

APPENDIX E Recovery Strategies



Strategy addresses a key pressure for highest priority life stages

Protect and Restore Floodplain Connectivity

Floodplains provide crucial habitat for juvenile salmon to rear and find refuge from floods and predators. Connected floodplains and associated riparian and instream habitat provide sources of large wood that slow fast-moving water and create channel complexity through braiding and formation of side channels, backwater channels, and off-channel wetlands. In addition, floodplain reconnection improves the connection between surface water and groundwater, and this connectivity provides a source of cooler water and reduces the impacts of increased water temperatures from other factors. This strategy will help decrease the negative impacts of nearby land use, levees and revetments, problematic peak and low flows, and increased sediment and pollutant loads. It will also promote resilience to effects of climate change. Monitoring data suggest that—for the Cedar River especially—rearing capacity is a greater limitation than spawning capacity, and restoring floodplain connectivity is the best way to address this limitation. Reconnecting floodplains often provides additional benefits, such as reducing flood risk, improving recreational opportunities, and improving water quality.

Focus areas:

- Highest priority – Cedar River from Landsburg Diversion Dam to Lake Washington
- Sammamish River – feasibility to implement may be limited
- Issaquah Creek – throughout sub-basin, including Carey and Holder Creeks, with restoration especially important along Lower Issaquah Reaches 1 – 7 and Lower North Fork and East Fork
- Bear Creek – throughout sub-basin, with restoration especially important along Lower Bear Reaches 1 – 7 and Cottage Lake Creek Reaches 1 and 2
- North, Little Bear, Evans, and Kelsey creeks, where opportunities exist

Life stages:

Juvenile rearing, especially parr migrant stage in the Cedar River.

Relevant actions:

Site-specific actions include installing levee setbacks, reducing or removing bank armoring to allow channel migration and interaction between the main channel and floodplain, and acquiring lands to protect areas featuring natural river processes or to enable future floodplain restoration work.

Outreach/education actions include building support for funding and implementation of restoration projects, with fact sheets, media coverage, and tours.

Land use actions include coordinating with and leveraging floodplain management to develop policies and identify areas where habitat and flood control benefits can be achieved jointly, and implementing and enforcing local government critical area ordinances and shoreline master programs (SMPs), especially buffer and setback requirements on rivers, streams, and lakeshore areas.

Habitat goals:

- Total connected floodplain acres on the Cedar River between Lake Washington and Landsburg Diversion Dam will be 1,170 acres by 2025.
 - Long-term goal: Total connected floodplain acres on the Cedar River between Lake Washington and Landsburg Diversion Dam will be at least 1,386 acres by 2055.
- Current average wood volume in the Cedar River will quadruple between RM 4 and Landsburg Diversion Dam by 2025.
 - Long-term goal: Average wood volume in the Cedar River between RM 4 and Landsburg Diversion Dam will be 93 m³/100 m by 2055 (the median standard wood volume for streams over 30 meters bankfull width).

Implementation goals: Reconnect 130 additional acres by 2025; increase wood volume from 10.4 m³/100 m to 42 m³/100 m by 2025.



Protect and Restore Functional Riparian Vegetation

Protecting and restoring riparian trees is important throughout the watershed and offers direct and indirect benefits to Chinook salmon via food web inputs, water quality protection (including reducing thermal, pollutant, and fine sediment inputs), and as a source of large wood for recruitment. This strategy mitigates some of the impacts of land conversion and urbanization, shoreline armoring, invasive plant infestations, polluted stormwater runoff and increased water temperature from climate change. In Tier 2 areas, this strategy is particularly important to prevent loss of spawning or rearing habitat, ultimately protecting the spatial diversity of Chinook salmon in the watershed. By trapping sediment and filtering pollutants, functional riparian buffers also reduce the impacts of nonpoint pollution.

Focus areas:

- Throughout the watershed along all Chinook salmon-bearing waterbodies in all Tier 1 and Tier 2 areas, including migratory corridors and the nearshore. Protection should occur where riparian buffers are relatively intact (such as the upper Cedar River, Bear Creek Reaches 6 – 15, Cottage Lake/Cold Creeks, and Issaquah Creek Reaches 9 – 12), and restoration should target areas where riparian buffer function is degraded.

