Grant Lake Hydroelectric Project (FERC No. 13212)

Aquatic Resources – Grant Creek Aquatic Habitat Mapping and Instream Flow Study Final Report

Prepared for
Kenai Hydro, LLC

Prepared by
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TABLE OF CONTENTS

1 Introduction 1
1.1. Proposed Project Description 1
1.2. Existing Information 5

2 Study Objectives 6
2.1. Overall Goals Identified during Project Scoping 6
2.2. Specific Goals of Aquatic Habitat Mapping 6
2.3. Specific Goals of the Instream Flow Study 6

3 Study Area 7

4 Methods 7
4.1. Grant Creek Aquatic Habitat Mapping 7
4.2. Grant Creek Instream Flow Study 12
4.2.1. Overview of Physical Habitat Simulation (PHABSIM) Methodology 12
4.2.2. Habitat Availability and Transect Selection 13
4.2.3. Habitat Utilization 15
4.2.4. Affected Species and Life Stages 19
4.2.5. Field Methods 19
4.2.6. Connectivity of Habitats Within Reach 5 20
4.2.7. Data Analysis 21
4.2.8. Measured Flows for Grant Creek 23
4.2.9. Flow Partitioning in Grant Creek 24
4.2.10. Production of WUA for Grant Creek 33

5 Results 33
5.1. Grant Creek Aquatic Habitat Mapping 33
5.2. Grant Creek Instream Flow Study 48
5.2.1. Weighted Usable Area 48
5.2.2. Reach 5 Connectivity 82

6 Conclusions 83
6.1. Grant Creek Aquatic Habitat Mapping 83
6.2. Grant Creek Instream Flow Study 83
6.2.1. Grant Creek Habitat 83
6.2.2. Connectivity 84

7 Variances from FERC-Approved Study Plan and Proposed Modifications....................84
7.1. Grant Creek Aquatic Habitat Mapping...84
7.2 Grant Creek Instream Flow Study 85

8 References...86

Appendices

Appendix 1: Grant Creek Instream Flow Photos
- 1a: Transect Photos at 17 cfs Calibration Flow
- 1b: Transect Photos at 64 cfs Calibration Flow
- 1c: Transect Photos at 132 cfs Calibration Flow
- 1d: Transect Photos at 182 cfs Calibration Flow
- 1e: Transect Photos at 706 cfs Calibration Flow

Appendix 2: HSC Curves
- 2a: Habitat Availability and Utilization
- 2b: HSC Curves

Appendix 3: Calibration Details

Appendix 4: Cross Sections, WSE, and Flow Hydraulics
- 4a: Reach 1 Main Channel
- 4b: Reach 1 Side Channel
- 4c: Reach 2
- 4d: Reach 3 Main Channel
- 4e: Reach 3 Side Channel
- 4f: Reach 4

Appendix 5: Weighted Usable Area Graphs
- 5a: Reach 1 Main Channel WUA
- 5b: Reach 1 Side Channel WUA
- 5c: Reach 2 WUA
- 5d: Reach 3 Main Channel WUA
- 5e: Reach 3 Side Channel WUA
- 5f: Reach 4 WUA

Appendix 6: Reach 5 Connectivity
- 6a: Reach 5 Bed Profiles and Water Surface Elevation (WSE)
- 6b: Reach 5 Rainbow Trout and Dolly Varden Passage
- 6c: Reach 5 Coho and Sockeye Salmon Passage
- 6d: Reach 5 Chinook Salmon Passage

List of Tables

Table 4.2-1. Mesohabitat assessment sites (revised from HDR 2010).. 14
Table 4.2-2. Parameters used in the habitat utilization study. 19
Table 4.2-3. Substrate size classes used in the Grant Creek Instream Flow Study. 19

Table 4.2-4. Potential target species and life history stages to be modeled in the Grant Creek Instream Flow Study. 20
Table 4.2-5. Species evaluated for connectivity in Grant Creek. 21
Table 4.2-6. Calibration flows, Grant Creek (as measured in the mainstem). 24
Table 4.2-7. Calculations of flow in side channels, lobes, and tributaries, as related to the Grant Creek flow[1]. 31
Table 4.2-8. Flow partitioning in Grant Creek for PHABSIM study. 32
Table 5.1-1. Mesohabitats found in Grant Creek. 47
Table 5.1-2. Aquatic habitats found in Grant Creek. 47
Table 5.2-1. Range of flows and models used to simulate Grant Creek WUA. 49
Table 5.2-2. Life history stages modeled at each Grant Creek transect. 50
Table 5.2-3. Salmonid Spawning WUA, Reach 1 distributary. 51
Table 5.2-4. Fry rearing WUA, Reach 1 distributary. 51
Table 5.2-5. Adult and juvenile rearing WUA, Reach 1 distributary. 53
Table 5.2-6. Spawning WUA, Reach 1, mainstem. 54
Table 5.2-7. Fry rearing WUA, Reach 1 mainstem. 55
Table 5.2-8. Adult and juvenile rearing WUA, Reach 1 mainstem. 56
Table 5.2-9. Spawning WUA, Reach 2 mainstem. 57
Table 5.2-10. Fry rearing WUA, Reach 2 mainstem. 58
Table 5.2-11. Adult and juvenile rearing WUA, Reach 2 mainstem. 59
Table 5.2-12. Spawning WUA, Reach 3 mainstem. 60
Table 5.2-13. Fry rearing WUA, Reach 3 mainstem. 61
Table 5.2-14. Adult and juvenile rearing WUA, Reach 3 mainstem. 62
Table 5.2-15. Spawning WUA, Reach 3 side channels. 63
Table 5.2-16. Fry rearing WUA, Reach 3 side channels. 64
Table 5.2-17. Adult and juvenile rearing WUA, Reach 3 side channels. 65
Table 5.2-18. Spawning WUA, Reach 3 combined. 66
Table 5.2-19. Fry rearing WUA, Reach 3 combined. 67
Table 5.2-20. Adult and juvenile rearing WUA, Reach 3 combined. 68
Table 5.2-21. Spawning WUA, Reach 4. 69
Table 5.2-22. Fry rearing WUA, Reach 4. 70
Table 5.2-23. Adult and juvenile rearing WUA, Reach 4. 71
Table 5.2-24. Discharge (cfs) for meeting salmonid passage criteria in Reach 5, Grant Creek. 83

List of Figures

Figure 1.1-1. Natural resources study area. 3
Figure 3.0-1. Grant Creek reaches. 9
Figure 4.2-1. Grant Creek instream flow transect locations. 17
Figure 4.2-2. Aquatic habitats. 25
Figure 5.1-1. Grant Creek mesohabitats. 35
Figure 5.2-1. Spawning WUA, Reach 1 distributary. 72
Figure 5.2-2. Fry rearing WUA, Reach 1 distributary. 72
Figure 5.2-3. Adult and juvenile rearing WUA, Reach 1 distributary. 73
Figure 5.2-4. Spawning WUA, Reach 1 mainstem. 73

Figure 5.2-5. Fry rearing WUA, Reach 1 mainstem. 74
Figure 5.2-6. Adult and juvenile rearing WUA, Reach 1 mainstem. 74
Figure 5.2-7. Spawning WUA, Reach 2 mainstem. 75
Figure 5.2-8. Fry rearing WUA, Reach 2 mainstem. 75
Figure 5.2-9. Adult and juvenile rearing WUA, Reach 2 mainstem. 76
Figure 5.2-10. Spawning WUA, Reach 3 mainstem. 76
Figure 5.2-11. Fry rearing WUA, Reach 3 mainstem. 77
Figure 5.2-12. Adult and juvenile rearing WUA, Reach 3 mainstem. 77
Figure 5.2-13. Spawning WUA, Reach 3 side channels. 78
Figure 5.2-14. Fry rearing WUA, Reach 3 side channels. 78
Figure 5.2-15. Adult and juvenile rearing WUA, Reach 3 side channels. 79
Figure 5.2-16. Spawning WUA, Reach 3 combined. 79
Figure 5.2-17. Fry rearing WUA, Reach 3 combined. 80
Figure 5.2-18. Adult and juvenile rearing WUA, Reach 3 combined. 80
Figure 5.2-19. Spawning WUA, Reach 4. 81
Figure 5.2-20. Fry rearing WUA, Reach 4. 81
Figure 5.2-21. Adult and juvenile rearing WUA, Reach 4. 82

Acronyms and Abbreviations

ADCP	Acoustic Doppler Current Profiler
AEIDC	Arctic Environmental Information and Data Center
ARWG	Aquatics Resource Work Group
cfs	cubic feet per second
cm	centimeter
DLA	Draft License Application
FERC	Federal Energy Regulatory Commission
GIS	geographic information system
GPS	Global Positioning System
HABSIM	Habitat Simulation
HSC	habitat suitability criteria
HYDSIM	Hydraulic Calibration Simulation
IFIM	Instream Flow Incremental Methodology
KHI	Kenai Hydro, Inc.
KHL	Kenai Hydro, LLC
LA	License Application
LWD	large woody debris
MW	megawatt
NAVD 88	North American Vertical Datum of 1988
NGVD 29	National Geodetic Vertical Datum of 1929
NOI	Notice of Intent
OHV	Overhead Vegetation
PAD	Pre-Application Document
PHABSIM	Physical Habitat Simulation
PM&E	protection, mitigation and enhancement
Project	Grant Lake Hydroelectric Project
Q	flow
SZF	stage of zero flow
TLP	Traditional Licensing Process
TWG	Technical Working Group
RHABSIM	Riverine Habitat Simulation
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Department of the Interior, Geological Survey
VAF	Velocity Adjustment Factor
WUA	weighted usable area
WSE	water surface elevation

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Aquatic Resources – Grant Creek Aquatic Habitat Mapping and Instream Flow Study
Final Report
Grant Lake Hydroelectric Project (FERC No. 13212)

1 INTRODUCTION

On August 6, 2009, Kenai Hydro, LLC (KHL) filed a Pre-Application Document (PAD; KHL 2009), along with a Notice of Intent (NOI) to file an application for an original license, for a combined Grant Lake/Falls Creek Project (FERC No. 13211/13212 ["Project" or "Grant Lake Project"]) under Part I of the Federal Power Act. On September 15, 2009, the Federal Energy Regulatory Commission (FERC) approved the use of the Traditional Licensing Process (TLP) for development of the License Application (LA) and supporting materials. Per the TLP, KHL underwent consultation with the requisite stakeholders in relation to the development of a series of natural resource studies that were completed in 2013. As described in more detail below, the proposed Project has been modified to eliminate the diversion of water from Falls Creek to Grant Lake.

The Aquatic Resources Study Plan was designed to address information needs identified in the PAD, during the TLP public comment process, and through early scoping conducted by FERC. This report specifically addresses the Instream Flow Study, one of the components to the Aquatic Resources investigations. Information from this report will be used to analyze flow-related Project impacts and to propose protection, mitigation, and enhancement (PM&E) measures.

1.1. Proposed Project Description

The Project is located near the community of Moose Pass, Alaska, approximately 25 miles north of Seward and just east of the Seward Highway. It lies within Section 13 of Township 4 North, Range 1 West; Sections 1, 2, 5, 6, 7, and 18 of Township 4 North, Range 1 East; and Sections 27, 28, 29, 31, 32, 33, 34, 35, and 36 of Township 5 North, Range 1 East, Seward Meridian (U.S. Geological Survey [USGS] Seward B-6 and B-7 Quadrangles).

The proposed Project would be composed of an intake structure at the outlet to Grant Lake, a tunnel, a surge tank, a penstock, and a powerhouse. It would also include a tailrace detention pond, a switchyard with disconnect switch and step-up transformer, and an overhead or underground transmission line. The preferred alternative would use approximately 15,900 acre-feet of water storage during operations between pool elevations of approximately 692 and up to 703 feet North American Vertical Datum of 1988 (NAVD 88)[1].

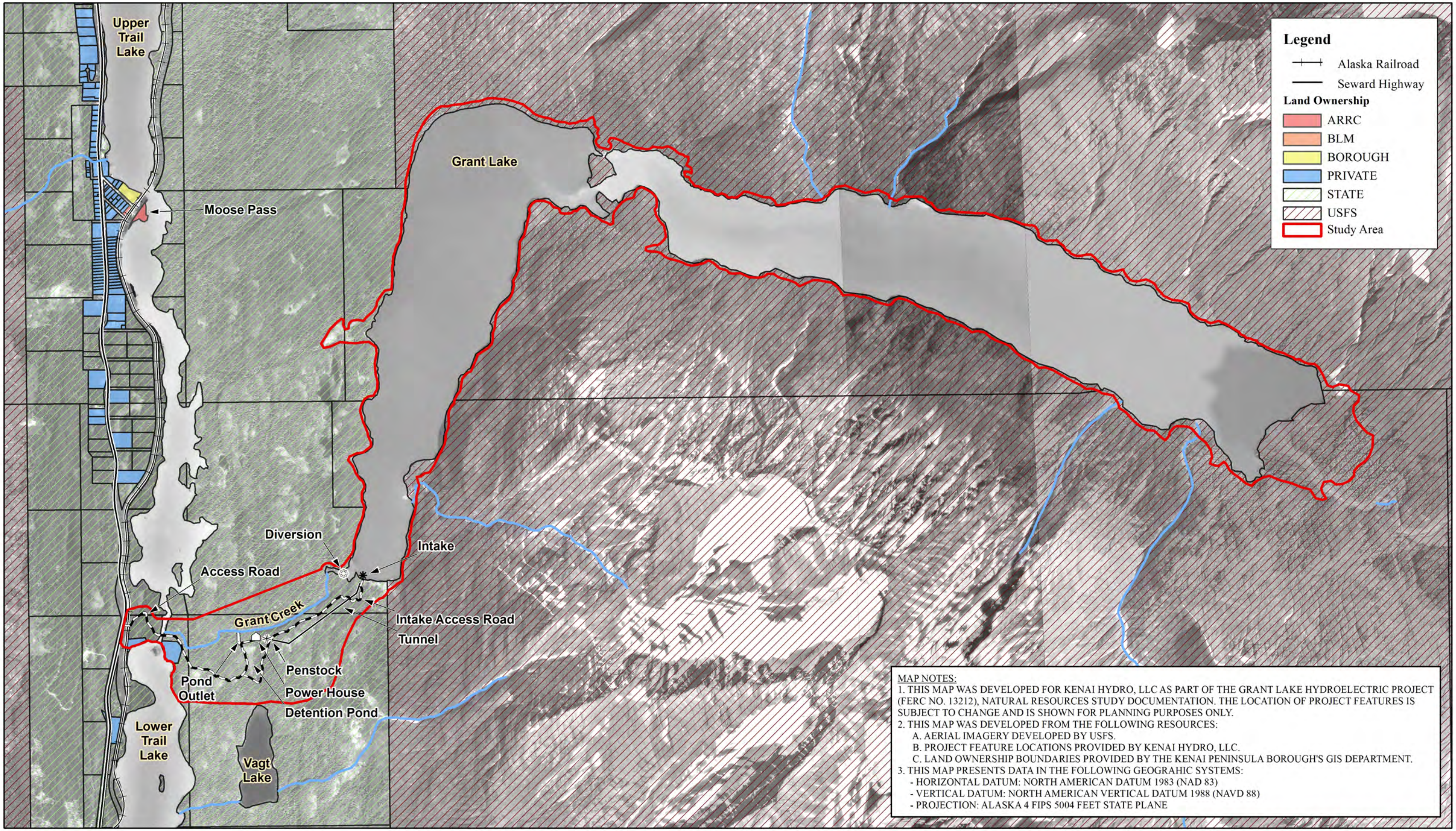
[1] The elevations provided in previous licensing and source documents are referenced to feet mean sea level in NGVD 29 [National Geodetic Vertical Datum of 1929] datum, a historical survey datum. The elevations presented in the Grant Lake natural resources study reports are referenced to feet NAVD 88 datum, which results in an approximate +5-foot conversion to the NGVD 29 elevation values.

An intake structure would be constructed approximately 500 feet east of the natural outlet of Grant Lake. An approximate 3,200-foot-long, 10-foot diameter horseshoe tunnel would convey water from the intake to directly above the powerhouse at about elevation 628 feet NAVD 88. At the outlet to the tunnel, a 360-foot-long section of penstock will convey water to the powerhouse located at about elevation 531 feet NAVD 88. An off-stream detention pond will be created to provide a storage reservoir for flows generated during the rare instance when the units being used for emergency spinning reserve are needed to provide full load at maximum ramping rates. The tailrace would be located in order to minimize impacts to fish habitat by returning flows to Grant Creek upstream of the most productive fish habitat.

Two concepts are currently being evaluated for water control at the outlet of Grant Lake. The first option would consist of a natural lake outlet that would provide control of flows out of Grant Lake. A new low-level outlet would be constructed on the south side of the natural outlet to release any required environmental flows when the lake is drawdown below the natural outlet level. The outlet works would consist of a 48-inch diameter pipe extending back into Grant Lake, a gate house, regulating gate, controls, and associated monitoring equipment. The outlet would discharge into Grant Creek immediately below the natural lake outlet.

In the second option, a concrete gravity diversion structure would be constructed near the outlet of Grant Lake. The gravity diversion structure would raise the pool level by a maximum height of approximately 2 feet (from 703 to 705 feet NAVD 88), and the structure would have an overall width of approximately 120 feet. The center 60 feet of the structure would have an uncontrolled spillway section with a crest elevation at approximately 705 feet NAVD 88. Similar to the first option, a low-level outlet would be constructed on the south side of the natural outlet to release any required environmental flows when the lake is drawn down below the natural outlet level. The outlet works would consist of a 48-inch diameter pipe extending back into Grant Lake, a gate house, a regulating gate, controls, and associated monitoring equipment. The outlet would discharge into Grant Creek immediately below the diversion structure.

Figure 1.1-1 displays the global natural resources study area for the efforts undertaken in 2013 and 2014 along with the likely location of Project infrastructure and detail related to land ownership in and near the Project area. Further discussions related to specifics of the aforementioned Project infrastructure along with the need and/or feasibility of the diversion dam will take place with stakeholders in 2014 concurrent with the engineering feasibility work for the Project. Refined Project design information will be detailed in both the Draft License Application (DLA) and any other ancillary engineering documents related to Project development. The current design includes two Francis turbine generators with a combined rated capacity of approximately 5.0 megawatts (MW) with a total design flow of 385 cubic feet per second (cfs). Additional information about the Project can be found on the Project website: http://www.kenaihydro.com/index.php.



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Drawing Scale:
0 0.25 0.5 1 Miles

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GRANT LAKE HYDROELECTRIC PROJECT - FERC PROJECT #P-13212

GRANT LAKE NATURAL RESOURCES STUDY

Figure 1.1-1
Natural Resources Study Area

DESIGNED Jake Woodbury
DRAWN Jake Woodbury
CHECKED C. Warnock
ISSUED DATE 1/9/2014
DRAWING
SCALE: 1:27,000

1.2. Existing Information

Information relating to aquatic resources has been collected during previous investigations into the potential development of hydroelectric generation on Grant Lake as well as during pre-licensing studies conducted by KHL in 2009 and early 2010.

Previous FERC licensing efforts in the 1960s and 1980s for a proposed hydroelectric project at Grant Lake included studies of fish resources in Grant Lake and Grant Creek. Arctic Environmental Information and Data Center (AEIDC 1983) conducted fish sampling from 1981 to 1982 as part of a comprehensive environmental baseline study effort, and the U.S. Fish and Wildlife Service (USFWS 1961) conducted limited sampling from 1959 to 1960. An Instream Flow Study was completed in 1987 as part of a preliminary FERC LA prepared by Kenai Hydro, Inc. (KHI; not related to the current Kenai Hydro, LLC; Envirosphere 1987, KHI 1987a, and KHI 1987b).

This effort included reports and written communications between KHI and state and federal agencies in 1986 and 1987 relative to a FERC LA for the proposed Grant Lake Hydroelectric Project (FERC No. 7633-002). Included were draft and final reports of a limited but complete Instream Flow Incremental Methodology (IFIM) investigation and negotiated minimum instream flows and ramping rates (Envirosphere 1987, KHI 1987a, and KHI 1987b).

The collaborative process for a study of "instream flow" effects in Grant Creek was initiated in 2009 (HDR 2009a). The primary goal of the 2009 Instream Flow Study program was to establish a Technical Working Group (TWG) consisting of state and federal resource agency staff, KHL staff, and interested members of the local community. Once established, the TWG met three times during the 2009 study season to review the results of the 2009 aquatic baseline study efforts, discuss and agree upon an acceptable instream flow evaluation method, and request additional information to support that selection (HDR 2009a). A technical memorandum was drafted and shared with the Instream Flow TWG participants in 2009 detailing the results of the previous Instream Flow Study efforts (HDR 2009b).

As part of the Instream Flow Study, and at the request of the TWG, a sampling event was conducted June 23–25, 2009 on Grant Creek to characterize the types of aquatic habitats used by resident fish and rearing fish (HDR 2009a). Aquatic habitat was described at each sample site by recording macro-, meso-, and micro-habitat characteristics. During the June sampling event, snorkeling was the primary method used to document fish presence. Electrofishing was used primarily to confirm species identification and calibrate fish length estimates (HDR 2009a).

Collaboratively, the TWG and KHL decided to select an Instream Flow Study methodology based on the knowledge obtained from the summer 2009 aquatic resources and hydrology studies (HDR 2009a). Data and analyses from these studies were shared with the TWG in July and September. Based on the knowledge gained of Grant Creek's fish and hydrologic resources, KHL presented a proposed instream flow approach to the TWG on September 23 (HDR 2009a). Physical stream data required for instream flow modeling, per the proposed approach, were collected at 18 transects during low- and mid-flow conditions in 2010. Where applicable, these data were used in the 2013 Instream Flow Study.

2 STUDY OBJECTIVES

2.1. Overall Goals Identified during Project Scoping

Together with existing information, the goals of the study efforts were to provide baseline information, and where applicable, information on alternative flow regimes, which would allow an assessment in the study report of potential Project impacts on aquatic resources. These impact assessments are used to identify potential PM&E measures.

The goals of this suite of studies were to provide supporting information on the potential resource impacts of the proposed Project that were identified during development of the PAD, public comment, and FERC scoping for the LA, as follows:

- Impact of Project operation on sediment transport (relative to the availability of spawning gravels) due to changes in flow in Grant Creek.
- Impact of Project operation (fluctuating lake levels in Grant Lake, changes in seasonal flow in Grant Creek, reduced flows between the dam and powerhouse on Grant Creek).

2.2. Specific Goals of Aquatic Habitat Mapping

- Prepare a geospatially referenced image of Grant Creek upon which aquatic habitat and fish use information can be superimposed.
- Develop a map of aquatic habitats that will provide a basis for describing the distribution of key habitat types.
- Identify important factors that influence fish use of key habitats for input to the instream flow analysis.
- Identify and map habitat with sufficient resolution so that the geographic information system (GIS) can be used to accurately calculate surface areas.

2.3. Specific Goals of the Instream Flow Study

- Assist impact analysis by modeling changes in key types of fish habitat relative to potential changes in stream flow.
- Provide a basis for planning Project instream flow mitigation measures.
- Provide a starting point for stream flow discussion.
- Provide supportable predictions of fish habitat availability in lower Grant Creek under various stream flow scenarios for key species and life history stages.
- Assess connectivity of the habitats present in Reach 5 (i.e., the Canyon Reach) to determine if reductions in stream flow in this reach potentially affect habitat connectivity.

The purposes of this study were to fully delineate and map the aquatic habitats available in Grant Creek, identify important spawning and rearing fish habitats for both resident and anadromous salmonids, and describe the distinguishing factors that may influence fish use of the key habitats over those habitat units not occupied by fish in Grant Creek.

3 STUDY AREA

The Project area is located near the town of Moose Pass, Alaska (population 206), approximately 25 miles north of Seward, Alaska (population 3,016), just east of the Seward Highway (State Route 9); this highway connects Anchorage (population 279,671) to Seward. The Alaska Railroad parallels the route of the Seward Highway and is also adjacent to the Project area. The town of Cooper Landing is located 24 miles to the northwest and is accessible via the Sterling Highway (State Route 1), which connects to the Seward Highway approximately 10 miles northwest of Moose Pass.

Grant Creek is approximately 5,180 feet long (about one mile) and flows west from the outlet of Grant Lake to the narrows between Upper and Lower Trail lakes (Figure 3.0-1). The Grant Creek watershed is approximately 44 square miles and the watershed contains Grant Lake as well as a portion of the Kenai Mountain Range, with glacier-capped peaks as high as 5,500 feet. Grant Creek has a mean annual flow of 193 cfs, with an average gradient of 207 feet per mile; its substrate includes cobble and boulder alluvial deposits and gravel shoals (Ebasco 1984). In its upper half, Grant Creek passes through a rocky gorge with three substantial waterfalls (i.e., the break between Reaches 5 and 6); in its lower half, the stream becomes less turbulent as it passes over gravel shoals and diminishing boulder substrate (Ebasco 1984).

For the purposes of the Grant Creek Instream Flow Study, the study area extends from the upstream border of Reach 5 downstream to the confluence of Grant Creek with the Trail Lakes. The study area includes only Grant Creek and its associated habitats (i.e., edge and mid-channel, main and side channels). This study area does not encompass the high water overflow channel, located between Reaches 1 and 2.

4 METHODS

This section provides methods for both the Grant Creek aquatic habitat mapping and the Instream Flow Study in Sections 4.1 and 4.2, respectively. Further details can be found in the Aquatic Resources Study Plan (KHL 2013).

4.1. Grant Creek Aquatic Habitat Mapping

The approach of this study involved three primary phases. During the first phase, the team spatially synthesized existing aquatic habitat and fish use data generated during various field efforts throughout the 2009 and 2010 field seasons. This exercise was completed primarily to identify spatial data gaps. In the second phase, the team then ground-truthed habitat data in the field, collected additional habitat and fish use data in Reaches 1 through 5, and incorporated other suitable habitat and fish use data collected in 2010 (e.g., Instream Flow Study). Finally, the team analyzed the suite of habitats and fish use data to identify important factors affecting distribution of fish. The primary tasks associated with this approach were as follows:

- Preparation of an office-based aquatic habitat map (i.e., based on habitat observations assembled throughout the 2009 and 2010 field seasons).

- Field surveys to ground-truth the office-based mapping effort and fill spatial data gaps relative to aquatic habitat and fish use in Reaches 1 through 4. Actual collection of fish habitat use information was accomplished by the resident and rearing fish tasks discussed in the Fisheries Report and the instream flow task.
- Incorporated aquatic habitat fish use data that identified key rearing, spawning, and feeding habitats for salmon and resident fish and potential overwintering habitats.
- Analyzed and identified the factors that may influence fish use of the key habitats over those habitat units not occupied by fish in Grant Creek.

The office-based mapping exercise incorporated existing habitat data overlain by fish use data into a spatial format, using ArcMap© GIS software. The initial dataset included habitat units mapped during a microhabitat fish use reconnaissance study completed in June 2009[2]. The team plotted locations of salmon spawning activity recorded during 2009 foot surveys and high-use spawning areas identified by historical data (Ebasco 1984). The teams used the preliminary spatial fish habitat information to catalog and identify gaps in coverage.

The team conducted surveys to ground-truth the preliminary aquatic habitat delineation (i.e., generated through the office-based exercise), redraw mapping boundaries where appropriate, and confirm the location of habitat areas that are in need of additional study. The team delineated aquatic habitats at the mesohabitat level and subcategory scale, consistent with the approach developed for the approved 2009 habitat reconnaissance study.

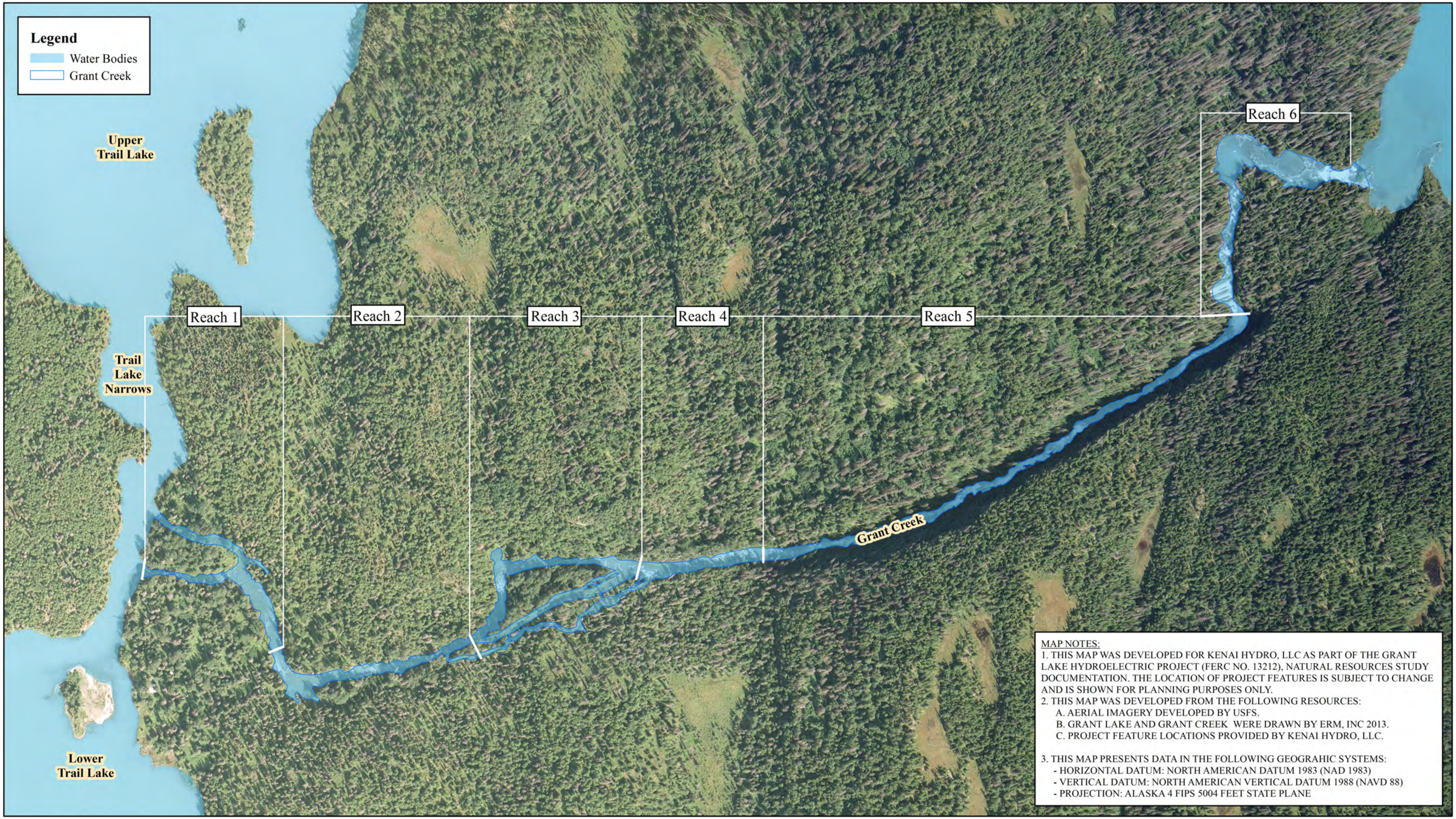
The team identified key fish habitats in Grant Creek, based on observed fish use. This was accomplished by analyzing the microhabitat fish use data collected in support of the habitat mapping study, data collected in support of the Instream Flow Study, and data collected in 2009 during the reconnaissance study (HDR 2009a). These data were incorporated into the spatial dataset. Other fish use habitat datasets (e.g., foot surveys, telemetry surveys, electrofishing) were considered when developing key habitat designations. Surface areas of habitat types were calculated as needed using the capability of the GIS software.

