this area are based on flood regulation ordinance maps or a reasonable method that meets the objectives of the SMA (See WAC 173-22-030(2)).

**Floodway** - The area, as identified in an SMP, that either: (i) has been established in Federal Emergency Management Agency flood insurance rate maps or floodway maps; or (ii) consists of those river valley areas lying streamward from the outer limits of a watercourse upon which flood waters are carried during periods of flooding that occur with reasonable regularity, identified, under normal conditions, by changes in surface soil conditions or in types or quality of vegetative ground cover condition, topography, or other flooding indicators occurring with reasonable regularity. The floodway shall not include those lands that are reasonably expected to be protected by flood control devices maintained by or under a license from the federal government, the state, or a political subdivision of the state.

**Geotechnical report or Geotechnical analysis** - A scientific study or evaluation conducted by a qualified expert that includes a description of the ground and surface hydrology and geology; the affected land form and its susceptibility to mass wasting, erosion, and other geologic hazards or processes; conclusions and recommendations regarding the effect of the proposed development on geologic conditions; the adequacy of the site to be developed; the impacts of the proposed development; alternative approaches to the proposed development; and measures to mitigate potential site-specific and cumulative geological and hydrological impacts of the proposed development, including the potential adverse impacts to adjacent and down-current properties. Geotechnical reports shall conform to accepted technical standards and must be prepared by qualified professional engineers or geologists who have professional expertise about the regional and local shoreline geology and processes.

**Grading** - The physical manipulation of the earth's surface and/or drainage pattern in preparation for an intended use or activity.

**Grassy swale** - A vegetated drainage channel that is designed to remove various pollutants from storm water runoff through biofiltration.

**Groin** - A barrier-type structure extending from, and usually perpendicular to, the backshore into a water body, to protect a shoreline and adjacent upland by influencing water movement and/or material deposits. This is accomplished by building or preserving an accretion beach on its up drift side by trapping littoral drift. A groin is relatively narrow in width but varies greatly in length. A groin is sometimes built in a series as a system and may be permeable or impermeable, high or low, and fixed or adjustable.

**Habitat** - The place or type of site where a plant or animal naturally or normally lives and grows.

**Hearing Examiner** - The Hearing Examiner of the City of Lakewood.

**Height** - The distance measured from the average grade level to the highest point of a structure; provided, that television antennas, chimneys and similar appurtenances shall not be used in calculating height, except where it obstructs the view of a substantial number of residences on areas adjoining such shorelines. Temporary construction equipment is excluded in this calculation (See WAC 173-27-030(9)).

**Heliport** - Any landing area or other facility used or intended to be used by private aircraft for landing or taking off of aircraft, including all associated or necessary buildings and open spaces.

**Hoist** - A device used for lifting or lowering a load by means of a drum or lift-wheel around which rope, fiber or chain wraps. It may be manually operated, electrically or pneumatically driven.

**Houseboat** - A vessel, principally used as an over water residence, licensed and designed for use as a mobile structure with detachable utilities or facilities, anchoring, and the adequate self-propulsion and steering equipment to operate as a vessel. Principal use as an overwater residence means occupancy in a single location, for a period exceeding two (2) months in any one calendar year. This definition includes live aboard vessels.

**Impervious surface** - Any horizontal surface artificially covered or hardened so as to prevent or impede the water percolation into the soil mantle including, but not limited to, roof tops, swimming pools, or paved or graveled roads, walkways or parking areas, but excluding landscaping and surface water retention/detention facilities.

**In-stream structure** - A structure placed by humans within a stream or river waterward of the OHWM that either causes or has the potential to cause water impoundment or water flow diversion, obstruction, or modification. In-stream structures may include structures used for hydroelectric generation, irrigation, water supply, flood control, transportation, utility service, fish habitat enhancement, or other purpose.

**Joint Use Community Pier or Dock** - A pier, dock, or secured float or floats for vessel moorage, fishing, or other water use that is shared by two (2) or more users.

**Lake** - A body of standing water in a depression of land or expanded part of a river, including, but not limited to, reservoirs of twenty (20) acres or greater in total area. A lake is bounded by the OHWM or, where a stream enters a lake, the extension of the elevation of the lake's OHWM within the stream (See RCW 90.58.030(1d); WAC 173-20-030; WAC 173-22-030(4)).