Life stages:

Lake rearing and stream rearing, spawning, migration

Relevant actions:

Site-specific actions for protection include acquisition of intact riparian habitat. Site-specific actions for restoration include the removal of invasive or noxious plants followed by replacement with native trees and shrubs. Restoration efforts should target riparian corridors whether the land is publicly or privately owned.

Outreach/education actions for both public and private landowners include reach-scale riparian stewardship programs (e.g., by nonprofits and jurisdictions) to remove invasive species and replace them with native plantings. Additional actions include incentive programs and other means to encourage streamside landowners to adopt best management practices (BMPs). Plantings provide an opportunity to involve and educate volunteers.

Land use actions include implementing and enforcing local government critical area ordinances and SMPs, especially buffer and setback requirements on rivers, streams, and lakeshore areas.

Habitat goals:

- Area of riparian cover in each Tier 1 and Tier 2 stream increases by 10 percent over current conditions (2015) by 2025.
 - o Long-term goal: Riparian areas along Tier 1 and Tier 2 streams are of sufficient size and quality to support sustainable and harvestable Chinook salmon populations in the watershed by 2055.
- Riparian cover along the Sammamish River increases by at least 10 percent to help make areas of the river cool enough to support Chinook salmon migration and survival by 2025.
 - o Long-term goal: Riparian forest cover along the Sammamish River helps keep it cool enough to support Chinook salmon migration and survival by 2055.

Implementation goal: Increase riparian forest cover in each Tier 1 and Tier 2 stream, plus Sammamish River, at least 10 percent over current conditions.

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Protect and Restore Channel Complexity

Complex stream channels provide a range of habitats necessary for Chinook salmon spawning, rearing, and survival. They provide pools and eddies where salmon can rest, feed, and find refuge from predators and floods. Adding large wood can improve natural processes for maintaining or creating pools and riffles and sorting sediment and gravels, all of which create the complex habitat that salmon require. Increased wood loading will improve habitat complexity in nearly all areas of stream habitat within WRIA 8. Restoring channel complexity lessens the impacts of shoreline hardening, altered peak flows due to impervious surfaces, and increased water temperatures.

Focus areas:

- Throughout the watershed, including the Cedar River and other Tier 1 streams (Bear/Cottage Lake, Issaquah); the Sammamish River; and Tier 2 streams, including Little Bear Creek, North Creek, Kelsey Creek, and Evans Creek.

Life stages:

Stream rearing, spawning

Relevant actions:

Site-specific actions for both public and private property include removing bank armoring, reactivating access to or re-creating side channels, and adding large woody debris or otherwise increasing hydraulic complexity in river and stream channels to reestablish habitat-forming processes..

Outreach/education actions include building support for funding and implementation of restoration projects, with fact sheets, media coverage, and tours.

Land use actions include coordinating with and leveraging floodplain management efforts to develop policies and identify areas where habitat and flood control benefits can be achieved.

Habitat goal:

- Total connected floodplain acres on the Cedar River between Lake Washington and Landsburg Diversion Dam will be 1,170 acres by 2025.
 - Long-term goal: Total connected floodplain acres on the Cedar River between Lake Washington and Landsburg Diversion Dam will be at least 1,386 acres by 2055.
- Current average wood volume in the Cedar River will quadruple between RM 4 and Landsburg Diversion Dam by 2025.
 - Long-term goal: Average wood volume in the Cedar River between RM 4 and Landsburg Diversion Dam will be 93 m³/100 m by 2055 (the median standard wood volume for streams over 30 meters bankfull width).
- Average wood volume will double over current basin conditions in Tier 1 and Tier 2 streams by 2025.
 - Long-term goal: Tier 1 and Tier 2 stream systems meet appropriate regional instream wood loading standards by 2055.

Implementation goal: Individual projects should strive to meet or exceed, as appropriate, the median values for wood volume found in Fox and Bolton (2007).



