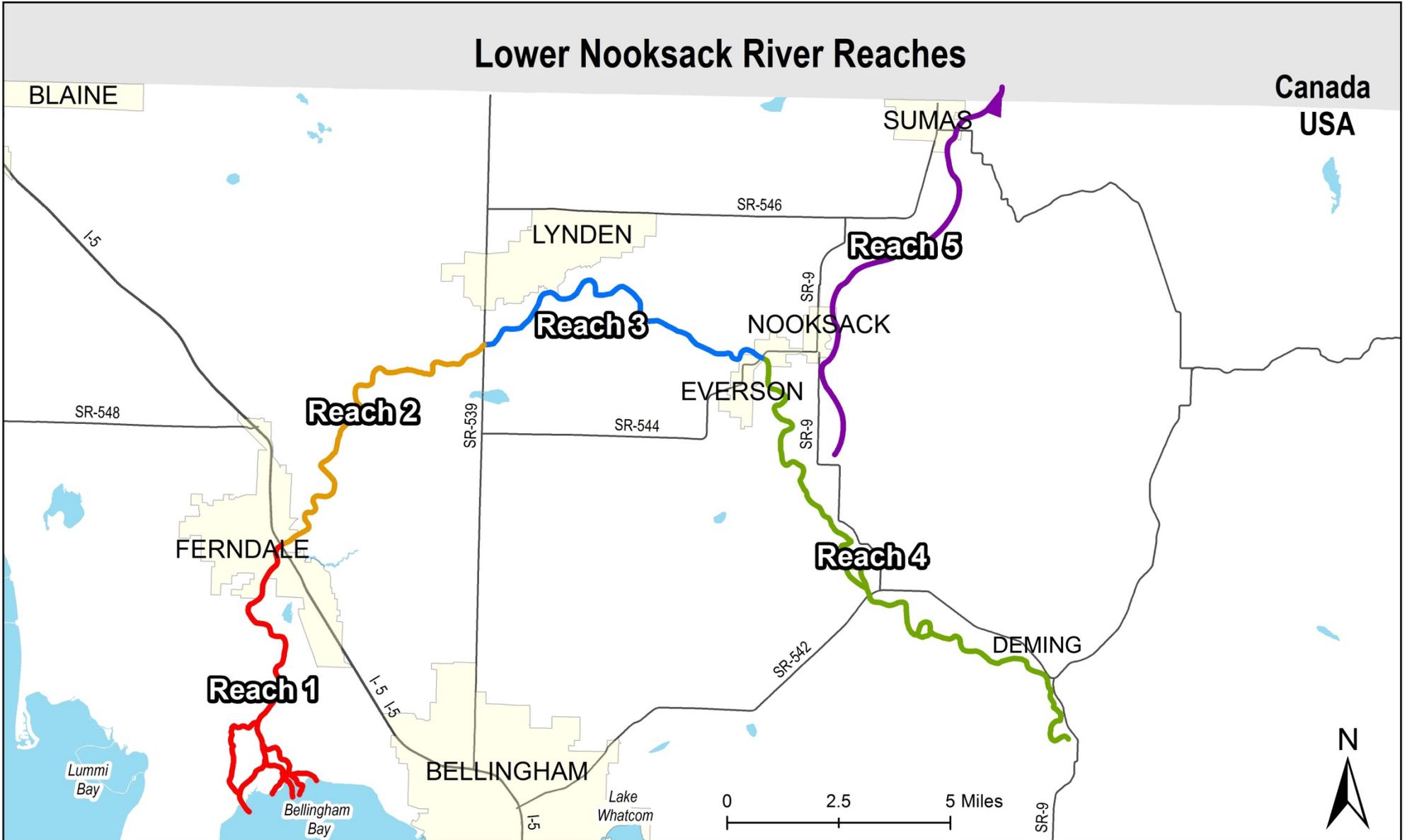
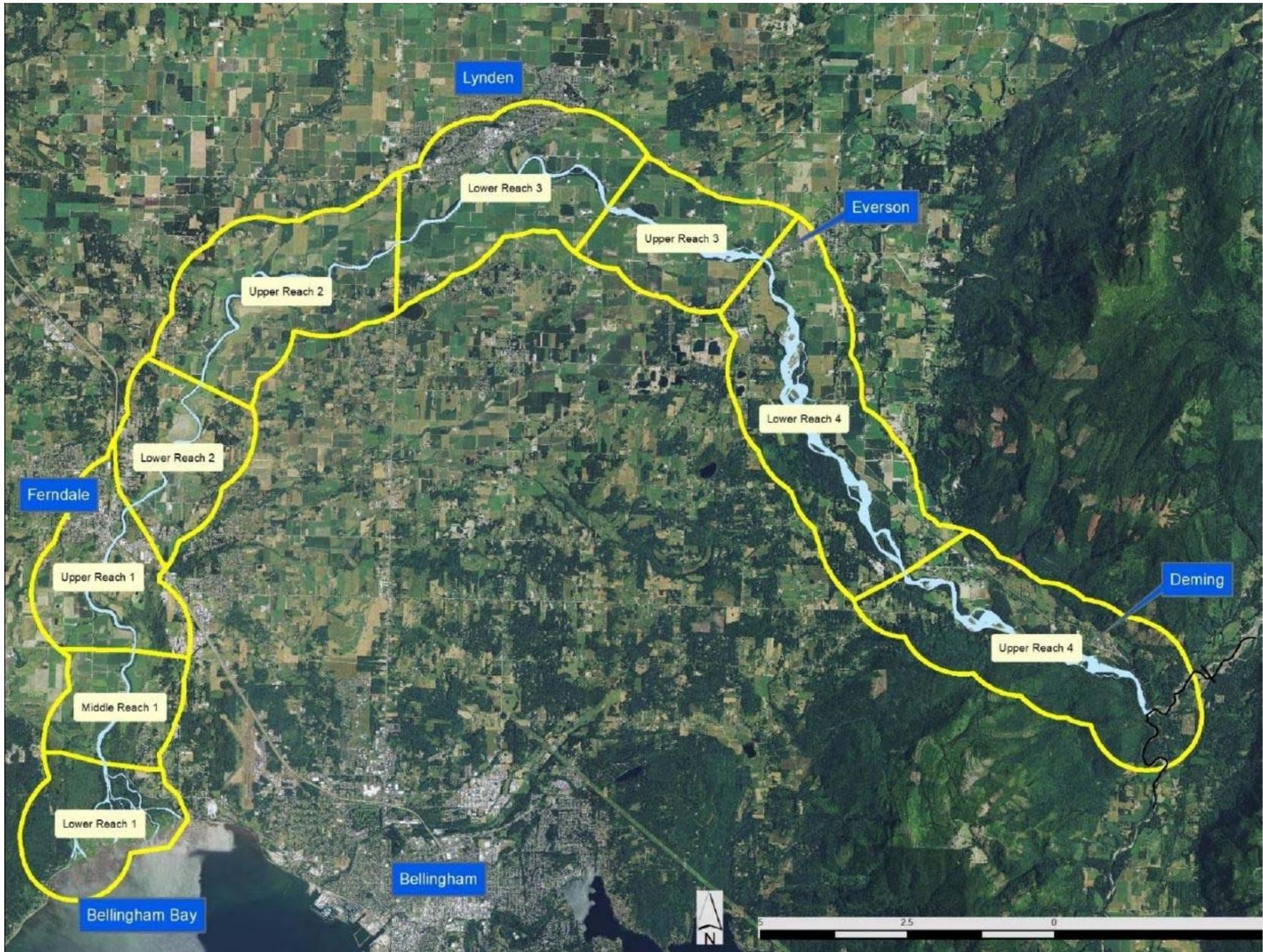