**Landfill** - The creation of, or addition to, a dry upland area (landward of the OHWM) by the addition of rock, soil, gravels and earth or other material, but not solid or hazardous waste.

**Landscaping** - Vegetation ground cover including shrubs, trees, flower beds, grass, ivy and other similar plants and including tree bark and other materials which aid vegetative growth and maintenance.

**Launching rail** - See Boat launch or ramp.

**Launching ramp** - See Boat launch or ramp.

**LID** - Low Impact Development.

**Littoral** - Living or occurring on the shore.

**Littoral drift** - The mud, sand, or gravel material moved parallel to the shoreline in the nearshore zone by waves and currents. **Marina** - A private or public facility providing the purchase or lease of a slip for storing, berthing and securing boats or watercraft, including both long-term and transient moorage, including, but not limited to, accessory facilities that provide incidental services to marina users, such as waste collection, boat sales or rental activities, and retail establishments providing fuel service, repair or service of boat. Community docks and piers, which serve specific upland parcels and which do not offer moorage for purchase by the general public, shall not be considered to be marinas.

**Low Impact Development (LID)** - A stormwater and land use management strategy that strives to mimic pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation, and transpiration by emphasizing conservation, use of on-site natural features, site planning, and distributed stormwater management practices that are integrated into a project design.

**May** - Signifies an action is permitted but not required, provided it conforms to the provisions of this SMP.

**Mitigation or Mitigation sequencing** - The process of avoiding, reducing, or compensating for the environmental impact(s) of a proposal through the following sequence of steps, listed in order of priority: (See WAC 197-11-768 and WAC 173-26-020(30))

- (a) Avoiding the impact all together by not taking a certain action or parts of an action;
- (b) Minimizing impacts by limiting the degree or magnitude of the action by using appropriate technology or by taking affirmative steps to avoid or reduce impacts;
- (c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
- (d) Reducing or eliminating the impact over time by preservation and maintenance operations;
- (e) Compensating for the impact by replacing, enhancing, or providing substitute resources or environments; and
- (f) Monitoring the impact and the compensation projects and taking appropriate corrective measures.

**Moorage** - Any device or structure used to secure a vessel for temporary anchorage, but which is not attached to the vessel (such as a pier or buoy).

**Moorage Piles** - Structural members driven into the lake bed to serve as a stationary moorage point. They are typically used for moorage of small boats in the absence of, or instead of, a dock or pier. In some cases, moorage piles may be associated with a dock or pier.

**Multi-family dwelling or Multi-family residence** - A building containing two (2) or more dwelling units, including, but not limited to, duplexes, triplexes, four-plexes, apartment buildings and condominium buildings.

**Must** - Signifies an action is required.

**Native plants** - Plants that occur naturally, and that distribute and reproduce without aid. Native plants in western Washington are those that existed prior to intensive settlement that began in the 1850s.

**Nonconforming use or development** - A shoreline use or structure which was lawfully constructed or established prior to the effective date of the SMA or the SMP or amendments thereto, but which no longer conforms to present regulations or standards of the program (See WAC 173-27-080).



**Ordinary High Water Mark (OHWM)** - The mark that will be found by examining the bed and banks and ascertaining where the presence and action of waters are so common and usual, and so long continued in all ordinary years, as to mark upon the soil a character distinct from that of the abutting upland, in respect to vegetation as that condition exists on June 1, 1971, as it may naturally change thereafter, or as it may change thereafter in accordance with permits issued by a local government or Ecology provided, that in any area where the OHWM cannot be found, OHWM adjoining fresh water shall be the line of mean high water. (See RCW 90.58.030(2)(b) and WAC 173-22-030(11)).

**Overwater structure** - Any device or structure projecting over the OHWM, including, but not limited to, piers, docks, floats, and moorage.

**Permit or Shoreline Permit** - Any substantial development permit, CUPs or variance, or revision, or any combination thereof, authorized by the Act (See WAC 173-27-030(13)).

