

# APPENDIX D

## Habitat Goals

### BACKGROUND

A goal is a formal statement of a desired future condition. The goals in this section describe desired future conditions of habitat components needed to conserve and restore Chinook salmon (Chinook viable salmonid population goals are discussed elsewhere in the Plan update). Goals may be quantitative (expressed as a number or numbers) or qualitative (expressed as a condition or other non-numeric characteristic), but to be useful, all goals should be specific, measurable, attainable, relevant, and time-bound. In the following paragraphs, WRIA 8 uses both quantitative and qualitative goals for desired future habitat conditions.

### WRIA 8 Habitat Components

1. Non-wadeable streams
  - a. Cedar River
  - b. Sammamish River
2. Wadeable Chinook streams
  - a. Tier 1 streams – (Bear Cottage Lake Creek and Issaquah Creek)
  - b. Tier 2 streams – (North, Little Bear, Kelsey, and Evans Creeks<sup>1</sup>)
3. Lakes (Lake Sammamish, Lake Washington, Lake Union and Ship Canal)
4. Nearshore (Pocket estuaries/stream mouths)

### HABITAT GOAL SETTING APPROACH

The relationships between habitat conditions and Chinook salmon growth and survival are multifaceted and complex, and operate at many spatial and temporal scales. Chinook population-level responses to even large-scale habitat improvements may not be detectable for years, and may be confounded by improvements or declines elsewhere in the watershed or in the marine environment. Nevertheless, known linkages exist between freshwater habitat and salmon, backed by decades of credible research.

The WRIA 8 Technical Committee selected a short list of goals (Table 1) that focus on key elements affecting critical habitat bottlenecks as determined by conservation science, and based on the 2016 WRIA 8 conceptual model and pressures assessment. These goals focus on the most important habitat elements for conservation and recovery of Chinook salmon in the watershed and are based on local data on existing habitat conditions, the unique constraints placed on rivers and streams in the WRIA 8 watershed, and the pace of implementation progress in the last ten years. These goals are ambitious but feasible within the framework of current conditions.

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<sup>1</sup> Coal and May Creeks were classified as Tier 3 streams in the 2005 Chinook Plan. They have experienced a recent increase in use by spawning Chinook salmon and contain areas with somewhat higher-quality habitat compared to some other Tier 2 areas. The Technical Committee will continue monitoring their status, and consider upgrading to Tier 2 if spawning continues to increase.

## WRIA 8 Habitat Goals

Habitat Component	2025 Goals	2055 Goals
<b>Cedar River</b>	<p>Total connected floodplain acres between Lake Washington and Landsburg Diversion Dam will be 1,170 acres (reconnect an additional 130 acres) by 2025.</p> <p>Average wood volume will quadruple over current basin conditions to 42 m<sup>3</sup>/100 m (RM 4 to Landsburg Diversion Dam) by 2025.</p>	<p>Total connected floodplain acres between Lake Washington and Landsburg Diversion Dam will be at least 1,386 acres by 2055 (reconnect on additional 346 acres).</p> <p>Average wood volume between RM 4 and Landsburg Diversion Dam will be 93 m<sup>3</sup>/100 m by 2055 (the median standard wood volume for streams over 30 m bankfull width – Fox and Bolton, 2007).</p>
<b>Sammamish River</b>	<p>Areas of river will be cool enough to support Chinook salmon migration and survival (increase riparian cover by at least 10% and add two thermal refugia) by 2025.</p>	<p>Riparian forest cover and thermal refugia along the river will help keep it cool enough to support Chinook salmon migration and survival by 2055.</p>
<b>Streams</b> (Bear/Cottage Lake, Issaquah, Evans, Kelsey, Little Bear, North creeks)	<p>Area of riparian cover in each Tier 1 and Tier 2 stream will increase by 10% over 2015 conditions by 2025.</p> <p>Average wood volume will double over current basin conditions by 2025.</p>	<p>Riparian areas along Tier 1 and Tier 2 streams will be of sufficient size and quality to support sustainable and harvestable Chinook salmon populations in the watershed by 2055.</p> <p>Each Tier 1 and Tier 2 stream system will meet appropriate regional instream wood-loading standards by 2055.</p>
<b>Lakes</b>	<p>Natural lake shoreline<sup>1</sup> south of I-90 (Lake Washington) and throughout Lake Sammamish will double over 2015 conditions by 2025</p> <p>Natural lake shoreline south of I-90 on Lake Washington and throughout Lake Sammamish will be restored adequately to support juvenile rearing and migration by 2055.</p>	<p>Natural lake shoreline south of I-90 on Lake Washington and throughout Lake Sammamish will be restored adequately to support juvenile rearing and migration by 2055.</p> <p>Natural vegetation within 25 feet of the shoreline south of I-90 (Lake Washington) and throughout Lake Sammamish is restored adequately to support juvenile rearing and migration by 2055.</p>
<b>Nearshore (Pocket Estuaries)</b>	<p>Pocket estuaries along WRIA 8 shoreline will support juvenile Chinook salmon for rearing and migration (reconnect two stream mouth pocket estuaries) by 2025.</p>	<p>Same as 2025 goal.</p>

<sup>1</sup> "Natural lake shoreline" is defined by the WRIA 8 Technical Committee as without bulkhead, with slope and substrate matching historic lakeshore contours for the area under consideration.