Floodplain Integrated Planning (FLIP) Process

Lower Nooksack River Reaches



FLIP Lower Nooksack River Subreach Map



FLIP Acronym Glossary

ACOE or USACE – United States Army Corps of Engineers
AGI – Applied Geomorphology Inc.
BFE – Base Flood Elevation
BiOP – Puget Sound Biological Opinion on National Flood Insurance Program
CAO – Critical Areas Ordinance
CAV – Community Assistance Visit
CDBFE – Community Determined Base Flood Elevation
CFHMP – Comprehensive Flood Hazard Management Plan
CFR – Code of Federal Regulations
CFS – Cubic feet per second
CHHA – Coastal High Hazard Area
CLOMR – Conditional Letter of Map Revision
CMZ – Channel Migration Zone
CRS – Community Rating System
DEM – Digital Elevation Model
DOD – DEM of Difference (map of elevation change)
DOE or WSDOE – Washington State Department of Ecology
D/S - Downstream
EC – Elevation Certificate
EEW – Estuarine Emergent Wetland
ESW – Estuarine Scrub-Shrub Wetland
ESA – Endangered Species Act
FbD – Floodplains by Design
FCZD – Flood Control Zone District
FCZDAC – Flood Control Zone District Advisory Committee
FEMA – Federal Emergency Management Agency
FEQ – Full Equations Unsteady Flow hydraulic model (used for the Nooksack River)
FIRM or DFIRM – Digital Flood Insurance Rate Map
FIS – Flood Insurance Study
FLIP – Nooksack River Floodplain Integrated Planning Team
FP – Floodplain
FPE – Flood Protection Elevation
GIS – Geographic Information System (mapping software)
HA – Habitat Assessment
HMZ – Historic Migration Zone
HOR – Hatchery origin returns/recruits (hatchery fish)
LiDAR – Light Detection and Ranging (method to collect topographic data)
LOMA – Letter of Map Amendment
LOMC – Letter of Map Change

