

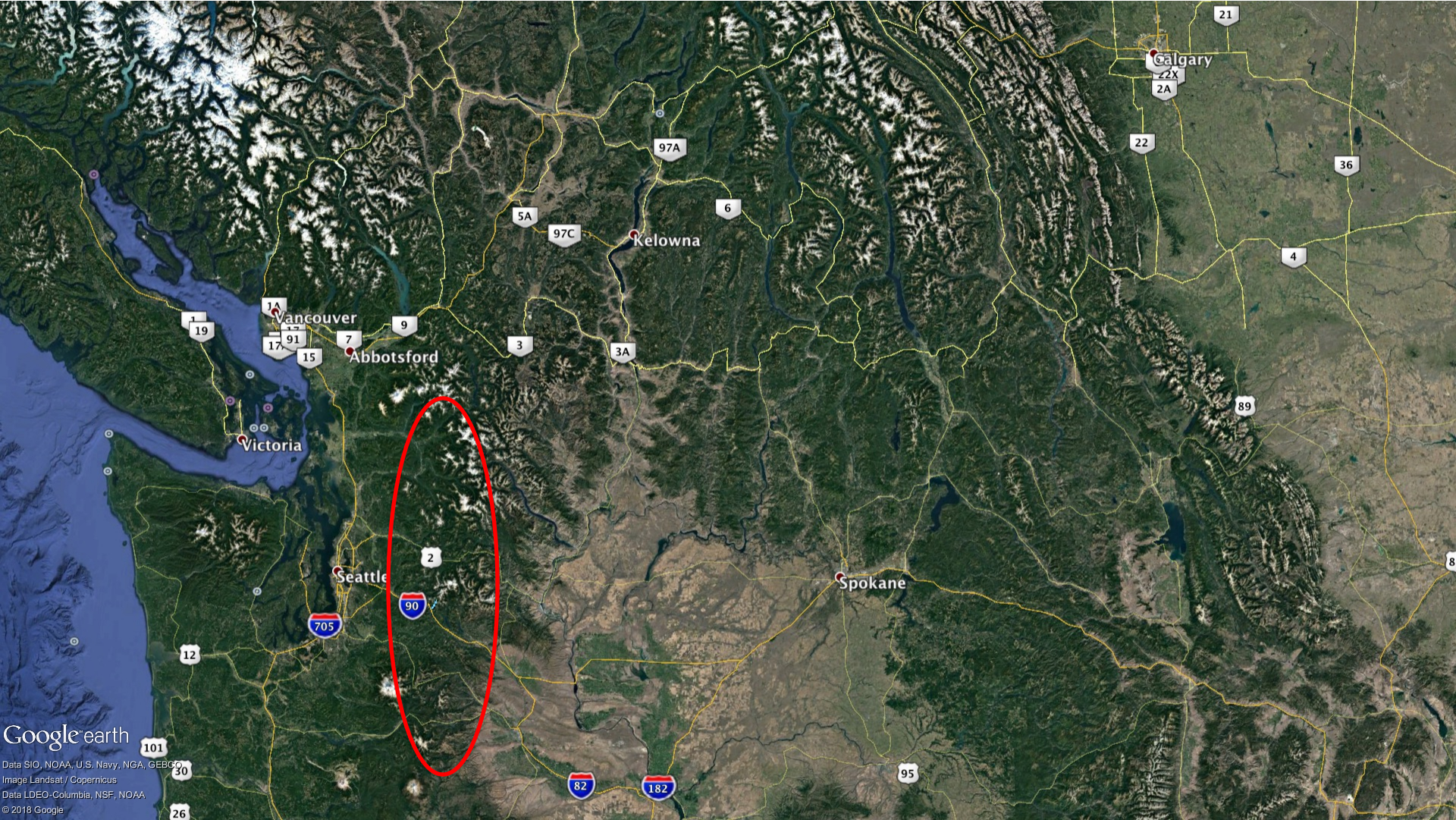
Using a Major Highway Construction Project to Improve both Transportation and Stream Connectivity:

The I-90 Case Study



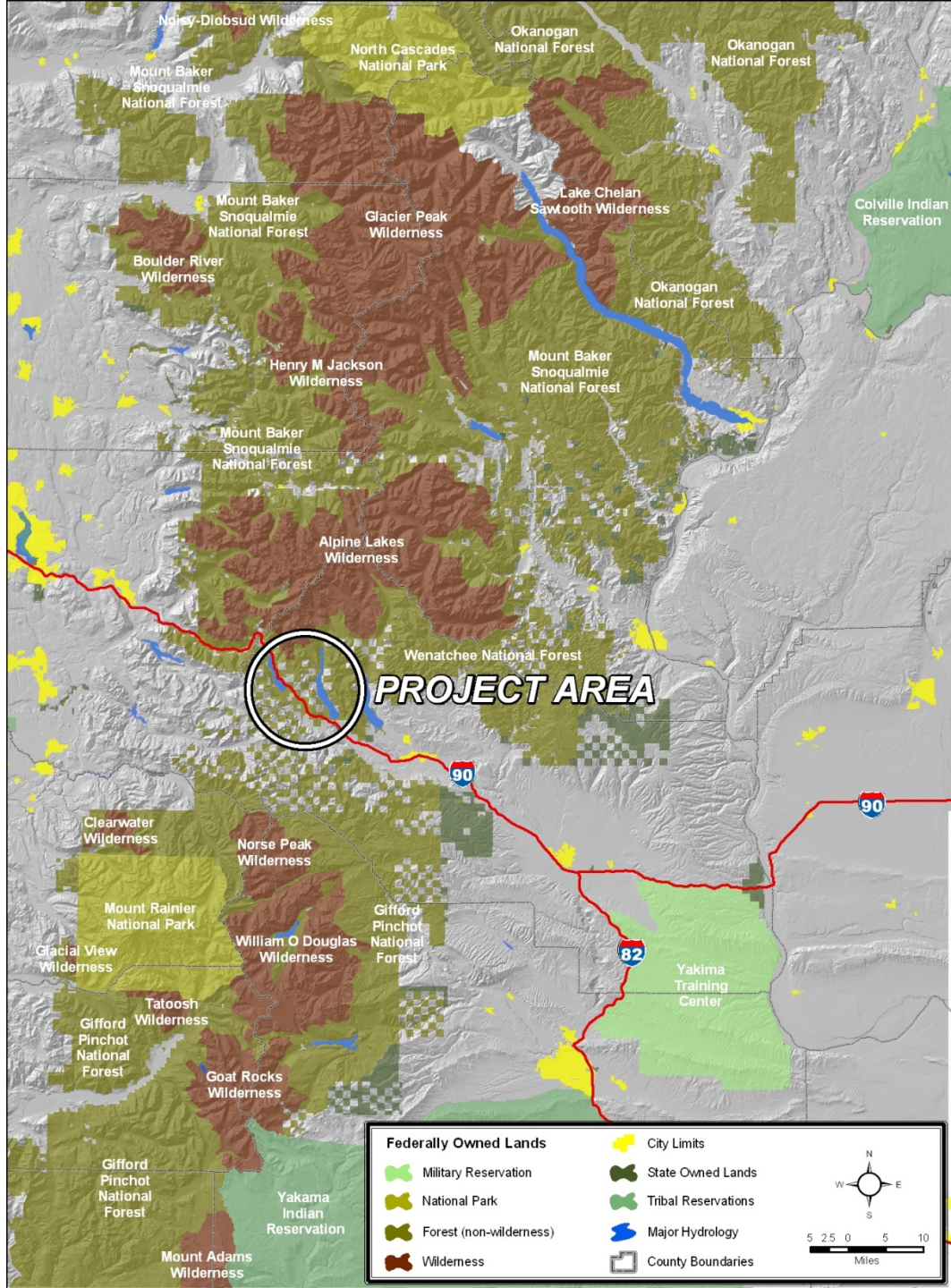
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Google earth

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Data LDEO-Columbia, NSF, NOAA
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Lake Keechelus

Interstate 90 at Snoqualmie Pass, Washington



I-90 Snoqualmie Pass East – Hyak to Easton

Project overview

Improve the highway



Replace existing deteriorating concrete lanes to provide a smoother, safer ride.