Definition of Terms

Mesohabitat types were identified and mapped in 2009/2010. The following definitions are provided for these habitat types (Overton et al. 1997, unless otherwise noted):

- Backwater: Pool formed by an eddy along a channel margin downstream from obstructions such as bars, rootwads, or boulders, or resulting from back-flooding upstream from an obstructional blockage. Also, a body of water, the stage of which is controlled by some feature of the channel downstream from the backwater, or in coves or covering low-lying areas and having access to the main body of water.

[2] The 2009 fish microhabitat use reconnaissance study was initiated to gain insight into the types of habitats that fish occupy in Grant Creek. The team identified discrete microhabitat types and sampled for fish presence at 16 sites in Grant Creek.



MAP NOTES:
1. THIS MAP WAS DEVELOPED FOR KENAI HYDRO, LLC AS PART OF THE GRANT LAKE HYDROELECTRIC PROJECT (FERC NO. 13212), NATURAL RESOURCES STUDY DOCUMENTATION. THE LOCATION OF PROJECT FEATURES IS SUBJECT TO CHANGE AND IS SHOWN FOR PLANNING PURPOSES ONLY.
2. THIS MAP WAS DEVELOPED FROM THE FOLLOWING RESOURCES:
   A. AERIAL IMAGERY DEVELOPED BY USFS.
   B. GRANT LAKE AND GRANT CREEK WERE DRAWN BY ERM, INC 2013.
   C. PROJECT FEATURE LOCATIONS PROVIDED BY KENAI HYDRO, LLC.

3. THIS MAP PRESENTS DATA IN THE FOLLOWING GEOGRAHIC SYSTEMS:
   - HORIZONTAL DATUM: NORTH AMERICAN DATUM 1983 (NAD 1983)
   - VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM 1988 (NAVD 88)
   - PROJECTION: ALASKA 4 FIPS 5004 FEET STATE PLANE

REV	DATE	BY	DESCRIPTION

N

Drawing Scale: 0 100 200 400 600 Feet

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GRANT LAKE HYDROELECTRIC PROJECT - FERC PROJECT NO. 13212

GRANT LAKE NATURAL RESOURCES STUDY

Figure 3.0-1
Grant Creek Reaches

DESIGNED J. Woodbury
DRAWN J. Woodbury
CHECKED C. Warnock
ISSUED DATE 3/4/2014

DRAWING

SCALE: 1:4,000

- Cover: Suspended material covering the land or water; measured as a percentage of the surface area when looking from above.
  - Fish: Anything that provides protection from predators or improves adverse conditions of stream flow or seasonal changes in metabolic costs. This may be overhead cover or submerged cover and it may be used for escape, feeding, hiding, or resting.
  - Overhead: Whitewater, surface turbulence, bank vegetation, tree branches, floating logs, or other debris touching or within 0.3 m of the water surface.
  - Submerged: Large woody debris, other organic debris, ledges, or aquatic vegetation below the water surface.
- Fast water: Habitat types consist of turbulent (cascade, step run, high gradient riffle, and low gradient riffle) and non-turbulent (runs and glides).
- Large woody debris (LWD): Large pieces of relatively stable woody material located within the bankfull channel and appearing to influence bankfull flows. These are categorized as singles, aggregates, or root wads.
  - Aggregate: Two or more clumped pieces, each of which qualifies as a single piece.
  - Rootwad: Root mass or boles attached to a log less than 3 m in length.
- Pocket: Small bed depressions, often less than 30 percent of wetted width, formed around channel obstructions (boulders, logs, irregular bank, jutting peninsulas, and so forth) within fast water habitat types.
- Pool: A habitat type formed by either scour that has carved out a depression in the channel, or a location where the channel has been dammed. Surface velocities may be slow to fast, but subsurface velocities tend to be slow. Pools are characterized by a head crest (upstream break in slope) and a tail crest (downstream break in slope). Types of pools include the following:
  - Dammed: Pool formed by downstream damming action. Dam pools can be located in the main channel (or side channel) or backwaters.
  - Scour: Pool formed by scour action when flowing water impinges against and is diverted by a streambank or channel obstruction (rootwad, woody debris, boulder, bedrock, and so forth). Scour pools may be lateral scour, mid-scour, plunge, or underscour pools.
  - Lateral scour: A pool formed by the scouring action of the flow as it is directed laterally or obliquely to one side of the stream by a partial channel obstruction, such as a gravel bar or wing deflector, or by a shift in channel direction.
  - Mid-channel scour: A pool formed by the scouring action of the flow as it is directed toward the middle of the channel by a partial channel obstruction.
  - Plunge: A pool formed by scouring action from vertically falling water.
  - Underscour: A pool formed by scouring under an obstruction, such as a log. Sometimes called an upsurge pool.
- Riffle: Shallow rapids where the water flows swiftly over completely or partially submerged obstructions to produce surface agitation, but where standing waves are absent.

- Side channel: A lateral channel with an axis of flow roughly parallel to the mainstem and which is fed by water from the mainstem; a braid of a river with flow appreciably lower than in the main channel.
- Slow water: Habitat types consist of dammed (main and backwater) and scour (lateral, mid-channel, plunge, and underscour).
- Stream margin: edge of the wetted perimeter.
- Undercut bank: A bank that has its base cut away at least 5 centimeters (cm) by the water or has been artificially made and overhangs directly above the water surface.

4.2. Grant Creek Instream Flow Study

The Grant Creek Instream Flow Study approach to be applied to lower Grant Creek Reaches 1–4 was collaboratively developed based on input from the Instream Flow TWG. Public meetings of the TWG were held in April and September 2009, and a conference call was held in May 2009; input and suggestions were solicited during these meetings and also through e-mail and phone communications with the TWG and TWG members. Subsequently, KHL met with the stakeholders in December 2012 to update study plans and to prepare for the 2013 field season.

As agreed to during the previous 2010 investigations, the selected Instream Flow Study approach emphasized a detailed study of utilized habitat types and addressed the desire of the TWG to examine how important individual habitat units may be affected by changes in flow due to the operation of the Project. Rather than applying a typical habitat study that generalized mesohabitat units in a study reach, the agreed-upon approach used several techniques to tie physical microhabitat to flow and timing, and applied *in situ* knowledge of fish habitat use in Grant Creek as tools to determine potential effects of the Project.

The selected approach included the following:

- A series of single transect analyses, with each transect going through a known fish use area such as high-use spawning or rearing areas.
- Fish studies that helped identify microhabitat factors that affected fish use within each key habitat type.
- Monitoring temperature and flows at multiple locations in Grant Creek in conjunction with the Water Resources study program to establish baseline stream flow and temperature changes.

The 2013 Instream Flow Study built upon the investigations that began in 2009. The following sections describe methods used for the various components to complete the instream flow assessment.

4.2.1. Overview of Physical Habitat Simulation (PHABSIM) Methodology

The instream flow methodology is based on the premise that stream-dwelling fish are more often found in a certain range of depths, velocities, substrates, and cover types, depending upon the species and life stage, and that the availability of these preferred habitat conditions varies with stream flow. Physical Habitat Simulation (PHABSIM) is designed to quantify potential physical habitat available for each target fish species and life stage of interest, at various levels of stream discharge, using a series of modeling programs initially developed by the U.S. Fish and Wildlife Service (USFWS). Major components of the methodology include (1) study site and transect selection; (2) transect weighting; (3) field collection of hydraulic data; (4) hydraulic simulation to determine the spatial distribution of combinations of depths and velocities with respect to substrate and cover under a variety of discharges; and (5) habitat simulation, using habitat suitability criteria (HSC) to generate an index of change in habitat relative to change in discharge. The product of the habitat simulation is expressed as weighted usable area (WUA) for a range of simulated stream discharges.

It is important to recognize that the product of an instream flow analysis is not a set value, but rather is a range of values to be used as a tool for discussing and determining a range of stream flows that will meet the needs of the affected resources.

4.2.2. Habitat Availability and Transect Selection

The purpose of the habitat availability component of the Instream Flow Study was to measure available habitat at proposed mesohabitat sites as a function of discharge (Table 4.2-1). Available habitat was correlated to results of the habitat utilization component described in Section 4.2.3. This information was cross-referenced with historic hydrographs, recent hydrologic data, and potential flow scenarios in Grant Creek to determine discrete time periods when the habitat unit may be available for its designated use.

Cross section geometry, substrate, cover, and hydraulic data were measured at each transect using techniques developed for PHABSIM. Application of PHABSIM techniques on Grant Creek is different from most other studies because transects were selected on important habitat units with known fish use, as opposed to a standard PHABSIM approach that attempts to represent all habitat units regardless of unique importance or known fish use.

Table 4.2-1. Mesohabitat assessment sites (revised from HDR 2010).

Transect	Channel Type	Fish Habitat Site	Notes
100	Rearing Distributary	R1FH11	Linear transect, slow water
110	Rearing Distributary	R1FH12	Linear transect, slow water, large woody debris (LWD)
120	Spawning Riffle		Spawning riffle
130	Rearing Main	R1FH05	Main channel fast water, Side channel, small mid channel bar, vegetated, LWD upstream
140	Rearing Main	R1FH05	Main channel fast water, Side channel, small mid channel bar, vegetated, LWD upstream
150	Rearing Main	R1FH13	Woody debris, left bank (LB), fast water main channel
160	Rearing Main	R1FH13	Woody debris, LB, fast water main channel
200	Rearing Main	R1FH06	Backwater lobe
210	Rearing Secondary	R2FH10	Small tertiary channel
220	Rearing Main	R2FH10	Main channel, fast water, right bank (RB) undercut bank
230	Rearing Main/ Secondary	R2FH10	Main channel, fast water, undercut bank on RB, surveyed across island to backwater pool
300	Rearing Main		Backwater lobe
310	Spawning Main	R2FH10	Backwater, low velocities, main channel, fast and deep
320	Rearing Secondary	R3FH09	LWD, Secondary channel and spawning
330	Rearing Secondary/Tertiary	R3FH09	LWD, Secondary channel, spawning and Tertiary channel
400	Rearing Main	R3FH16	Small side channel, cobble/gravel bar - no vegetation, very deep undercut bank
410	Rearing Main	R3FH16	Small side channel, cobble/gravel bar - no vegetation
430	Spawning Main	R5FH15	Pool, deep fast, LWD upstream, shallow slow margin shelf
Channel Type		**Count**	**Percent**
Rearing Distributary		2.0	11.1
Rearing Secondary/Tertiary		3.5	19.4
Spawning Main		3.0	16.7
Rearing Main		9.5	52.8
Total		18.0	

Head pins, tail pins, and a temporary benchmark were set at each transect. Survey instrument and photo points were established and marked. Each transect site was fixed using a handheld Global Positioning System (GPS). Habitat unit cross sectional profiles were surveyed using standard differential survey techniques. Cross section survey points divided the profile into 1 – 3 foot cells, depending upon changes in elevation, substrate, or hydraulic conditions. Dominant and subdominant substrate and cover were recorded within each cell.

Water surface elevations (WSE) at each transect were measured using a survey instrument at 3 to 5 discharges in the mainstem of Grant Creek, ranging from a low flow of approximately 17 cfs to a high flow of approximately 700 cfs. WSE were measured at 3 – 4 discharges in the side channels, ranging from a low flow of 1.4 cfs to a high flow of approximately 114 cfs. Mean column velocities were measured within each cell at a high flow of 170 to 200 cfs (as measured at the Grant Creek stream gage), or the highest possible flow within practical and safety limitations. Numerous photos from established photopoints were taken at each of the 3 to 5 flow levels.

Cross sections (Table 4.2-1) were located during a site visit on September 24, 2009. The locations were set based on presence of physical microhabitat (i.e., undercut bank, overhead cover, bedrock outcrops, and pocket water) and observations of fish during the site visit and during snorkeling studies. Locations of the modeled transects are shown in Figure 4.2-1. Photos of IFIM transects at the calibration flows are included in Appendix 1.

4.2.3. Habitat Utilization

The purpose of the habitat utilization component of the Instream Flow Study was to determine which meso- and microhabitat factors the fish in Grant Creek occupied to assess the impacts, if any, the Project would have on instream habitat. To maximize the knowledge of habitat selection factors for fish in Grant Creek, observations were made at the locations of the transects and fish habitat sites, as described in the previous section.

Fish spawning and rearing microhabitat values were recorded at programmatically-selected sites in Reaches 1 through 4. Measured microhabitat use parameters varied by habitat units. During the Instream Flow TWG meeting on September 23, 2009, Table 4.2-2 was developed with input from TWG members.

In 2013, measurements of 99 spawning pairs of Sockeye salmon were taken at flows ranging from 338 cfs – 469 cfs in the mainstem and 28 cfs – 74 cfs in the side channels. Measurements of 47 Coho salmon spawning pairs were taken at flows ranging from 169 cfs – 285 cfs; however, all but 4 of the observed Coho spawning occurred at flows ranging from 169 cfs – 179 cfs. For this reason, McMillen extended the probability of use curves to reflect the upper end of optimum utilization (i.e., value of 1.0) in the Cooper Creek curves. Only three Chinook salmon pairs were observed spawning; these were discarded and literature-based curves were used.
Information relating to site-specific HSC was developed from these data and used in combination with HSC curves available in the existing literature and professional judgment to determine final HSC curves to be used in modeling. Development of final HSC curves was pursued as a collaborative effort with the Aquatics Resource Work Group (ARWG), which has been established to review aquatic data in 2014. HSC curves were combined with the transect measurements and mesohabitat characterizations to model changes in habitat as a function of discharge. Methods for normalizing values for HSC curves, using habitat utilization and habitat availability, are described in WDFW/WDOE (2013). HSC curves are found in Appendix 2.

Habitat utilization data are covered extensively in Aquatic Resources Study – Grant Creek, Alaska Fisheries Assessment, Final Report (KHL 2014a).

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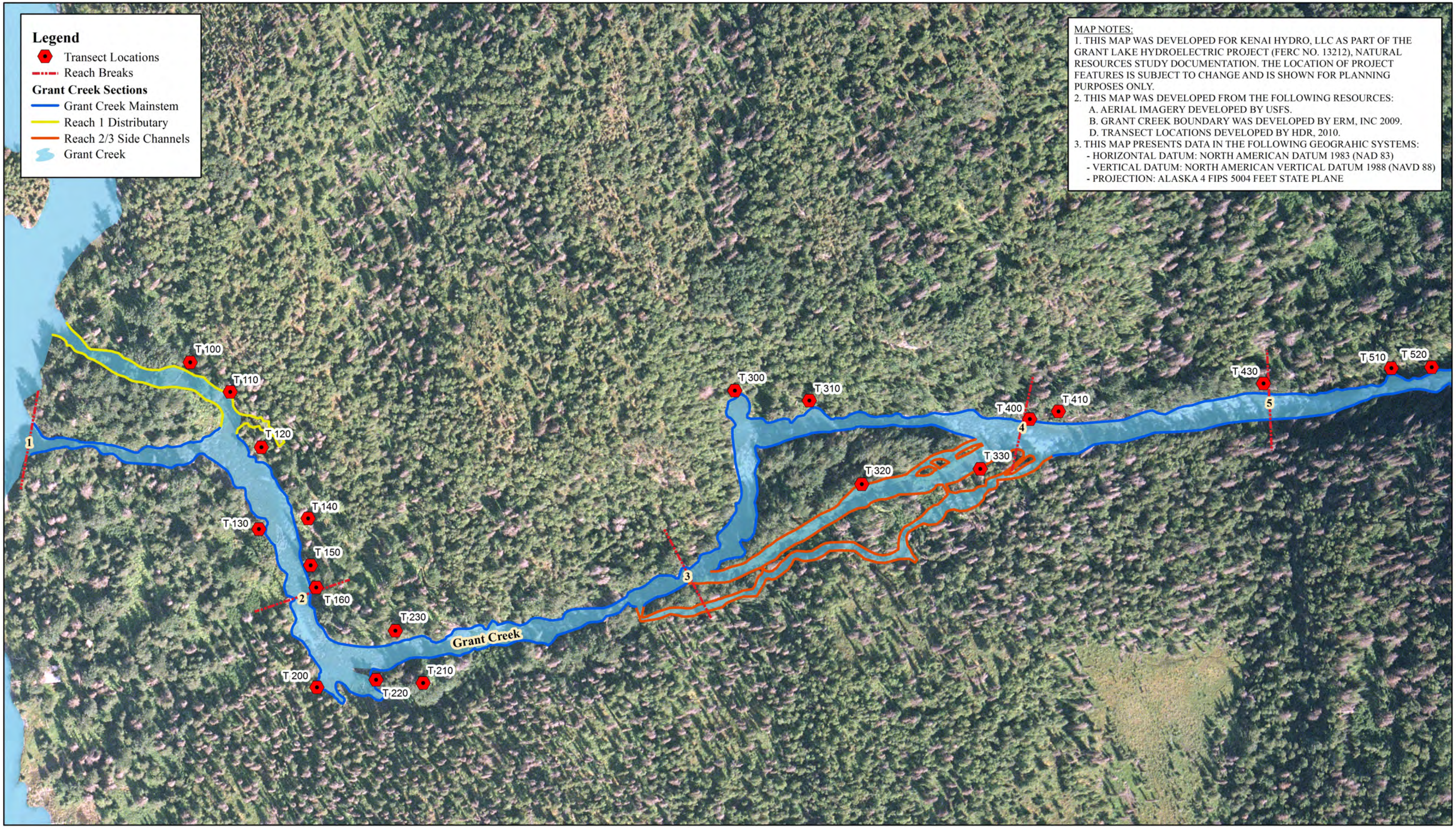

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Drawing Scale:

0 95 190 380 Feet

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GRANT LAKE HYDROELECTRIC PROJECT - FERC PROJECT NO. 13212

GRANT LAKE NATURAL RESOURCES STUDY

Figure 4.2-1
Grant Creek Instream Flow
Transect Locations

DESIGNED J. Woodbury

DRAWN J. Woodbury

CHECKED J. Blum

ISSUED DATE 3/5/2014

SCALE 1:2,000

DRAWING

REV DATE BY DESCRIPTION

In areas of observed spawning use, depth and mean column velocity were recorded. Dominant and subdominant types of substrate size were recorded by visual estimate, using categories as described in Table 4.2-3.

Table 4.2-2. Parameters used in the habitat utilization study.

Habitat Use Function by Life History	Habitat Use Parameters to Measure
Salmon rearing	Depth, velocity, cover, wetted perimeter, habitat connectivity
Salmon spawning	Substrate, depth, velocity, temperature
Rainbow Trout spawning	Substrate, depth, velocity, temperature
Incubation	Depth, wetted perimeter, temperature
Resident rearing and spawning	Salmon rearing will be used as a surrogate

Table 4.2-3. Substrate size classes used in the Grant Creek Instream Flow Study.

Substrate Type	Size (inches)
Organics, vegetation	--
Clay, silt (fines)	<0.002
Sand (coarse)	0.002 - 0.07
Small gravel	0.07- 0.30
Medium gravel	0.30 – 1.25
Large gravel	1.25 – 2.5
Small cobble	2.5 – 5.0
Large cobble	5.0 – 10.0
Boulder	>10.0
Bedrock	--

4.2.4. Affected Species and Life Stages

Fisheries resources of primary concern in Grant Creek are commercial and game fish that include Chinook (*Oncorhynchus tshawytscha*), Coho (*O. kisutch*), and Sockeye (*O. nerka*) salmon, Rainbow trout (*O. mykiss*), and Dolly Varden char (*Salvelinus malma*). All of these species have been documented to utilize portions of the study area during some part of their life cycles.

Fish use Grant Creek in a variety of ways. Adults of the anadromous species use Grant Creek for upstream migration, spawning and rearing. Salmonid fry and juveniles use the creek for rearing and as a downstream migration corridor on their journey toward the sea. Proposed species and life stages for the Instream Flow Study are found in Table 4.2-4.

4.2.5. Field Methods

Transects were oriented across the selected habitat unit to best capture the average condition of interest in that unit, such as spawning or rearing potential. Field data were collected at the Grant Creek transects at a high, several middle, and low flows for model calibration purposes. Generally, all field data were taken using the standard procedures described in Trihey and Wegner (1981) and Bovee (1982). Not all transects used the same benchmark. Head pin elevations, hydraulic slopes, stage of zero flow (SZF), WSEs, and channel cross sections were measured using a Topcon auto level and stadia rod, using standard survey techniques. The surveyor tied these features to the transect benchmark to the nearest 0.01 feet.

Table 4.2-4. Potential target species and life history stages to be modeled in the Grant Creek Instream Flow Study.

Species	Spawning	Fry Rearing	Juvenile Rearing	Adult Rearing
Sockeye Salmon	✓			
Coho Salmon	✓	✓	✓	
Chinook Salmon	✓	✓	✓	
Rainbow Trout	✓	✓	✓	✓
Dolly Varden Char	✓	✓	✓	✓

A series of field measurements were taken in 2010. Due to the possibility of changes in bed profiles and hydraulic controls (i.e., SZF), all transects were resurveyed to determine if head or tail pins had moved or if high flow events since 2010 had altered the stream profile or the hydraulic controls. In addition, KHL collected discharge and stage data at a wide variety of flows in order to extend the extrapolation range of the models. Measurements in the main channel ranged from a low of 17 cfs, to a high of approximately 700 cfs.

Depth and velocity distributions at the calibration flows were measured using a digital, Swoffer brand, propeller-type velocity meter mounted on a standard top-set wading rod. Velocity was measured at sixth tenths of the depth when depth was less than 2.5 feet and at two tenths and eight tenths of the depth where depths equaled or exceeded 2.5 feet, or when flow was influenced by an upstream obstruction. If prior investigations had adequate depth and velocity measurements and there were no bed elevation changes, KHL used those measurements. If the number of measurements was not adequate or if the bed profile had changed, KHL made additional measurements within the channel. Temporary staff gage levels and the time of day were recorded at the beginning and end of each transect measurement to note changes in stage; the outside staff height at the Grant Creek stream gage was also recorded.

Substrate was classified using a three-digit code representing the most abundant particle size, the second-most abundant particle size, and the percentage of the most abundant particle size (see Table 4.2-3 for substrate classification).

4.2.6. Connectivity of Habitats Within Reach 5

During the 2013 field season, two transects (T510 and T520) that represented the areas sensitive to changes in flow and stage were selected and measured in the canyon (i.e., Reach 5). Cross sections were surveyed at both transects. Head and tail pins on each bank as well as a benchmark were surveyed to establish relative elevations. A tape was stretched horizontally across the channel and attached to the head and tail pins. With an auto level and stadia rod, elevations of the streambed and banks were surveyed at regular intervals along the tape and WSEs were surveyed at locations where accurate measurements could be obtained. Water surface elevations were surveyed at flows ranging from 17 cfs – 706 cfs.

Riverine Habitat Simulation (RHABSIM) uses a power function to calculate the stage-discharge relationship at transects. This stage/discharge relationship was used to calculate the water surface elevation for each simulated flow.

Station location, streambed elevations, discharges, water surface stage, slope, and SZF were entered into the PHABSIM hydraulic model; depths at each station were simulated for the modeled range of flows. Depths equal to or exceeding the passage depth criteria for each species were tallied at each modeled flow. Adjoining cells with depths equal to or exceeding the criteria were also tallied. The total width of the cells in each of these categories at each modeled flow was divided by the total wetted width at each flow to compute the percent of the transect that is currently passable. Table 4.2-5 shows the species considered at each stream and the passage depth criteria used to evaluate fish passage success.

Connectivity of the various pools and channels was measured and assessed using the Oregon Method (Thompson 1972). After 10 years of research on depth and velocity in streams in Oregon, Thompson concluded that the depth over “the shallow bars most critical of adult passage” was the feature that determined the likelihood of successful migration. Thompson recommends a minimum depth of 0.6 feet for large trout and 0.8 feet for Chinook salmon to achieve successful passage. The “Oregon Method”, as it is now commonly called, concludes that the passage flow is adequate when the depth criterion is met on at least 25 percent of the transect width and on at least a 10 percent continuous portion. Transect data were collected to determine where connectivity meets these criteria and where it does not. Connectivity was assessed concurrently with the Instream Flow Study conducted downstream in Reaches 1 – 4, at the same range of flows.

Table 4.2-5. Species evaluated for connectivity in Grant Creek.

Species Evaluated	Minimum Depth Criteria
Chinook Salmon	0.80 feet
Coho and Sockeye Salmon	0.60 feet
Dolly Varden Char and Rainbow Trout	0.40 feet

4.2.7. Data Analysis

4.2.7.1. Hydraulic Modeling

Analysis and integration of physical stream measurements and habitat preference criteria require the use of a group of the RHABSIM (Riverine Habitat Simulation) computer programs. There are two main programs in the RHABSIM library: the hydraulic model (called HYDSIM), and the habitat model (called HABSIM).

Hydraulic modeling involves two sequential steps. The first step is to develop a stage-discharge relationship, and the second step is velocity calibration. The stage is the height of the water surface elevation (WSE) at a location (in this case, at each transect). At a minimum of three widely separated calibration flows, stages and flows should be measured and recorded; generally, the lower flow should be half or less of the next higher flow. A power function predicts the WSE and calculates the depth of the water at that flow by subtracting the bed profile from the WSE. At each point (station) along a transect, a velocity calibration is needed to estimate velocity. An average velocity for the river can be calculated at a transect if the flow and the cross sectional area of the river are known at the transect. Flow (Q, in cubic feet per second) = cross sectional area (A) *X* average velocity (V), and A=depth *X* width*;* thus V = Q/A.

Velocity calibration allows fine-tuning of velocity distribution across a transect. Velocity is not uniform across a transect, but faster in some places and slower in others. Over a range of flows, it is possible to modify (either increase or decrease) the "cell" velocity relative to the average velocity by using a measured velocity to indicate relative resistance to flow or roughness. Successful velocity calibration generates reasonable approximations of the actual velocity measurements at the calibrated and extrapolated flows. Other velocity calibration methods are also available.

The Habitat Simulation (HABSIM) program integrates the simulated hydraulic information from Hydraulic Calibration Simulation (HYDSIM) with HSC curves and quantifies habitat availability over a range of flows for the specified target species and life stages. Habitat quantification is expressed as an index called WUA, and is given in units of square feet of habitat per 1,000 linear feet of stream.

4.2.7.2. Hydraulic Modeling Procedures

McMillen calibrated the Grant Creek hydraulic models using methods described below. All of the input decks were initially processed using the Problem Report subroutine of the Field Data Entry Module of RHABSIM. This program looks for errors in data placement and produces a hard copy of the pertinent information needed to run the model, including transect weighting factors, slopes, SZF, and WSE.

4.2.7.3. Hydraulic Model Calibration

One of the goals of the hydraulic simulation is to have the model accurately simulate the measured velocities and depths at the calibration flows, while minimizing changes to the data. In this regard, only minor changes were made to the instream flow data in order for the model to more accurately predict cell velocities at the simulated flows.

Only minor changes were made to the original input data. Most revisions fell into one of four categories:

1. Replacing a measured velocity of 0.0 feet/second with a velocity of 0.1 feet/second in some cells where there was depth but no measured velocity. The model "sees" a measured zero velocity as a blank and will attempt to fill that cell with a velocity based on a mass balance equation for the transect, taking into consideration slope, adjacent velocities, and the resistance of the bed of a channel to the flow of water in it (referred to as Manning's N, a roughness coefficient). Replacing a measured velocity of 0.00 with a velocity of 0.01 or 0.1 often corrects this problem.
2. Changing the Manning's N value to either reduce or increase the velocities in the given cell. Edge cells are often assigned high Manning's N values by the model. The

high N values slow the velocities through these cells, giving an unrealistic simulation of velocities. In these instances, the N values were manually reduced.

3. Adjusting the bed elevations at the stream margin cells slightly.
4. Changing the SZF in certain instances when it improved the mean error of the stage discharge relationship.

Changes were kept to a minimum and the decks were revised only when specific changes improved model performance. The goal is to have the simulated velocities fall within 20 percent or 0.2 feet/second of the measured velocity, whichever is greater.

Mean error (for both given and predicted discharges), ratio of measured versus predicted discharges, and *B* coefficients were all within the acceptable limits for PHABSIM calibration. Velocity Adjustment Factors (VAFs) are generally a measure of how well a model simulates the actual velocities. In a one-velocity set model, however, the VAFs are actually adjustment factors of discharge, not velocities, and a wider range of values is acceptable. A summary of VAFs and calibration details for all transects is presented in Appendix 3. Cross section, WSE, and flow hydraulic summaries are found in Appendix 4. All VAF values were within the acceptable range for one-velocity set models.

A one-velocity set model tends to model velocities better in a downward, or decreasing direction; as the discharges are increased above the calibration flow measurement, drag on the banks (in the form of higher roughness coefficients) tends to underestimate habitat. Another calibration method, known as depth calibration, sets Manning's N values to 0.06 and simulates velocities so that the thalweg and deeper areas are assigned higher velocities. This method tends to overestimate habitat slightly. To balance these differing WUAs, the results are averaged together for the higher flow ranges.

4.2.7.4. Transect Weighting

In a typical PHABSIM study, transect weighting is dictated by the frequency of that particular mesohabitat type present in the study reach. Per previous consultation with the Instream Flow TWG, transects were placed on locations of known salmonid utilization (see Section 4.2), rather than representing gross habitat frequencies. Given this approach, all transects were weighted equally, so relative weighing and lengths were the same for all transects.