Restore Shallow-water Rearing and Refuge Habitat

Gently sloping sandy beaches maximize shallow-water habitat for lake-rearing juveniles outmigrating to Puget Sound, and can help provide refuge from native and non-native predators. Bulkheads or other shoreline hardening and nighttime lighting affect juvenile behavior in ways that may increase their susceptibility to predation. The effects of these changes can be mitigated in key areas through soft shoreline techniques and lighting modifications. Shallow-water rearing and refuge habitats are particularly critical in Lake Washington south of I 90 as lake-rearing juveniles enter from the Cedar River to rear in and migrate through the lake, as well as the south end of Lake Sammamish where juveniles enter from Issaquah Creek. Improved shorelines throughout the migration corridor would improve refuge from predation and provide terrestrial insects for food.

Focus areas:

- Highest priority – Lake Washington shoreline south of I-90 (especially lakeshore Segments 1 and 2), including the southern end of Mercer Island
- Lake Sammamish

Life stages:

Lake rearing and juvenile migration

Relevant actions:

Site-specific actions include removing bulkheads, softening shorelines, planting native shoreline vegetation, and removing or retrofitting nighttime lighting to reduce effects on juvenile migration patterns.

Outreach/education actions include promoting Green Shorelines messages and incentive/education programs (Green Shores for Homes, Shore Friendly, etc.) to landowners on both lakes, particularly in priority locations. Other outreach/education actions include raising awareness for/via realtors, and encouraging decision-makers to support protective regulations.

Land use actions include implementing and enforcing local government critical area ordinances and SMPs, especially buffer and setback requirements.

Habitat goal:

- Natural lake edge habitat south of I-90 on Lake Washington and throughout Lake Sammamish doubles over current conditions (2015) by 2025.
 - o Long-term goal: Natural lake edge habitat south of I-90 on Lake Washington and throughout Lake Sammamish is restored adequately to support juvenile rearing and migration by 2055.
- Natural riparian vegetation within 25 feet of the shoreline south of I-90 in Lake Washington and throughout Lake Sammamish doubles over current conditions (2015) by 2025.
 - o Long-term goal: Natural vegetation within 25 feet of the shoreline south of I-90 in Lake Washington and throughout Lake Sammamish is restored adequately to support juvenile rearing and migration by 2055.

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Reconnect and Enhance Creek Mouths

The area where a creek enters a river or lake provides habitat for juvenile rearing and refuge from predators as juveniles migrate to marine waters. Daylighting or restoring creeks, reducing their gradient to make them available to juvenile salmon, and removing armoring near creek mouths should restore their ecological function and reduce the impact of land cover conversion for residential, commercial, or industrial use, as well as the effects of predation. All creek mouths are important, but efforts should prioritize those in the south end of Lake Washington for rearing and migration to increase survival of Cedar River juveniles. This includes enhancing the associated creek delta habitat.

Focus areas:

- Lake Washington shoreline south of I-90, particularly south of Seward Park in Segments 1, 2, and 3 (including southern portion of Mercer Island)
- Lake Sammamish
- Sammamish River

Life stages:

Lake rearing and juvenile migration

Relevant actions:

Site-specific actions include acquiring land to protect creeks or enable restoration, daylighting creeks or otherwise restoring the lower segments to reduce their gradient and make them available to juvenile salmon (~100 meters from mouth), and removing armoring.

Outreach/education actions include building support for funding and implementation of restoration projects, including fact sheets, media coverage, and tours.

Land use actions include implementing and enforcing local government critical area ordinances and SMPs, especially buffer and setback requirements.



Protect and Restore Cold-water Sources and Reduce Thermal Barriers to Migration

Areas of water warmer than about 65 degrees F can delay migration, diminish spawning success, and contribute to pre-spawn mortality. While other strategies help protect and restore cold water sources (e.g., floodplain reconnection, riparian cover and forest retention throughout the watershed), this strategy focuses specifically on key areas known to be migratory bottlenecks, or where problems could develop for other life stages through climate change impacts. Because ocean-type Chinook salmon do not live in fresh water during summer, the effects of increased summer temperature are less pronounced for them than for other resident salmonids. However, high water temperatures may indirectly exacerbate other stresses to Chinook salmon (e.g., disease) as they migrate or rear, ultimately affecting their survival and/or ability to reproduce. This emerging issue will be tracked and adaptively managed, particularly as it affects key life stages. Cold-water sources will become more important throughout the watershed for all life stages, not just migration, as water temperatures increase.