RM = River Mile

Table D-1. WRIA 8 Habitat Goals

While the number of habitat goals is relatively small, the Technical Committee considers them to be proxies for a larger set of expected habitat improvements. Some of these multiple benefits are described in the notes accompanying the goal narratives.

Monitoring is necessary to track progress toward these goals (See Appendix A). Reporting will occur at five-year intervals. To align with other planning horizons and still be ecologically meaningful, we recommend that adaptive management course corrections occur in 2025, at which time goals will be re-examined and the next adaptive management planning horizon will be set. The Technical Committee will oversee monitoring efforts in the intervening periods and recommend changes if warranted by interim results.

### Cedar River Habitat Goals

**Short-Term Goal:** Total connected floodplain acres 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.

*Indicator:* total connected floodplain areas.

Reconnecting floodplains along the Cedar River is a key action and one of the highest priorities for Chinook salmon recovery in WRIA 8. Monitoring indicates that while juvenile Chinook salmon fry are density-independent (more redds = more fry), parr survival appears to be density-dependent (more redds ≠ more parr).

For this goal, the moderate channel migration zone (CMZ) is used to define the floodplain area and assess floodplain connectivity. The moderate CMZ was chosen because this area could be actively engaged by the river by lateral migration, and therefore would directly (and positively) affect river processes. The WRIA 8 TC chose the CMZ rather than the Federal Emergency Management Agency (FEMA) 100-year floodplain because of this direct relationship to the restoration of habitat-forming processes.

There are 1,419 total floodplain acres on the Cedar River below the Landsburg Diversion Dam, using the moderate CMZ as the indicator of floodplain area. As of 2015 (WRIA 8 TC, unpublished data) approximately 380 acres, or 26 percent of the CMZ<sup>2</sup> is behind levees, revetments, or other hard structures (i.e., disconnected). The pace of reconnection in the first 10 years of the 2005 Plan implementation (which averaged 6.44 acres per year, for a total of 64.4 acres) is insufficient to support long-term Chinook salmon viability in the watershed. The WRIA 8 TC determined that doubling that pace is appropriate as well as feasible. This would add 130 acres by 2025 and decrease the amount of disconnected floodplain from 26 percent to 17.5 percent of the total area. The 2055 goal would be to decrease the amount of disconnected floodplain further, to 9 percent of the CMZ or less.

**Short-Term Goal:** Average wood volume will quadruple by 2025 relative to 2015 basin conditions (river mile [RM] 4 to Landsburg Diversion Dam) by 2025 (i.e., from 10.4 m<sup>3</sup>/100 m to 42 m<sup>3</sup>/100 m).

**Long-Term Goal:** Average wood volume between RM 4 and Landsburg Diversion Dam will be 93 m<sup>3</sup>/100 m by 2055 (the median wood volume for streams over 30 meters bankfull width) (Fox and Bolton, 2007).

*Indicator:* Average wood volume (m<sup>3</sup>/100 m)

<sup>2</sup> All mentions of CMZ in this document refers to the moderate CMZ.

Using a recent remote-sensing product (NOAA 2015), the WRIA 8 TC estimates 5.2 m<sup>2</sup>/100 m wood area in the Cedar River between RM 4 and Landsburg Diversion Dam. If the typical wood logjam is assumed to be 2 meters tall, the estimated wood volume would total 10.4 m<sup>3</sup>/100 m. This value is substantially below regional standards (Fox and Bolton, 2007) and needs to be enhanced. Even four times the current value (42 m<sup>3</sup>/100 m) does not achieve the 25th percentile of the regional standard and is still poor by that standard, but it is an ambitious goal to achieve by 2025. The 2055 goal would be to reach the median value for streams over 30 meters bankfull width (i.e., 93 m<sup>3</sup>/100 m).

## Sammamish River Habitat Goals

**Short-Term Goal:** Areas of river will be cool enough in 2025 to support Chinook salmon migration and survival.

**Long-Term Goal:** Riparian forest cover and thermal refugia along the river will keep it cool enough to support Chinook salmon migration and survival by 2055.

*Indicator:* Number of thermal refugia – target would be to add 2 by 2025.

*Indicator:* Acres of riparian forest – increase -2015 area by at least 10 percent by 2025.

A recent remote-sensing product (NOAA 2015) detected zero incidence of large wood in the Sammamish River (WRIA 8 TC, unpublished GIS data). However, constructed logjams are known to be present in the Sammamish River in and near Redmond. Notwithstanding the few known logjams, the TC considers the Sammamish River to reflect poor condition for wood volume.