4.2.8. Measured Flows for Grant Creek

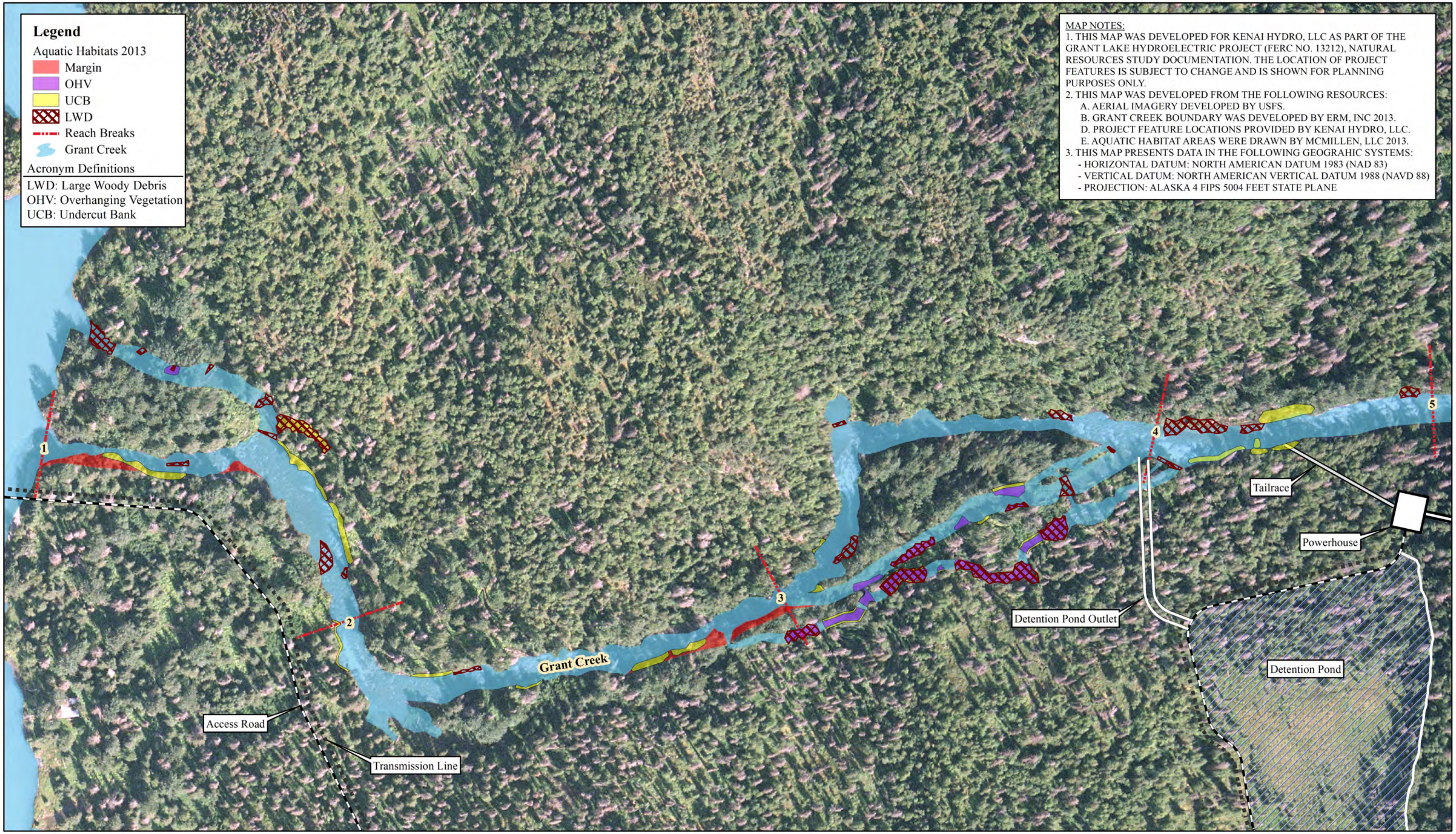
When possible, McMillen collected up to five sets of stage/discharge data at each transect. This was in addition to two sets of stage/discharge measurements taken in 2010. In some instances, distributary or side channel transects were either dry or still frozen, precluding some measurements. Additional WSE measurements were taken in these two areas at a Grant Creek flow of approximately 440 cfs. Due to channel changes at Transect 330, a new calibration measurement was also taken at this flow. KHL collected WSEs at each transect at a very high flow (approximately 700 cfs, as measured by an Acoustic Doppler Current Profiler [ADCP]). These flows and a WSE at each transect were used to generate the stage-discharge relationships. The calibration flows are shown in Table 4.2-6 for each transect. Figures 4.2-1 and 4.2-2 show the locations of these transects, as well as the main channel, side channels, and Reach 1 distributary.

Table 4.2-6. Calibration flows, Grant Creek (as measured in the mainstem).

Area	Measured Flows (cfs)					
	17	**64**	**132**	**182**	**440**	**700**
Main Channel	✓	✓	✓	✓		✓
Distributary	Dry/Frozen	Dry	Dry	✓	✓	✓
Reach 3 Side Channels	Frozen	✓	✓	✓	✓	✓

4.2.9. Flow Partitioning in Grant Creek

As shown in Figure 4.2-1, Grant Creek below the powerhouse consists of a main channel, several side channels, two low-velocity lobes (T200 and T300), a backwater channel (T210 and T230), a high flow overflow channel (when flows are approximately 450 cfs), and a distributary in Reach 1 that does not get wetted until approximately 190 cfs (T100 and T110). The Figure 4.2-2 map series also shows these features. The side channels in Reaches 2 and 3 are wetted at all flows; however, the smaller side channels may be frozen over in winter at low flows and temperatures. All of these channels affect flow at the Grant Creek measured transects. KHL ran regression analyses in order to partition the flow appropriately for the PHABSIM model. Table 4.2-7 summarizes the calculated partitioning of flow for each area of Grant Creek; Table 4.2-8 presents the table of flows used for the PHABSIM analysis.



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Drawing Scale:
0 85 170 340 Feet

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THE SONNA BUILDING 910 MAIN ST. SUITE 258 BOISE, ID 83702 OFFICE: 208.342.4214 FAX: 208.342.4216

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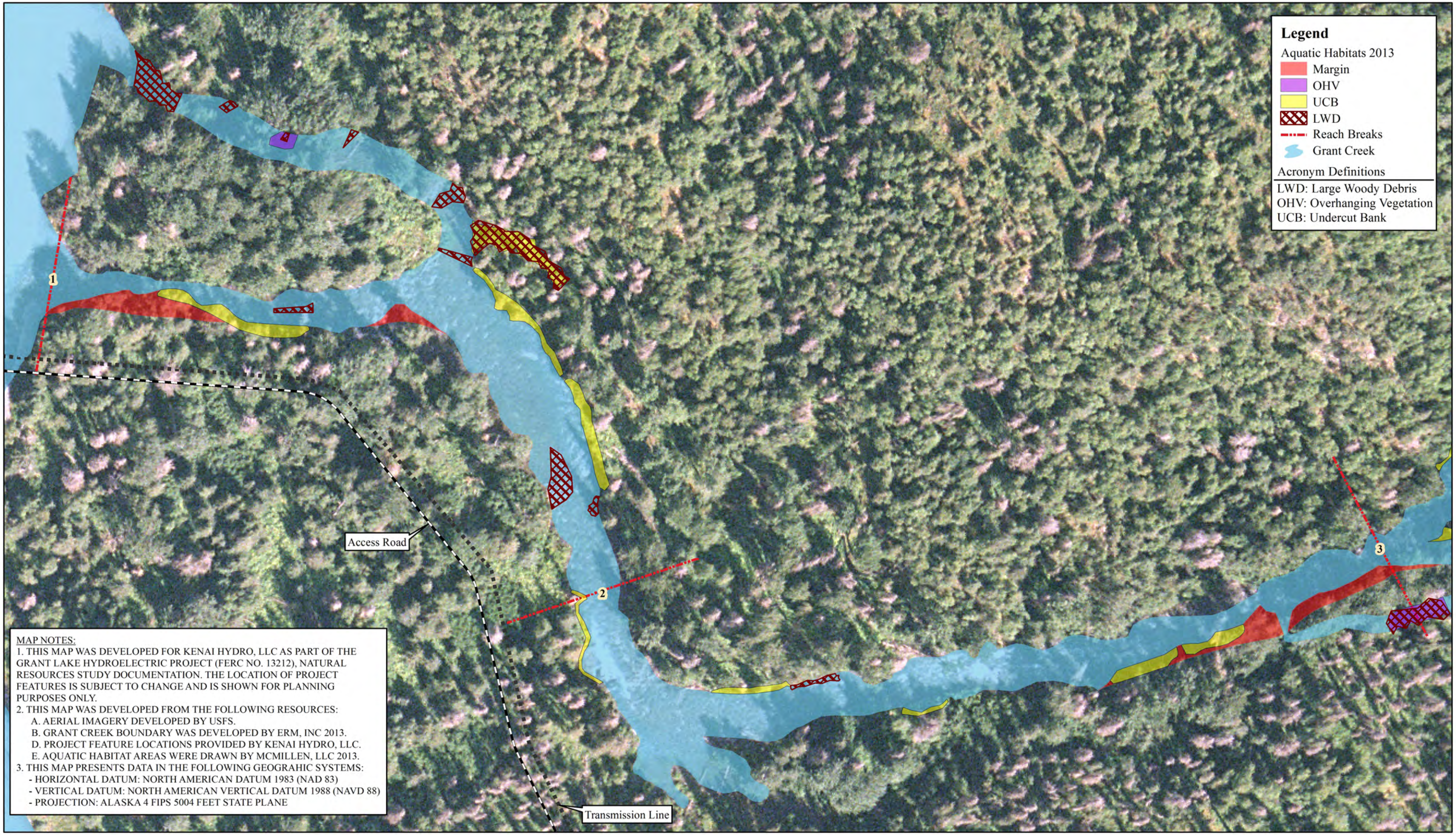
GRANT LAKE HYDROELECTRIC PROJECT - FERC PROJECT NO. 13212

GRANT LAKE NATURAL RESOURCES STUDY

Figure 4.2-2
Aquatic Habitats
Grant Creek: Reaches 1-4

DESIGNED J. Woodbury
DRAWN J. Woodbury
CHECKED J. Blum
ISSUED DATE 2/13/2014

DRAWING 1 of 3
SCALE: 1:1,800



MAP NOTES:
1. THIS MAP WAS DEVELOPED FOR KENAI HYDRO, LLC AS PART OF THE GRANT LAKE HYDROELECTRIC PROJECT (FERC NO. 13212), NATURAL RESOURCES STUDY DOCUMENTATION. THE LOCATION OF PROJECT FEATURES IS SUBJECT TO CHANGE AND IS SHOWN FOR PLANNING PURPOSES ONLY.
2. THIS MAP WAS DEVELOPED FROM THE FOLLOWING RESOURCES:
   A. AERIAL IMAGERY DEVELOPED BY USFS.
   B. GRANT CREEK BOUNDARY WAS DEVELOPED BY ERM, INC 2013.
   D. PROJECT FEATURE LOCATIONS PROVIDED BY KENAI HYDRO, LLC.
   E. AQUATIC HABITAT AREAS WERE DRAWN BY MCMILLEN, LLC 2013.
3. THIS MAP PRESENTS DATA IN THE FOLLOWING GEOGRAPHIC SYSTEMS:
   - HORIZONTAL DATUM: NORTH AMERICAN DATUM 1983 (NAD 83)
   - VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM 1988 (NAVD 88)
   - PROJECTION: ALASKA 4 FIPS 5004 FEET STATE PLANE

REV	DATE	BY	DESCRIPTION

N

Drawing Scale: 0 45 90 180 Feet

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GRANT LAKE HYDROELECTRIC PROJECT - FERC PROJECT NO. 13212

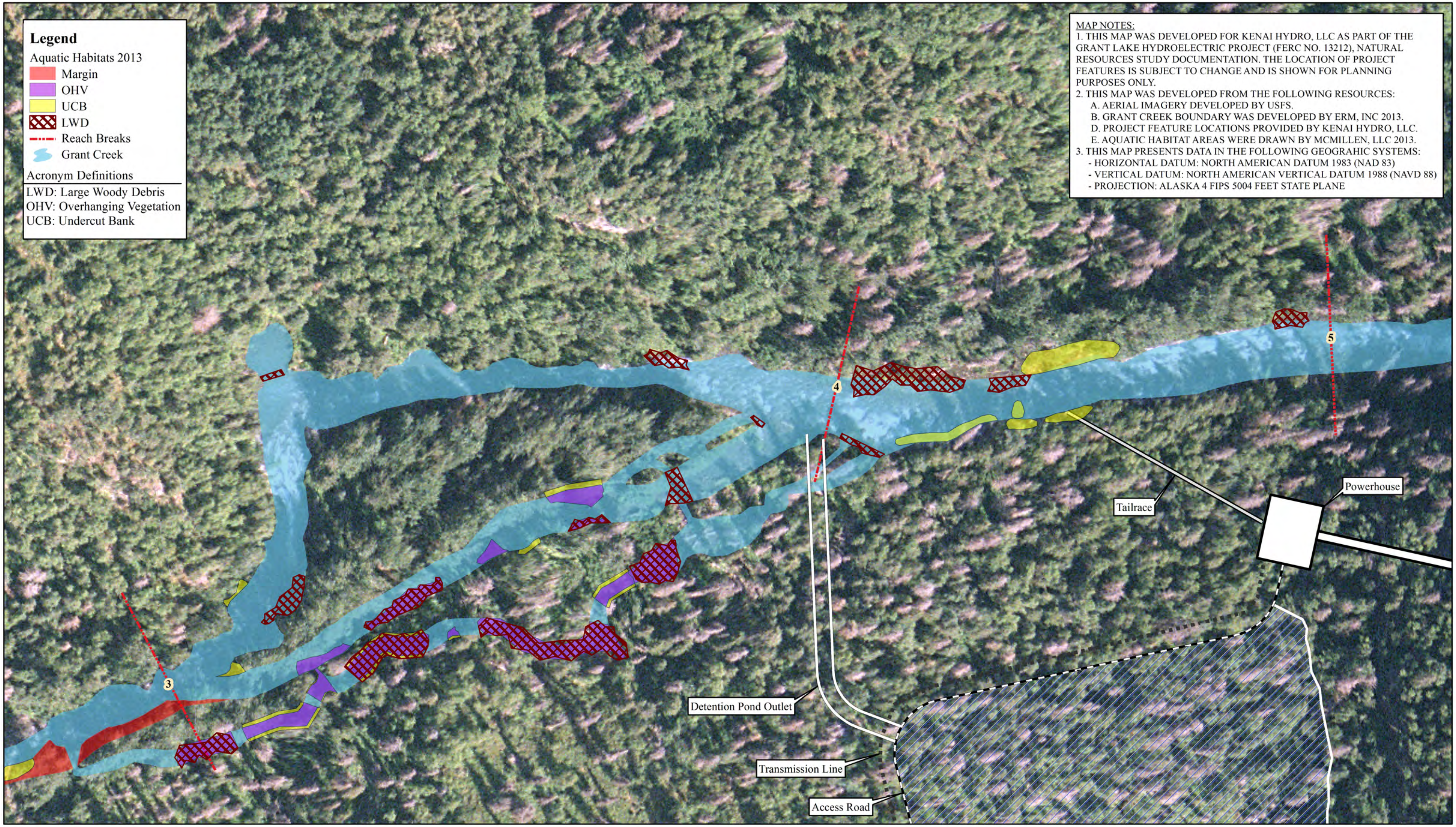
GRANT LAKE NATURAL RESOURCES STUDY

Figure 4.2-2
Aquatic Habitats
Grant Creek: Reaches 1 & 2

DESIGNED: J. Woodbury
DRAWN: J. Woodbury
CHECKED: J. Blum
ISSUED DATE: 2/13/2014

DRAWING: **2 of 3**

SCALE: 1:1,000



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Drawing Scale:
0 50 100 200 Feet

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GRANT LAKE NATURAL RESOURCES STUDY

Figure 4.2-2
Aquatic Habitats
Grant Creek: Reaches 3 & 4

DESIGNED	J. Woodbury
DRAWN	J. Woodbury
CHECKED	J. Blum
ISSUED DATE	2/13/2014

DRAWING
3 of 3

SCALE: 1:1,000

REV	DATE	BY	DESCRIPTION

Table 4.2-7. Calculations of flow in side channels, lobes, and tributaries, as related to the Grant Creek flow[1].

Transect	% Flow	r^2	Comments
T100/110	0.99%	0.951	Dry at flows < 190 cfs
Overflow Channel	~ 1.70%	N/A	Activates at ~ 450 cfs; affects Reach 1 main channel transects
T200	*8.94%*	N/A	% of main channel at calibration measurement
T210/230 Side Channel (SC)	0.00%	N/A	Backwater with no velocity; WSE is dependent upon T200
T300	1.71%	N/A	% of main channel at calibration measurement
T310	GC-T330	N/A	All Reach 2/3 side channels flow represented by T330
T320	15.81%	0.990	
T330-M	15.06%	0.986	Main Channel of T330
T330-2nd	0.0844 T330-M	0.934	Secondary channel; percent of T330-M flow
T330-3rd	0.0219 T330-M	0.839	Tertiary channel; percent of T330-M flow

Notes:
1 Flow from Grant Creek stream gage unless otherwise noted.

Table 4.2-8. Flow partitioning in Grant Creek for PHABSIM study.

Reach 2/4[1]	T100/110	T200	T300	T310	T320	T330-MC	T330-2	T330-3	Reach 1[2]
10		0.89	0.17	8.33	1.58	1.51	0.13	0.03	10
20		1.79	0.34	16.67	3.16	3.01	0.25	0.07	20
30		2.68	0.51	25.00	4.74	4.52	0.38	0.10	30
40		3.57	0.68	33.33	6.33	6.03	0.51	0.13	40
50		4.47	0.85	41.67	7.91	7.53	0.64	0.16	50
60		5.36	1.02	50.00	9.49	9.04	0.76	0.20	60
70		6.26	1.19	58.33	11.07	10.54	0.89	0.23	70
80		7.15	1.36	66.67	12.65	12.05	1.02	0.26	80
90		8.04	1.53	75.00	14.23	13.56	1.15	0.30	90
100		8.94	1.71	83.33	15.81	15.06	1.27	0.33	100
110		9.83	1.88	91.67	17.40	16.57	1.40	0.36	110
120		10.72	2.05	100.00	18.98	18.08	1.53	0.40	120
130		11.62	2.22	108.33	20.56	19.58	1.65	0.43	130
140		12.51	2.39	116.67	22.14	21.09	1.78	0.46	140
150		13.40	2.56	125.00	23.72	22.60	1.91	0.49	150
160		14.30	2.73	133.33	25.30	24.10	2.04	0.53	160
170		15.19	2.90	141.67	26.88	25.61	2.16	0.56	170
180		16.08	3.07	150.00	28.46	27.12	2.29	0.59	180
190	1.89	16.98	3.24	158.33	30.05	28.62	2.42	0.63	190
200	1.99	17.87	3.41	166.67	31.63	30.13	2.54	0.66	200
225	2.24	20.11	3.84	187.50	35.58	33.89	2.86	0.74	225
250	2.49	22.34	4.26	208.33	39.53	37.66	3.18	0.82	250
275	2.74	24.57	4.69	229.17	43.49	41.43	3.50	0.91	275
300	2.99	26.81	5.12	250.00	47.44	45.19	3.82	0.99	300
325	3.23	29.04	5.54	270.83	51.39	48.96	4.14	1.07	325
350	3.48	31.28	5.97	291.67	55.35	52.72	4.45	1.15	350
375	3.73	33.51	6.40	312.50	59.30	56.49	4.77	1.24	375
400	3.98	35.74	6.82	333.34	63.25	60.26	5.09	1.32	400
450	4.48	40.21	7.67	375.00	71.16	67.79	5.73	1.48	449
500	4.98	44.68	8.53	416.67	79.07	75.32	6.36	1.65	497
550	5.47	49.15	9.38	458.34	86.98	82.85	7.00	1.81	545
600	5.97	53.61	10.23	500.00	94.88	90.38	7.63	1.98	592
650	6.47	58.08	11.09	541.67	102.79	97.92	8.27	2.14	640
700	6.97	62.55	11.94	583.34	110.70	105.45	8.91	2.31	688
750	7.46	67.02	12.79	625.00	118.60	112.98	9.54	2.47	736
800	7.96	71.49	13.64	666.67	126.51	120.51	10.18	2.64	784
850	8.46	75.95	14.50	708.34	134.42	128.05	10.82	2.80	831
900	8.96	80.42	15.35	750.00	142.32	135.58	11.45	2.97	879
950	9.46	84.89	16.20	791.67	150.23	143.11	12.09	3.13	927
1000	9.95	89.36	17.06	833.34	158.14	150.64	12.72	3.30	975

Notes:
1 Transects 220, 230 (Main Channel), 400, 410, and 430.
2 Transects 120, 130, 140, 150, and 160.

4.2.10. Production of WUA for Grant Creek

After the hydraulic models were calibrated, transect weighting and relative lengths to simulate a 1,000-foot reach were added for the rearing and spawning life stages. Flow apportioned to each of the transects was added, and final hydraulic model runs were made to produce input for the HABTAT habitat model.

Output from the hydraulic models was then used to determine changes in the Grant Creek water depths, velocities, surface area, and fish habitat throughout a range of flows from 10 cfs to 1,000 cfs, depending on individual study site.

In order to develop the most accurate models, KHL conducted three model runs for each transect and performed the following analysis:

- A one-velocity set model was used to model down from the middle flow measurement (approximately 180 to 200 cfs in the main channel as measured at the gage).
- Both one-velocity set and depth calibration models were run from the middle flow measurement (approximately 180 to 200 cfs as measured in the main channel at the gage) up to 1,000 cfs.
- The WUA results from the one-velocity set and depth calibration models were averaged to produce one WUA table for each species and life stage at each transect (from 180 to 200 cfs upward to 1,000 cfs, as measured at the gage).

The results of these model runs were then combined to produce WUA over the entire range of flows of interest. [Note: the exception to these measured flows was in the side channels in Reach 3. At Transect 330, a calibration measurement was taken at a flow of 440 cfs, as measured at the gage].

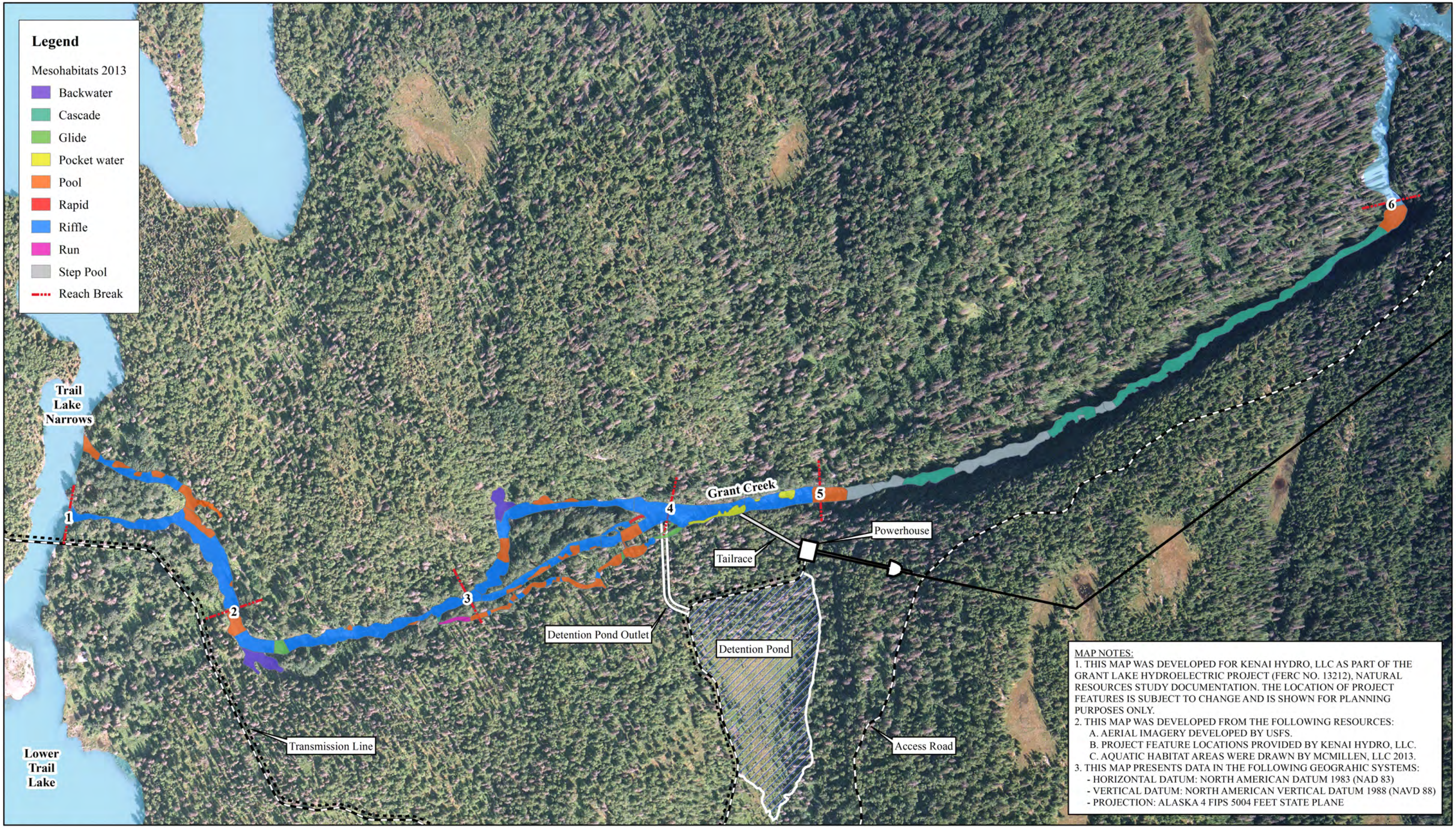
5 RESULTS

5.1. Grant Creek Aquatic Habitat Mapping

Grant Creek consists of six reaches; however, the focus of the mapping was on Reaches 1 – 5, located below the upstream migrational barrier. GIS maps of aquatic habitats in Grant Creek are found in Figures 5.1-1 and 4.2-2. There are two series of maps: the first series (Figure 5.1-1) shows mesohabitats found in Reaches 1 – 5 (pools, glides, etc.); the second series (Figure 4.2-2) shows aquatic habitats (undercut banks, overhead cover, etc.) in the same reaches.

Table 5.1-1 summarizes mesohabitats found in Grant Creek. Riffle habitats were predominant, accounting for 50 percent of all habitats. This was consistent throughout all reaches, with the exception of the secondary channel in Reach 3. Riffle habitats were followed by pools (19.3 percent) and cascades (15.3 percent); all of the cascades were found in the canyon (Reach 5).

Table 5.1-2 shows habitat types (stream margin, overhead vegetation, undercut banks, and LWD) found in Grant Creek. LWD was sparse in the mainstem of Grant Creek. High flows in Grant Creek move LWD downstream and eventually into the Trail Lakes. In the side channels and distributaries, where flows and velocities are much less than in the main channel, LWD is relatively abundant.



REV | DATE | BY | DESCRIPTION

N

Drawing Scale: 0 150 300 600 Feet

MCMILLEN, LLC

Developed For: Homer Electric Association, Inc. A Touchstone Energy Cooperative

GRANT LAKE HYDROELECTRIC PROJECT - FERC PROJECT NO. 13212

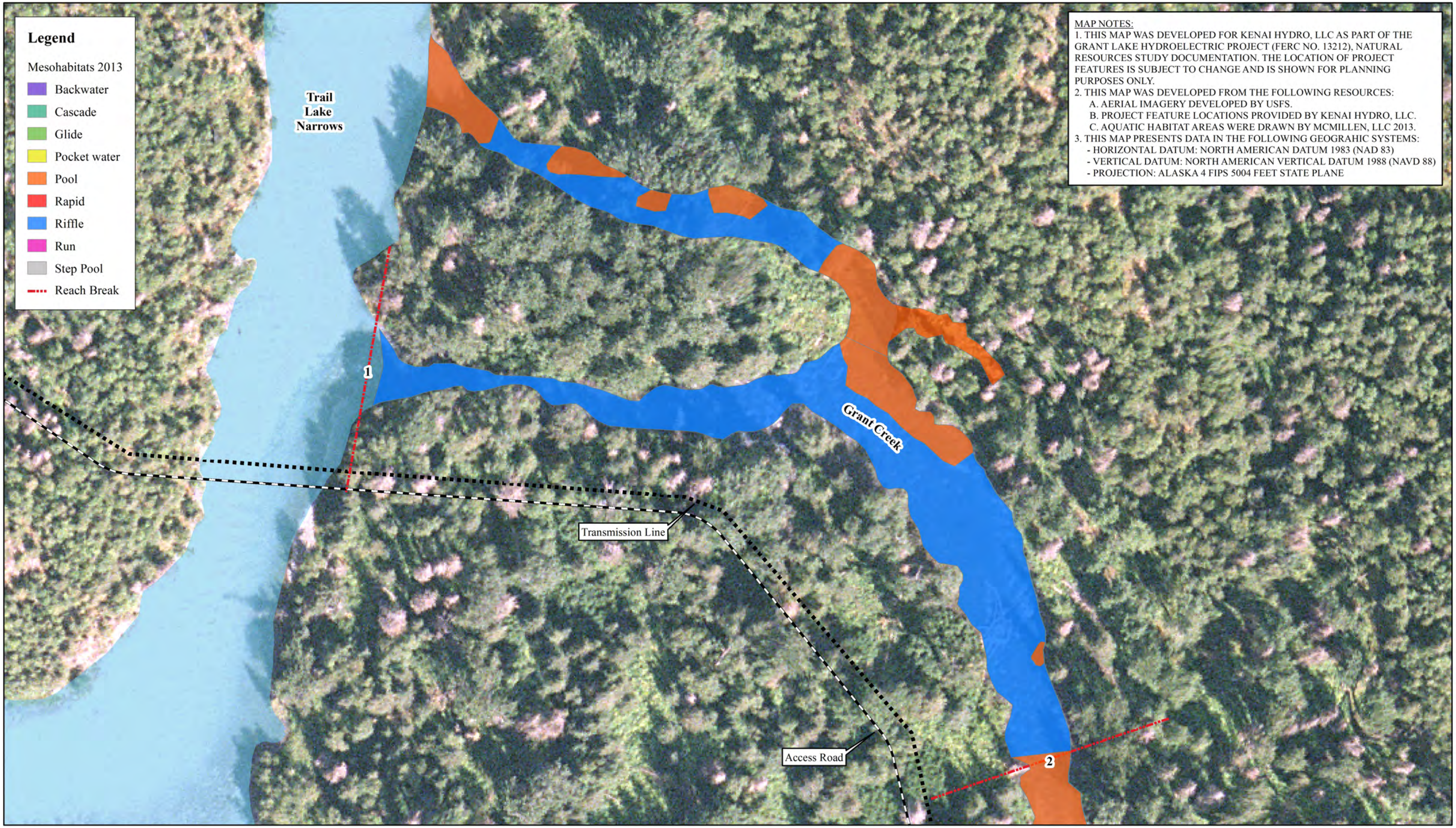
GRANT LAKE NATURAL RESOURCES STUDY

Figure 5.1-1
Grant Creek Mesohabitats
Reaches 1 - 5

DESIGNED J. Woodbury
DRAWN J. Woodbury
CHECKED J. Blum
ISSUED DATE 2/13/2014

DRAWING 1 of 6

SCALE 1:3,300



REV DATE BY DESCRIPTION

N

Drawing Scale:
0 25 50 100 Feet

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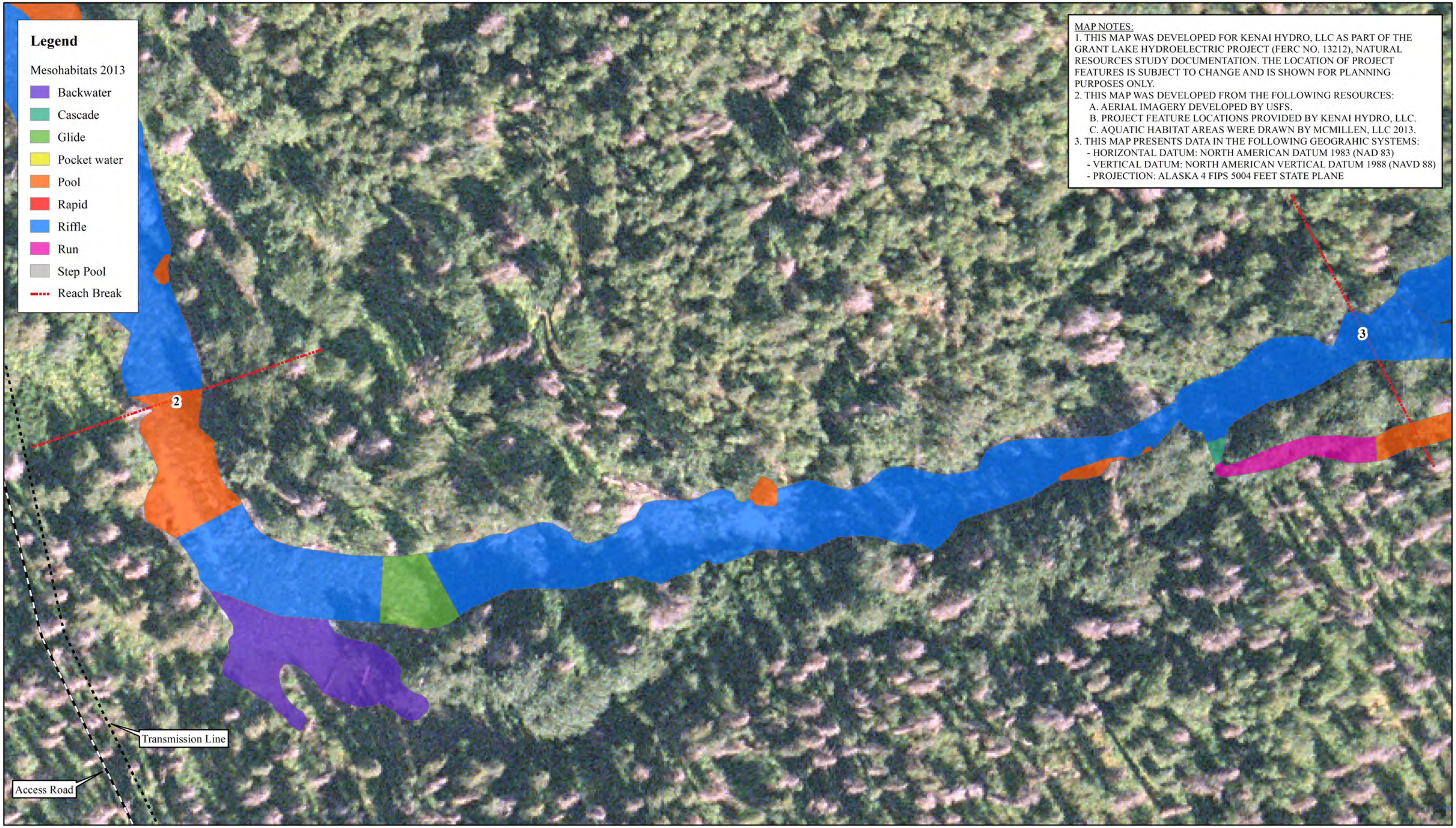
GRANT LAKE NATURAL RESOURCES STUDY