Focus areas:

- Ship Canal
- Sammamish River

Life stages:

Adult migration, juvenile migration

Relevant actions:

Site-specific actions include limiting water withdrawals and, where necessary, testing and creating engineered solutions (e.g., creating cool water refugia in the Ship Canal, withdrawing cool water [hypolimnetic withdrawal] from Lake Washington and inserting it into the Ship Canal). Increasing shade (see Strategy to Protect and Restore Functional Riparian Vegetation) will have limited benefits in isolation but may be an important part of an overall strategy.

Outreach/education actions include developing fact sheets and media coverage to raise public awareness; encouraging adoption of green infrastructure BMPs (e.g., planting trees, improving infiltration) by development community and landowners; and involving volunteers in plantings (see riparian strategy).

Land use actions include implementing and enforcing local government critical area ordinances and SMPs, especially buffer and setback requirements on rivers, streams, and lakeshore areas.

Habitat goal:

- Areas of Sammamish River are cool enough to support Chinook salmon migration and survival by 2025.
 - Long-term goal: Temperatures in the Sammamish River do not pose a thermal barrier to migration by 2055.

Implementation goal: Complete two thermal refugia projects in the Sammamish River by 2025; increase riparian forest cover by at least 10 percent over current conditions by 2025.

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Improve Juvenile and Adult Survival at the Ballard Locks

The primary fish passage barrier in the watershed is the Ballard Locks, which affects salmon survival and the timing of adult and juvenile passage into and out of the watershed. As a legacy land use impact that forever changed the hydrology of the watershed, the pressure exerted by the Ballard Locks can be mitigated but not removed. Measures to improve fish passage conditions and survival through the Ballard Locks are of paramount importance. This strategy focuses on USACOE funding and implementing critical facility upgrades to ensure effective fish passage and continued safe facility operation.

Focus area:

Ballard Locks

Life stages:

Adult migration, juvenile migration

Relevant actions:

Site-specific actions include improving fish passage facilities in concert with overall structural improvements. Fish passage improvements include updating or replacing smolt flumes, replacing large lock filling culvert valves and machinery (i.e., Stoney Gate valves) permanently screening off the diffuser well to prevent entrainment of salmon in the saltwater drain, ensuring effective passage at the fish ladder, scraping the filling culverts annually to remove barnacles and prevent harm to fish, and implementing “reasonable and prudent measures” identified in the Lake Washington Ship Canal Biological Opinion.

Outreach/education actions include outreach to state legislators, Congress, and federal agencies through fact sheets, media coverage, and tours, and building support for funding among decision-makers.

Regulatory actions include supporting National Marine Fisheries Service and USACOE work to update the Biological Opinion for operation of the Ballard Locks, with salmon passage and survival needs as a primary consideration, including updated and revised “reasonable and prudent measures” and other required actions.

Pressure reduction goal:

- By 2025, the USACOE has completed critical fish passage facility improvements at the Ballard Locks for both adults and juveniles.



Reduce Predation of Juvenile Migrants and Lake-rearing Fry

Predation of juvenile Chinook salmon by native and non-native species is a long-suspected issue affecting juvenile survival in the freshwater system, especially in Lake Washington, Lake Sammamish, and the Ship Canal. The magnitude of the problem is not well quantified, and ongoing research is attempting to clarify the relative impact of predation on freshwater juvenile survival in WRIA 8. Additionally, emerging research suggests that artificial nighttime lighting may alter juvenile fish behavior in a way that makes them more susceptible to predators and increases the length of time predators actively feed. With improved juvenile survival, greater numbers of adults are likely to return, boosting the odds for recovering a self-sustaining Chinook salmon population.

Focus areas:

- Lake Washington
- Ship Canal (Ballard Locks to Portage Bay)
- Lake Sammamish

Life stages:

Juvenile migration, lake rearing

Relevant actions:

Site-specific actions will be determined once sub-strategies are better defined but could include predator control (e.g., bounties on native and non-native fish that are determined to cause significant predation on Chinook salmon juveniles, or removal of predators from focal areas such as parts of the Ship Canal), artificial light modifications, and improvement of coho salmon habitat to diminish cutthroat trout success. Actions that reduce water temperatures and remove or mitigate overwater structures (represented in other strategies) may also reduce predation.