Reduce traffic congestion by adding a new lane in each direction to accommodate projected traffic volumes for the next 20 years.

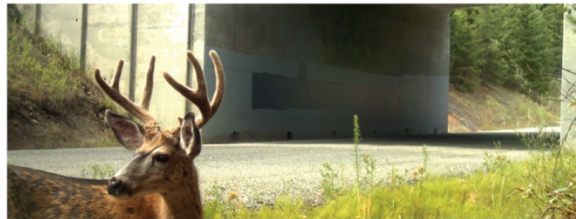


Straighten roadway curves to improve sight distance, drivability and safety.

Protect the public



Reduce road closures and create a reliable and safe highway with a new, wider and longer snowshed.



Reduce wildlife and vehicle collisions with wildlife structures over and under the highway.



Stabilize rock slopes to minimize rock fall hazards, reducing lane closures and improve public safety.

An aerial photograph of a large reservoir, likely Lake Stevens, in the Snoqualmie Pass area. The reservoir is surrounded by dense evergreen forests and mountains with patches of snow. A multi-lane highway runs along the left side of the reservoir, with several vehicles visible. The water is calm, reflecting the sky, and there are several small islands and peninsulas within the reservoir. The overall scene is a mix of natural beauty and infrastructure.

The Snoqualmie Pass Adaptive Management Area Plan (FEIS/ROD 1997)

Standards and Guidelines:

- Aquatic Conservation Strategy
- **Connectivity Emphasis Areas**—more restrictive standards and guidelines apply to recreational uses and facilities, and the expansion of special uses, such as ski areas and utility corridors.

WSDOT

Coordination with others



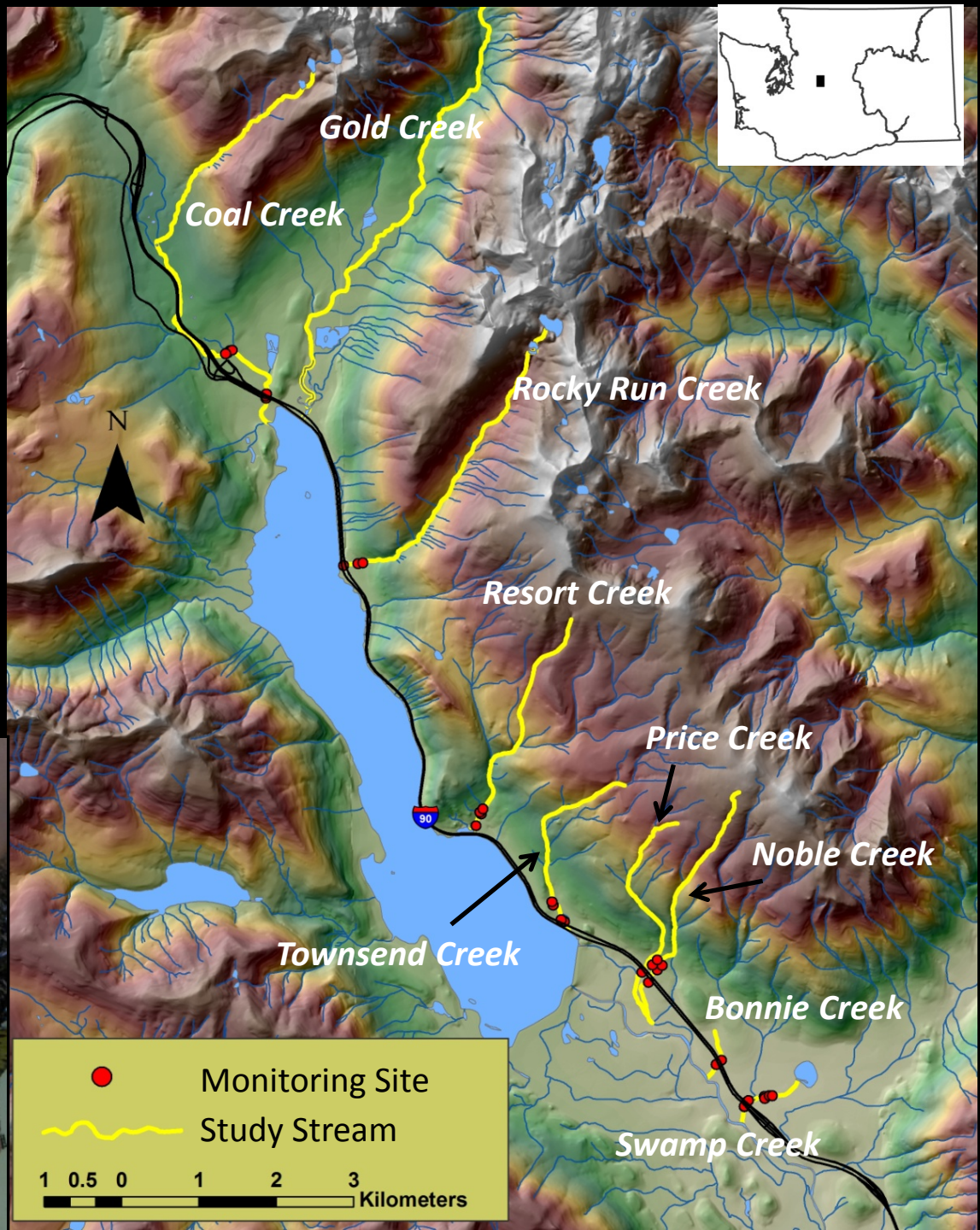
Connectivity Emphasis Areas



Bull Trout (*Salvelinus confluentus*)