Figure 5.1-1
Grant Creek Mesohabitats
Reach 1

DESIGNED J. Woodbury
DRAWN J. Woodbury
CHECKED J. Blum
ISSUED DATE 2/13/2014

DRAWING
2 of 6

SCALE: 1:800



REV	DATE	BY	DESCRIPTION

N

Drawing Scale: 0 25 50 100 Feet

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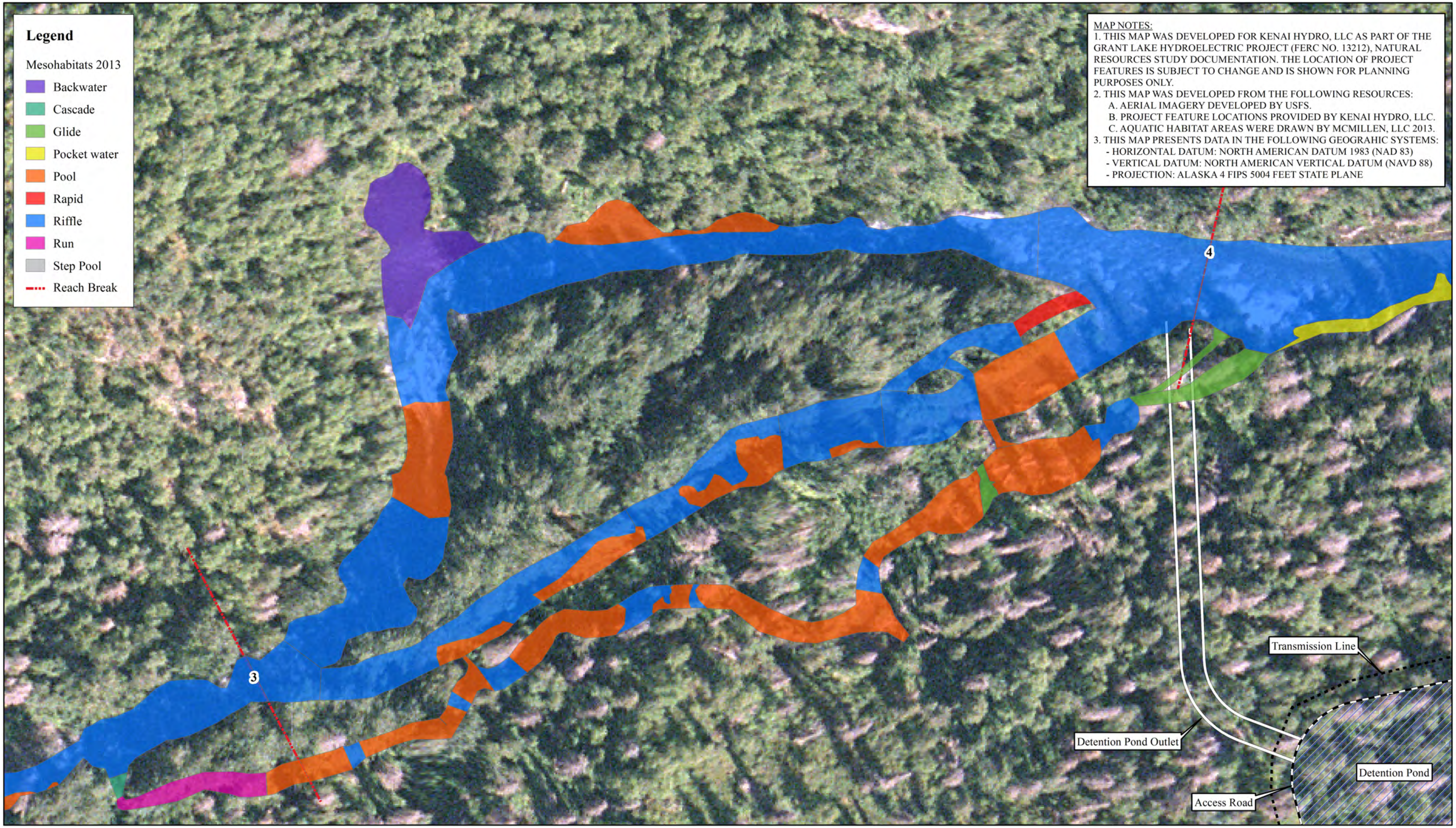
GRANT LAKE NATURAL RESOURCES STUDY

Figure 5.1-1
Grant Creek Mesohabitats
Reach 2

DESIGNED J. Woodbury
DRAWN J. Woodbury
CHECKED J. Blum
ISSUED DATE 2/13/2014

DRAWING 3 of 6

SCALE: 1:650



REV | DATE | BY | DESCRIPTION

N

Drawing Scale:
0 25 50 100 Feet

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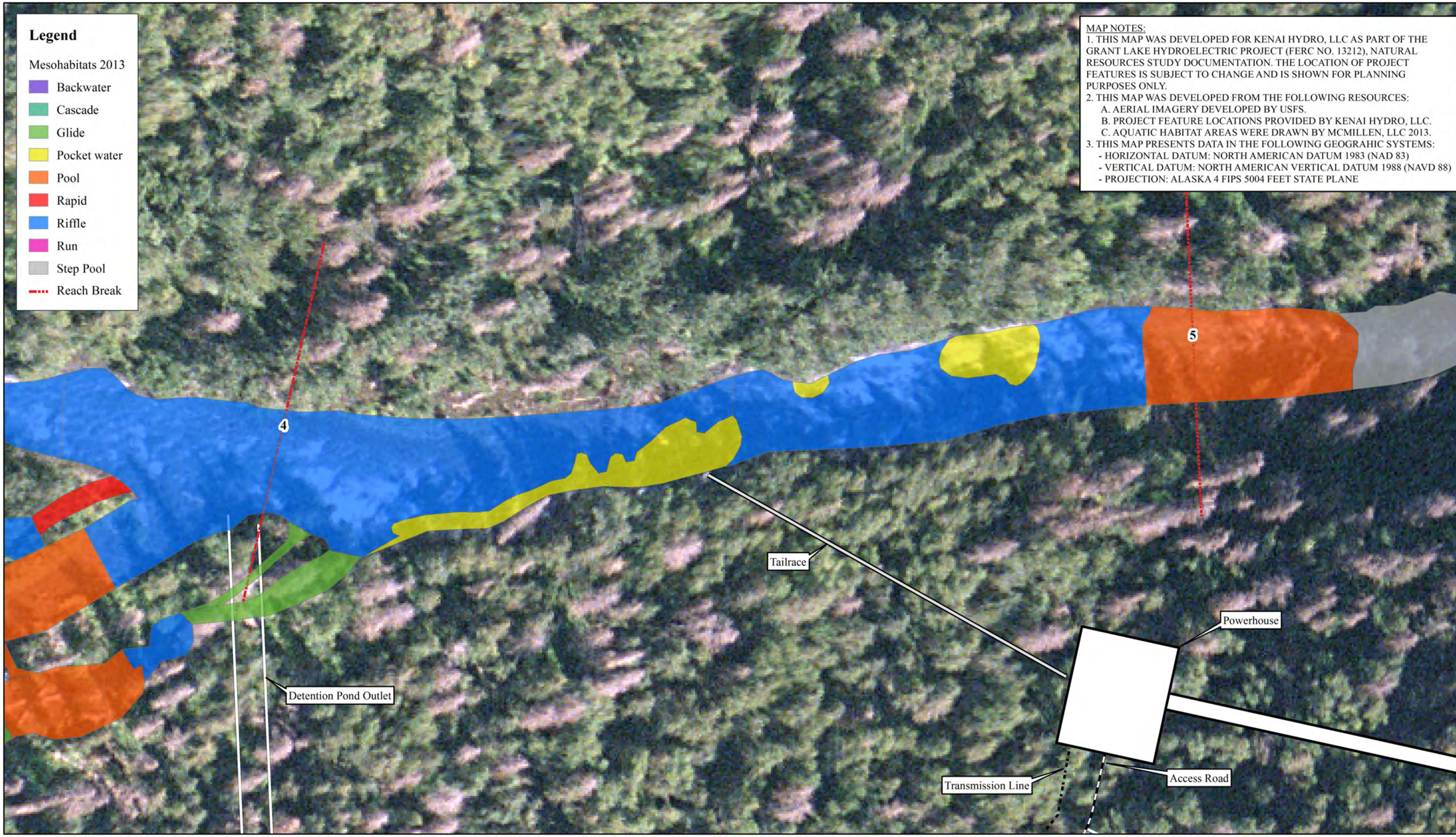
GRANT LAKE NATURAL RESOURCES STUDY

Figure 5.1-1
Grant Creek Mesohabitats
Reach 3

DESIGNED: J. Woodbury
DRAWN: J. Woodbury
CHECKED: J. Blum
ISSUED DATE: 2/13/2014

DRAWING
4 of 6
SCALE: 1:700



REV DATE BY DESCRIPTION

N

Drawing Scale:
0 25 50 100 Feet

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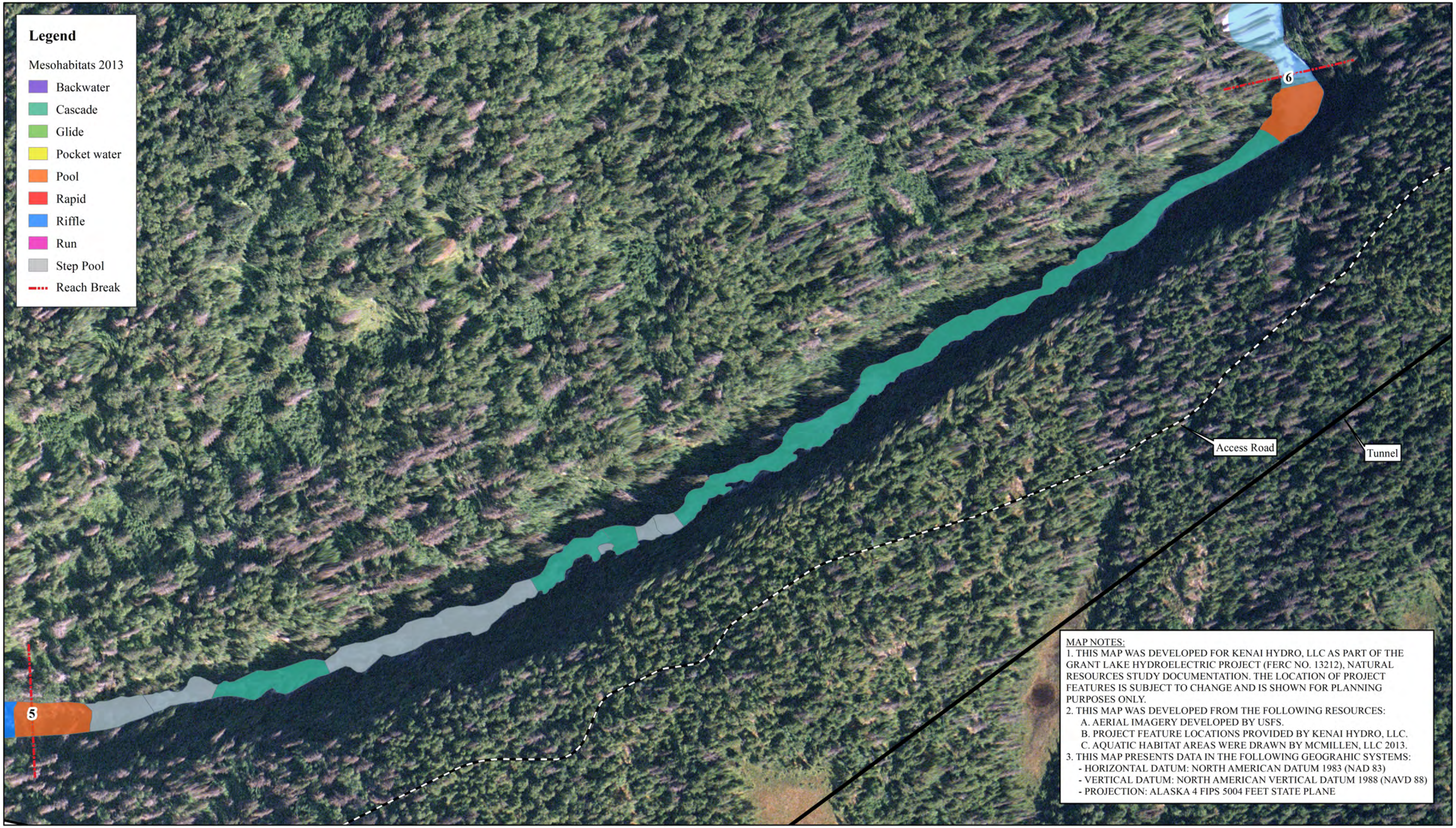
GRANT LAKE NATURAL RESOURCES STUDY

Figure 5.1-1
Grant Creek Mesohabitats
Reach 4

DESIGNED J. Woodbury
DRAWN J. Woodbury
CHECKED J. Blum
ISSUED DATE 2/13/2014

DRAWING 5 of 6

SCALE: 1:550



REV	DATE	BY	DESCRIPTION

N

Drawing Scale:

0 50 100 200 Feet

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GRANT LAKE NATURAL RESOURCES STUDY

Figure 5.1-1
Grant Creek Mesohabitats
Reach 5

DESIGNED: J. Woodbury
DRAWN: J. Woodbury
CHECKED: J. Blum
ISSUED DATE: 2/13/2014

DRAWING
6 of 6

SCALE: 1:1,500

Table 5.1-1. Mesohabitats found in Grant Creek.

Habitat Type	Total Area (Sq. Ft)	Reach 1 Distributary	Reach 1 Mainstem	Reach 2 Backwater Habitat	Reach 2 Mainstem	Reach 2 Secondary Channel	Reach 3 Backwater Habitat	Reach 3 Mainstem	Reach 3 Primary Side Channel	Reach 3 Secondary Channel	Reach 4 Mainstem	Reach 5 Mainstem
Backwater	8,534	0	0	4,837	0	0	3,697	0	0	0	0	0
Cascade	33,707	0	0	0	0	114	0	0	0	0	0	33,593
Glide	3,202	0	0	0	1,613	0	0	0	0	1,588	0	0
Pocket water	3,709	0	0	0	0	0	0	0	0	0	3,709	0
Pool	42,568	7,495	3,143	0	3,834	398	0	3,997	5,018	9,510	1,195	7,977
Rapid	511	0	0	0	0	0	0	0	511	0	0	0
Riffle	110,429	6,004	23,168	0	23,669	1,189	0	25,585	11,672	1,493	17,649	0
Run	576	0	0	0	0	0	0	0	0	576	0	0
Step Pool	16,858	0	0	0	0	0	0	0	0	0	0	16,858

Table 5.1-2. Aquatic habitats found in Grant Creek.

Habitat Type	Total Area (Sq. Ft)	Reach 1 Distributary	Reach 1 Mainstem	Reach 2 Backwater Habitat	Reach 2 Mainstem	Reach 2 Secondary Channel	Reach 3 Backwater Habitat	Reach 3 Mainstem	Reach 3 Primary Side Channel	Reach 3 Secondary Channel	Reach 4 Mainstem	Reach 5 Mainstem
Margin	7,214	0	3,343	0	3,871	0	0	0	0	0	0	0
Overhead Vegetation (OHV)	10,096	302	0	0	0	0	0	0	,2455	7,339	0	0
UCB	12,187	1,513	3,372	0	2,193	0	0	278	110	1,214	3,216	0
Large Woody Debris (LWD)	17,750	3,556	1,894	0	182	0	0	1,142	1,611	6,218	3,040	0

5.2. Grant Creek Instream Flow Study

5.2.1. Weighted Usable Area

Within the HABTAT program, output from the hydraulic modeling is combined with habitat suitability criteria for depth, velocity, and substrate/cover for the target species life stages. The output from this model is expressed as Flow (Q - cfs) versus WUA, which is an index of available habitat (in feet^2 per 1,000 lineal feet of stream) for each species and life stage of concern.

One-velocity set models and depth calibration models were developed to evaluate habitat at flows ranging from 10 – 1,000 cfs, as measured at the Grant Creek gage. Since one-velocity set models tend to predict velocities better when modeling lesser flows, a combination of one-velocity set and depth calibration models was used to evaluate flows > 200 cfs in the mainstem. Above the velocity calibration measurement, the WUA results of the two methods were averaged. The same methodology was used in side channels (Reaches 2/3), the distributary (T100 and T110), and in the mainstem where side channel habitat decreased flows in the mainstem (T320 and T330). Table 5.2-1 summarizes flows and models used to simulate flows in Grant Creek.

Transects were run independently and were given the same weighting, since they were selected as being important rearing and spawning areas. WUA graphs and tables are found in Appendix 5 for the target species and life history stages for Grant Creek. Table 5.2-2 indicates which life history stages were modeled at each transect.

Tables 5.2-3 to 5.2-23 and Figures 5.2-1 to 5.2-21 show Grant Creek Flow versus WUA graphs for the species and life history stages shown in Table 4.2-4. Appendix 5 includes the graphs and tables for the target species and life history stages for Grant Creek by transect. As stated in Section 4.9, the Reach 2 and 3 side channels are wetted at all flows, although low winter flows may result in freezing in the smaller side channels. The distributary in Reach 1 becomes wetted at a flow of approximately 190 cfs, while the overflow channel near the Reach 1/Reach 2 break becomes wetted at a flow of approximately 450 cfs.

Table 5.2-1. Range of flows and models used to simulate Grant Creek WUA.

Transect	Flow Range (cfs)	
	1-Velocity Model - Low	1-Velocity Set/Depth Calibration High
100	0.0 - 1.99	1.99 - 9.95
110	0.0 - 1.99	1.99 - 9.95
120	10 - 200	200 - 975
130	10 - 200	200 - 975
140	10 - 200	200 - 975
150	10 - 200	200 - 975
160	10 - 200	200 - 975
200	0.89 - 17.87	17.87 - 89.36
210	-	-
220	10 - 200	200 - 1,000
230-Main	10 - 200	200 - 1,000
230-Side	-	-
300	0.17 - 3.41	3.41 - 17.06
310	8.33 - 166.67	166.67
320	1.58 - 31.63	31.63 - 158.14
330-Main	1.51 - 30.13	30.13 - 150.64
330-Sec	0.13 - 2.54	2.54 - 12.72
330-Ter	0.03 - 0.66	0.66 - 3.30
400	10 - 200	200 - 1,000
410	10 - 200	200 - 1,000
430	10 - 200	200 - 1,000

Table 5.2-2. Life history stages modeled at each Grant Creek transect.

Transect	Life History Stage	
	Spawning	Rearing
100	✓	✓
110	✓	✓
120	✓	✓
130	✓	✓
140	✓	✓
150	✓	✓
160	✓	✓
200		✓
210[1/]		✓
220	✓	✓
230-MC	✓	✓
230-SC[1/]		✓
300	✓	✓
310	✓	✓
320	✓	✓
330-MC	✓	✓
330-SC		✓
330-TC	✓	✓
400	✓	✓
410	✓	✓
430	✓	✓

Note:
1 backwater

Table 5.2-3. Salmonid Spawning WUA, Reach 1 distributary.

Flow (cfs)	Surface Area	Chinook	Coho	Dolly Varden	Rainbow	Sockeye
1.89	22,534	0	5	240	153	4
1.99	22,832	0	7	267	171	7
2.34	23,670	0	13	375	240	15
2.49	24,091	1	19	431	273	19
2.74	24,638	1	35	542	333	26
2.99	24,863	2	52	661	403	38
3.23	25,070	3	69	771	474	53
3.48	25,223	5	86	875	553	76
3.73	25,328	6	111	996	638	103
3.98	26,572	7	141	1,129	726	131
4.48	27,880	10	232	1,433	918	197
4.98	28,558	11	338	1,736	1,122	284
5.47	28,902	16	461	2,011	1,323	386
5.97	29,813	24	616	2,304	1,538	503
6.47	30,676	34	794	2,585	1,759	630
6.97	33,195	46	973	2,813	1,976	762
7.46	33,889	53	1,151	3,012	2,176	889
7.96	34,378	61	1,322	3,191	2,385	1,026
8.46	34,852	68	1,485	3,361	2,599	1,167
8.96	35,301	76	1,635	3,513	2,814	1,303
9.46	36,740	83	1,765	3,647	3,025	1,436

Table 5.2-4. Fry rearing WUA, Reach 1 distributary.

Flow (cfs)	Surface Area	Chinook	Coho	Dolly Varden	Rainbow
1.89	22,534	16,343	15,097	18,979	12,134
1.99	22,832	16,804	15,450	19,336	12,485
2.34	23,670	18,402	16,889	20,655	13,678
2.49	24,091	19,046	17,511	21,207	14,119
2.74	24,638	19,880	18,276	21,948	14,620
2.99	24,863	20,710	18,909	22,479	15,153
3.23	25,070	21,530	19,492	22,822	15,698
3.48	25,223	22,237	19,986	23,135	16,131
3.73	25,328	22,759	20,360	23,393	16,414
3.98	26,572	23,137	20,632	23,665	16,551
4.48	27,880	23,695	20,938	24,316	16,665
4.98	28,558	24,209	21,218	25,065	16,732

Flow (cfs)	Surface Area	Chinook	Coho	Dolly Varden	Rainbow
5.47	28,902	24,858	21,830	25,801	16,960
5.97	29,813	25,536	22,484	26,540	17,241
6.47	30,676	26,173	22,963	27,130	17,488
6.97	33,195	26,922	23,579	27,962	17,815
7.46	33,889	27,548	24,127	28,923	18,021
7.96	34,378	28,121	24,553	29,818	18,198
8.46	34,852	29,118	25,519	30,641	18,817
8.96	35,301	30,073	26,510	31,451	19,389
9.46	36,740	30,841	27,339	32,441	19,770

Table 5.2-5. Adult and juvenile rearing WUA, Reach 1 distributary.

Flow (cfs)	Surface Area	Coho Juvenile	Dolly Varden Juvenile	Rainbow Juvenile	Dolly Varden Adult	Rainbow Adult	Chinook Juvenile
1.89	22,534	17,881	13,111	7,914	1,558	332	1,597
1.99	22,832	18,438	13,632	8,333	1,681	396	1,811
2.34	23,670	20,209	14,987	9,757	2,127	644	2,563
2.49	24,091	20,881	15,443	10,309	2,330	784	2,889
2.74	24,638	21,800	16,159	11,152	2,674	1,028	3,409
2.99	24,863	22,568	17,176	11,972	3,013	1,273	3,942
3.23	25,070	23,233	18,241	12,610	3,342	1,509	4,466
3.48	25,223	23,766	19,131	13,211	3,693	1,752	5,035
3.73	25,328	24,178	19,702	13,808	4,063	2,001	5,603
3.98	26,572	24,579	20,177	14,404	4,434	2,261	6,165
4.48	27,880	25,055	21,078	15,614	5,170	2,801	7,321
4.98	28,558	25,564	21,928	16,702	5,899	3,344	8,543
5.47	28,902	26,628	22,436	17,644	6,624	3,897	9,741
5.97	29,813	27,472	22,916	18,582	7,361	4,503	10,952
6.47	30,676	28,192	23,675	19,493	8,089	5,113	12,173
6.97	33,195	28,846	24,544	20,242	8,811	5,723	13,310
7.46	33,889	29,537	25,223	20,949	9,526	6,332	14,359
7.96	34,378	30,049	25,919	21,649	10,260	6,958	15,395
8.46	34,852	31,595	26,630	22,338	10,994	7,580	16,330
8.96	35,301	32,859	27,181	23,002	11,737	8,203	17,203
9.46	36,740	33,597	27,629	23,694	12,481	8,833	17,950

Table 5.2-6. Spawning WUA, Reach 1, mainstem.

Flow (cfs)	Surface Area	Chinook	Coho	Dolly Varden	Rainbow	Sockeye
10	26,967	872	3,379	8,350	6,746	3,123
20	33,098	3,558	5,460	12,047	10,378	4,942
30	36,447	6,344	6,955	13,447	12,060	6,149
40	38,915	8,532	8,049	14,478	13,274	7,217
50	42,337	10,023	8,962	15,328	14,250	7,999
60	45,620	11,102	9,564	15,939	15,157	8,640
70	47,902	12,146	10,018	16,785	15,914	9,063
80	50,334	13,138	10,326	17,399	16,602	9,310
90	52,139	14,103	10,599	17,956	17,333	9,571
100	56,432	15,075	10,916	18,614	18,085	9,763
110	59,596	16,071	11,293	19,057	18,745	9,995
120	61,244	16,812	11,648	19,396	19,293	10,207
130	63,573	17,386	11,990	19,590	19,738	10,448
140	64,872	17,884	12,362	19,770	20,143	10,683
150	65,799	18,313	12,689	19,880	20,498	10,932
160	67,198	18,840	13,083	19,878	20,803	11,223
170	69,974	19,364	13,475	19,811	21,082	11,499
180	70,706	19,850	13,822	19,768	21,326	11,778
190	72,686	20,432	14,175	19,713	21,499	12,022
200	73,413	20,970	14,481	19,621	21,625	12,261
225	76,822	22,079	15,012	19,405	21,661	12,944
250	79,180	23,036	15,493	19,220	21,445	13,414
275	79,952	24,114	15,726	18,837	21,234	13,764
300	82,531	25,582	15,810	18,341	21,018	13,987
325	83,117	27,001	15,718	17,825	20,871	14,056
350	83,686	27,977	15,515	17,340	20,689	14,004
375	84,230	28,427	15,154	16,845	20,374	13,925
400	85,103	28,744	14,863	16,371	20,000	13,839
449	88,895	28,385	14,515	15,397	19,285	13,544
497	92,108	27,393	14,163	14,225	18,472	13,168
545	93,643	26,342	13,709	13,135	17,683	12,720
592	95,048	25,529	13,190	12,263	17,024	12,273
640	96,630	24,797	12,627	11,455	16,355	11,878
688	99,448	24,088	12,094	10,773	15,712	11,518
736	101,217	23,337	11,562	10,231	15,040	11,143
784	102,415	22,595	11,052	9,780	14,389	10,766
831	103,503	21,926	10,586	9,413	13,805	10,455
879	105,212	21,333	10,130	9,095	13,236	10,144
927	106,171	20,705	9,729	8,841	12,761	9,841
975	107,507	20,081	9,376	8,660	12,366	9,602

Table 5.2-7. Fry rearing WUA, Reach 1 mainstem.

Flow (cfs)	Surface Area	Chinook	Coho	Dolly Varden	Rainbow
10	26,967	18,102	12,479	19,131	9,386
20	33,098	17,887	11,044	19,882	9,359
30	36,447	18,464	10,797	19,779	9,591
40	38,915	18,953	10,581	19,567	9,371
50	42,337	18,841	10,049	19,342	9,142
60	45,620	18,935	9,746	19,419	9,110
70	47,902	18,979	9,273	19,368	8,783
80	50,334	18,746	8,632	19,228	8,541
90	52,139	18,549	8,168	19,102	8,533
100	56,432	18,393	7,978	19,101	8,528
110	59,596	18,249	8,158	19,424	8,579
120	61,244	18,415	8,369	19,806	8,526
130	63,573	19,054	8,933	20,083	8,749
140	64,872	19,848	9,528	20,528	9,220
150	65,799	20,835	10,231	20,782	9,849
160	67,198	21,574	10,622	20,680	10,337
170	69,974	22,273	10,686	20,494	10,716
180	70,706	22,520	10,604	20,603	10,894
190	72,686	22,675	10,978	20,912	11,206
200	73,413	22,884	11,500	21,357	11,626
225	76,822	23,742	12,439	21,907	12,664
250	79,180	24,585	13,157	22,765	13,074
275	79,952	25,437	13,608	22,988	13,288
300	82,531	26,239	14,242	23,045	13,572
325	83,117	26,346	14,356	23,255	13,398
350	83,686	26,776	14,853	23,319	13,676
375	84,230	27,300	15,529	23,299	13,995
400	85,103	27,753	15,939	23,038	14,408
449	88,895	27,920	16,028	23,811	14,502
497	92,108	28,918	16,667	25,133	14,811
545	93,643	29,941	17,384	25,805	15,438
592	95,048	30,887	18,177	26,101	15,975
640	96,630	31,640	18,677	26,225	16,106
688	99,448	31,909	18,627	26,582	15,733
736	101,217	32,301	18,843	27,391	15,690
784	102,415	33,239	19,841	28,329	16,031
831	103,503	34,286	20,594	28,715	16,657
879	105,212	34,976	20,837	28,709	17,112
927	106,171	35,261	21,023	28,978	17,162
975	107,507	35,477	21,329	29,481	17,160

Table 5.2-8. Adult and juvenile rearing WUA, Reach 1 mainstem.