Outreach or education actions will be determined once current research clarifies predation impacts and management actions that address them.

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Remove or Reduce Impact of Overwater Structures

Removing or reducing the impact of overwater structures works to alleviate the pressure of residential and commercial land use along the lakeshores and migration corridors. This strategy reduces the effects of docks, piers, pilings, and other overwater structures that make juveniles more susceptible to predation since docks can provide cover for predators and/or juveniles will avoid overwater structures and move to deeper water where they are more susceptible to predators. The primary purpose of this strategy is to improve juvenile survival during lake rearing and outmigration.

Focus areas:

- Lake Washington, especially south Lake Washington in Segments 1 and 2, including southern end of Mercer Island, and Segment 7 at the north end of the lake
- Lake Sammamish
- Sammamish River
- Ship Canal

Life stage:

Lake rearing and juvenile migration

Relevant actions:

Site-specific actions include removing or consolidating docks, piers, and pilings, or retrofitting existing docks with grating to allow natural light to reach the water (or other modifications if indicated by new data).

Outreach/education actions include promoting Green Shorelines messages and incentive/education programs (Green Shores for Homes, Shore Friendly, etc.) to landowners on both lakes, particularly in priority locations. Other outreach/education actions include raising awareness for/via realtors, and encouraging decision-makers to support protective regulations.

Land use actions include implementing and enforcing local government critical area ordinances and SMPs, especially buffer and setback requirements.



Remove Fish Passage Barriers

Ensuring that Chinook salmon can access a range of habitat types is important for all life stages, but fish passage is not a primary limiting factor in WRIA 8 for many life stages of Chinook, especially since the two largest passage barriers that existed at the time of the ESA listing—the Landsburg Diversion Dam and the Issaquah Hatchery Intake Dam—have been addressed. Providing juvenile Chinook salmon with access to more area for rearing, especially in small channels where many fish passage barriers still exist, is important. Also, ensuring juvenile access to available cooler water habitat can mitigate the effects of increased water temperatures. Removing barriers to fish passage is also an important strategy to ensure that Tier 2 areas are not further degraded and that spatial diversity of the populations is not hampered by cutting off habitat through current or future land use. Although most barriers in the watershed affecting Chinook salmon are thought to be partial rather than full, these barriers could degrade and create larger impediments to fish passage. As development continues and new roads are built, creek crossings should be minimized to prevent future barriers, and new crossings should use bridges or culverts designed to accommodate fish passage.

Focus areas:

- Issaquah Creek sub-basin (middle and upper, North Fork)
- Lower reaches of some upper Cedar River tributaries within the Cedar River Municipal Watershed
- Little Bear Creek
- Kelsey Creek (includes private culverts)
- Creek mouths along the lakeshores or nearshore that restrict juvenile access (Snohomish County has identified all barrier culverts in their jurisdiction)
- Tributary connections along the Sammamish River inaccessible due to perched culverts

Life stage:

Juvenile rearing and adult migration

Relevant actions:

Site-specific actions include replacing barrier culverts with passable culverts, conducting an inventory of barriers, and prioritizing key areas. Fish passage improvements should target both public and private culverts.

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Protect and Restore Forest Cover and Headwater Areas

Retaining forest cover and functional upland habitat in areas throughout the watershed is important for water quantity and quality, particularly to address changes in winter peak flows, summer low flows, and water temperatures as climate change progresses. This strategy reduces the impacts of land conversion, pollutant- and sediment-filled runoff, and changes in water flow and temperature. Since implementation of the 2005 Plan, many of the opportunities to purchase or protect headwater areas have been acted on or otherwise addressed. Remaining opportunities are limited but exist along the middle and upper reaches of Bear/Cottage Lake, Issaquah, Little Bear, and North creeks. Incentivizing and regulating retention of forest cover and reforestation on private lands, as well as reducing impervious cover through low-impact development (LID) practices, are likely to indirectly benefit all life stages of WRIA 8 Chinook salmon populations.

Focus areas:

- Bear Creek – especially upper Bear Creek Reaches 7 – 14, and throughout Cottage Lake Creek and Cold Creek
- Issaquah Creek – especially along Carey and Holder creeks, middle Issaquah Creek Reaches 11 and 12, Fifteenmile Creek, and East Fork Issaquah Creek
- Upper reaches and headwaters areas of all Tier 2 sub-basins

Life stage:

All life stages benefit but this is not a key strategy for any specific life stage.