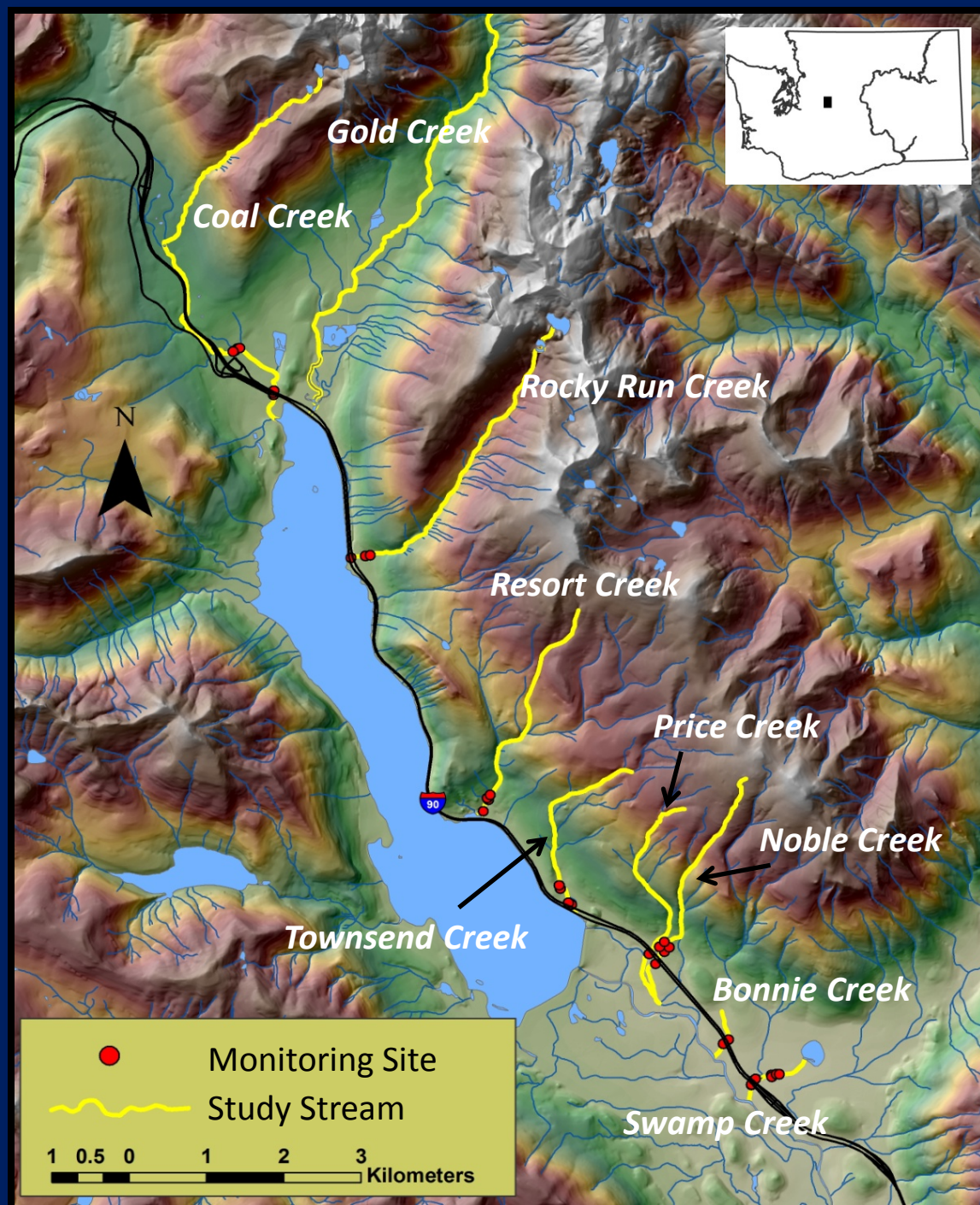


Focal Species



Study Streams and Monitoring Sites

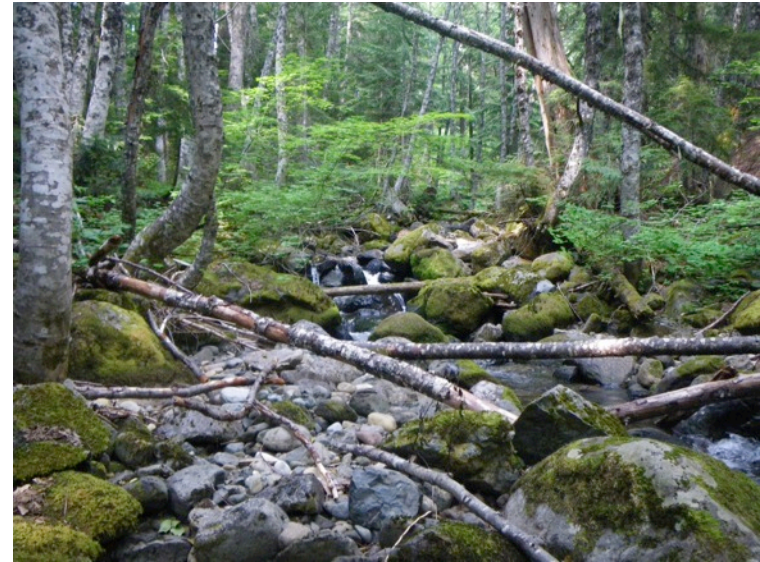
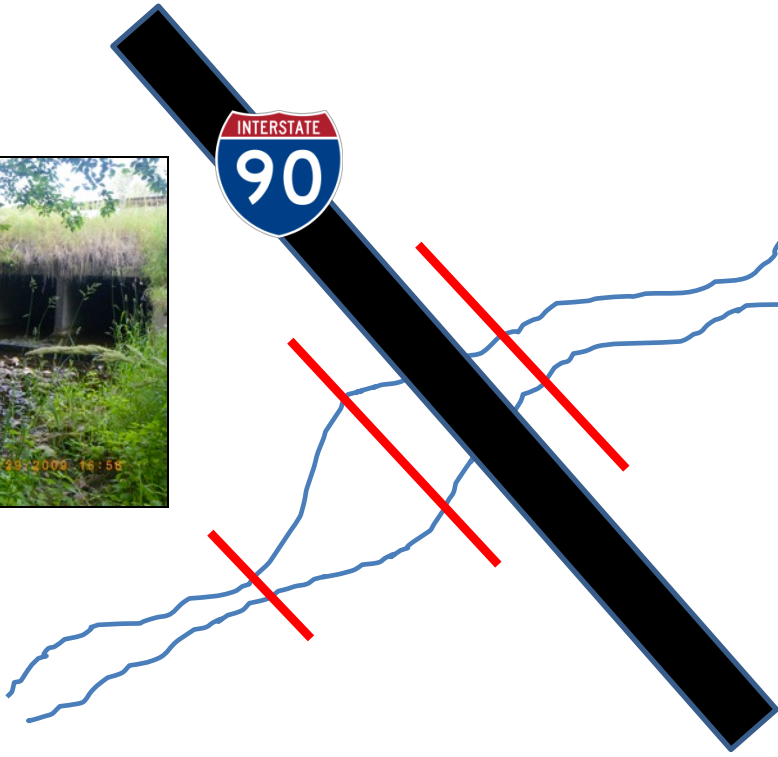
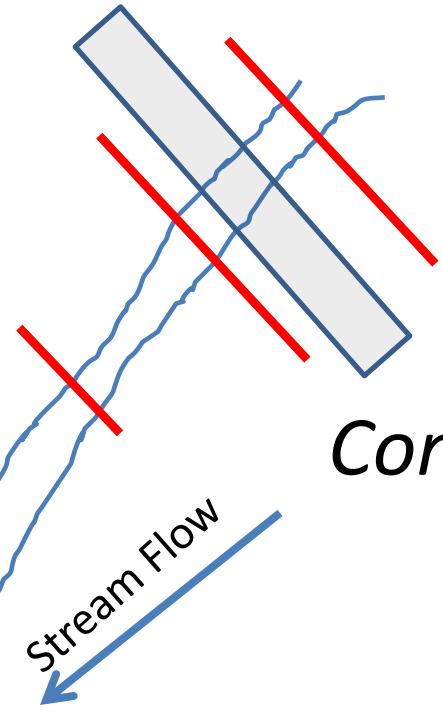
B-A-C-I Study Design