Flow (cfs)	Surface Area	Coho Juvenile	Dolly Varden Juvenile	Rainbow Juvenile	Dolly Varden Adult	Rainbow Adult	Chinook Juvenile
10	26,967	22,255	20,247	15,763	7,743	5,517	9,063
20	33,098	24,342	22,088	16,888	10,185	7,415	10,434
30	36,447	25,542	24,363	17,997	12,004	8,889	10,639
40	38,915	25,854	25,018	18,077	13,374	10,095	10,534
50	42,337	25,533	25,550	17,904	14,248	11,046	10,144
60	45,620	25,431	26,784	17,436	14,992	11,825	9,882
70	47,902	25,379	27,100	17,202	15,708	12,478	9,659
80	50,334	25,527	27,278	17,189	16,359	13,017	9,613
90	52,139	25,719	27,421	17,401	16,857	13,408	9,640
100	56,432	25,478	27,616	17,280	17,200	13,673	9,691
110	59,596	25,571	27,939	17,271	17,394	13,832	9,726
120	61,244	25,584	28,027	17,396	17,559	13,952	9,781
130	63,573	26,702	27,948	17,229	17,720	14,045	9,797
140	64,872	27,256	27,850	16,955	17,757	14,055	9,844
150	65,799	28,032	28,147	16,882	17,737	14,026	9,828
160	67,198	28,388	28,826	17,190	17,635	13,909	9,735
170	69,974	28,040	30,371	17,492	17,526	13,787	9,634
180	70,706	27,485	30,925	17,619	17,513	13,705	9,567
190	72,686	27,608	30,654	17,659	17,556	13,656	9,505
200	73,413	27,926	30,196	17,688	17,615	13,611	9,464
225	76,822	27,872	30,259	17,900	17,789	13,594	9,709
250	79,180	28,642	29,505	18,088	18,079	13,773	10,032
275	79,952	29,392	30,645	18,621	18,470	14,146	10,429
300	82,531	29,829	32,194	19,208	18,942	14,629	10,820
325	83,117	29,399	31,953	19,572	19,559	15,102	11,232
350	83,686	29,878	31,779	19,893	20,108	15,575	11,807
375	84,230	29,934	31,931	20,245	20,564	16,036	12,447
400	85,103	29,633	32,482	20,535	20,980	16,549	12,974
449	88,895	28,937	32,147	20,531	21,771	17,477	13,775
497	92,108	30,891	32,210	20,961	22,470	18,152	14,411
545	93,643	31,891	33,537	22,209	23,241	18,819	15,001
592	95,048	32,622	34,279	23,412	23,980	19,464	15,639
640	96,630	32,649	35,395	24,200	24,750	20,245	16,216
688	99,448	32,377	35,494	24,826	25,550	21,066	16,818
736	101,217	32,689	35,811	25,615	26,250	21,841	17,467
784	102,415	34,229	35,752	26,457	26,949	22,570	18,192
831	103,503	35,070	36,393	26,997	27,547	23,187	18,924
879	105,212	35,166	37,667	27,587	28,078	23,770	19,675
927	106,171	35,073	37,998	27,894	28,647	24,367	20,377
975	107,507	35,237	37,601	28,087	29,189	24,918	21,011

Table 5.2-9. Spawning WUA, Reach 2 mainstem.

Flow (cfs)	Surface Area	Chinook	Coho	Dolly Varden	Rainbow	Sockeye
10	31,269	236	1,777	7,073	5,290	1,642
20	35,944	2,018	2,924	10,244	8,147	2,645
30	39,224	4,515	3,928	11,888	9,810	3,465
40	41,713	6,728	4,786	12,883	11,160	4,062
50	42,780	8,097	5,355	13,047	12,015	4,549
60	43,867	9,385	5,545	12,789	12,449	4,880
70	44,472	10,434	5,608	12,381	12,633	5,053
80	45,042	11,408	5,758	12,118	12,717	5,119
90	45,761	12,109	5,796	11,983	12,681	5,064
100	45,828	12,687	5,770	11,590	12,594	4,933
110	46,574	13,085	5,746	11,124	12,472	4,811
120	47,242	13,195	5,676	10,575	12,286	4,759
130	47,876	13,171	5,615	10,130	12,092	4,708
140	50,679	13,176	5,581	9,785	11,885	4,655
150	51,632	13,177	5,504	9,438	11,640	4,611
160	53,836	13,170	5,347	9,046	11,219	4,526
170	54,513	13,161	5,209	8,703	10,796	4,448
180	55,164	13,127	5,123	8,363	10,424	4,398
190	55,791	13,089	5,047	8,112	10,082	4,350
200	59,112	13,046	4,959	7,873	9,802	4,300
225	59,322	12,897	4,796	7,310	9,353	4,162
250	59,404	12,717	4,558	7,339	9,048	4,040
275	59,481	12,622	4,331	7,526	8,994	4,055
300	59,554	12,543	4,100	7,764	8,889	4,202
325	59,623	12,162	4,242	8,331	8,907	4,364
350	59,688	11,710	4,630	8,922	8,976	4,618
375	59,751	11,342	5,084	9,181	8,934	4,954
400	59,811	10,900	5,630	9,275	8,846	5,271
450	59,925	10,399	6,638	9,137	8,719	5,764
500	60,021	10,586	7,235	8,554	8,790	6,168
550	60,109	11,238	7,407	7,987	8,913	6,502
600	60,192	11,728	7,195	7,394	8,755	6,623
650	60,270	11,805	6,877	6,746	8,318	6,520
700	60,345	11,629	6,447	6,149	7,697	6,308
750	60,416	10,973	6,025	5,599	7,035	5,953
800	60,485	10,339	5,600	5,177	6,427	5,584
850	60,602	9,740	5,171	4,785	5,820	5,191
900	60,947	9,251	4,748	4,433	5,253	4,845
950	61,280	8,806	4,313	4,079	4,695	4,498
1000	61,602	8,221	3,980	3,730	4,277	4,163

Table 5.2-10. Fry rearing WUA, Reach 2 mainstem.

Flow (cfs)	Surface Area	Chinook	Coho	Dolly Varden	Rainbow
10	31,269	24,484	17,008	25,081	12,448
20	35,944	21,904	12,212	22,542	10,279
30	39,224	19,647	9,281	20,897	9,021
40	41,713	18,503	8,125	20,274	8,840
50	42,780	17,904	8,141	19,172	8,746
60	43,867	17,343	8,198	18,113	8,482
70	44,472	17,321	8,259	17,079	8,500
80	45,042	17,179	8,372	16,362	8,356
90	45,761	16,837	8,091	15,516	7,996
100	45,828	15,673	7,069	13,822	7,452
110	46,574	15,078	6,781	13,169	7,093
120	47,242	14,397	6,399	12,664	6,652
130	47,876	13,904	6,218	12,310	6,394
140	50,679	13,635	6,176	12,268	6,223
150	51,632	13,409	6,042	12,528	6,087
160	53,836	13,175	6,078	13,129	5,998
170	54,513	13,533	6,771	13,850	6,262
180	55,164	13,971	7,531	14,554	6,462
190	55,791	14,685	8,340	15,133	6,842
200	59,112	15,181	8,671	15,476	7,000
225	59,322	16,823	9,436	16,726	7,710
250	59,404	18,729	11,185	17,467	8,315
275	59,481	19,851	11,163	16,729	8,070
300	59,554	20,304	10,182	15,607	7,761
325	59,623	19,273	8,434	14,550	7,125
350	59,688	17,989	7,441	13,621	6,627
375	59,751	16,816	6,775	12,783	6,172
400	59,811	16,192	6,148	11,976	5,768
450	59,925	14,987	5,196	10,575	5,161
500	60,021	14,175	4,327	9,318	4,591
550	60,109	13,244	3,539	8,165	4,074
600	60,192	12,325	2,920	7,157	3,688
650	60,270	11,415	2,466	6,225	3,344
700	60,345	10,622	2,117	5,481	3,036
750	60,416	9,947	1,803	4,817	2,758
800	60,485	9,419	1,615	4,310	2,491
850	60,602	8,954	1,460	3,904	2,213
900	60,947	8,544	1,266	3,562	1,920
950	61,280	8,215	1,158	3,305	1,693
1000	61,602	7,999	1,103	3,081	1,514

Table 5.2-11. Adult and juvenile rearing WUA, Reach 2 mainstem.

Flow (cfs)	Surface Area	Coho Juvenile	Dolly Varden Juvenile	Rainbow Juvenile	Dolly Varden Adult	Rainbow Adult	Chinook Juvenile
10	31,269	29,262	27,497	24,362	9,099	5,457	12,123
20	35,944	29,786	29,517	25,358	12,272	8,137	14,734
30	39,224	28,332	28,670	22,919	14,655	10,187	14,324
40	41,713	27,726	28,334	20,783	16,432	11,846	13,142
50	42,780	26,767	28,652	18,644	17,567	13,110	12,107
60	43,867	25,361	28,121	17,675	18,050	13,801	10,975
70	44,472	24,498	27,560	16,567	17,981	13,972	9,832
80	45,042	23,538	26,597	15,711	17,881	14,020	8,977
90	45,761	22,382	25,667	15,052	17,639	13,932	8,307
100	45,828	20,024	24,475	14,228	17,254	13,720	7,719
110	46,574	18,846	23,536	13,530	16,887	13,477	7,218
120	47,242	17,609	22,239	12,845	16,396	13,080	6,839
130	47,876	16,810	21,160	12,421	15,918	12,710	6,488
140	50,679	16,168	20,184	12,026	15,402	12,306	6,251
150	51,632	15,563	19,482	11,618	14,866	11,837	6,063
160	53,836	15,122	18,690	11,197	14,246	11,283	5,897
170	54,513	15,883	18,170	10,829	13,740	10,854	5,744
180	55,164	16,551	17,550	10,629	13,366	10,548	5,625
190	55,791	17,480	17,153	10,561	12,883	10,143	5,550
200	59,112	17,806	17,335	10,611	12,424	9,746	5,513
225	59,322	18,690	19,110	10,953	11,694	9,137	5,499
250	59,404	20,914	19,227	11,492	10,844	8,338	5,548
275	59,481	21,286	20,826	12,511	10,048	7,485	5,705
300	59,554	20,474	22,524	13,556	9,475	6,818	5,947
325	59,623	19,466	21,593	14,296	9,179	6,342	6,203
350	59,688	18,591	20,730	14,735	9,059	6,081	6,547
375	59,751	17,847	19,941	14,960	9,009	5,910	7,009
400	59,811	17,120	19,246	15,103	9,066	5,948	7,427
450	59,925	15,936	17,936	15,003	9,250	6,290	7,980
500	60,021	14,689	16,617	13,690	9,497	6,701	8,236
550	60,109	13,332	15,256	12,386	9,613	7,012	8,146
600	60,192	11,848	13,902	10,640	9,621	7,226	7,869
650	60,270	10,402	12,601	9,458	9,511	7,315	7,418
700	60,345	9,165	11,357	8,334	9,279	7,281	6,873
750	60,416	7,998	10,242	7,237	9,007	7,212	6,230
800	60,485	7,149	9,242	6,338	8,705	7,084	5,551
850	60,602	6,427	8,383	5,524	8,441	6,975	4,988
900	60,947	5,660	7,605	4,905	8,128	6,806	4,427
950	61,280	5,069	6,875	4,428	7,713	6,521	3,910
1000	61,602	4,714	6,198	3,977	7,278	6,218	3,449

Table 5.2-12. Spawning WUA, Reach 3 mainstem.

Flow (cfs)	Surface Area	Chinook	Coho	Dolly Varden	Rainbow	Sockeye
8.3	32,346	151	2,140	7,544	6,590	2,043
16.7	42,740	2,809	3,446	10,756	9,846	3,140
25.0	51,753	6,013	4,453	11,949	11,625	4,051
33.3	53,791	8,267	5,033	12,995	12,785	4,745
41.7	54,616	9,238	5,471	13,906	13,676	5,319
50.0	54,999	9,870	5,850	14,728	14,357	5,715
58.3	55,337	10,345	6,186	15,286	14,889	5,861
66.7	55,708	10,777	6,467	15,659	15,412	5,948
75.0	56,061	11,103	6,682	15,926	15,916	6,064
83.3	56,385	11,707	6,883	15,835	16,190	6,079
91.7	56,741	12,294	6,999	15,560	16,287	6,065
100.0	57,100	12,786	7,061	15,003	16,299	6,085
108.3	57,438	13,257	7,079	14,434	16,242	6,103
116.7	57,757	13,626	7,092	13,818	16,110	6,103
125.0	58,209	13,952	7,118	13,210	15,958	6,091
133.3	58,744	14,274	7,089	12,668	15,652	6,073
141.7	59,221	14,538	7,034	12,099	15,232	6,067
150.0	59,471	14,793	6,988	11,577	14,828	6,067
158.3	59,711	15,045	6,913	11,126	14,404	6,070
166.7	59,942	15,290	6,815	10,740	13,951	6,067
187.5	60,470	15,860	6,689	10,071	13,073	6,089
208.3	60,874	15,998	6,621	9,918	12,459	6,113
229.2	61,188	15,810	6,566	9,920	12,116	6,096
250.0	61,481	15,553	6,495	10,000	11,847	6,114
270.8	61,756	15,193	6,432	10,163	11,686	6,110
291.7	62,016	14,729	6,396	10,250	11,738	6,060
312.5	62,263	14,255	6,383	10,306	11,789	5,995
333.3	62,423	13,826	6,355	10,309	11,811	5,955
375.0	62,561	13,226	6,279	10,156	11,849	5,963
416.7	62,687	13,050	6,357	10,036	11,729	5,957
458.3	62,805	13,149	6,490	9,621	11,511	5,889
500.0	62,915	13,546	6,507	9,183	10,983	5,837
541.7	63,018	14,110	6,424	8,595	10,419	5,764
583.3	63,116	14,586	6,181	7,923	9,830	5,742
625.0	63,208	15,009	5,930	7,251	9,271	5,712
666.7	63,296	15,222	5,713	6,629	8,823	5,614
708.3	63,380	14,884	5,471	6,068	8,315	5,449
750.0	63,461	14,517	5,175	5,539	7,739	5,268
791.7	65,946	14,064	4,856	5,011	7,141	5,051
833.3	67,051	13,531	4,516	4,492	6,544	4,806

Table 5.2-13. Fry rearing WUA, Reach 3 mainstem.

Flow (cfs)	Surface Area	Chinook	Coho	Dolly Varden	Rainbow
8.3	32,346	29,903	24,015	28,929	18,070
16.7	42,740	27,783	19,495	31,277	16,562
25.0	51,753	32,397	23,690	37,584	21,026
33.3	53,791	37,491	28,419	40,047	25,608
41.7	54,616	39,662	29,949	39,638	28,192
50.0	54,999	39,510	29,277	38,241	28,807
58.3	55,337	38,353	28,323	36,938	28,327
66.7	55,708	37,058	27,333	35,748	27,686
75.0	56,061	36,010	26,648	34,864	26,992
83.3	56,385	35,130	26,300	34,113	26,331
91.7	56,741	34,238	26,009	33,206	25,691
100.0	57,100	33,467	25,731	32,454	25,077
108.3	57,438	33,022	25,576	31,901	24,397
116.7	57,757	32,807	25,451	31,465	23,987
125.0	58,209	32,662	25,266	31,075	23,625
133.3	58,744	32,519	25,010	30,755	23,370
141.7	59,221	32,490	24,939	30,625	23,268
150.0	59,471	32,419	24,906	30,551	23,106
158.3	59,711	32,313	24,863	30,541	22,970
166.7	59,942	32,271	24,705	30,441	22,781
187.5	60,470	32,325	24,402	29,809	22,288
208.3	60,874	31,741	23,640	28,949	21,222
229.2	61,188	30,960	22,764	28,099	20,267
250.0	61,481	30,149	21,962	27,459	19,498
270.8	61,756	29,567	21,285	26,810	18,785
291.7	62,016	29,133	20,440	25,930	17,973
312.5	62,263	28,412	19,381	25,086	17,179
333.3	62,423	27,590	18,427	24,343	16,544
375.0	62,561	26,275	17,093	22,990	15,545
416.7	62,687	25,178	15,794	21,365	14,326
458.3	62,805	23,923	14,483	19,862	13,193
500.0	62,915	22,575	13,320	18,473	12,105
541.7	63,018	21,392	12,292	17,186	11,080
583.3	63,116	20,290	11,421	15,962	10,154
625.0	63,208	19,388	10,606	14,783	9,293
666.7	63,296	18,495	9,837	13,675	8,489
708.3	63,380	17,617	9,113	12,636	7,761
750.0	63,461	16,802	8,446	11,668	7,096
791.7	65,946	16,033	7,784	11,085	6,525
833.3	67,051	15,306	7,202	10,921	6,003

Table 5.2-14. Adult and juvenile rearing WUA, Reach 3 mainstem.

Flow (cfs)	Surface Area	Coho Juvenile	Dolly Varden Juvenile	Rainbow Juvenile	Dolly Varden Adult	Rainbow Adult	Chinook Juvenile
8.3	32,346	31,450	28,955	23,971	9,234	5,651	13,061
16.7	42,740	34,698	30,328	28,111	14,041	9,778	20,164
25.0	51,753	42,000	34,550	28,848	17,586	12,986	21,726
33.3	53,791	47,541	38,414	28,524	20,444	15,469	21,837
41.7	54,616	47,877	41,083	27,222	22,991	17,630	21,626
50.0	54,999	46,658	41,986	26,976	25,135	19,593	21,289
58.3	55,337	44,853	41,567	26,666	26,736	21,284	21,205
66.7	55,708	43,208	41,281	26,091	28,008	22,832	21,042
75.0	56,061	42,041	40,631	25,541	28,966	24,061	21,075
83.3	56,385	40,962	39,686	25,369	29,504	24,837	21,234
91.7	56,741	39,725	38,939	25,206	29,740	25,210	21,445
100.0	57,100	38,428	38,245	24,800	29,590	25,158	21,704
108.3	57,438	37,718	37,267	24,535	29,210	24,875	22,031
116.7	57,757	37,115	36,286	24,419	28,658	24,447	22,394
125.0	58,209	36,489	35,523	24,370	28,153	24,072	22,705
133.3	58,744	35,996	34,997	24,409	27,663	23,691	22,952
141.7	59,221	35,733	34,467	24,227	27,120	23,277	23,191
150.0	59,471	35,630	33,725	23,932	26,715	22,979	23,393
158.3	59,711	35,283	33,039	23,691	26,199	22,541	23,550
166.7	59,942	34,978	32,723	23,548	25,742	22,183	23,663
187.5	60,470	34,765	32,932	23,482	25,767	22,337	23,562
208.3	60,874	33,703	32,841	23,485	25,804	22,450	23,027
229.2	61,188	32,593	32,547	23,206	26,065	22,658	22,302
250.0	61,481	32,021	31,751	23,072	26,377	22,784	21,574
270.8	61,756	31,400	31,112	23,073	26,648	22,950	21,048
291.7	62,016	30,646	31,096	23,141	27,007	23,269	20,495
312.5	62,263	29,686	30,678	23,204	27,252	23,555	19,859
333.3	62,423	28,925	29,963	23,101	27,401	23,813	19,144
375.0	62,561	27,843	28,692	22,507	27,118	23,963	17,875
416.7	62,687	26,500	27,786	22,075	26,191	23,719	16,610
458.3	62,805	25,039	26,597	21,327	25,305	23,408	15,275
500.0	62,915	23,599	25,013	20,452	23,998	22,464	13,960
541.7	63,018	22,180	23,373	19,466	22,471	21,088	12,676
583.3	63,116	20,746	21,929	18,236	21,225	19,922	11,439
625.0	63,208	19,330	20,595	16,969	20,149	18,937	10,263
666.7	63,296	17,939	19,345	15,917	19,182	18,064	9,150
708.3	63,380	16,580	18,060	14,781	18,102	17,084	8,082
750.0	63,461	15,369	16,819	13,659	16,966	16,036	7,096
791.7	65,946	14,198	15,606	12,649	15,807	14,950	6,193
833.3	67,051	13,045	14,424	11,619	14,688	13,912	5,348

Table 5.2-15. Spawning WUA, Reach 3 side channels.

Flow (cfs)	Surface Area	Chinook	Coho	Dolly Varden	Rainbow	Sockeye
2	32,404	0	145	1,049	657	147
3	35,974	22	424	2,503	1,568	345
5	36,746	146	765	3,167	2,113	608
7	37,374	435	1,184	3,825	2,622	903
8	38,000	910	1,590	4,357	3,090	1,223
10	38,499	1,310	2,006	4,884	3,524	1,639
12	38,832	1,743	2,436	5,359	3,939	2,057
13	39,610	2,172	2,965	5,858	4,343	2,448
15	40,349	2,442	3,400	6,240	4,700	2,803
17	40,848	2,749	3,817	6,372	5,005	3,153
18	41,832	3,055	4,191	6,502	5,294	3,472
20	42,914	3,364	4,469	6,637	5,570	3,761
22	43,608	3,646	4,705	6,743	5,802	3,977
23	44,579	3,935	4,863	6,843	6,026	4,179
25	45,959	4,234	4,959	6,918	6,248	4,373
27	47,801	4,480	5,036	6,999	6,453	4,545
28	48,964	4,707	5,103	7,068	6,642	4,683
30	50,155	4,932	5,155	7,127	6,826	4,802
32	50,737	5,087	5,209	7,192	6,990	4,877
33	50,652	5,152	5,256	7,244	7,085	4,880
37	51,649	5,312	5,391	7,346	7,299	4,905
42	53,245	5,483	5,519	7,409	7,492	4,945
46	53,965	5,577	5,652	7,435	7,670	4,970
50	54,889	5,674	5,782	7,381	7,769	4,996
54	55,932	5,778	5,914	7,322	7,867	5,023
58	56,809	5,880	6,022	7,273	7,939	5,055
63	57,610	6,020	6,086	7,181	7,944	5,098
67	58,643	6,173	6,126	7,071	7,944	5,147
75	60,644	6,491	6,152	6,876	7,945	5,243
83	62,013	6,794	6,161	6,830	8,020	5,341
92	63,301	7,060	6,132	6,821	8,052	5,480
100	66,612	7,259	6,195	6,876	8,065	5,607
108	68,209	7,384	6,283	6,932	8,038	5,722
117	69,816	7,486	6,367	6,892	8,001	5,840
125	70,918	7,589	6,404	6,875	7,962	5,938
133	72,029	7,684	6,389	6,833	7,912	6,032
142	72,825	7,777	6,380	6,794	7,832	6,103
150	73,607	7,851	6,386	6,778	7,721	6,150
158	74,279	7,930	6,408	6,782	7,627	6,204
167	74,940	8,022	6,433	6,787	7,550	6,268

Table 5.2-16. Fry rearing WUA, Reach 3 side channels.

Flow (cfs)	Surface Area	Chinook	Coho	Dolly Varden	Rainbow
2	32,404	22,323	22,277	26,991	18,292
3	35,974	25,215	22,852	30,218	19,446
5	36,746	27,267	24,050	31,763	21,018
7	37,374	29,224	25,275	32,287	22,493
8	38,000	30,415	25,671	31,902	23,178
10	38,499	30,862	25,498	31,434	23,315
12	38,832	30,766	25,155	31,050	23,086
13	39,610	30,535	24,685	30,709	22,802
15	40,349	30,203	24,143	30,354	22,357
17	40,848	29,861	23,773	30,169	22,022
18	41,832	29,597	23,642	30,137	21,747
20	42,914	29,452	23,682	30,285	21,470
22	43,608	29,352	23,741	30,461	21,246
23	44,579	29,331	23,861	30,730	21,109
25	45,959	29,478	24,017	31,090	21,088
27	47,801	29,673	24,218	31,644	21,225
28	48,964	30,074	24,650	32,342	21,567
30	50,155	30,551	25,077	33,151	21,955
32	50,737	31,169	25,546	33,924	22,485
33	50,652	31,654	25,860	34,322	22,900
37	51,649	33,499	27,422	35,539	24,613
42	53,245	34,885	28,475	36,432	25,997
46	53,965	35,822	28,986	37,076	26,914
50	54,889	36,607	29,534	37,645	27,617
54	55,932	37,383	30,032	38,104	28,225
58	56,809	38,124	30,490	38,521	28,835
63	57,610	38,662	30,714	38,790	29,231
67	58,643	39,018	30,844	39,032	29,373
75	60,644	39,565	30,889	39,536	29,487
83	62,013	39,760	30,766	39,885	29,298
92	63,301	39,881	30,823	40,280	28,996
100	66,612	40,211	31,035	41,030	28,819
108	68,209	41,030	31,401	42,020	29,003
117	69,816	41,875	31,972	43,118	29,211
125	70,918	43,232	32,856	43,864	29,819
133	72,029	44,353	33,367	44,203	30,269
142	72,825	45,195	33,969	44,515	30,553
150	73,607	45,822	33,892	44,250	30,782
158	74,279	45,958	33,364	43,959	30,476
167	74,940	45,714	32,547	43,485	29,934

Table 5.2-17. Adult and juvenile rearing WUA, Reach 3 side channels.

Flow (cfs)	Surface Area	Coho Juvenile	Dolly Varden Juvenile	Rainbow Juvenile	Dolly Varden Adult	Rainbow Adult	Chinook Juvenile
2	32,404	24,355	15,607	7,862	1,834	683	2,237
3	35,974	29,181	19,229	11,332	2,804	1,129	3,673
5	36,746	32,701	22,900	14,102	3,666	1,625	4,870
7	37,374	34,866	25,736	16,597	4,480	2,093	5,849
8	38,000	35,912	28,202	18,334	5,298	2,566	6,670
10	38,499	35,795	29,682	19,282	6,074	3,029	7,475
12	38,832	35,610	30,199	20,054	6,841	3,523	8,170
13	39,610	35,078	30,352	20,536	7,574	4,065	8,828
15	40,349	34,495	30,539	20,864	8,281	4,591	9,444
17	40,848	33,987	30,666	20,965	8,945	5,106	9,984
18	41,832	33,959	30,675	20,948	9,596	5,625	10,504
20	42,914	33,938	30,560	20,924	10,228	6,140	11,043
22	43,608	33,848	30,509	20,951	10,795	6,632	11,541
23	44,579	33,847	30,561	21,005	11,341	7,121	12,015
25	45,959	33,955	30,695	21,111	11,846	7,588	12,462
27	47,801	34,144	30,625	21,226	12,338	8,042	12,877
28	48,964	34,830	30,571	21,287	12,783	8,461	13,296
30	50,155	35,338	30,574	21,355	13,219	8,869	13,713
32	50,737	35,978	30,789	21,429	13,631	9,257	14,095
33	50,652	36,303	31,047	21,583	14,028	9,631	14,476
37	51,649	38,567	32,172	22,176	14,995	10,530	15,392
42	53,245	39,997	33,173	22,918	15,864	11,360	16,235
46	53,965	40,783	34,151	23,583	16,666	12,118	17,034
50	54,889	41,863	35,035	24,237	17,451	12,870	17,860
54	55,932	42,780	36,157	25,018	18,180	13,601	18,611
58	56,809	43,247	37,372	25,764	18,939	14,335	19,372
63	57,610	43,825	38,544	26,538	19,718	15,087	20,098
67	58,643	44,373	39,265	27,335	20,516	15,826	20,828
75	60,644	45,008	40,662	29,001	22,087	17,220	22,403
83	62,013	45,615	41,562	30,667	23,596	18,633	23,900
92	63,301	46,227	42,267	31,945	25,103	20,091	25,435
100	66,612	47,115	42,839	33,153	26,502	21,568	26,917
108	68,209	48,170	44,016	34,122	27,884	22,972	28,142
117	69,816	49,601	44,867	35,043	29,235	24,286	29,104
125	70,918	51,261	46,516	36,011	30,606	25,521	29,966
133	72,029	52,297	48,352	37,072	32,003	26,817	30,770
142	72,825	53,419	49,259	38,047	33,382	28,084	31,367
150	73,607	53,886	50,591	38,975	34,784	29,417	31,965
158	74,279	53,915	51,312	39,799	36,116	30,783	32,531
167	74,940	53,733	51,945	40,625	37,452	32,214	33,044

Table 5.2-18. Spawning WUA, Reach 3 combined.

Flow (cfs)	Surface Area	Chinook	Coho	Dolly Varden	Rainbow	Sockeye
10	64,750	151	2,284	8,593	7,247	2,190
20	78,714	2,831	3,870	13,259	11,415	3,485
30	88,499	6,159	5,218	15,116	13,738	4,659
40	91,165	8,702	6,217	16,820	15,407	5,649
50	92,616	10,147	7,060	18,263	16,765	6,543
60	93,498	11,181	7,856	19,612	17,880	7,354
70	94,169	12,088	8,622	20,644	18,829	7,918
80	95,319	12,949	9,431	21,517	19,755	8,396
90	96,410	13,545	10,082	22,165	20,616	8,867
100	97,233	14,456	10,700	22,207	21,195	9,232
110	98,573	15,349	11,190	22,063	21,580	9,537
120	100,014	16,149	11,529	21,640	21,869	9,845
130	101,045	16,903	11,784	21,177	22,044	10,079
140	102,336	17,561	11,954	20,661	22,136	10,282
150	104,168	18,187	12,077	20,129	22,206	10,464
160	106,545	18,754	12,125	19,667	22,105	10,617
170	108,184	19,245	12,136	19,167	21,874	10,751
180	109,626	19,725	12,143	18,704	21,654	10,869
190	110,447	20,132	12,122	18,318	21,394	10,948
200	110,594	20,442	12,071	17,985	21,036	10,947
225	112,119	21,107	11,997	17,242	20,233	10,923
250	114,119	21,337	11,966	16,990	19,636	10,928
275	115,152	21,137	11,950	16,901	19,280	10,877
300	116,369	20,857	11,918	16,865	18,925	10,871
325	117,688	20,456	11,898	16,956	18,689	10,851
350	118,825	19,913	11,891	17,030	18,678	10,797
375	119,873	19,374	11,878	17,076	18,637	10,749
400	121,066	18,871	11,853	17,097	18,618	10,743
450	123,205	18,059	11,776	17,083	18,688	10,842
500	124,701	17,640	11,870	17,311	18,809	10,946
550	126,106	17,439	12,055	17,295	18,950	11,024
600	129,527	17,568	12,305	17,202	18,892	11,123
650	131,227	17,893	12,544	16,941	18,799	11,228
700	132,932	18,226	12,659	16,495	18,664	11,424
750	134,126	18,640	12,747	16,089	18,555	11,610
800	135,325	18,998	12,809	15,673	18,493	11,770
850	136,205	18,906	12,786	15,378	18,221	11,844
900	137,068	18,864	12,731	15,111	17,873	11,896
950	140,225	18,829	12,650	14,845	17,519	11,927
1,000	141,991	18,804	12,544	14,585	17,190	11,965

Table 5.2-19. Fry rearing WUA, Reach 3 combined.