**Pier** - A fixed, pile-supported moorage structure.

**Priority habitat** - A habitat type with unique or significant value to one or more species. An area classified and mapped as priority habitat must have one or more of the following attributes:

- (a) Comparatively high fish or wildlife density;
- (b) Comparatively high fish or wildlife species diversity;
- (c) Fish spawning habitat;
- (d) Important wildlife habitat;
- (e) Important fish or wildlife seasonal range;
- (f) Important fish or wildlife movement corridor;
- (g) Rearing and foraging habitat;
- (h) Important marine mammal haul-out;
- (i) Refuge habitat;
- (j) Limited availability;
- (k) High vulnerability to habitat alteration;
- (l) Unique or dependent species; or
- (m) Shellfish bed.

A priority habitat may be described by a unique vegetation type or by a dominant plant species that is of primary importance to fish and wildlife (such as oak woodlands or eelgrass meadows); by a successional stage (such as, old growth and mature forests); or by a specific habitat element (such as a consolidated marine/estuarine shoreline, talus slopes, caves, snags) of key value to fish and wildlife. A priority habitat may contain priority and/or non-priority fish and wildlife.

**Priority species** - Species requiring protective measures and/or management guidelines to ensure their persistence at genetically viable population levels, and that meet any of the criteria listed below:

- (a) State-listed or state proposed species. State-listed species are those native fish and wildlife species legally designated as endangered (WAC 232-12-014), threatened (WAC 232-12-011), or sensitive (WAC 232-12-011). State proposed species are those fish and wildlife species that will be reviewed by DFW (POL-M-6001) for possible listing as endangered, threatened, or sensitive according to the process and criteria defined in WAC 232-12-297.
- (b) Vulnerable aggregations. Vulnerable aggregations include those species or groups of animals susceptible to significant population declines, within a specific area or statewide, by virtue of their inclination to congregate. Examples include heron colonies, seabird concentrations, and marine mammal congregations.

- (c) Species of recreational, commercial, and/or tribal importance. Native and nonnative fish, shellfish, and wildlife species of recreational or commercial importance and recognized species used for tribal ceremonial and subsistence purposes that are vulnerable to habitat loss or degradation.
- (d) Species listed under the federal Endangered Species Act as proposed, threatened, or endangered.

**Professional engineer** - A person who, by reason of his or her special knowledge of the mathematical and physical sciences and the principles and methods of engineering analysis and design, acquired by professional education and practical experience, is qualified to practice engineering and is licensed by the State of Washington or another state.

**Proposed, Threatened, and Endangered Species** - Those native species that are proposed to be listed or are listed by DFW as threatened or endangered, or that are proposed to be listed or are listed as threatened or endangered under the federal Endangered Species Act.

**Public access** - The ability of the general public to reach, touch, and enjoy the water's edge, to travel on the waters of the state, and to view the water and the shoreline from adjacent locations. (See WAC 173-26-221(4)).

**Public interest** - The interest shared by the citizens of the state or community at large in the affairs of government, or some interest by which their rights or liabilities are affected such as an effect on public property or on health, safety, or general welfare resulting from a use or development (See WAC 173-27-030(14)).

**Public use** - Public use means to be made available daily to the general public on a first-come, first-served basis, and may not be leased to private parties on any more than a day use basis. (See WAC 332-30-106)).

**RCW** - Revised Code of Washington.

**Residential development** - Development which is primarily devoted to or designed for use as a dwelling(s), including, but not limited to, single-family development, multi-family development, and the creation of new residential lots through land division.

**Recreational float** - A floating structure that is moored, anchored, or otherwise secured in the water offshore and that is generally used for recreational purposes such as swimming and diving.

**Recreational Use or Development** - Facilities such as parks, trails, and pathways, whether public, private or commercial, that provide a means for relaxation, play, or amusement. For the purposes of this SMP, recreational facilities are divided into two categories:

- (a) Water-oriented (i.e. - moorage facilities, fishing piers, recreational floats, trails, swimming beaches, overlooks, etc.); and
- (b) Non-water-oriented (i.e. - sports fields, golf courses, sport courts, etc.).

**Restoration or Ecological restoration** - The reestablishment or upgrading of impaired ecological shoreline processes or functions accomplished through measures including, but not limited to, revegetation, removal of intrusive shoreline structures and removal or treatment of toxic materials. Restoration does not imply a requirement for returning the shoreline area to aboriginal or pre-European settlement conditions.

**Riparian** - Of, on, or pertaining to the banks of a river, stream or lake.

**Riprap** - A layer, facing, or protective mound of stones placed to prevent erosion, scour, or sloughing of a structure or embankment; also, the stone so used.