LOMR – Letter of Map Revision
LOMR-F – Letter of Map Revision based on Fill
LOP – Level of Protection
LWD – Large Woody Debris
MSY – Maximum Sustainable Yield
NFIP – National Flood Insurance Program
NHC – Northwest Hydraulic Consultants
NLD – National Levee Database (maintained by USACE)
NOR – Natural origin returns/recruits (wild fish)
NWS - National Weather Service
PDO – Pacific Decadal Oscillation
PDS – Planning and Development Services
PEW – Palustrine Emergent Wetland
PFC – Properly functioning conditions
PFW – Palustrine Forested Wetland
PSW – Palustrine Scrub-Shrub Wetland
RM – River Mile
RTF – Riverine-Tidal freshwater Wetland
RTS – Riverine-Tidal Scrub-Shrub Wetland
SEPA – State Environmental Policy Act
SFHA – Special Flood Hazard Area
SS – Scrub shrub
TNC – The Nature Conservancy
U/S – Upstream
USACE – United States Army Corps of Engineers
USGS – United States Geological Survey
UWCIG – University of Washington Climate Impacts Group
WCC – Whatcom County Code
WCPDS – Whatcom County Planning and Development Services
WCPW – Whatcom County Public Works
WDFW – Washington Department of Fish and Wildlife
WSDOE – Washington State Department of Ecology
WID – Watershed Improvement District
WSE – Watershed Science and Engineering (consultant)
 or - Water Surface Elevation
WRIA1- Water Resource Inventory Area 1
WY – Water Year (Oct 1 – Sept 30)

3H's – Harvest, hatcheries and habitat

Lower Nooksack Salmon Habitat Assessment – An overview of habitat surveys and rearing capacity analyses

Presentation to the Nooksack River Floodplain Integrated Planning Team

Presentation by Jason Hall

Date: October 29, 2019

Acronym Glossary

CFS – Cubic feet per second
EEW – Estuarine Emergent Wetland
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FP – Floodplain
PEW – Palustrine Emergent Wetland
PFW – Palustrine Forested Wetland
PSW – Palustrine Scrub-Shrub Wetland
RM – River mile
RTF – Riverine-Tidal freshwater Wetland
RTS – Riverine-Tidal Scrub-Shrub Wetland
SS – Scrub shrub
WDFW – Washington Department of Fish and Wildlife

Glossary of Terms

Abundance – The number of individuals.

Braid Channel

Capacity – The overall ability for a habitat to support fish and wildlife.

Complexity – The variability, or lack thereof, in the physical habitat (ex. water velocity, substrate, channel unit, cover) within a given region. Habitat complexity is often positively related to population productivity or stability.

Connectivity – The presence of a physical wetted or hydrological connection between two or more habitats, or the ability of fish to move between two or more habitats.

Cover – Overhead structure which can provide refuge and protection for fish, often from overhanging vegetation, large wood, or undercut banks.

Confinement – The degree to which an active channel can laterally migrate within the floodplain or active channel migration zone.

Current habitat – The current extent and type of habitat available.

Distributary

Distributary – A branching channel that distributes freshwater through the delta which have a clear upstream river connection and downstream flow path to the marine environment. In contrast to tidal channels, riverine flows are the primary source of flow in distributaries.

Drivers (geomorphic assessment) – Physical conditions that create a specific impact on habitat conditions, extent, or processes.

Egg-fry survival – The percentage of fry surviving after incubation and emergence from gravel.

Enhance habitat – The modification of degraded habitat to improve or diversify current conditions (e.g., roughening armored banks to increase cover and slow water edge habitat area).

Estuary – The aquatic transition between a large river and the marine environment resulting in a gradient of salinities from freshwater to marine.