Relevant actions:

Site-specific actions include fee-simple land acquisition, transfer of development rights, and conservation easements to protect intact forestlands, especially in areas where contiguous forest cover can be protected. Restoration is focused on reforestation of lands outside the riparian corridor.

Outreach/education actions include streamside landowner outreach, and awareness and incentive programs focused on retaining forest cover, reforestation, and reducing impervious cover through LID practices.

Land use actions include implementing and enforcing local government critical area ordinances and SMPs, especially buffer and setback requirements on rivers and streams, and offering incentives to retain forest cover and plant forested areas.



Provide Adequate Streamflow

Adequate streamflow is important to provide habitat during critical rearing and migration stages. This strategy, intended to address the impacts of both high and low flows, would reduce the impacts of land conversion, water withdrawals, increasing water temperatures, scouring events, and fish passage barriers. Reducing illegal withdrawals and protecting or enhancing flows are important actions throughout WRIA 8, especially in the Sammamish River basin and its tributaries, and may become more important in the future as climate changes.

Focus areas:

- Bear Creek – especially upper Bear Creek Reaches 7 through 16, and Cottage Lake Creek and Cold Creek
- Issaquah Creek – especially North Fork Issaquah Creek Reach 1
- Sammamish River

Life stage:

All life stages benefit but this is not a key strategy for any specific life stage.

Relevant actions:

Actions to protect instream flows include reconnecting floodplains, preventing illegal withdrawals, and protecting aquifers and critical aquifer recharge areas (CARA). Green stormwater infrastructure (GSI) projects that improve groundwater recharge could help sustain streamflow.

Outreach/education actions include promoting water conservation and LID to the general public, and incentivizing retention of forest cover and reforestation to private landowners and the development community.

Land use actions include implementing and enforcing local government development regulations and stormwater regulations (e.g., National Pollutant Discharge Elimination System [NPDES] permits), protecting groundwater recharge areas through CARA protections, enforcing prohibition of illegal water withdrawals or other flow-altering practices, and reducing impervious cover through LID and GSI.

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Restore Sediment Processes Necessary for Key Life Stages

This strategy addresses two issues – excessive fine-grained sediments and insufficient spawning gravel. An excess of fine sediment is of concern during incubation, when redds/eggs can be suffocated by fine particles. Beneficial gravels for spawning can be lacking where natural sediment recruitment processes are interrupted. This strategy reduces the impacts of land conversion, shoreline hardening, and impervious surface runoff.

Focus areas:

- All Tier 2 sub-basins
- Issaquah Creek
- Cedar River

Life stages:

Spawning and incubation

Relevant actions:

Site-specific actions include protecting confluence areas that provide high quality spawning gravel, removing shoreline armoring, placing instream wood, and planting riparian areas.

Outreach/education actions to reduce the amount of fine sediments include promoting water quality BMPs and green infrastructure programs to landowners and developers in priority areas, incentivizing retention of forest cover and reforestation of private lands, as well as reducing impervious cover through LID practices.

Land use actions include implementing and enforcing local government development regulations and stormwater regulations, and reducing impervious cover through LID and GSI.



Restore Natural Marine Shorelines

Preventing and removing bulkheads and armoring along the marine shoreline will allow for a more natural shoreline with increased overhanging vegetation, connected drift cells and pocket estuaries, and increased extent of eelgrass beds and forage fish spawning habitat. These features will improve the marine food web function and increase success of juvenile Chinook salmon rearing and migrating. The BNSF railway runs along most of the WRIA 8 marine shoreline, severely limiting restoration opportunities. However, any shoreline enhancement or restoration will offer regional salmon recovery benefits, as Chinook salmon from other watersheds also rear in or migrate through the WRIA 8 nearshore. Opportunities exist to enhance the habitat in front of the BNSF railway through beach nourishment, as well as behind or above BNSF through riparian restoration. Identifying and restoring shoreline sediment processes is also important to support habitat for primary Chinook prey species, such as sand lance and smelt.