Methods – Fish, invertebrates, and aquatic habitat

Treatment

Control



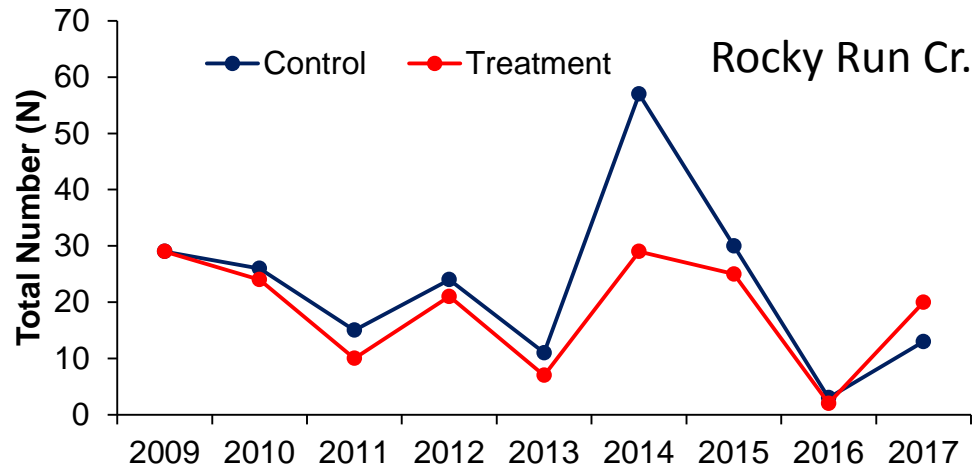
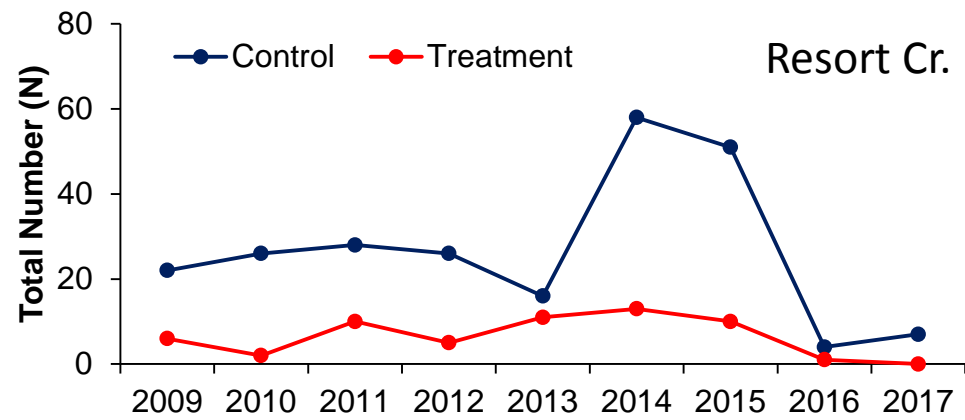
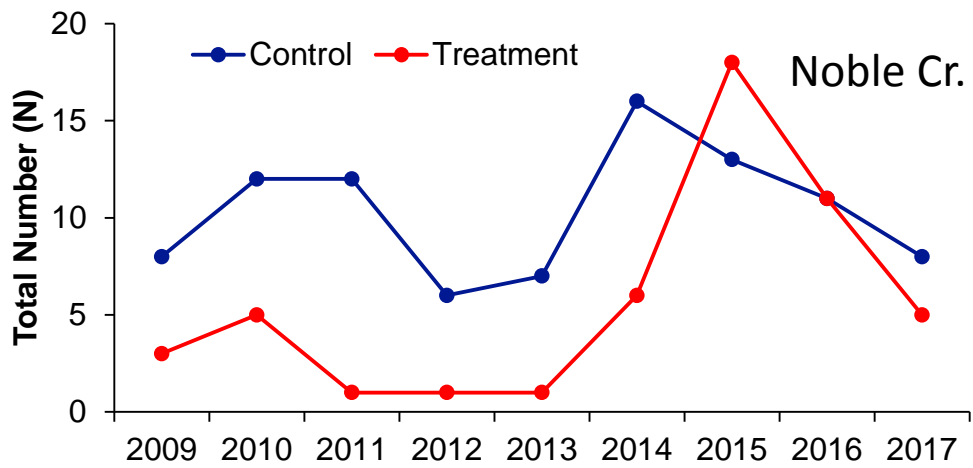
— Stream Velocity and Channel Shape Transects

▭ Hypothetical Stream Crossing

Methods – Fish Population Data

- One pass electrofishing surveys for most streams
- 50 - 100 m transects in each study reach
- PIT-tag target species in all streams (except Gold Creek)
- Snorkel surveys in Gold Creek
- Surber sampler for benthic invertebrates





Cutthroat Trout
(*Oncorhynchus clarki*)