Flow (cfs)	Surface Area	Chinook	Coho	Dolly Varden	Rainbow
10	64,750	52,226	46,291	55,920	36,361
20	78,714	52,997	42,348	61,496	36,008
30	88,499	59,664	47,740	69,348	42,044
40	91,165	66,715	53,693	72,335	48,101
50	92,616	70,077	55,620	71,540	51,370
60	93,498	70,372	54,775	69,675	52,122
70	94,169	69,119	53,478	67,988	51,412
80	95,319	67,593	52,018	66,457	50,488
90	96,410	66,214	50,791	65,218	49,349
100	97,233	64,991	50,073	64,282	48,353
110	98,573	63,835	49,651	63,342	47,438
120	100,014	62,919	49,413	62,739	46,547
130	101,045	62,374	49,317	62,362	45,643
140	102,336	62,138	49,312	62,195	45,097
150	104,168	62,140	49,283	62,165	44,713
160	106,545	62,192	49,227	62,399	44,595
170	108,184	62,564	49,588	62,967	44,835
180	109,626	62,969	49,983	63,702	45,061
190	110,447	63,482	50,409	64,465	45,455
200	110,594	63,925	50,565	64,763	45,680
225	112,119	66,090	52,168	65,613	47,156
250	114,119	67,208	52,816	65,959	47,738
275	115,152	67,710	52,794	66,092	47,958
300	116,369	68,027	52,868	66,379	48,157
325	117,688	68,566	53,017	66,559	48,335
350	118,825	69,246	52,929	66,469	48,410
375	119,873	69,410	52,356	66,270	48,283
400	121,066	69,274	51,776	66,138	48,049
450	123,205	69,116	50,981	66,069	47,660
500	124,701	68,873	50,083	65,566	46,653
550	126,106	68,353	49,263	65,160	45,600
600	129,527	67,872	48,721	65,152	44,692
650	131,227	68,046	48,444	65,438	44,191
700	132,932	68,302	48,527	65,857	43,791
750	134,126	69,294	48,952	65,930	43,817
800	135,325	70,016	49,023	65,639	43,693
850	136,205	70,429	49,185	65,348	43,421
900	137,068	70,635	48,709	64,528	43,129
950	140,225	70,363	47,729	64,037	42,428
1,000	141,991	69,729	46,550	63,809	41,537

Table 5.2-20. Adult and juvenile rearing WUA, Reach 3 combined.

Flow (cfs)	Surface Area	Coho Juvenile	Dolly Varden Juvenile	Rainbow Juvenile	Dolly Varden Adult	Rainbow Adult	Chinook Juvenile
10	64,750	55,805	44,562	31,833	11,068	6,334	15,298
20	78,714	63,879	49,557	39,443	16,845	10,908	23,837
30	88,499	74,701	57,450	42,950	21,253	14,611	26,596
40	91,165	82,407	64,151	45,121	24,924	17,562	27,685
50	92,616	83,789	69,285	45,556	28,289	20,196	28,296
60	93,498	82,453	71,668	46,258	31,209	22,621	28,764
70	94,169	80,463	71,767	46,720	33,577	24,807	29,375
80	95,319	78,286	71,633	46,627	35,582	26,897	29,870
90	96,410	76,537	71,169	46,404	37,247	28,653	30,520
100	97,233	74,949	70,352	46,335	38,449	29,943	31,217
110	98,573	73,684	69,614	46,154	39,336	30,835	31,949
120	100,014	72,366	68,804	45,724	39,818	31,298	32,747
130	101,045	71,565	67,776	45,486	40,005	31,507	33,572
140	102,336	70,962	66,847	45,424	39,999	31,568	34,409
150	104,168	70,444	66,218	45,481	40,000	31,660	35,166
160	106,545	70,140	65,622	45,635	40,001	31,733	35,829
170	108,184	70,563	65,038	45,515	39,903	31,738	36,487
180	109,626	70,967	64,298	45,288	39,934	31,849	37,106
190	110,447	71,261	63,827	45,120	39,829	31,797	37,646
200	110,594	71,281	63,770	45,131	39,770	31,814	38,139
225	112,119	73,508	65,027	45,736	40,466	32,590	38,954
250	114,119	74,137	65,938	46,623	41,099	33,273	39,262
275	115,152	74,120	66,702	47,211	41,963	34,050	39,336
300	116,369	74,969	66,953	47,987	42,952	34,829	39,434
325	117,688	75,642	67,674	49,059	43,920	35,705	39,659
350	118,825	75,760	69,197	50,172	45,133	36,859	39,867
375	119,873	75,809	70,351	51,357	46,389	38,123	39,957
400	121,066	76,034	70,790	52,441	47,671	39,433	39,971
450	123,205	76,558	71,880	54,334	49,847	41,805	40,278
500	124,701	76,888	72,964	56,506	51,565	44,066	40,510
550	126,106	77,039	73,572	57,967	53,406	46,421	40,710
600	129,527	77,442	73,731	59,201	54,890	48,351	40,876
650	131,227	77,983	74,403	60,078	56,075	49,702	40,818
700	132,932	78,820	74,825	60,629	57,314	50,963	40,542
750	134,126	79,817	76,037	61,039	58,625	52,202	40,229
800	135,325	80,180	77,497	61,753	60,069	53,613	39,920
850	136,205	80,559	77,950	62,211	61,380	54,873	39,448
900	137,068	80,415	78,834	62,599	62,643	56,115	39,061
950	140,225	79,839	79,120	62,991	63,815	57,342	38,724
1,000	141,991	79,013	79,317	63,275	65,012	58,675	38,392

Table 5.2-21. Spawning WUA, Reach 4.

Flow (cfs)	Surface Area	Chinook	Coho	Dolly Varden	Rainbow	Sockeye
10	26,670	185	544	2,236	1,971	550
20	30,139	1,464	775	3,017	2,559	743
30	34,570	2,006	969	3,505	3,071	911
40	36,574	2,174	1,028	3,991	3,452	967
50	38,660	2,441	1,090	4,402	3,773	1,055
60	40,667	2,738	1,174	4,754	4,107	1,080
70	42,620	3,048	1,354	4,889	4,403	1,157
80	44,566	3,365	1,558	4,998	4,644	1,217
90	46,415	3,557	1,686	5,002	4,782	1,265
100	49,000	3,721	1,759	4,953	4,850	1,292
110	52,800	3,889	1,810	4,707	4,909	1,320
120	56,740	3,991	1,874	4,381	4,936	1,335
130	59,240	4,099	1,975	4,053	4,988	1,342
140	60,292	4,256	2,029	3,819	4,990	1,337
150	61,602	4,449	2,025	3,607	4,934	1,324
160	62,806	4,613	1,974	3,394	4,869	1,309
170	64,650	4,763	1,890	3,204	4,779	1,315
180	65,848	4,934	1,788	3,144	4,668	1,324
190	66,802	5,103	1,702	3,169	4,568	1,329
200	67,725	5,250	1,617	3,363	4,556	1,335
225	74,079	5,591	1,457	3,819	4,488	1,429
250	79,270	5,822	1,454	4,324	4,454	1,554
275	81,701	5,905	1,572	4,740	4,488	1,696
300	83,832	5,821	1,819	5,095	4,686	1,843
325	85,750	5,781	2,074	5,422	4,998	2,012
350	86,453	5,748	2,303	5,823	5,363	2,159
375	88,054	5,773	2,541	6,238	5,742	2,345
400	89,335	5,829	2,883	6,539	6,093	2,590
450	90,523	5,841	3,841	7,110	6,597	3,088
500	91,751	5,994	4,768	7,506	7,070	3,664
550	93,681	6,720	5,471	7,785	7,520	4,256
600	95,014	7,536	5,929	7,889	7,936	4,910
650	96,226	8,305	6,365	7,962	8,353	5,441
700	97,352	8,939	6,777	7,877	8,639	5,813
750	97,717	9,486	7,062	7,699	8,749	6,068
800	97,998	9,853	7,188	7,449	8,727	6,225
850	98,378	10,233	7,230	7,068	8,664	6,309
900	98,776	10,535	7,173	6,616	8,525	6,302
950	99,160	10,766	7,058	6,120	8,335	6,227
1000	99,532	10,945	6,896	5,592	8,105	6,128

Table 5.2-22. Fry rearing WUA, Reach 4.

Flow (cfs)	Surface Area	Chinook	Coho	Dolly Varden	Rainbow
10	26,670	18,442	12,221	19,236	9,760
20	30,139	16,802	8,756	17,377	7,684
30	34,570	15,620	6,142	15,838	6,484
40	36,574	14,257	4,940	14,713	6,261
50	38,660	13,152	4,220	13,134	6,098
60	40,667	12,075	3,619	11,613	5,507
70	42,620	10,940	3,208	10,709	4,978
80	44,566	10,314	3,265	10,401	4,735
90	46,415	10,071	3,494	10,477	4,490
100	49,000	10,279	4,036	11,063	4,631
110	52,800	10,499	4,279	11,693	4,739
120	56,740	11,092	4,964	12,891	5,103
130	59,240	11,823	5,830	14,484	5,496
140	60,292	12,979	7,044	16,086	6,244
150	61,602	14,492	8,673	17,530	7,390
160	62,806	16,358	10,447	18,546	8,785
170	64,650	18,073	11,808	19,291	9,883
180	65,848	19,413	12,662	19,769	10,562
190	66,802	20,384	13,255	20,171	10,970
200	67,725	20,399	12,373	19,942	10,397
225	74,079	21,498	12,544	20,757	10,416
250	79,270	22,425	12,843	23,419	10,891
275	81,701	24,854	15,465	26,401	13,252
300	83,832	27,779	17,970	28,068	16,275
325	85,750	30,111	19,663	28,928	18,663
350	86,453	31,279	20,564	29,410	19,897
375	88,054	32,251	21,350	29,472	20,978
400	89,335	32,455	21,376	29,394	21,267
450	90,523	32,735	21,875	29,271	21,523
500	91,751	33,046	22,166	28,553	21,477
550	93,681	32,651	21,466	27,666	20,951
600	95,014	31,974	20,882	27,308	20,337
650	96,226	31,851	20,803	26,810	20,269
700	97,352	31,520	20,340	25,964	19,792
750	97,717	30,693	19,582	24,842	18,906
800	97,998	29,739	18,726	23,398	17,895
850	98,378	28,622	17,763	22,079	16,591
900	98,776	27,561	16,766	20,819	15,254
950	99,160	26,581	15,914	19,613	13,995
1000	99,532	25,675	14,931	18,221	12,842

Table 5.2-23. Adult and juvenile rearing WUA, Reach 4.

Flow (cfs)	Surface Area	Coho Juvenile	Dolly Varden Juvenile	Rainbow Juvenile	Dolly Varden Adult	Rainbow Adult	Chinook Juvenile
10	26,670	23,007	20,878	16,763	6,918	4,331	8,740
20	30,139	23,616	23,698	17,770	9,383	6,231	9,523
30	34,570	23,097	24,619	16,690	11,083	7,557	8,701
40	36,574	22,337	23,913	15,373	12,336	8,560	7,763
50	38,660	20,686	23,238	13,693	13,135	9,254	6,983
60	40,667	18,309	22,903	12,365	13,755	9,865	6,374
70	42,620	15,730	21,501	11,445	13,924	10,149	5,847
80	44,566	15,060	19,721	10,112	13,928	10,340	5,386
90	46,415	14,299	18,133	8,966	13,745	10,348	5,013
100	49,000	14,076	17,180	8,226	13,283	10,085	4,675
110	52,800	13,818	16,673	7,662	12,660	9,676	4,350
120	56,740	14,050	15,978	7,260	12,010	9,226	4,022
130	59,240	14,759	15,599	7,022	11,587	8,964	3,744
140	60,292	16,053	15,452	6,947	11,189	8,701	3,520
150	61,602	18,050	15,729	7,064	10,770	8,419	3,339
160	62,806	20,022	16,996	7,345	10,343	8,119	3,183
170	64,650	21,234	18,518	7,763	10,000	7,830	3,080
180	65,848	21,932	20,116	8,386	9,685	7,522	3,017
190	66,802	22,136	21,320	8,987	9,491	7,268	2,984
200	67,725	22,493	21,989	9,726	9,447	7,099	3,057
225	74,079	23,948	22,617	11,922	9,506	6,710	3,541
250	79,270	24,965	23,482	13,700	9,418	6,451	4,298
275	81,701	28,884	23,627	14,706	9,314	6,256	5,038
300	83,832	31,406	25,964	15,351	9,363	6,281	5,751
325	85,750	32,893	28,585	15,972	9,635	6,451	6,505
350	86,453	33,716	29,496	16,857	10,102	6,704	7,249
375	88,054	34,441	30,358	17,828	10,566	6,926	8,223
400	89,335	34,074	31,304	18,825	11,013	7,179	9,255
450	90,523	34,230	31,500	20,461	11,883	7,829	11,313
500	91,751	33,989	32,163	21,582	12,973	8,675	13,141
550	93,681	32,816	32,205	22,093	14,153	9,658	14,474
600	95,014	32,135	30,985	21,937	15,317	10,697	15,444
650	96,226	31,638	30,515	21,692	16,305	11,683	16,251
700	97,352	30,513	30,712	21,571	17,192	12,618	16,788
750	97,717	29,162	30,194	21,346	17,980	13,361	17,055
800	97,998	27,822	29,445	21,143	18,520	13,943	17,056
850	98,378	26,343	28,122	20,767	18,810	14,419	16,870
900	98,776	24,941	26,837	20,172	18,822	14,752	16,509
950	99,160	23,488	25,449	19,207	18,691	14,888	16,023
1000	99,532	21,921	24,511	18,274	18,431	14,859	15,384

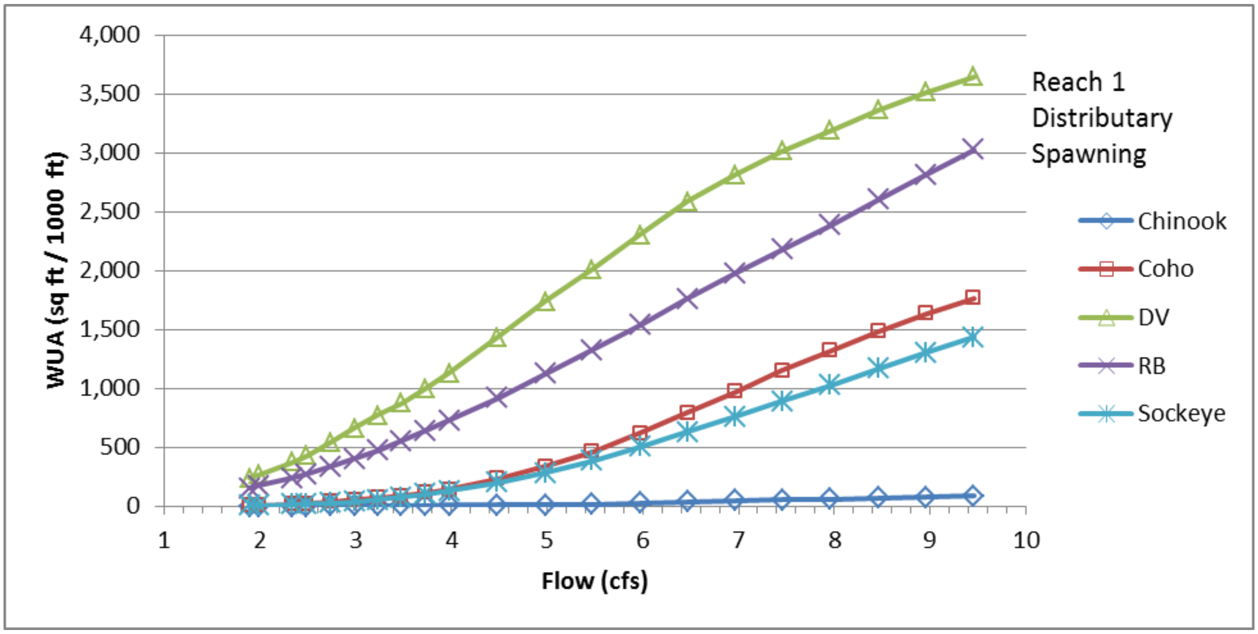

Figure 5.2-1. Spawning WUA, Reach 1 distributary.

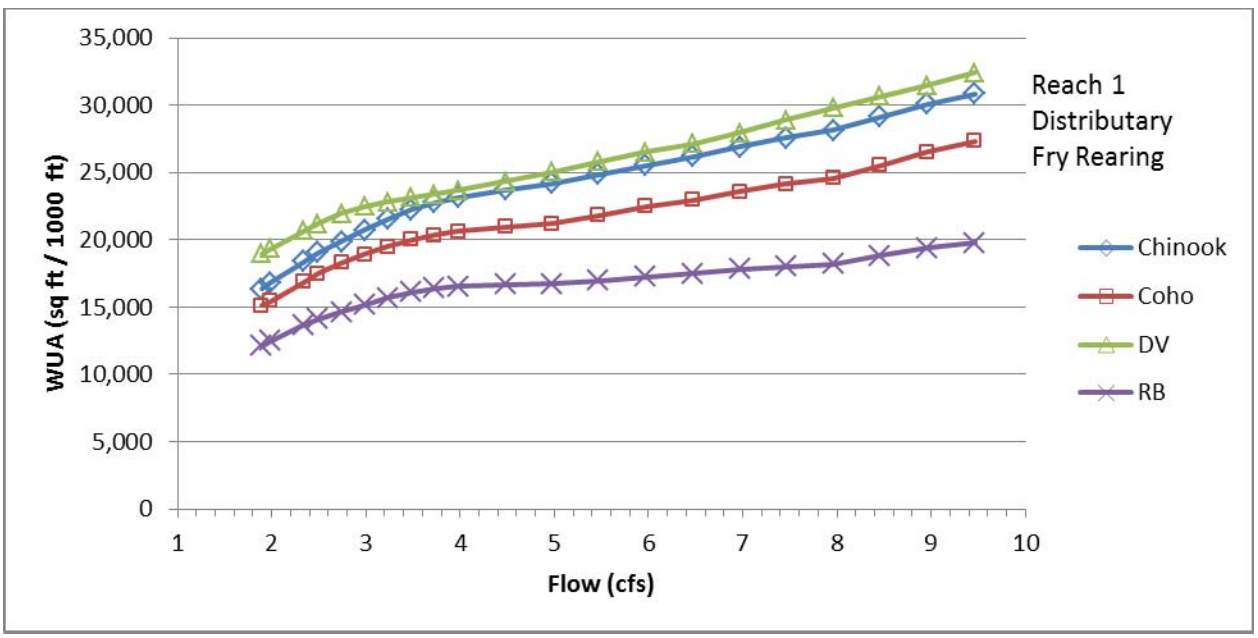

Figure 5.2-2. Fry rearing WUA, Reach 1 distributary.

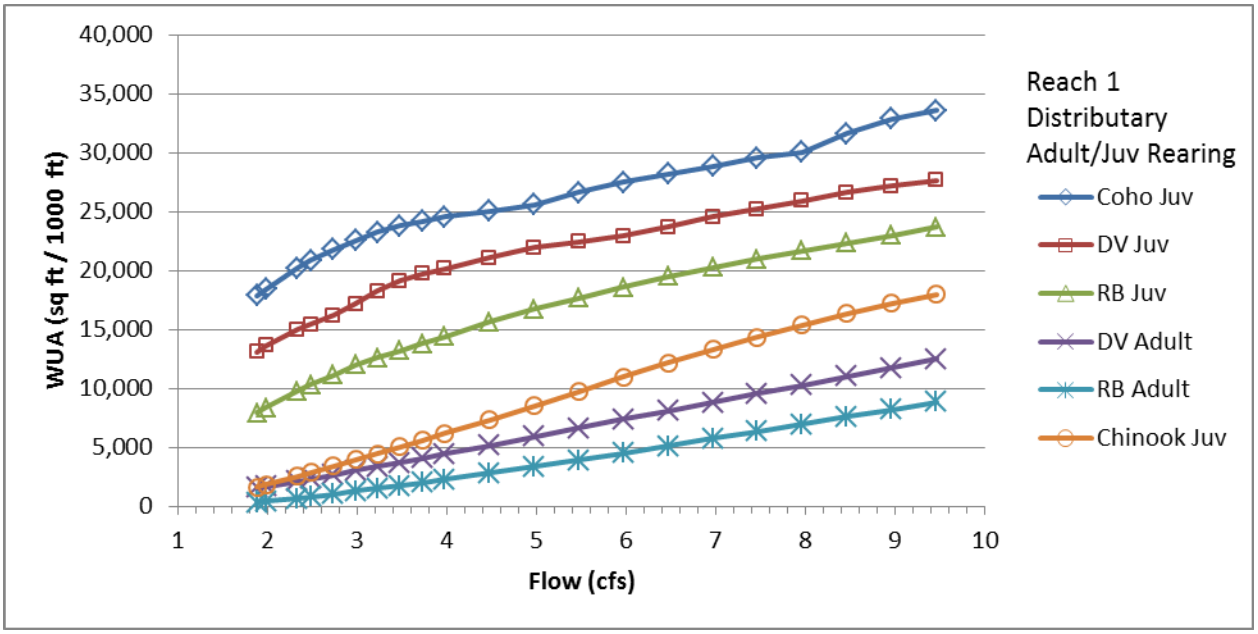

Figure 5.2-3. Adult and juvenile rearing WUA, Reach 1 distributary.

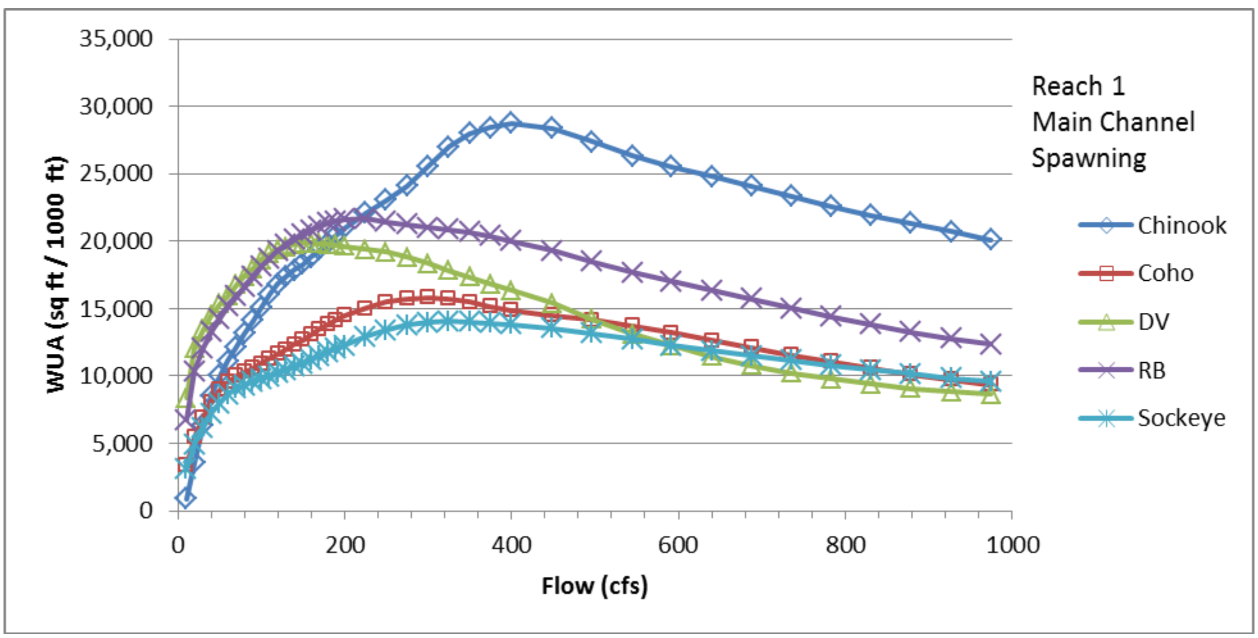

Figure 5.2-4. Spawning WUA, Reach 1 mainstem.

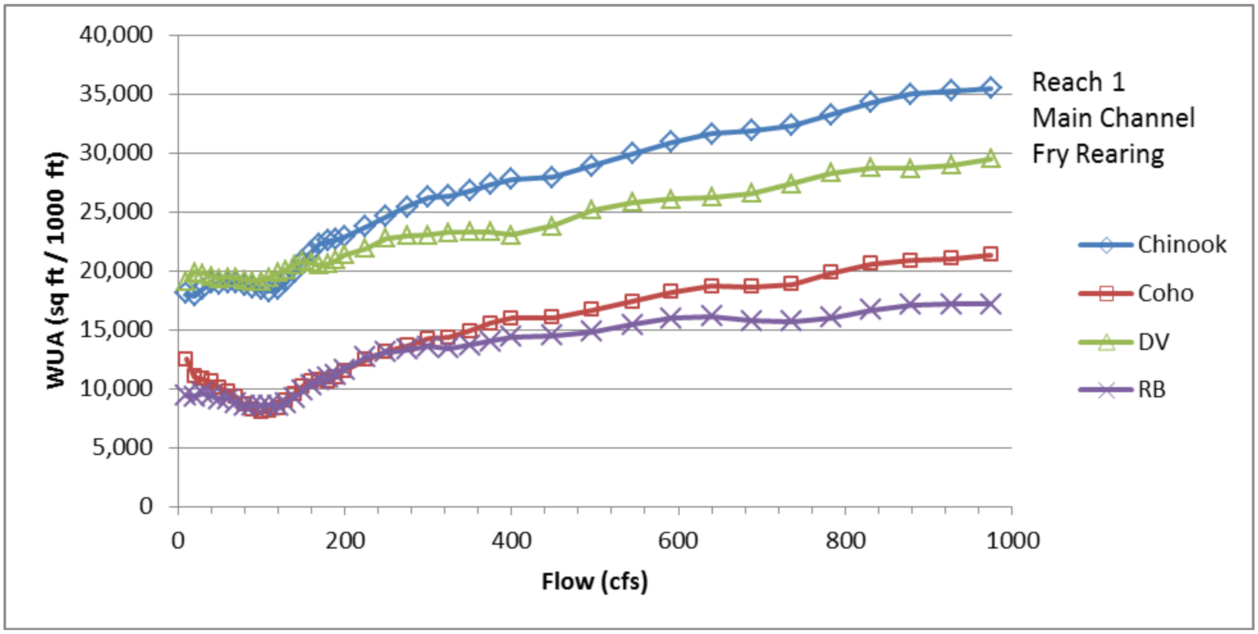

Figure 5.2-5. Fry rearing WUA, Reach 1 mainstem.

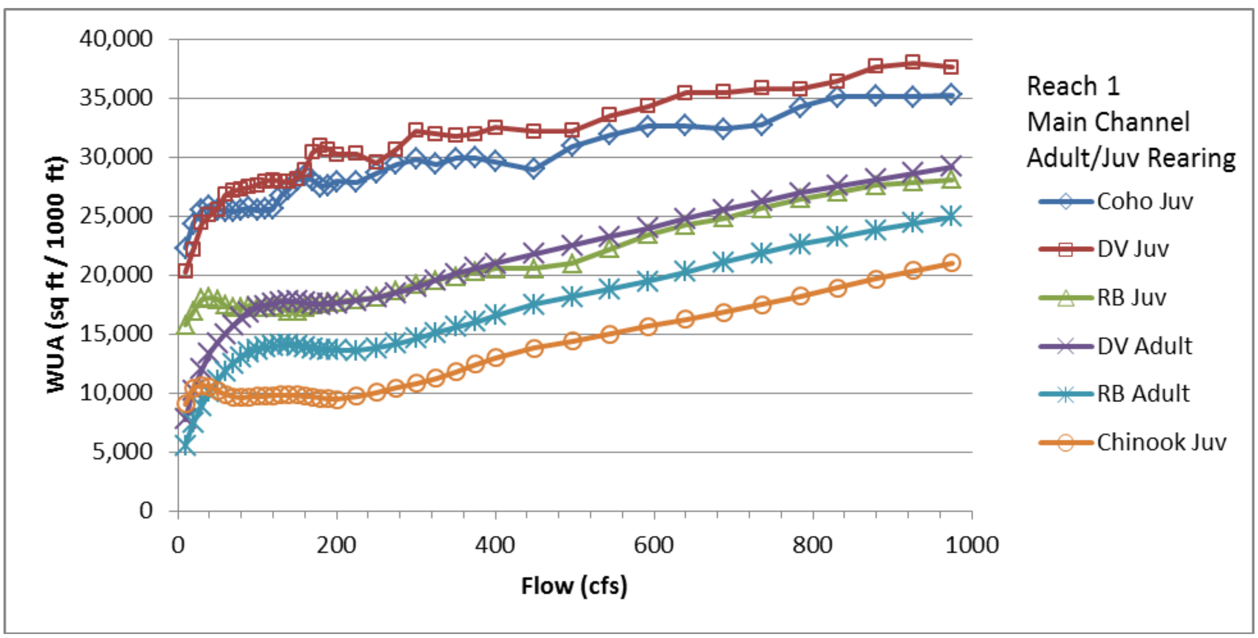

Figure 5.2-6. Adult and juvenile rearing WUA, Reach 1 mainstem.