Focus Area:

- Entire WRIA 8 marine nearshore (Snohomish County and King County have identified potential beach nourishment locations that could be used to support prioritization)

Life stages:

Juvenile migration and marine rearing

Relevant actions:

Site-specific actions may include removing bulkheads and shoreline armoring to enable habitat-forming processes, and completing beach nourishment projects where beach substrates need supplementation or where restoring habitat-forming processes is not feasible. The replacement of culverts under the railroad with bridges or trestles can also facilitate greater sediment transport to the nearshore, enabling beach formations to establish and persist. Establishment of pocket beaches and coves can also provide important rearing and refuge opportunities, especially close to the Ballard Locks.

Outreach/education actions include outreach to property owners, including jurisdictions and BNSF, to promote green and shoreline softening alternatives to bulkheads and other shoreline armoring; project-specific fact sheets; media coverage; and tours.

Land use actions include implementing and enforcing local government SMP regulations, and working with regional partners and BNSF to identify and implement priority beach nourishment actions.

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Reconnect Backshore Areas and Pocket Estuaries

Many backshore areas and pocket estuaries (generally defined here as small creek mouths) have been disconnected from Puget Sound, resulting in a lack of tidal inundation and reducing or preventing access by migrating adult and juvenile salmon. Along the nearshore, creek mouths provide important rearing habitat, and recent research suggests these areas are important to the overall life history of Puget Sound salmon. Much of the WRIA 8 shoreline is disconnected from the Sound by armoring from the railroad prism, but juvenile salmon need viable rearing and refuge locations along the shoreline wherever possible. This strategy will mitigate the effects of the railroad, perched culverts, and shoreline hardening in commercial and residential areas.

Focus area:

- Entire WRIA 8 marine nearshore, with particular emphasis on those small streams that have the greatest potential to offer non-natal rearing habitat

Life stages:

Juvenile migration and marine rearing (for all populations in the evolutionarily significant unit south of WRIA 8, and potentially the WRIA 7 population in the northernmost portions of the watershed)

Relevant actions:

Site-specific actions include replacing culverts or other obstructions in a manner that allows natural processes and tidal interaction with backshore habitat, daylighting streams along the nearshore, and reconnecting tidal wetlands and pocket estuaries that have been disconnected (in many cases by the railroad).

Outreach/education actions include outreach to property owners, including jurisdictions and BNSF; project-specific fact sheets; media coverage; and tours.

Land use actions include implementing and enforcing local government SMP regulations, and working with regional partners, state and federal agencies, local governments, and BNSF to reconnect pocket estuaries where coastal streams flow into Puget Sound through culverts under the railroad tracks.

Habitat goal:

- Pocket estuaries along WRIA 8 shoreline support juvenile Chinook salmon for rearing and migration.

Implementation goal:

Reconnect two pocket estuaries (tributary stream mouths) to the nearshore by 2025.



Protect and Restore Marine Water and Sediment Quality

Improving marine water and sediment quality where possible and capping contaminated sediment in the nearshore, especially near commercial and industrial areas, may improve early marine survival directly or indirectly. Additional research is needed to better understand how impaired marine water and sediment affect Chinook salmon early marine survival and the food web. WRIA 8 will track and adaptively manage this emerging issue. The strategy will mitigate the legacy and current impacts of land conversion and of point and nonpoint source pollution.

Focus areas:

- Portions of the WRIA 8 marine nearshore affected by commercial or industrial water or sediment quality issues

Life stages:

Juvenile migration and marine rearing

Relevant actions:

Site-specific actions will be determined through adaptive management. Most water quality issues will be more appropriately addressed through regulatory site cleanup and remediation, although creosote-treated in-water structures may fall outside of the regulatory landscape.

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Improve Water Quality

“Water quality” is multi-faceted and intersects with salmon recovery in many ways. The purpose of this strategy is to support water quality improvements beyond water quality permit requirements through encouraging individuals and jurisdictions to participate in voluntary and incentive-based programs. Improvements should target reductions in polluted runoff from impervious surfaces, nonpoint source pollution, fine sediment inputs, and altered flows. This strategy is primarily implemented through education and outreach programs. Several water quality elements are also addressed by other strategies in this section (local and regional planning, regulations, and permitting; protect and restore cold water sources and reduce thermal barriers to migration). New regional research is underway to identify possible impacts of polluted stormwater runoff on Chinook salmon, and any findings will be adaptively managed at the local level and in implementation of the 2017 Plan.