Gold Creek Bridge and Floodplain Restoration



Gold Creek Bridge and Floodplain Restoration



Gold Creek Bridge and Floodplain Restoration



Gold Creek Bridge and Floodplain Restoration



Before



After

Gold Creek mouth at Lake Keechelus



Gold Creek mouth at Lake Keechelus



Gold Creek mouth at Lake Keechelus



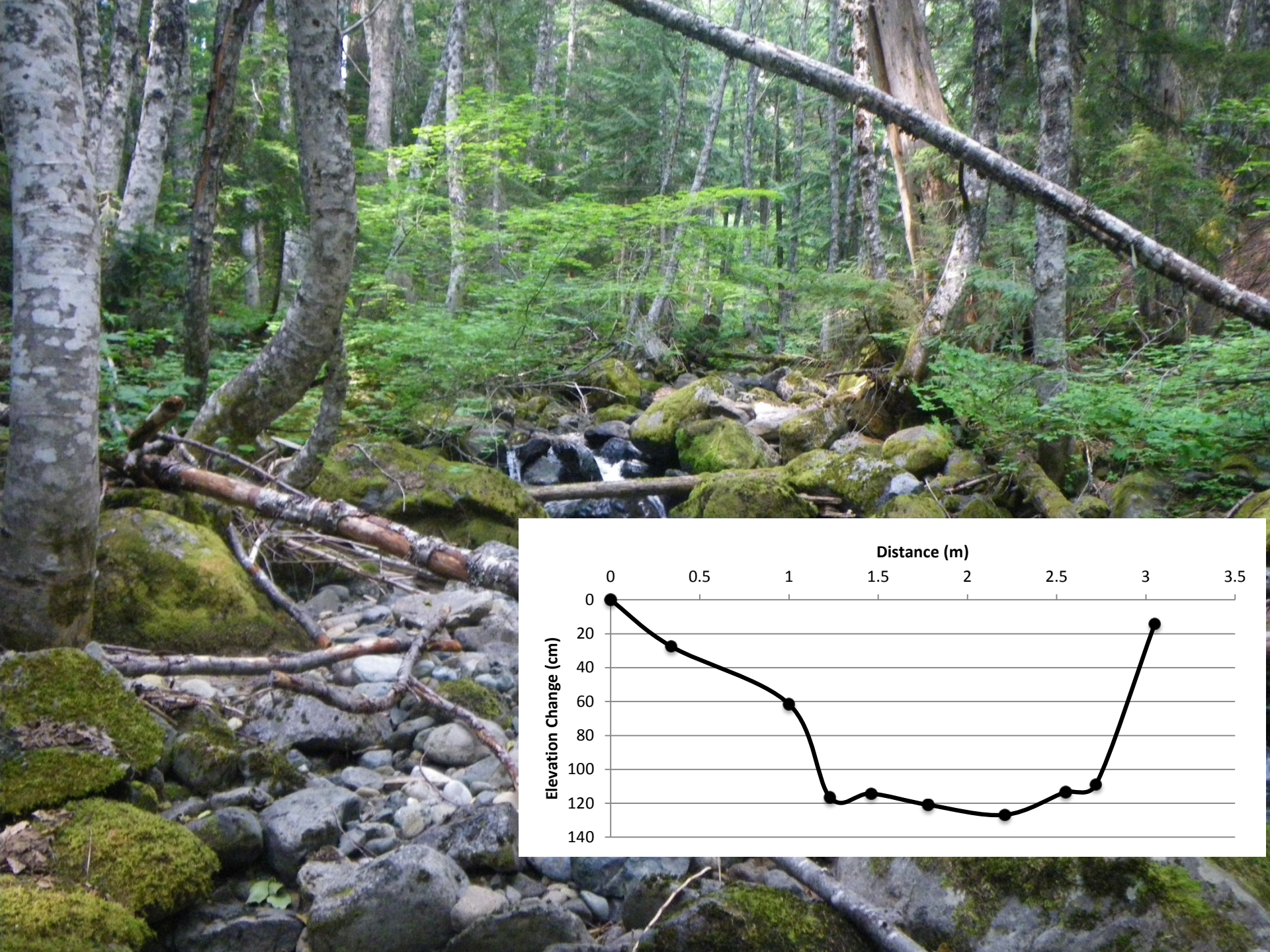


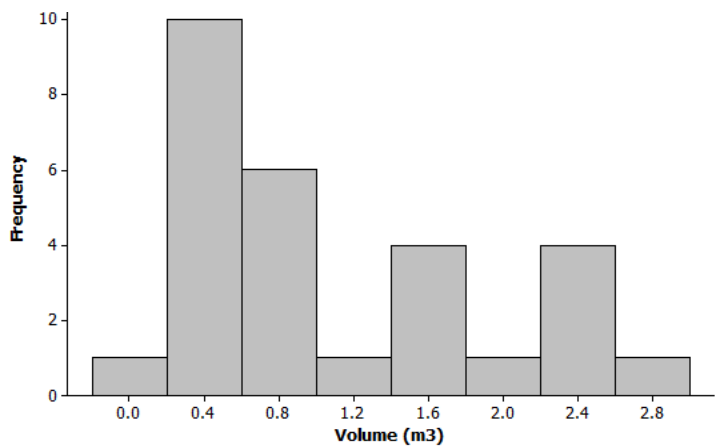
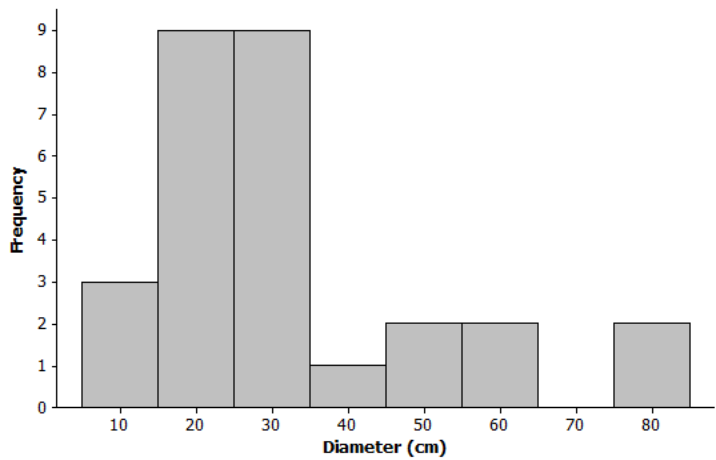
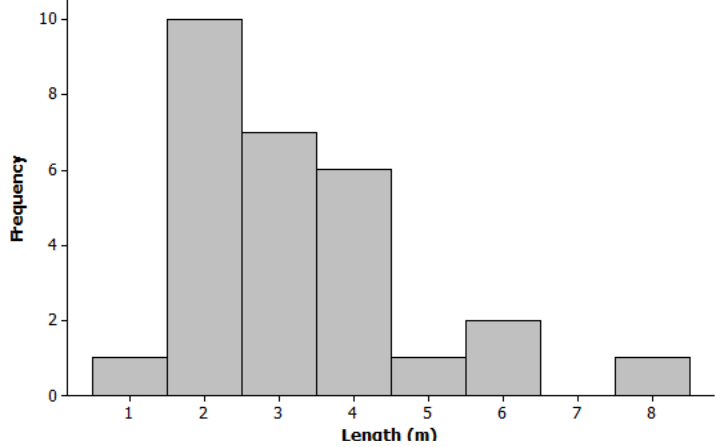
GC6