Floodplain – The extent of potential aquatic habitat at flows above bankfull, which are confined by valley hillside or slope, or abandoned terraces.

Fish density – The number of fish per unit area.

Flow attenuation – The weakening of stream discharge peaks over time, which can occur as a result of dispersing flows over a larger area (e.g., flooding onto a floodplain surface) or by disbursing flows into multiple channels (e.g., activation of side channels).

Historical habitat – Historical reconstructions of aquatic habitat based on conditions circa 1880's that represent pre-impact/development conditions, which are meant to be used as context or reference and not a recovery goal.

Holding – Strategic locations used by juvenile and adult fish for resting and flow refuge, often located behind or beside hydraulically dynamic structures (ex. log jams, boulders, channel spanning pools).

Hydromodified – Hydraulically modified.

Hydromodified bank edge – Hydraulically modified bank edge (ex. rip rap), leveed, or diked bank.

Incision – Vertical down-cutting of the active channel, which often results in reduced connectivity or activation of secondary channel or floodplain habitats.

Life stages – Key phases of a salmon life cycle (e.g., egg, embryo, alevin, fry, parr, smolt, adult).

Life history – Variability within a salmon species use of aquatic habitat with respect to time and space (e.g., a subyearling Chinook life history migrates downstream out of freshwater within days to months of emerging while a yearling life history overwinters in freshwater habitat before migrating downstream).

Limiting Conditions and Strategies – The identification and potential remedies of environmental or ecological features which is attributed to have the greatest adverse impact on a population.

Mainstem – The primary Nooksack River channel and its associated braid and side channels.

Migration – Movement of juvenile and adult fish within the riverine network over large distances. Most commonly used to describe juvenile seaward movements and adult returns from the marine environment to freshwater spawning locations.

Natural bank edge – A bank edge unaltered by anthropogenic modification or structures that has a naturally steeper interface with the water edge.

Natural bar edge – A bar edge unaltered by anthropogenic modification or structures which has a gentle slope interface at the water edge and typically has slower water velocities compared to bank edges.

Overwintering (floodplains) – Prolonged rearing strategy whereby juvenile fish remain in freshwater through at least their first winter after emergence before migrating downstream to transition to saltwater habitats.

Productivity – The ability of an individual or population to produce offspring.

Progradation – The deposition of sediments in the delta resulting in the seaward growth of an alluvial fan.

Rearing – Extended use of habitats for foraging to grow or mature.

Recharge – The replenishment of groundwater storage (usually occurs during winter) compared to transport of water downstream. Recharge can positively impact summer low flow and base flows in a river.

Reconstructions (1800s) – Pre-anthropogenic impact estimates of habitat extent, depicted from historical maps and Collins and Sheikh (2004).

Recruitment (wood) – The availability of large wood debris and delivery to the stream.

Refuge

Restore processes – To allow the system to return to a more natural delivery, transportation, and deposition of regimes, such as sediment, wood, nutrients, and flow that create and maintain desired habitats.

Retention (wood) – The channel's ability to entrain fluvially (river) transported woody debris.

Secondary Channel (braid and side) – A channel hydraulically connected at its top (inflow) and bottom (outflow) to the main channel, contains less than 50% of the flow, and separated by a feature below bankfull or a feature above bankfull but shorter in length than the bankfull width.

Side Channel – A channel hydraulically connected at its top (inflow) and bottom (outflow) to the main channel, contains less than 50% of the flow, and is separated by an island (a feature above bankfull, as long as the bankfull width, and colonized by woody plants).

Slow-water – Hydraulically distinct slow-moving water as seen behind a current seam along a bank, or classified by channel unit as distinguished by smooth, low-gradient, laminar flow.

Spawning – The method of salmon reproduction in which adults deposit eggs in river substrate after.

Stream power – The rate of energy dissipated against the stream bed or banks over a given distance.

Subyearling – An age 0 fish, also known as young of the year. In Pacific salmon these fish emerge and migrate to marine or transitional estuarine habitats within their first year of life.

Synthesize (geomorphic assessment) – Integrating the results of the habitat and geomorphic assessments to identify habitat conditions and drivers/processes that could impact salmon



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Tidal Channel – A channel that may be connected to a distributary, but within which tidal flooding is the primary source of water flow. These are often called blind tidal channels, but tidal channels may be connected to distributary channels at both upstream and downstream ends.

Tidal Wetland – A low-lying tidally inundated surface that is vegetated by estuarine plant species and is typically channelized by tidal channels.