**Rotovating** - An aquatic vegetation harvesting technique that uses rototilling technology to uproot and remove plants.

**Runoff** - Water that is not absorbed into the soil but rather flows along the ground surface following the topography.

**Sediment** - The fine grained material deposited by water or wind.

**SEPA** - see State Environmental Policy Act

**SEPA Checklist** - The checklist required of some projects under SEPA to identify the probable significant adverse impacts on the quality of the environment, to help to reduce or avoid impacts from a proposal, and to help the responsible governmental agency decide whether a full environmental impact statement (EIS) is required (See WAC 197-11-960).

**Setback** - A required open space, specified in SMPs, measured horizontally upland from and perpendicular to the OHWM.

**Shall** - Signifies an action is required.

**Shorelands or Shoreland Areas** - Those lands extending landward for two hundred (200) feet in all directions as measured on a horizontal plane from the OHWM; floodways and contiguous flood plain areas landward two hundred (200) feet from such floodways; and all wetlands and river deltas associated with the streams, lakes, and tidal waters which are subject to the provisions of the SMA. Shorelands in the City are limited to those areas within two hundred (200) feet of the OHWM of American Lake, Gravelly Lake, Lake Louise, Lake Steilacoom, Waughop Lake, Chambers Creek, and Clover Creek and any associated wetlands.

**Shoreline Administrator** - The City of Lakewood Planning and Community Development Director or his/her designee, charged with the responsibility of administering this SMP.

**Shoreline jurisdiction** - All of the geographic areas covered by the SMA, related rules and the applicable SMP. In the City, shoreline jurisdiction includes American Lake, Gravelly Lake, Lake Louise, Lake Steilacoom, Waughop Lake, Chambers Creek, and Clover Creek, those areas within two hundred (200) feet of the OHWM of these water bodies, and any associated wetlands. See definitions of Shorelines, Shorelines of the state, Shorelines of statewide significance, Shorelands, and Wetlands,

**Shoreline Management Act (SMA)** - Chapter 90.58 RCW, as amended. Washington law adopted to prevent the inherent harm in an uncoordinated and piecemeal development of the state's shorelines.

**Shoreline Master Program (SMP)** - The comprehensive use plan and related use regulations used by local governments to administer and enforce the permit system for shoreline management. SMPs must be developed in accordance with the policies of the SMA, be approved and adopted by the state, and be consistent with the rules WACs) adopted by Ecology.

**Shoreline Master Program Guidelines** - The Shoreline Master Program (SMP) Guidelines are state standards which local governments must follow in drafting their shoreline master programs. The Guidelines translate the broad policies of the Shoreline Management Act (RCW 90.58.020) into standards for regulation of shoreline uses.

**Shoreline modification** - Those actions that modify the physical configuration or qualities of the shoreline area, usually through the construction of a physical element such as a dike, breakwater, pier, weir, dredged basin, fill, bulkhead, or other shoreline structure. They can also include other actions, such as clearing, grading, or application of chemicals.

**Shoreline permit** - A substantial development permit, CUP, revision, or variance or any combination thereof (See WAC 173-27-030(13)).

**Shoreline stabilization** - Actions taken to address erosion impacts to property and dwellings, businesses, or structures caused by natural processes, such as current, flood, tides, wind or wave action. These actions include structural measures such as bulkheads and nonstructural methods such as soil bioengineering.

**Shoreline vegetation management plan (SVMP)** - A plan prepared by an applicant that identifies appropriate mitigation, performance assurances, and maintenance and monitoring requirements necessary to assure no net loss of ecological functions.

**Shorelines** - All of the water areas of the state, including reservoirs and their associated shorelands, together with the lands underlying them, except those areas excluded under RCW 90.58.030(2)(d).

**Shorelines Hearings Board** - A state-level quasi-judicial body, created by the SMA, which hears appeals by any aggrieved party on the issuance of a shoreline permit, enforcement penalty and appeals by local government. (See RCW 90.58.170; 90.58.180).

**Shorelines of statewide significance** - A select category of shorelines of the state, defined in RCW 90.58.030(2)(e), where special use preferences apply and greater planning authority is granted by the SMA. SMP policies, use regulations and permit review must acknowledge the use priorities for these areas established by the SMA. (See RCW 90.58.020).