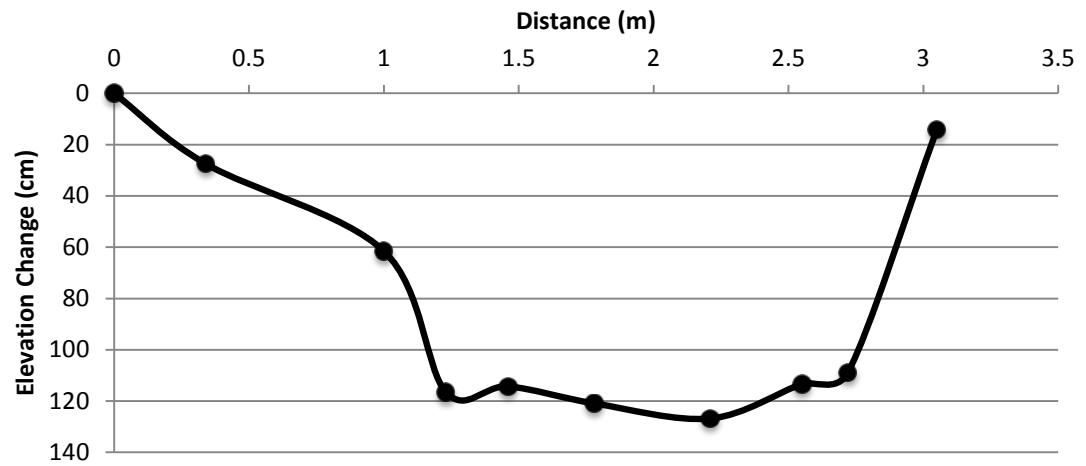
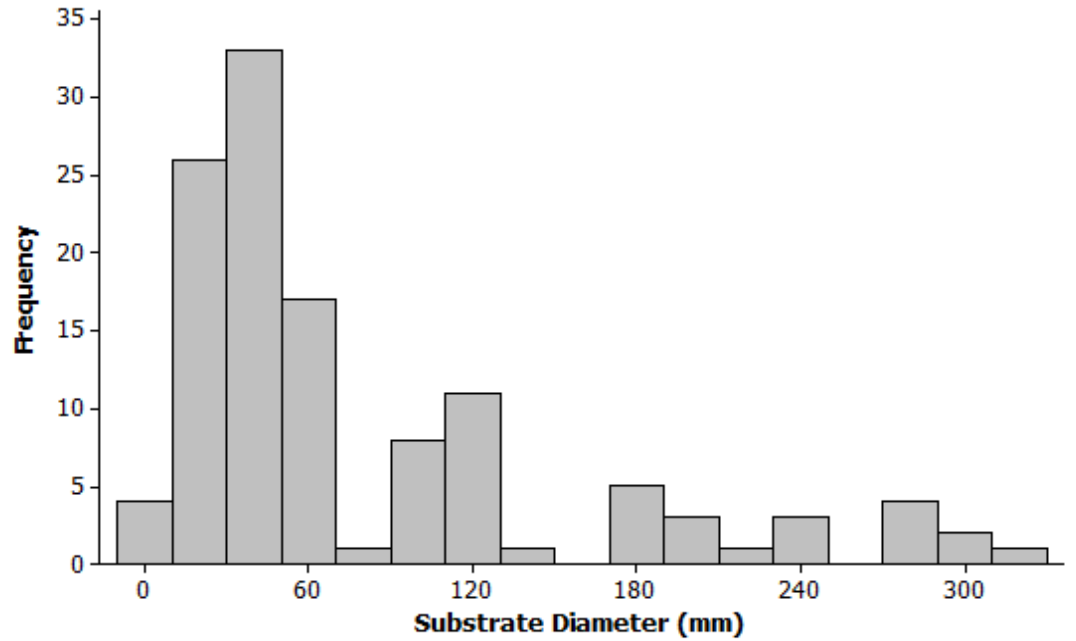
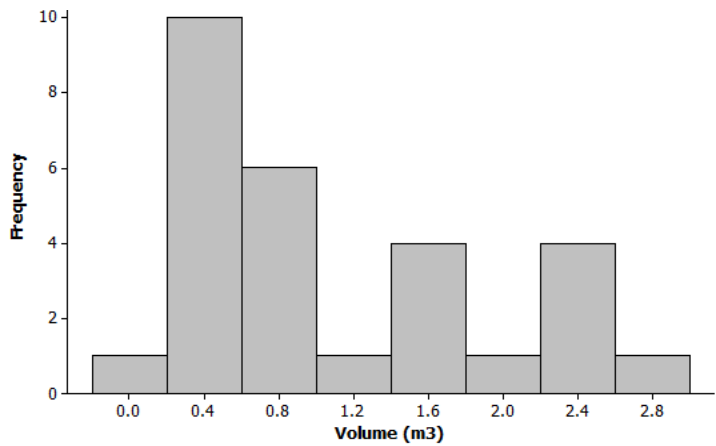
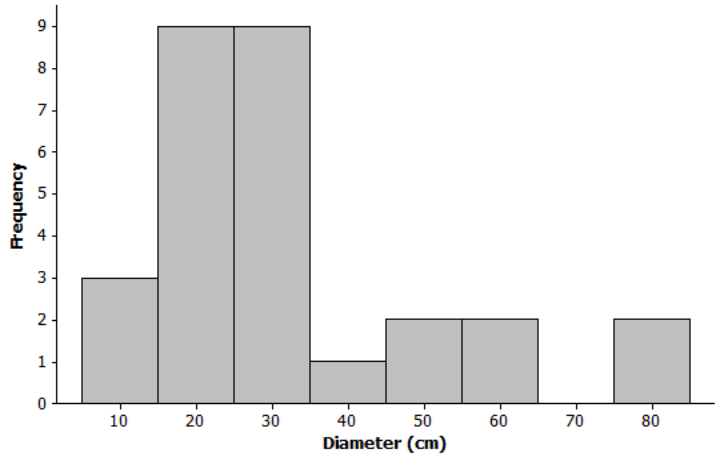
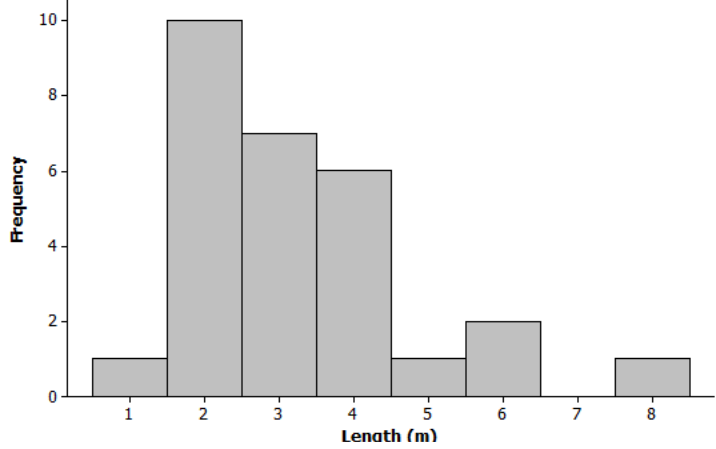
RECONYA







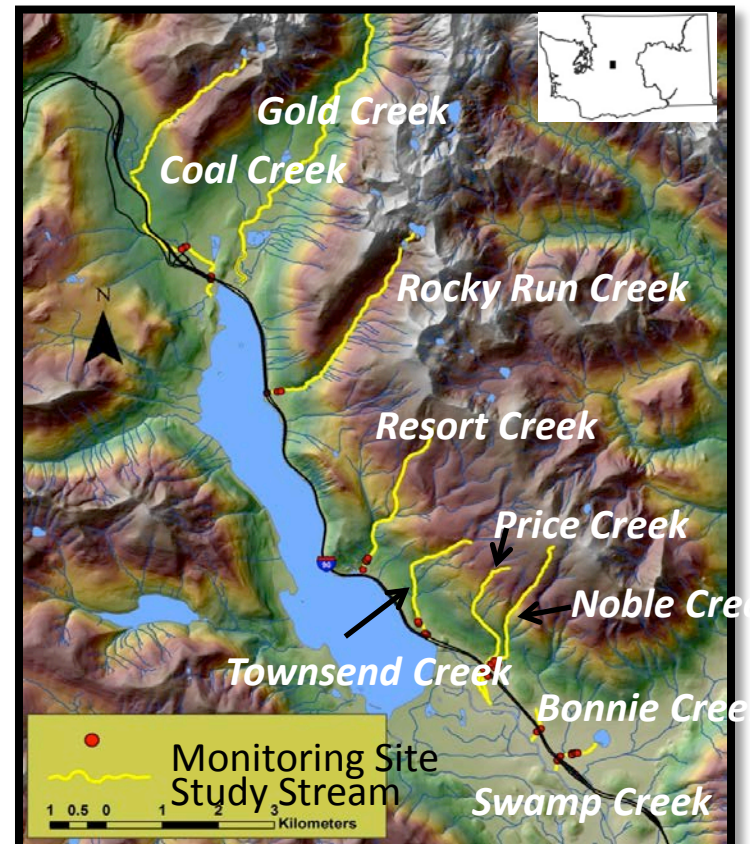






Rocky Run Creek

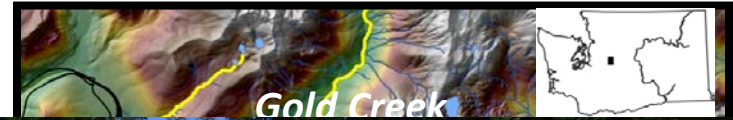
- culverts replaced with bridges
- Stream channel reconstruction
- Passage barrier removal