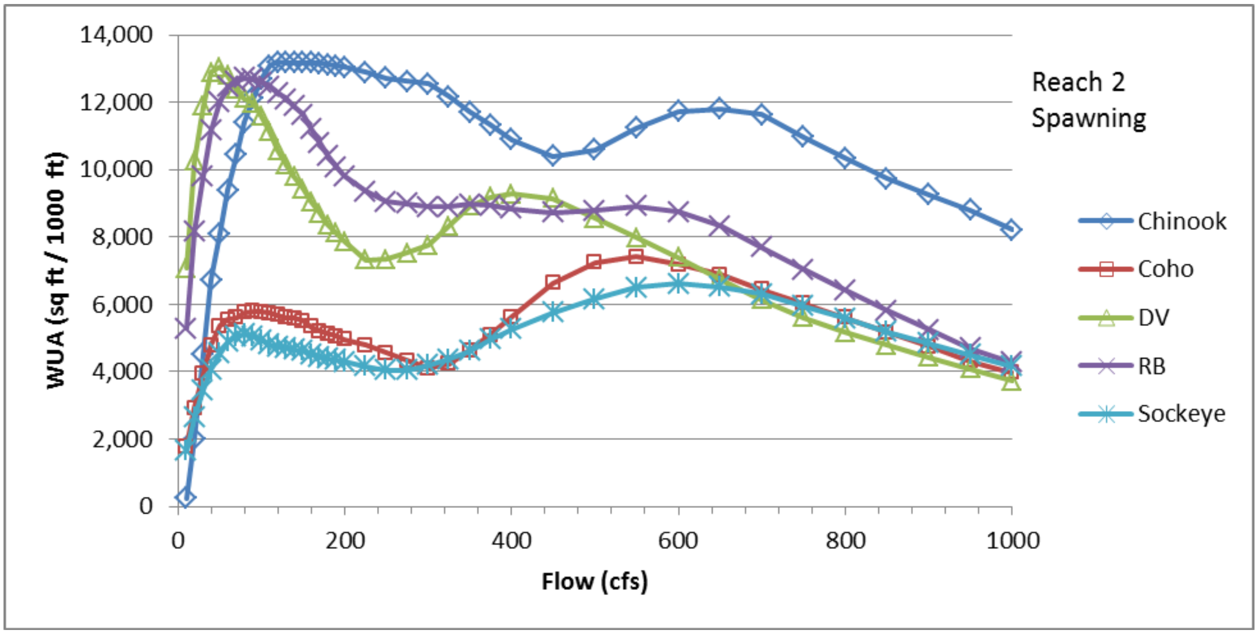

Figure 5.2-7. Spawning WUA, Reach 2 mainstem.

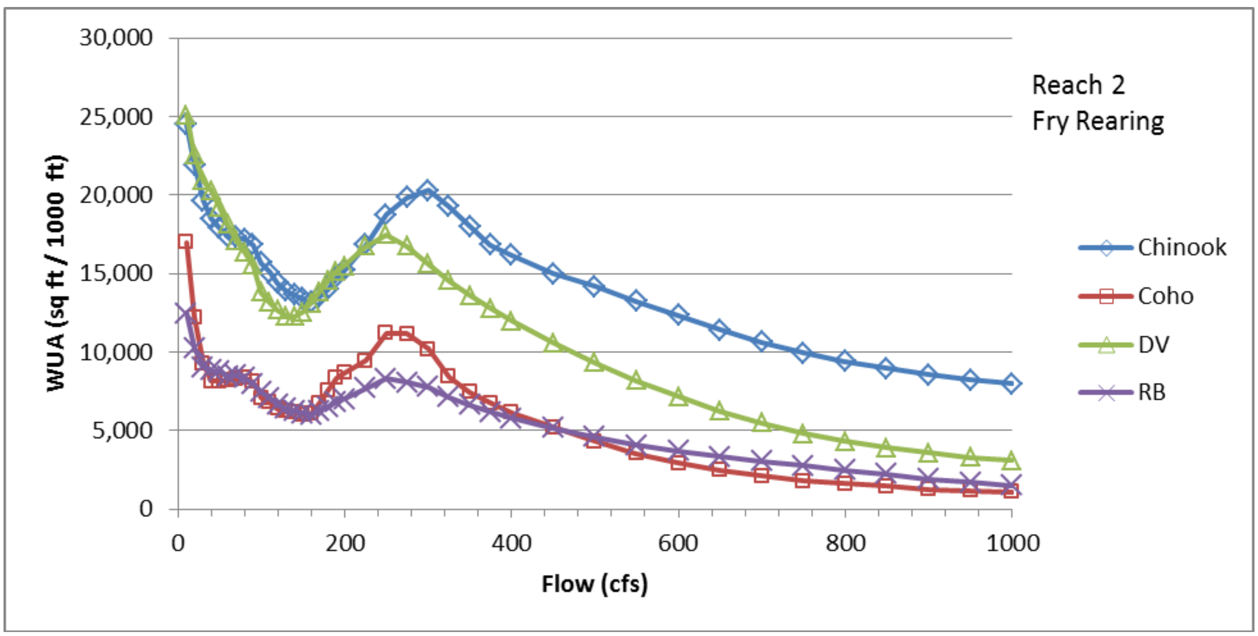

Figure 5.2-8. Fry rearing WUA, Reach 2 mainstem.

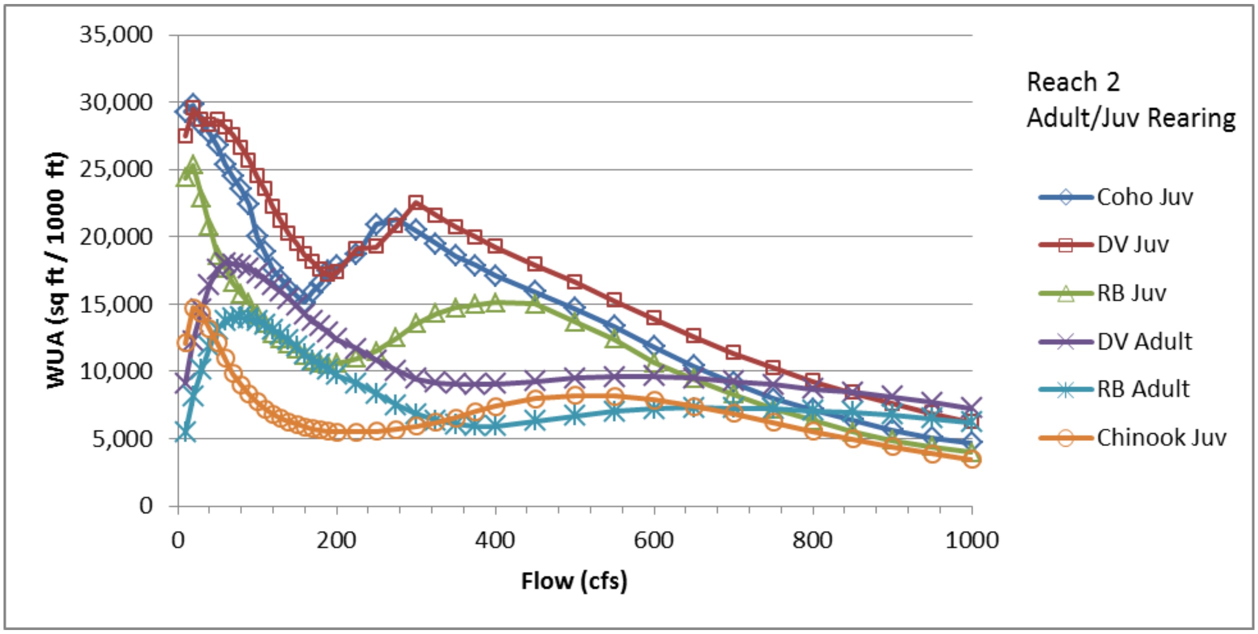

Figure 5.2-9. Adult and juvenile rearing WUA, Reach 2 mainstem.

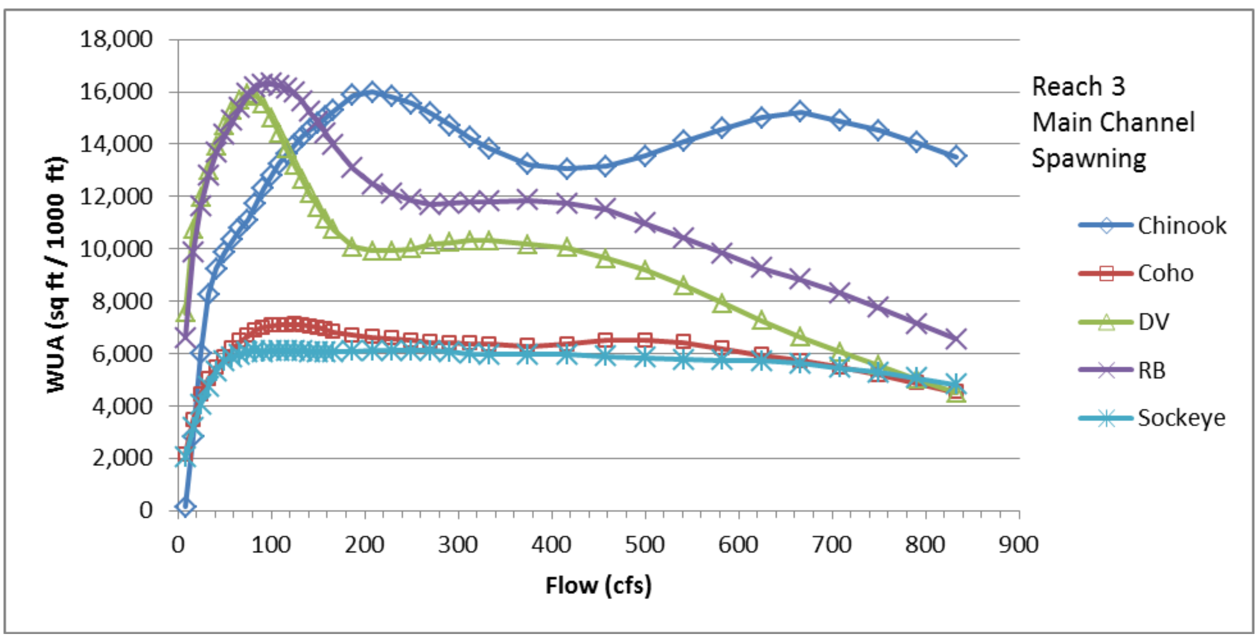

Figure 5.2-10. Spawning WUA, Reach 3 mainstem.

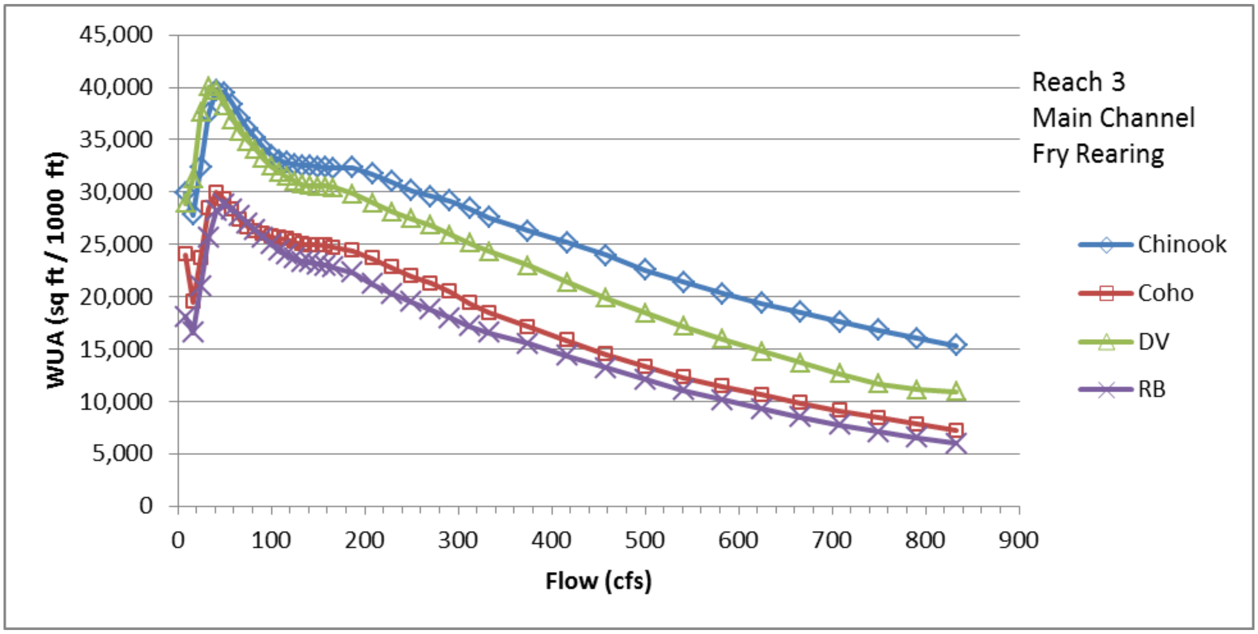

Figure 5.2-11. Fry rearing WUA, Reach 3 mainstem.

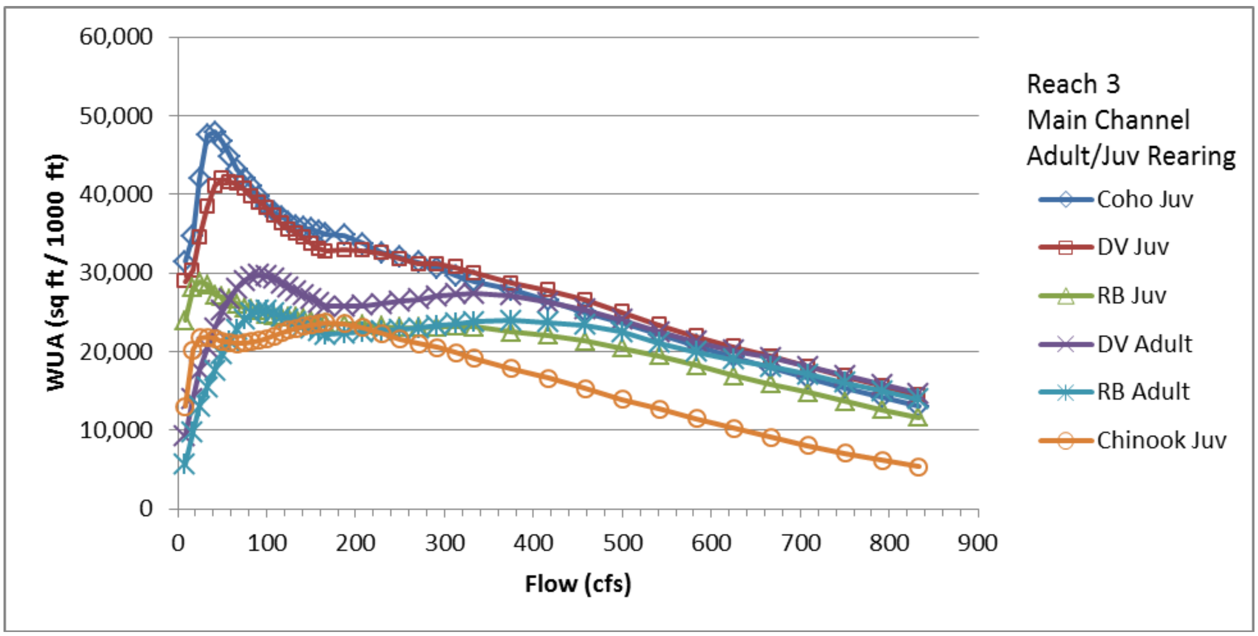

Figure 5.2-12. Adult and juvenile rearing WUA, Reach 3 mainstem.

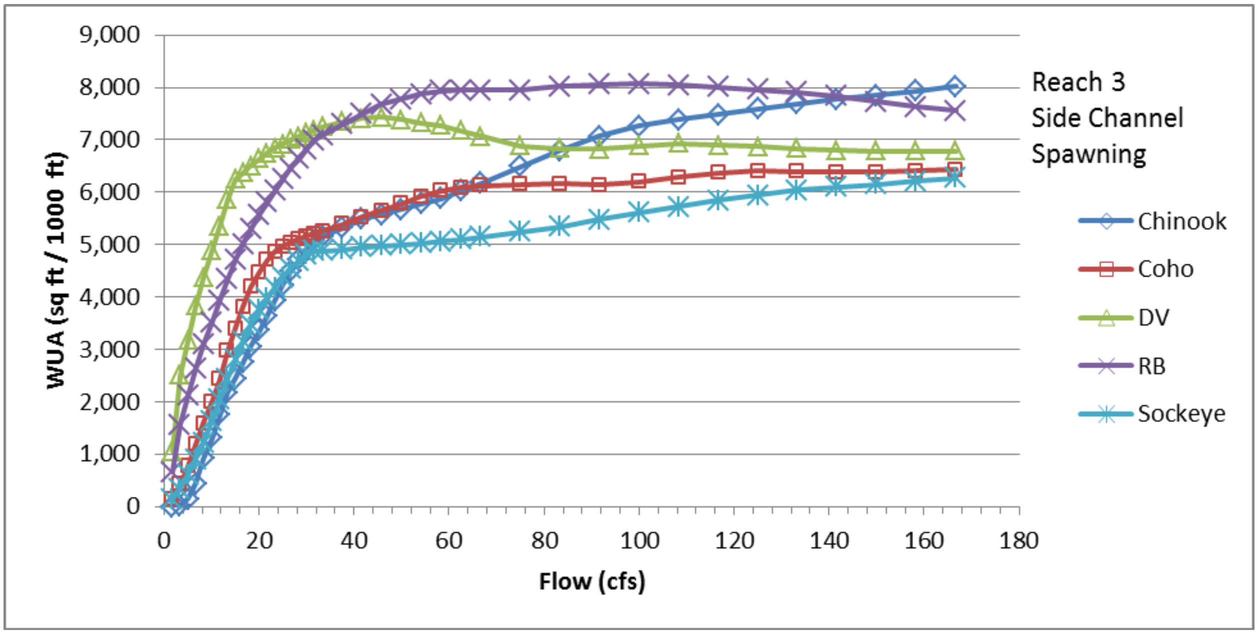

Figure 5.2-13. Spawning WUA, Reach 3 side channels.

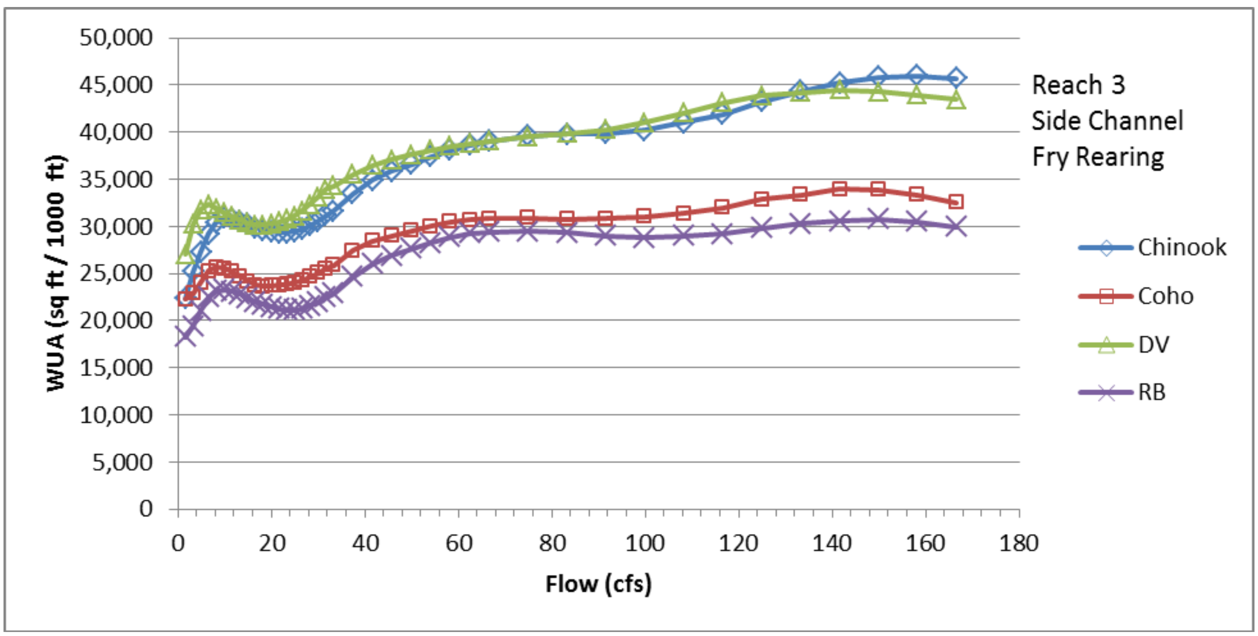

Figure 5.2-14. Fry rearing WUA, Reach 3 side channels.

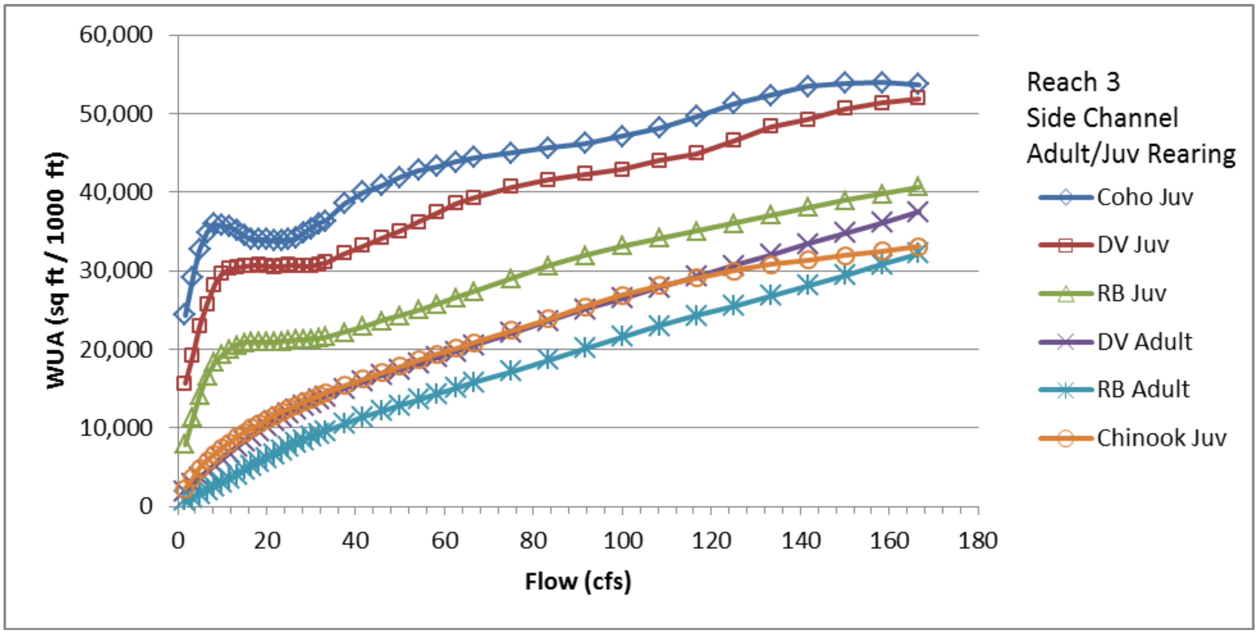

Figure 5.2-15. Adult and juvenile rearing WUA, Reach 3 side channels.

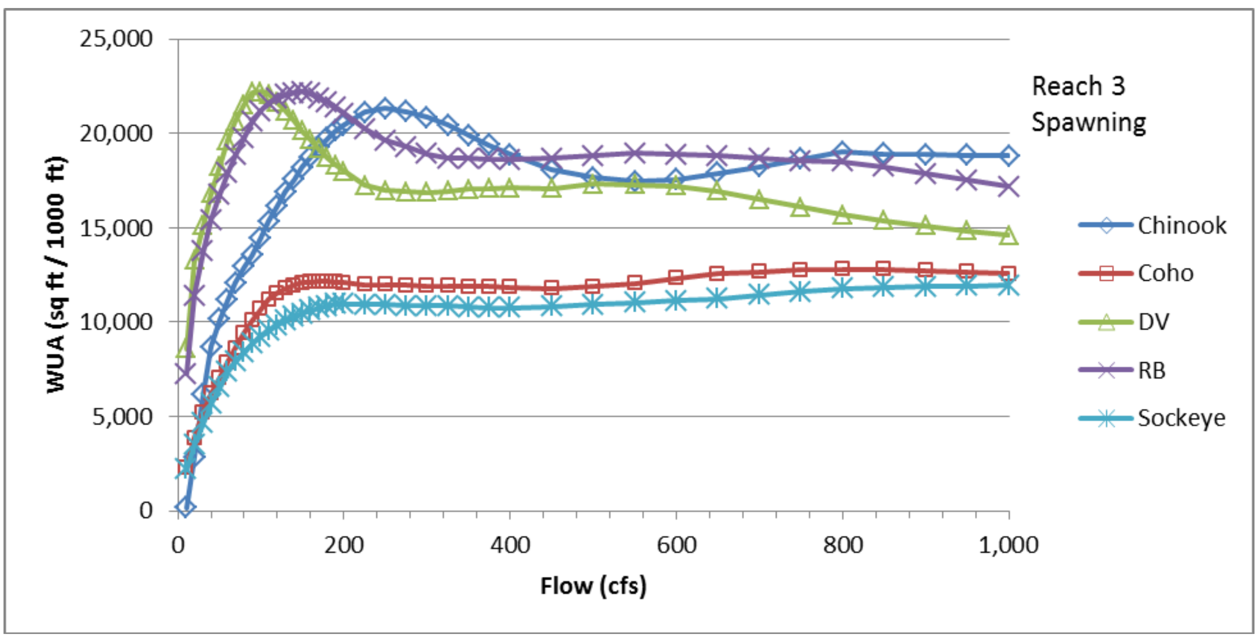

Figure 5.2-16. Spawning WUA, Reach 3 combined.

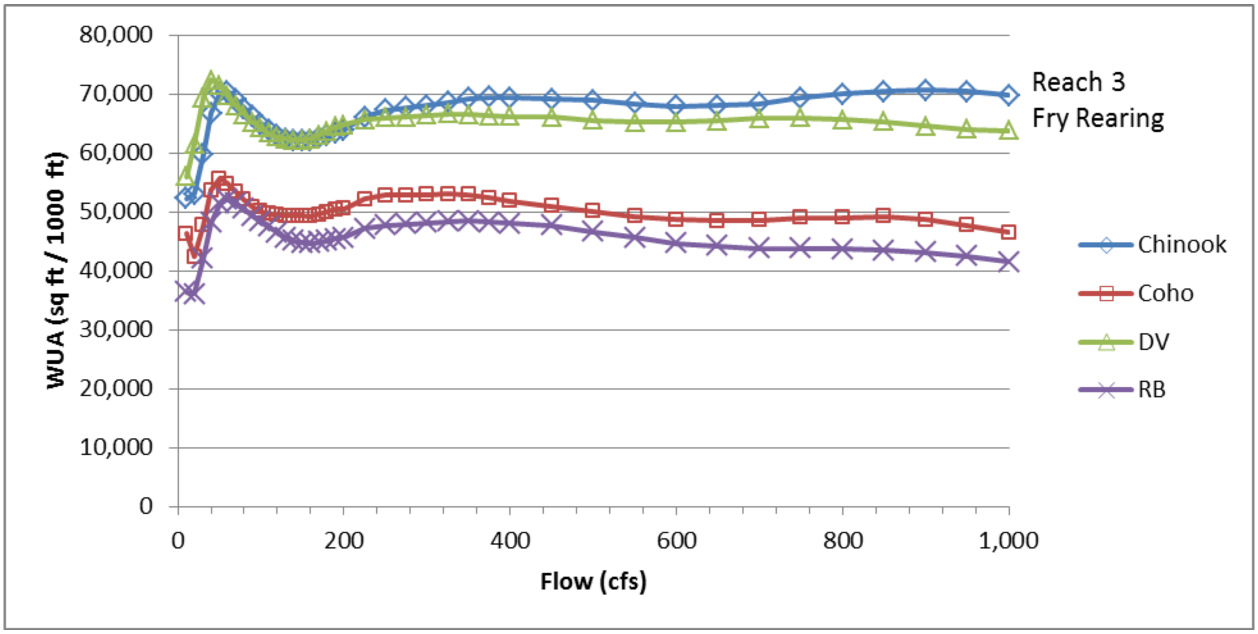

Figure 5.2-17. Fry rearing WUA, Reach 3 combined.

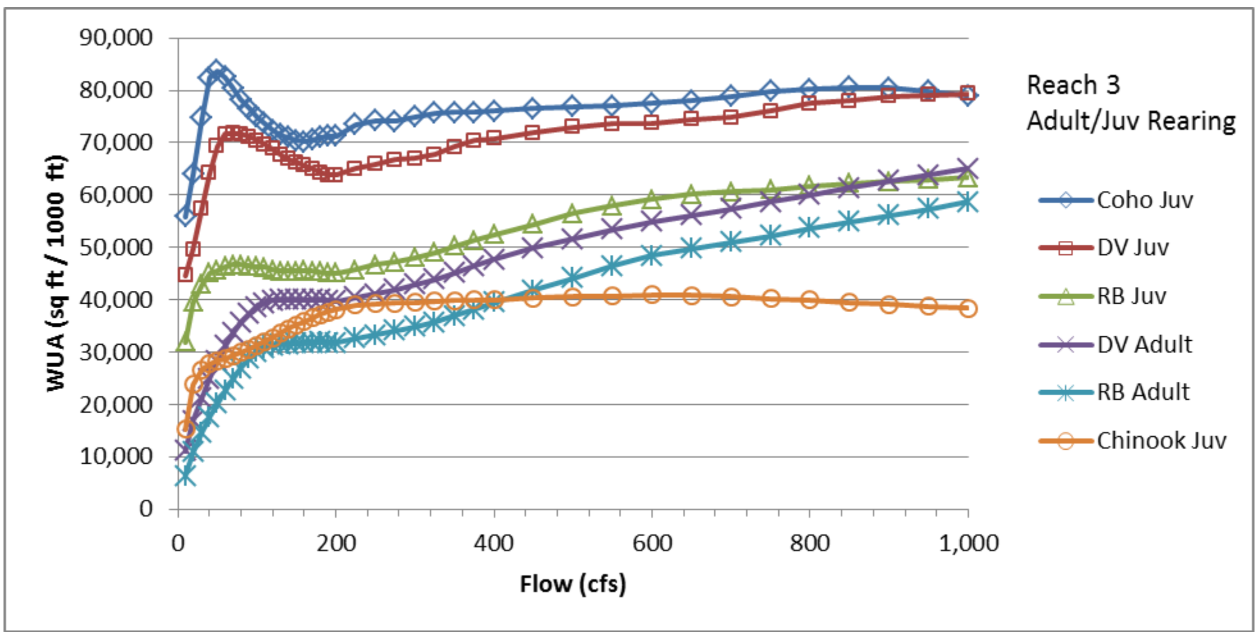

Figure 5.2-18. Adult and juvenile rearing WUA, Reach 3 combined.