**Shorelines of the state** - Shorelines and shorelines of statewide significance.

**Should** - Signifies an action is required unless there is a demonstrated, compelling reason, based on policy of the SMA and this SMP, against taking the action.

**Sign** - A board or other display containing words and/or symbols used to identify or advertise a place of business or to convey information. Excluded from this definition are signs required by law and the flags of national and state governments.

**Single-family residence** - A detached dwelling designed for and occupied by one (1) family including those structures and developments within a contiguous ownership which are a normal appurtenance (See WAC 173-27-040(2g)).

**SMA** - see Shoreline Management Act.

**SMP** - see Shoreline Master Program.

**Soil bioengineering** - An applied science that combines structure, biological and ecological concepts to construct living structures that stabilizes the soil to control erosion, sedimentation and flooding using live plant materials as a main structural component.

**Solid waste** - All garbage, rubbish trash, refuse, debris, scrap, waste materials and discarded materials of all types, whether the sources be residential or commercial, exclusive of hazardous wastes, and including any and all source-separated recyclable materials and yard waste.

**State Environmental Policy Act (SEPA)** - State law that requires state agencies, local governments and other lead agencies to consider environmental factors when making most permit decisions, especially for development proposals of a significant scale. As part of the SEPA process, EISs and public comment may be required.

**Stream** - A naturally occurring body of periodic or continuously flowing water where the mean annual flow is greater than twenty (20) cubic feet per second and the water is contained within a channel (See WAC 173-22-030(8)).

**Structure** - A permanent or temporary edifice or building, or any piece of work artificially built or composed of parts joined together in some definite manner, whether installed on, above or below the surface of the ground or water, except for vessels (See WAC 173-27-030(15)).

**Substantial Development** - Any development of which the total cost or fair market value exceeds six thousand, four hundred, and sixteen dollars (\$6,416), or any development which materially interferes with the normal public use of the water or shorelines of the state. The dollar threshold established in this definition must be adjusted for inflation by the Washington State Office of Financial Management every five (5) years based upon changes in the consumer price index during that time period. "Consumer price index" means, for any calendar year, that year's annual average consumer price index, Seattle, Washington area, for urban wage earners and clerical workers, all items, compiled by the Bureau of Labor and Statistics, United States Department of Labor. The total cost or fair market value of the development shall include the fair market value of any donated, contributed or found labor, equipment or materials. A list of activities and developments that shall not be considered substantial development is provided in Chapter 7 (See WAC 173-27-040(2)(a)).

**SVMP** - see Shoreline Vegetation Management Plan.

**Terrestrial** - Of or relating to land as distinct from air or water.

**Upland** - The dry land area above and landward of the OHWM.

**Utilities** - Services and facilities that produce, transmit, store, process or dispose of electric power, gas, water, stormwater, sewage and communications.

**Utilities, Accessory** - Utilities comprised of small-scale distribution and collection facilities connected directly to development within the shoreline area. Examples include local power, telephone, cable, gas, water, sewer and stormwater service lines.

**Utilities, Primary** - Utilities comprised of trunk lines or mains that serve neighborhoods, areas and cities. Examples include solid waste handling and disposal sites, water transmission lines, sewage treatment facilities and mains, power generating or transmission facilities, gas storage and transmission facilities and stormwater mains and regional facilities.

**Variance** - A means to grant relief from the specific bulk, dimensional or performance standards specified in the applicable SMP, but not a means to vary a shoreline use. A variance must be specifically approved, approved with conditions, or denied by Ecology (See WAC 173-27-170).

**WAC** - Washington Administrative Code.

**Water-dependent use** - A use or a portion of a use which cannot exist in any other location and is dependent on the water by reason of the intrinsic nature of its operations, including, but not limited to, moorage structures (including those associated with residential properties), ship cargo terminal loading areas, ferry and passenger terminals, barge loading facilities, ship building and dry docking, marinas, aquaculture, float plane facilities and sewer outfalls.

**Water-enjoyment use** - A recreational use or other use that facilitates public access to the shoreline as a primary characteristic of the use; or a use that provides for recreational use or aesthetic enjoyment of the shoreline for a substantial number of people as a general characteristic of the use and which through location, design, and operation ensures the public's ability to enjoy the physical and aesthetic qualities of the shoreline. In order to qualify as a water-enjoyment use, the use must be open to the general public and the shoreline-oriented space within the project must be devoted to the specific aspects of the use that fosters shoreline enjoyment.