Rocky Run Creek

- culverts replaced with bridges
- Stream channel reconstruction
- Passage barrier removal







Wolfe Creek Culvert Replacement

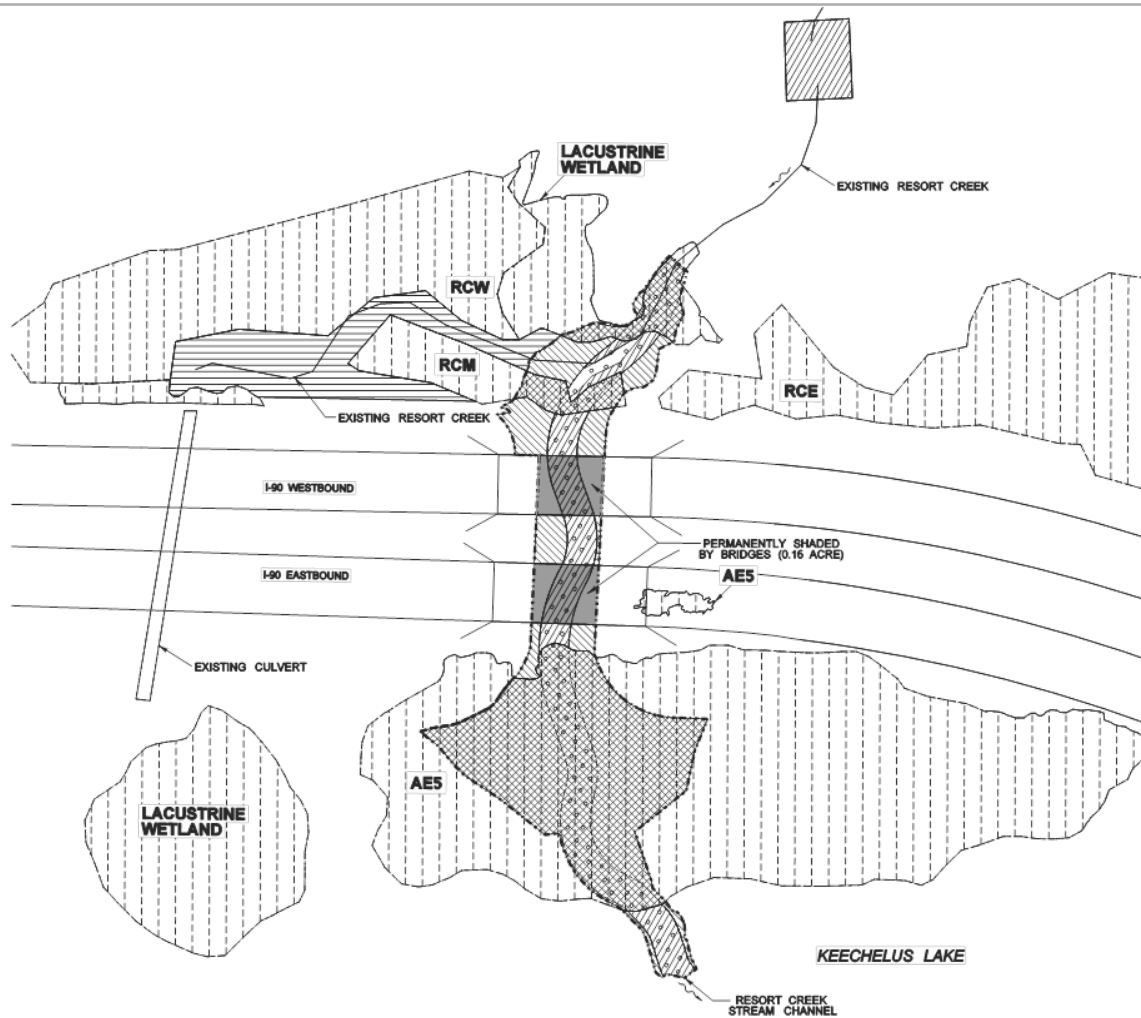


Resort Creek Culvert



Resort Creek Culvert





LEGEND

- STRUCTURE
- MITIGATION AREA
- SHOULDER PAVED EDGE
- RCE** WETLAND NAME
- EXISTING WETLAND
- STREAM BUFFER RESTORATION
0.22 ACRE (NON SHADED)
- STREAM RESTORATION
0.14 ACRES (NON SHADED)
- WETLAND CONVERSION
0.67 ACRES
- STREAMBED BOULDER
- WETLAND RE-ESTABLISHMENT
0.36 ACRES

0 55 110
SCALE IN FEET

PHASE 1 FINAL WARM PLAN - UPDATED DECEMBER 2010

FILE NAME K:\452263\CADD\98L2779\WARM Plan 2010\CADD\ResortCreek_P8_WARM_121010.dgn
 TIME 3:25:03 PM
 DATE 12/6/2010
 PLOTTED BY jls@wdk
 DESIGNED BY R. THOMAS
 ENTERED BY K. LEISETH
 CHECKED BY C. BROADHEAD
 PROJ. MANAGER J. SMITH
 REGIONAL ADM. D. WHITEHOUSE

FED.AID PROJ.NO.
 10 WASH
 JOB NUMBER
 CONTRACT NO. LOCATION NO.