Focus areas:

- Throughout watershed, primarily in areas with higher stormwater management needs, including existing developed areas and areas likely to experience development pressure.

Life stages:

All

Relevant actions:

Outreach/education actions aim to promote water quality BMPs (such as landscaping and livestock management practices), and LID and green infrastructure incentive programs.

Land use actions include improving stormwater management to provide detention, infiltration, or spill containment facilities where practicable; improving pollution control at commercial facilities (especially marinas); incentivizing LID; and implementing GSI practices.



Integrate Salmon Recovery Priorities into Local and Regional Planning, Regulations, and Permitting

Local jurisdictions, state agencies, and federal agencies should consult the WRIA 8 plan for the best available science on incorporating Chinook salmon requirements into required planning for shorelines, land use, water quality, and project permitting. The 2005 Plan and this update are built on the assumption that regulations are protective and supportive of sustaining salmon in the watershed; the other strategies articulated in the plan provide the additional ecological lift necessary for recovery. While WRIA 8 staff will not track these actions specifically, or likely fund capital projects through the process, this strategy is foundational to the others.

Focus areas:

- Throughout watershed

Life stages:

All

Relevant actions:

Outreach/education actions will promote the WRIA 8 plan as best available science for regulatory updates and permitting. These actions will also promote model programs where jurisdictions successfully implement their regulatory programs in a manner that aligns with Chinook salmon recovery strategies.

Land use actions for integrating salmon recovery priorities include developing and updating land use regulations to include provisions that seek to protect salmon habitat needs. These salmon habitat needs include large shoreline and riparian buffers and setbacks, strong stormwater management standards, appropriately restrictive development codes and standards, and effective protections for critical and environmentally sensitive areas.

Goal:

- Land use regulations limit additional habitat degradation and support all habitat restoration goals through implementation of recovery strategies and actions.

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Continue Existing and Conduct New Research, Monitoring, and Adaptive Management on Key Issues

Specific research and monitoring are necessary to ensure that the latest science informs implementation of recovery strategies and actions. The MAP (Appendix A) details the indicators that should be tracked to support a complete adaptive management cycle. This strategy highlights research and monitoring needed to further develop or refine strategies or address data gaps on specific issues critical for recovery. These include emerging issues such as impacts on salmon survival from predation, artificial light, and climate change. WRIA 8 relies on regional research for issues related to stormwater impacts and early marine survival, such as the Salish Sea Marine Survival Project.

Focus areas:

Throughout watershed, as determined by priority issues or data needs

Life stages:

All, primarily salmon population recovery bottlenecks (e.g., stream and lake rearing and migration)

Specific research under way:

Fish use of habitat restoration projects (i.e., project effectiveness), juvenile passage and survival at the Ballard Locks, predation in the Ship Canal and Lake Washington, and effects of artificial light on juvenile salmon behavior and survival

Goal:

Gaps are identified where future research is needed; feasibility studies are implemented to identify possible options for reducing temperatures in the Ship Canal and Sammamish River.



Increase Awareness of and Support for Salmon Recovery

While most strategies include specific outreach/education actions to support their implementation, this strategy is entirely focused on the importance of raising awareness of and broadening support for salmon recovery in general. The intent of this strategy is to ensure watershed-wide awareness of salmon, agreement on the ecological, cultural, recreational and economic importance of salmon in the watershed, and an understanding of the individual actions that can support salmon recovery. With a growing human population in the watershed and many new residents who may be unfamiliar with Chinook salmon, this strategy is critical to meeting specific habitat and Chinook salmon population goals articulated in this plan.

Focus areas:

Throughout watershed

Life stages:

All

Relevant actions:

Outreach/education actions include continuing to coordinate the Salmon SEEs on program and other general salmon recovery awareness-building to increase public knowledge of, interest in, and support for salmon recovery, such as Cedar River Salmon Journey, Beach Naturalists. Additional actions include behavior change programs, and outreach and education for key audiences, including elected officials, schoolchildren, development and landscaping industries, and shoreline and streamside property owners.

Goal:

- Education and outreach actions support all habitat restoration goals.