**Water-oriented use** - Refers to any combination of water-dependent, water-related, and/or water enjoyment uses.

**Water quality** - The physical characteristics of water within shoreline jurisdiction, including water quantity, hydrological, physical, chemical, aesthetic, recreation-related, and biological characteristics. "Water quantity" refers only to development and uses regulated and affecting water quantity, such as impermeable surfaces and storm water handling practices. Water quantity does not mean the withdrawal of ground water or diversion of surface water pursuant to RCW 90.03.250 through RCW 90.03.340.

**Water-related use**- A use or a portion of a use which is not intrinsically dependent on a waterfront location but whose economic viability is dependent upon a waterfront location because:

- (a) Of a functional requirement for a waterfront location such as the arrival or shipment of materials by water or the need for large quantities of water or,

The use provides a necessary service supportive of the water-dependent commercial activities and the proximity of the use to its customers makes its services less expensive and/or more convenient. Examples include manufacturers of ship parts large enough that transportation becomes a significant factor in the products cost, professional services serving primarily water-dependent activities and storage of water-transported foods. Examples of water-related uses may include warehousing of goods transported by water, seafood processing plants, hydroelectric generating plants, gravel storage when transported by barge, oil refineries where transport is by tanker and log storage.

**Wetlands or Wetland areas** - Areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, generally including swamps, marshes, bogs and similar areas, but not those artificial wetlands intentionally created from non-wetland sites, such as irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. Wetlands may include those artificial wetlands intentionally created from non-wetland areas to mitigate the conversion of wetlands.

**Zoning** - To designate by ordinance, including maps, areas of land reserved and regulated for specific land uses.

## 9. REFERENCES

- Bustard, D.R., and D.W. Narver. 1975. Aspects of the winter ecology of juvenile coho salmon (*Oncorhynchus kisutch*) and steelhead trout (*Salmo gairdneri*). *J. Fish. Res. Board Can.* 32:667-680.
- Chambers-Clover Creek Watershed Management Committee. 1997. Watershed Action Plan: A Water Quality Plan for Reducing Nonpoint Pollution. October 1997.
- Chambers-Clover Creek Watershed Council. 2018. 2018-2023 Action Agenda.
- Federal Register. 2016. Final rule. Designation of Critical Habitat for Lower Columbia River Coho Salmon and Puget Sound Steelhead. Volume 81, No. 9252.
- Herrera Environmental Consultants. 2009. Lake Steilacoom Calcium Hydroxide Treatment Monitoring Report. Prepared for City of Lakewood Public Works Department. June 2009.
- Peterson, N.P. 1982. Immigration of juvenile coho salmon (*Oncorhynchus kisutch*) into riverine ponds. *Can. J. Fish. Aquat. Sci.* 39:1308-1310.
- Pierce Conservation District. 2003. Salmonid Habitat Limiting Factors Analysis Chambers- Clover Creek Watershed – Water Resource Inventory Area 12. June 2003.
- Pierce County (Lead Entity). 2008. Salmon Habitat Protection and Restoration Strategy, WRIA-10 (Puyallup Watershed), WRIA 12 (Chambers/Clover Creek Watershed). March, 2008.
- Robinson and Noble. 2003. Chambers-Clover Technical Assessment Final Report. April 10, 2003. Prepared for Tacoma-Pierce County Health Department.
- Russell, Donald and Douglas Dorling. 2008. Waughop Lake-Lake Nutrient Inactivation Experimental Use of Calcium Hydroxide. Prepared jointly by Chambers-Clover Creek Watershed Council and Northwest Aquatic Eco-Systems.
- Tetra Tech KCM. 2002. Clover Creek Basin Plan. Prepared for Pierce County Surface Water Management, October 2002.
- Woodward-Clyde. January 1998. American Lake Watershed Management Plan. Prepared for Pierce County Department of Public Works and Utilities.
- Brown and Caldwell and UW Tacoma. 2017. Waughop Lake Management Plan, February 2017.
- Aquatechnex and Stakeholder Group. 2018. American Lake Integrated Aquatic Vegetation Management Plan, August 30, 2018.