I-90
 WARM PLAN
 RESORT CREEK
 MITIGATION SCHEMATIC

PLAN SHEET NO.
 RCMS
 SHEET
 1
 OF
 5
 SHEETS

DATE P.E. STAMP BOX DATE P.E. STAMP BOX





Before



After

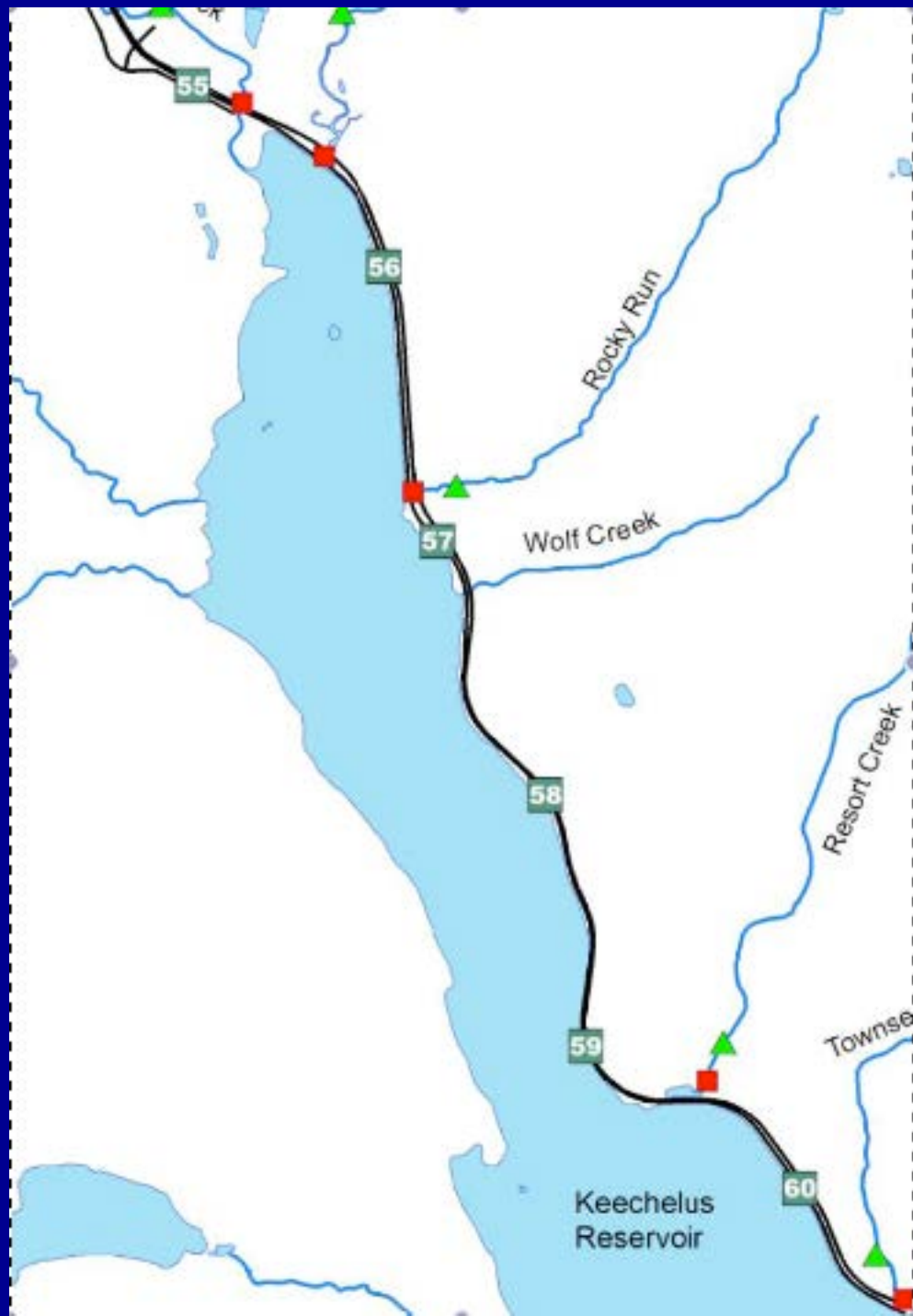


Townsend Creek

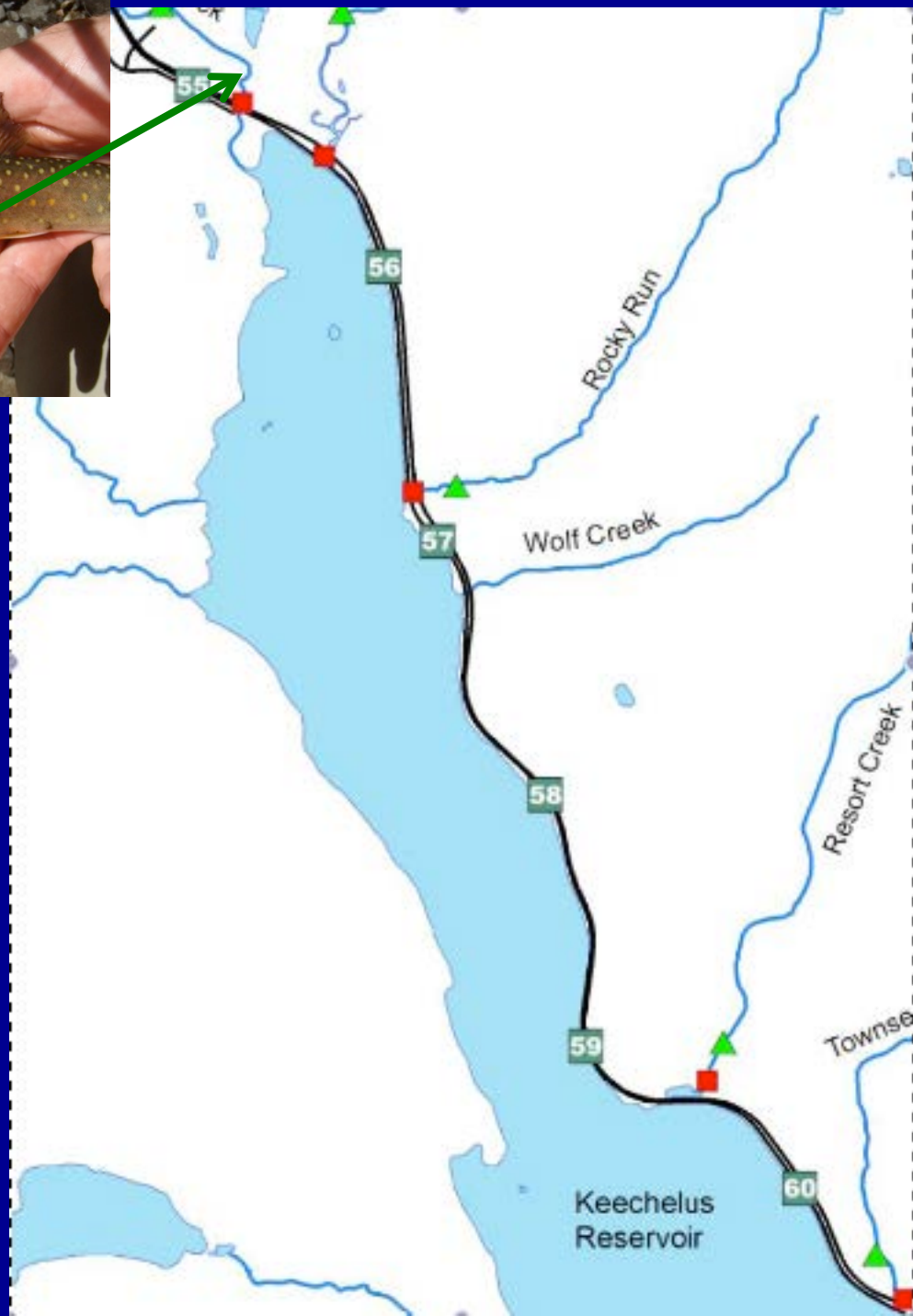


Townsend Creek





Coal Creek Bull Trout
2011 - 2016



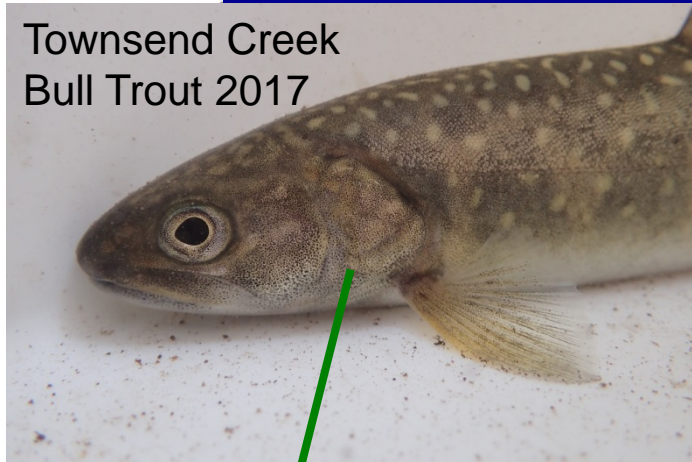
Coal Creek Bull Trout
2011 - 2016



Rocky Run Creek Bull Trout 2013



Townsend Creek
Bull Trout 2017



Resort Creek Bull Trout 2013







Google earth