A recent report on cooling options for the Sammamish River indicates that there are limited opportunities for creating thermal refugia along the river (R2 Resource Consultants 2010). As indicated in the Strategies section of the Plan update, WRIA 8 and partners should also investigate other actions for cold-water supplementation. The target riparian forest cover area would add at least 45 acres by 2025.

## Tier 1 and Tier 2 Wadeable Streams Habitat Goals

**Short-Term Goal:** Area of riparian cover in Tier 1 and Tier 2 stream will increase by 10 percent over current conditions (2015) by 2025.

**Long-Term Goal:** Riparian areas along Tier 1 and Tier 2 streams will be of sufficient size and quality to support sustainable and harvestable Chinook salmon populations in the watershed by 2055.

*Indicator:* Acres of riparian forest

- Bear/Cottage Lake Creek
- Issaquah Creek
- North Creek
- Little Bear Creek
- Evans Creek
- Kelsey Creek

This indicator will use a high-resolution land cover product by the NOAA Coastal Change Analysis Program and/or Washington high-resolution land cover product.

**Short-Term Goal:** Average wood volume will double over 2015 basin conditions by 2025. Long-term goal is to meet appropriate standards (Fox and Bolton 2007) for each stream system. Individual projects should strive to meet or exceed Fox Bolton (2007) standards.

**Long-Term Goal:** Tier 1 and Tier 2 stream systems will meet appropriate regional instream wood-loading standards by 2055.

*Indicator:* Wood volume (m<sup>3</sup>/100 m)

- Bear/Cottage Lake Creek
- Issaquah Creek
- North Creek
- Little Bear Creek
- Evans Creek
- Kelsey Creek

Wood volume is currently far below minimum standards for functional stream systems in every WRIA 8 stream (King County 2015). The TC acknowledges that the best realistic goal for streams inside the UGA would be to attain the 25th percentile of Fox and Bolton (2007) standards. Some WRIA 8 streams outside the UGA can realistically attain the 50th percentile, while a few may approach the 75th percentile in some reaches. The TC will encourage project proponents to install loads approaching the 75th percentile in appropriate projects.

This goal requires fieldwork to quantify current wood loads in these streams. The WRIA 8 TC will determine whether a census-based or probabilistic sampling-based approach should be taken.

## Lakes Habitat Goals

**Short-Term Goal:** Natural lake edge habitats south of Interstate 90 (I-90) (Lake Washington) and throughout Lake Sammamish will double over current conditions by 2025.

**Long-Term Goal:** Natural lake edge habitat south of I-90 (Lake Washington) and throughout Lake Sammamish will be restored adequately to support juvenile rearing and migration by 2055.

*Indicator:* Length of natural bank profile.

“Natural bank profile” refers to a bank without bulkhead, with a slope and substrate matching historic lakeshore contours. The southern ends of the lakes are the highest priority. A field survey will be required to quantify current conditions.

**Short-Term Goal:** Area of natural riparian vegetation within 25 feet of shoreline south of I-90 (Lake Washington) and throughout Lake Sammamish will double over 2015 conditions by 2025.

**Long-Term Goal:** Natural vegetation within 25 feet of the shoreline south of I-90 (Lake Washington) and throughout Lake Sammamish will be restored adequately to support juvenile rearing and migration by 2055.

*Indicator:* Natural riparian vegetation within 25 feet of shoreline (acres).

Natural riparian shoreline refers to native trees and tall shrubs. This may also include projects from the City of Seattle’s guide to environmentally sound alternatives to shoreline bulkheads (a.k.a. Green Shorelines projects – City of Seattle, nd). It may be possible to quantify current conditions via remote sensing. Note: the minimum assessment unit size is 25 feet by 25 feet.

## Marine Nearshore Habitat Goals

**Short-Term Goal:** Pocket estuaries along WRIA 8 shoreline will support juvenile Chinook salmon for rearing and migration. Reconnect two stream mouth pocket estuaries by 2025.

*Indicator:* Number of tributary stream mouths connected to nearshore.

A stream mouth assessment that quantifies the number of stream mouths connected or disconnected is still needed. A “connected” stream is defined as connected to the nearshore through natural channel profile and delta formation processes.

## References

City of Seattle. nd. Green Shorelines: Bulkhead alternatives for a healthier Lake Washington. Seattle, WA. <http://www.govlink.org/watersheds/8/action/greenshorelines/>

Fox, M. and S. Bolton. 2007. A regional and geomorphic reference for quantities and volumes of instream wood in unmanaged forested basins of Washington State. *North American Journal of Fisheries Management*, 27:342-359.

King County. 2015. Wadeable streams status and trends. <http://www.kingcounty.gov/depts/dnrp/wlr/sections-programs/science-section/doing-science/wadeable-streams.aspx>

R2 Resource Consultants. 2010. Assessment of summer temperatures and feasibility and design of improved adult Chinook salmon thermal refuge habitat in the Sammamish River. Prepared for the Muckleshoot Indian Tribe Fisheries Division. Redmond, Washington.