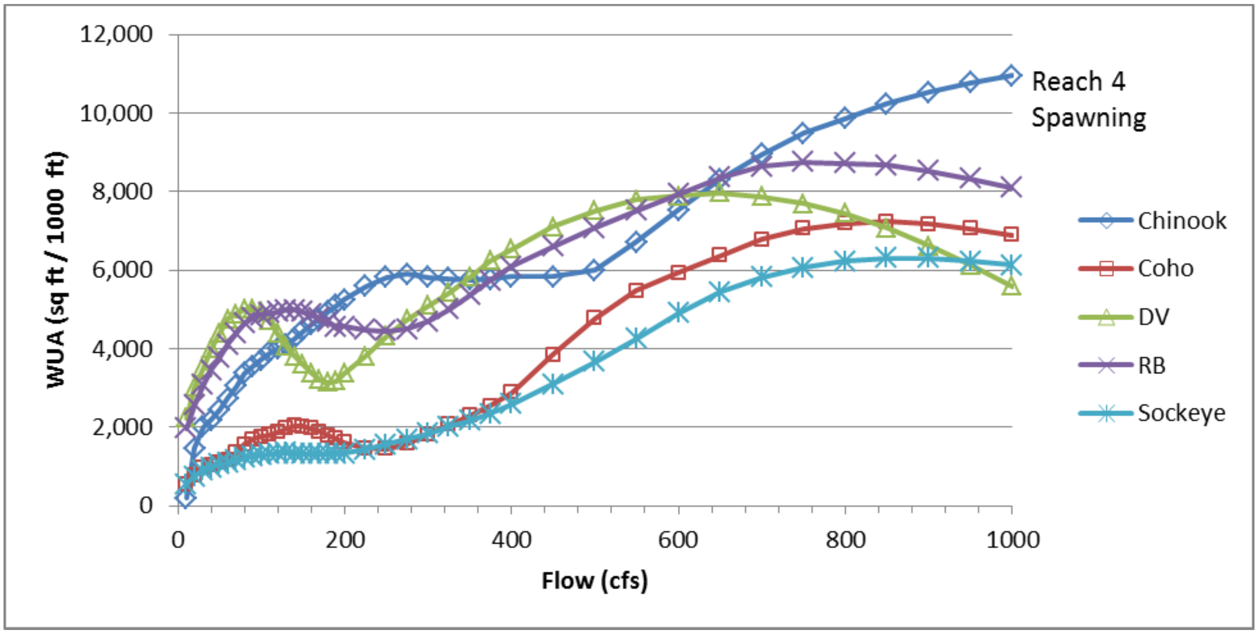

Figure 5.2-19. Spawning WUA, Reach 4.

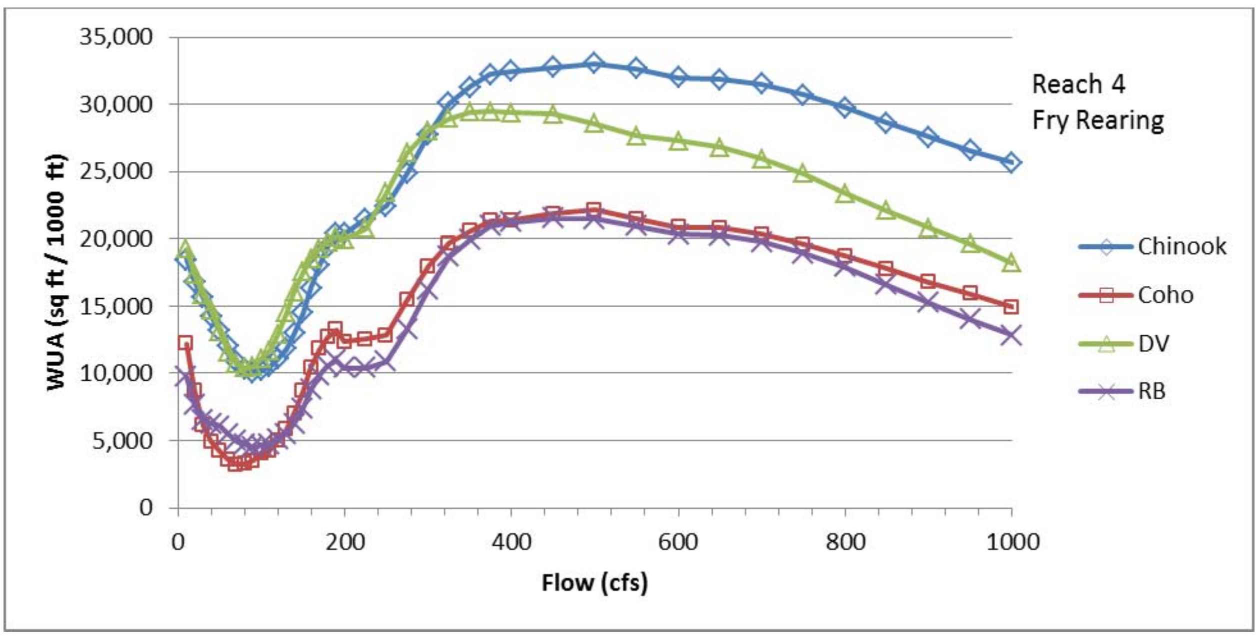

Figure 5.2-20. Fry rearing WUA, Reach 4.

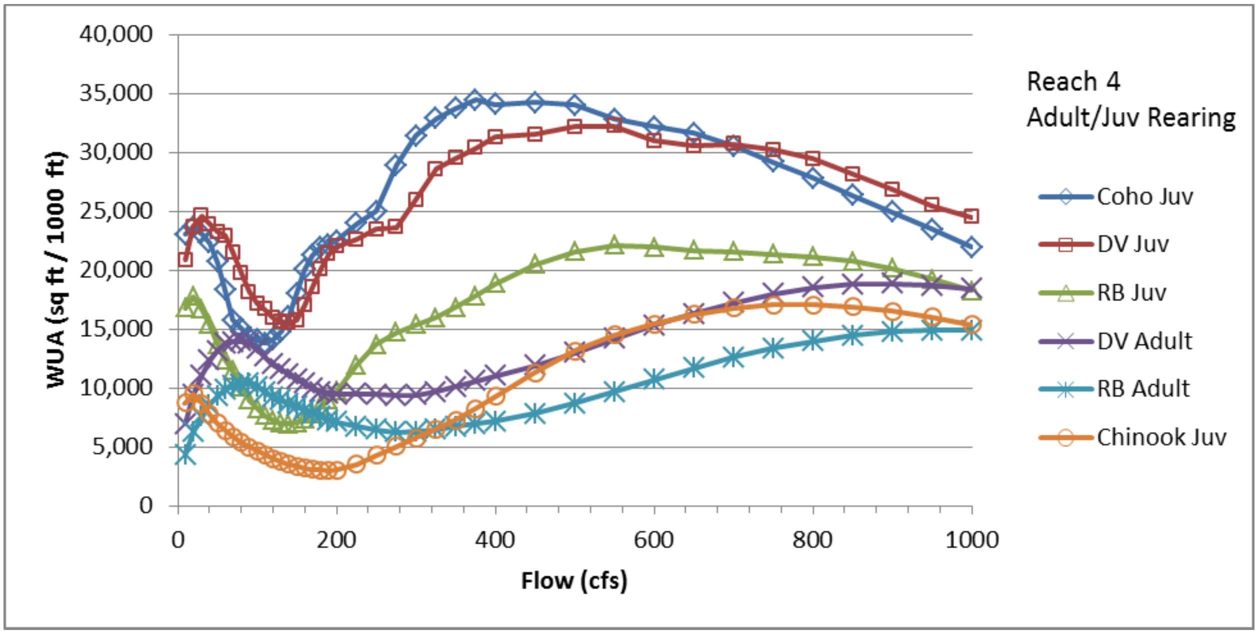

Figure 5.2-21. Adult and juvenile rearing WUA, Reach 4.

5.2.2. Reach 5 Connectivity

Appendix 6 includes bed profiles and water surface elevations for a range of flows for each transect modeled for the Instream Flow Study. This appendix also graphically represents the percent of the total wetted width that meets depth criterion, as well as meeting the 10 percent continuous criterion per flow for Chinook, coho and sockeye salmon, and Dolly Varden char and rainbow trout.

Table 5.2-24 shows that for 25 percent of total width, the passage depth criterion for Chinook salmon, is met on individual transects from 7 cfs – 30 cfs, with an average of 30 cfs. Discharges for continuous passage meet criterion at flows ranging from 7 cfs – 25 cfs, with an average of 25 cfs. The discharges at which both passage criteria are met range from 7 cfs – 30 cfs, with an average of 30 cfs.

The 25 percent of total width, the passage depth criterion for coho and sockeye salmon, is met on individual transects at flows ranging from 7 cfs – 15 cfs, with an average of 10 cfs. Discharges for continuous passage meet criterion at flows ranging from 7 cfs – 10 cfs, with an average of 10 cfs. The discharges at which both passage criteria are met range from 7 cfs – 15 cfs, with an average of 10 cfs.

For Dolly Varden and rainbow trout, the passage depth criterion for 25 percent of total width is met on individual transects at 7 cfs. Discharges for continuous passage meet criterion also at a flow of 7 cfs. The discharge at which both passage criteria are met is at a flow of 7 cfs.

Table 5.2-24. Discharge (cfs) for meeting salmonid passage criteria in Reach 5, Grant Creek.

Species	Passage Criteria	T510	T520	Average
Trout	Total (25%)	7	7	7
	Continuous (10%)	7	7	7
	Both Criteria	7	7	7
Coho	Total (25%)	15	7	10
	Continuous (10%)	10	7	10
	Both Criteria	15	7	10
Chinook	Total (25%)	30	7	30
	Continuous (10%)	25	7	25
	Both Criteria	30	7	30

6 CONCLUSIONS

6.1. Grant Creek Aquatic Habitat Mapping

Grant Creek is a higher gradient, very flashy stream. High flows and velocities limit the amount of LWD in the system because there are only a few places where LWD will collect in the main channel. Most wood is found in the distributary and the Reach 2/3 side channels, where flows are greatly reduced and are protected from the main discharges in Grant Creek. The system is dominated by riffles in the lower four reaches and cascades in Reach 5. Pools are also generally lacking in the mainstem. As with LWD, the exception is in the side channels and distributary. The other major habitat found with some abundance is undercut banks, primarily in Reaches 1 and 4.

6.2. Grant Creek Instream Flow Study

6.2.1. Grant Creek Habitat

Preliminary results from the Instream Flow Study indicate that spawning is limited in Grant Creek due to lack of suitable spawning substrate; the substrate that is present is recruited from Reaches 5 and 6 (canyon). Substrates do not tend to be rounded, as observed in most high quality salmonid streams. The sediment from the canyon consists mostly of slate and greywacke (i.e., sandstone). When slate fractures, it tends to be platy (i.e., broad and flat), while greywacke fractures tend to be angular in nature (KHL 2014b).

Spawning appears to be opportunistic and activity more directed by the presence of spawning sediment rather than by water depths and velocities. For example, KHL observed sockeye salmon spawning in 1 foot of depth and 1 foot per second velocities, while spawning activity was also observed about 30 feet away in the middle of the channel where depths of 3 to 4 feet and velocities up to 6 feet per second were noted. As indicated by the spawning WUA curves and field observations, much of the spawning occurs along the stream margins, where velocities and depths can be lower, and spawning substrates are perched. What was observed in the field, however, is that redds that were constructed along the stream margins at higher discharges were left dry and exposed as Grant Creek flows diminished. This was particularly noted for sockeye spawning; fish were observed spawning at much higher flows than coho (flows were relatively stable during the 2013 coho spawning period).

Significant side channel habitat exists in Grant Creek, notably in Reaches 2 and 3. Salmon were observed spawning in these side channels, which provide reduced flows and complex rearing habitats. There is also a hydraulic control at the upper entrance to the Reach 1 distributary, which prevents water from coursing through these habitats at flows below approximately 190 cfs. The control at the upper end of this distributary consists mainly of logs and larger-sized sediments, which have been deposited there by Grant Creek at higher flows as the stream cuts transversely to the opposite bank just downstream of the distributary.

Many of these side channel habitats are either dry or frozen during the winter period due to the reduced flows. There is most likely a substantial, yet unquantified loss of production in these side channels due to desiccation and freezing. Habitat for salmonids could likely be increased by several methods, notably: 1) altering the upstream control in the Reach 1 distributary, adding additional flow at optimal spawning and rearing periods; and 2) increasing base flows, which would result in more water into the side channels in Reaches 2 and 3.

6.2.2. Connectivity

Flows in Reaches 5 and 6 (i.e., the canyon) would be reduced by Project operations. There has been concern that these reduced flows would affect upstream connectivity of pool and other habitats within Reach 5. Two transects, which represented the more sensitive types of habitats within the canyon, were modeled using the Oregon Method (Thompson 1972). Analysis of these habitats, using the criteria recommended by Thompson (1972), indicates that connectivity is accomplished for trout at a flow of 7 cfs for both total wetted and continuous width. Connectivity for Sockeye and Coho salmon was accomplished at flows ranging from 7 cfs – 15 cfs, averaging 10 cfs for both transects. Chinook salmon passage is accomplished at flows ranging from 7 cfs – 30 cfs, averaging 25 cfs (continuous passage) and 30 cfs (total wetted width).

Current utilization of the canyon by the target species has not been incorporated into this report. More information can be found in the Fisheries Assessment (KHL 2014a).

7 VARIANCES FROM FERC-APPROVED STUDY PLAN AND PROPOSED MODIFICATIONS

7.1. Grant Creek Aquatic Habitat Mapping

There were no substantial variances from the FERC- and agency-approved study plan. Production of several analyses (e.g., incubation analysis, as mentioned in the Study Objectives), will be completed after consultation with the Aquatics Resource Work Group (ARWG) and integration with other disciplines.

7.2 Grant Creek Instream Flow Study

There were no substantial variances from the FERC- and agency-approved study plan as related to the Instream Flow Study. KHL added a study component to examine connectivity in Reach 5 because salmonids had been observed in the canyon. Information related to wetted perimeter analysis with substrate and effective spawning, and lateral connectivity, is being developed cooperatively with the Instream Flow Sub-Committee of the ARWG.

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Appendix 1: Grant Creek Instream Flow Photos

Appendix 1a	Transect Photos at 17 cfs Calibration Flow
Appendix 1b	Transect Photos at 64 cfs Calibration Flow
Appendix 1c	Transect Photos at 132 cfs Calibration Flow
Appendix 1d	Transect Photos at 182 cfs Calibration Flow
Appendix 1e	Transect Photos at 706 cfs Calibration Flow

Appendix 1a Transect Photos at 17 cfs Calibration Flow

This sub-appendix contains the following figures:

Figure A.1a-1. Dewatered side channel 100 at main channel at 17 cfs.
Figure A.1a-2. Transect 100 at 17 cfs.
Figure A.1a-3. Transect 120 at 17 cfs.
Figure A.1a-4. Transect 130 at 17 cfs.
Figure A.1a-5. Transect 140 at 17 cfs.
Figure A.1a-6. Transect 150 at 17 cfs.
Figure A.1a-7. Transect 160 at 17 cfs.
Figure A.1a-8. Transect 200 at 17 cfs.
Figure A.1a-9. Transect 220 at 17 cfs.
Figure A.1a-10. Transect 230 at 17 cfs.
Figure A.1a-11. Transect 230 side channel at 17 cfs.
Figure A.1a-12. Transect 300 at 17 cfs.
Figure A.1a-13. Transect 310 at 17 cfs.
Figure A.1a-14. Transect 320 at 17 cfs.
Figure A.1a-15. Transect 330 at 17 cfs.
Figure A.1a-16. Transect 400 at 17 cfs.
Figure A.1a-17. Transect 410 at 17 cfs.
Figure A.1a-18. Transect 430 at 17 cfs.
Figure A.1a-19. Transect 510 at 17 cfs.
Figure A.1a-20. Transect 520 at 17 cfs.

Figure A.1a-1. Dewatered side channel 100 at main channel at 17 cfs.

Figure A.1a-2. Transect 100 at 17 cfs.

Figure A.1a-3. Transect 120 at 17 cfs.

Figure A.1a-4. Transect 130 at 17 cfs.

Figure A.1a-5. Transect 140 at 17 cfs.

Figure A.1a-6. Transect 150 at 17 cfs.

Figure A.1a-7. Transect 160 at 17 cfs.

Figure A.1a-8. Transect 200 at 17 cfs.

Figure A.1a-9. Transect 220 at 17 cfs.

Figure A.1a-10. Transect 230 at 17 cfs.

Figure A.1a-11. Transect 230 side channel at 17 cfs.

Figure A.1a-12. Transect 300 at 17 cfs.

Figure A.1a-13. Transect 310 at 17 cfs.

Figure A.1a-14. Transect 320 at 17 cfs.

Figure A.1a-15. Transect 330 at 17 cfs.

Figure A.1a-16. Transect 400 at 17 cfs.

Figure A.1a-17. Transect 410 at 17 cfs.

Figure A.1a-18. Transect 430 at 17 cfs.

Figure A.1a-19. Transect 510 at 17 cfs.

Figure A.1a-20. Transect 520 at 17 cfs.

Appendix 1b. Transect Photos at 64 cfs Calibration Flow

This sub-appendix contains the following figures:

Figure A.1b-1. Side channel 100 at Trail Lakes confluence at 64 cfs.
Figure A.1b-2. Transect 100 at 64 cfs.
Figure A.1b-3. Transect 110 at 64 cfs.
Figure A.1b-4. Side channel 100 at main channel confluence at 64 cfs.
Figure A.1b-5. Transect 120 at 64 cfs.
Figure A.1b-6. Transect 130 at 64 cfs.
Figure A.1b-7. Transect 140 at 64 cfs.
Figure A.1b-8. Transect 150 at 64 cfs.
Figure A.1b-9. Transect 160 at 64 cfs.
Figure A.1b-10. Transect 200 at 64 cfs.
Figure A.1b-11. Transect 210 side channel at 64 cfs.
Figure A.1b-12. Transect 220 at 64 cfs.
Figure A.1b-13. Transect 230 side channel at 64 cfs.
Figure A.1b-14. Transect 300 at 64 cfs.
Figure A.1b-15. Transect 310 at 64 cfs.
Figure A.1b-16. Transect 320 at 64 cfs.
Figure A.1b-17. Transect 330 at 64 cfs.
Figure A.1b-18. Transect 400 at 64 cfs.
Figure A.1b-19. Transect 410 at 64 cfs.
Figure A.1b-20. Transect 430 at 64 cfs.
Figure A.1b-21. Transect 510 at 64 cfs.
Figure A.1b-22. Transect 520 at 64 cfs.

Figure A.1b-1. Side channel 100 at Trail Lakes confluence at 64 cfs.

Figure A.1b-2. Transect 100 at 64 cfs.

Figure A.1b-3. Transect 110 at 64 cfs.

Figure A.1b-4. Side channel 100 at main channel confluence at 64 cfs.

Figure A.1b-5. Transect 120 at 64 cfs.

Figure A.1b-6. Transect 130 at 64 cfs.

Figure A.1b-7. Transect 140 at 64 cfs.

Figure A.1b-8. Transect 150 at 64 cfs.

Figure A.1b-9. Transect 160 at 64 cfs.

Figure A.1b-10. Transect 200 at 64 cfs.

Figure A.1b-11. Transect 210 side channel at 64 cfs.

Figure A.1b-12. Transect 220 at 64 cfs.

Figure A.1b-13. Transect 230 side channel at 64 cfs.

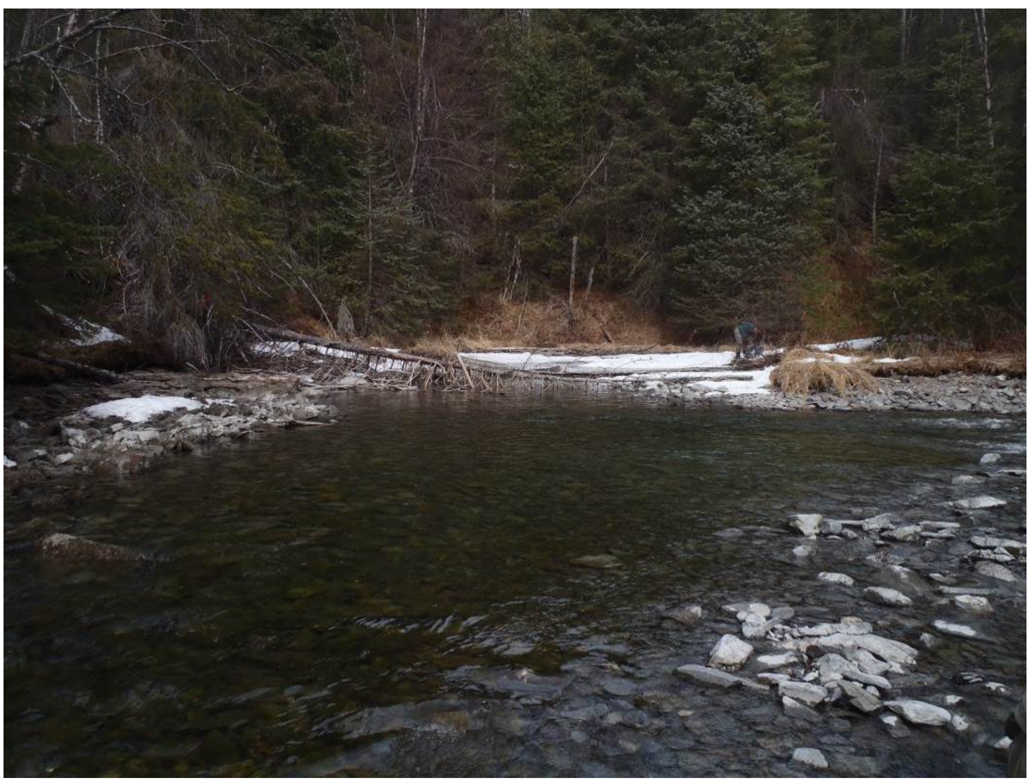

Figure A.1b-14. Transect 300 at 64 cfs.

Figure A.1b-15. Transect 310 at 64 cfs.

Figure A.1b-16. Transect 320 at 64 cfs.

Figure A.1b-17. Transect 330 at 64 cfs.

Figure A.1b-18. Transect 400 at 64 cfs.

Figure A.1b-19. Transect 410 at 64 cfs.

Figure A.1b-20. Transect 430 at 64 cfs.

Figure A.1b-21. Transect 510 at 64 cfs.

Figure A.1b-22. Transect 520 at 64 cfs.

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Appendix 1c. Transect Photos at 132 cfs Calibration Flow

This sub-appendix contains the following figures:

Figure A.1c-1. Side channel 100 at Trail Lakes confluence at 132 cfs.
Figure A.1c-2. Transect 100 at 132 cfs.
Figure A.1c-3. Transect 110 at 132 cfs.
Figure A.1c-4. Side channel 100 at main channel confluence.
Figure A.1c-5. Transect 120 at 132 cfs.
Figure A.1c-6. Transect 130 at 132 cfs.
Figure A.1c-7. Transect 140 at 132 cfs.
Figure A.1c-8. Transect 150 at 132 cfs.
Figure A.1c-9. Transect 160 at 132 cfs.
Figure A.1c-10. Transect 200 at 132 cfs.
Figure A.1c-11. Transect 210 side channel at 132 cfs.
Figure A.1c-12. Transect 220 at 132 cfs.
Figure A.1c-13. Transect 230 side channel at 132 cfs.
Figure A.1c-14. Transect 230 at 132 cfs.
Figure A.1c-15. Side channel 300 bottom confluence with main channel at 132 cfs.
Figure A.1c-16. Transect 300 at 132 cfs.
Figure A.1c-17. Transect 310 at 132 cfs.
Figure A.1c-18. Transect 320 at 132 cfs.
Figure A.1c-19. Transect 330 at 132 cfs.
Figure A.1c-20. Transect 400 at 132 cfs.
Figure A.1c-21. Transect 410 at 132 cfs.
Figure A.1c-22. Transect 330 at 132 cfs.
Figure A.1c-23. Transect 520 at 132 cfs.

Figure A.1c-1. Side channel 100 at Trail Lakes confluence at 132 cfs.

Figure A.1c-2. Transect 100 at 132 cfs.

Figure A.1c-3. Transect 110 at 132 cfs.

Figure A.1c-4. Side channel 100 at main channel confluence.

Figure A.1c-5. Transect 120 at 132 cfs.

Figure A.1c-6. Transect 130 at 132 cfs.

Figure A.1c-7. Transect 140 at 132 cfs.

Figure A.1c-8. Transect 150 at 132 cfs.

Figure A.1c-9. Transect 160 at 132 cfs.

Figure A.1c-10. Transect 200 at 132 cfs.

Figure A.1c-11. Transect 210 side channel at 132 cfs.

Figure A.1c-12. Transect 220 at 132 cfs.

Figure A.1c-13. Transect 230 side channel at 132 cfs.

Figure A.1c-14. Transect 230 at 132 cfs.

Figure A.1c-15. Side channel 300 bottom confluence with main channel at 132 cfs.

Figure A.1c-16. Transect 300 at 132 cfs.

Figure A.1c-17. Transect 310 at 132 cfs.

Figure A.1c-18. Transect 320 at 132 cfs.

Figure A.1c-19. Transect 330 at 132 cfs.

Figure A.1c-20. Transect 400 at 132 cfs.

Figure A.1c-21. Transect 410 at 132 cfs.

Figure A.1c-22. Transect 330 at 132 cfs.

Figure A.1c-23. Transect 520 at 132 cfs

Appendix 1d. Transect Photos at 182 cfs Calibration Flow

This sub-appendix contains the following figures:

Figure A.1d-1. Transect 120 at 182 cfs.
Figure A.1d-2. Transect 130 at 182 cfs.
Figure A.1d-3. Transect 140 at 182 cfs.
Figure A.1d-4. Transect 150 at 182 cfs.
Figure A.1d-5. Transect 160 at 182 cfs.
Figure A.1d-6. Transect 230 side channel at 182 cfs.
Figure A.1d-7. Transect 230 at 182 cfs.
Figure A.1d-8. Transect 330 side channel 1 at 182 cfs.
Figure A.1d-9. Transect 330 side channel 2 at 182 cfs.
Figure A.1d-10. Transect 330 at 182 cfs.
Figure A.1d-11. Transect 400 at 182 cfs.
Figure A.1d-12. Transect 410 at 182 cfs.
Figure A.1d-13. Transect 430 at 182 cfs.

Figure A.1d-1. Transect 120 at 182 cfs.

Figure A.1d-2. Transect 130 at 182 cfs.

Figure A.1d-3. Transect 140 at 182 cfs.

Figure A.1d-4. Transect 150 at 182 cfs.

Figure A.1d-5. Transect 160 at 182 cfs.

Figure A.1d-6. Transect 230 side channel at 182 cfs.

Figure A.1d-7. Transect 230 at 182 cfs.

Figure A.1d-8. Transect 330 side channel 1 at 182 cfs.

Figure A.1d-9. Transect 330 side channel 2 at 182 cfs.

Figure A.1d-10. Transect 330 at 182 cfs.

Figure A.1d-11. Transect 400 at 182 cfs.

Figure A.1d-12. Transect 410 at 182 cfs.

Figure A.1d-13. Transect 430 at 182 cfs.

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Appendix 1e. Transect Photos at 706 cfs Calibration Flow

This sub-appendix contains the following figures:

Figure A.1e-1. Side channel 100 at Trail Lakes confluence at 706 cfs.
Figure A.1e-2. Transect 100 at 706 cfs.
Figure A.1e-3. Transect 110 at 706 cfs.
Figure A.1e-4. Transect 120 at 706 cfs.
Figure A.1e-5. Transect 130 at 706 cfs.
Figure A.1e-6. Transect 140 at 706 cfs.
Figure A.1e-7. Transect 150 at 706 cfs.
Figure A.1e-8. Transect 160 at 706 cfs.
Figure A.1e-9. Transect 200 at 706 cfs.
Figure A.1e-10. Transect 210 at 706 cfs.
Figure A.1e-11. Transect 220 at 706 cfs.
Figure A.1e-12. Transect 230 side channel at 706 cfs.
Figure A.1e-13. Side channel 300 bottom confluence with main channel at 706 cfs.
Figure A.1e-14. Transect 310 at 706 cfs.
Figure A.1e-15. Transect 320 at 706 cfs.
Figure A.1e-16. Transect 330 at 706 cfs.
Figure A.1e-17. Transect 330 side channel (merged) at 706 cfs.
Figure A.1e-18. Transect 330 at 706 cfs.
Figure A.1e-19. Transect 400 at 706 cfs.
Figure A.1e-20. Transect 410 at 706 cfs.
Figure A.1e-21. Transect 430 at 706 cfs.

Figure A.1e-1. Side channel 100 at Trail Lakes confluence at 706 cfs.

Figure A.1e-2. Transect 100 at 706 cfs.

Figure A.1e-3. Transect 110 at 706 cfs.

Figure A.1e-4. Transect 120 at 706 cfs.

Figure A.1e-5. Transect 130 at 706 cfs.

Figure A.1e-6. Transect 140 at 706 cfs.

Figure A.1e-7. Transect 150 at 706 cfs.

Figure A.1e-8. Transect 160 at 706 cfs.

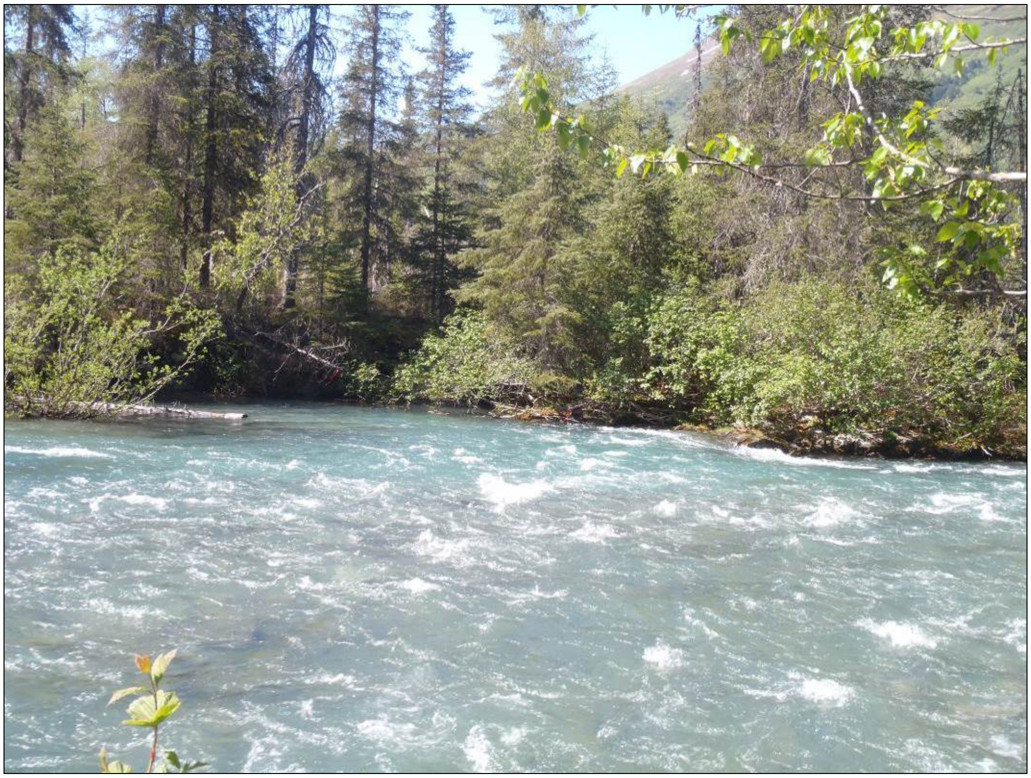

Figure A.1e-9. Transect 200 at 706 cfs.

Figure A.1e-10. Transect 210 at 706 cfs.

Figure A.1e-11. Transect 220 at 706 cfs.

Figure A.1e-12. Transect 230 side channel at 706 cfs.

Figure A.1e-13. Side channel 300 bottom confluence with main channel at 706 cfs.

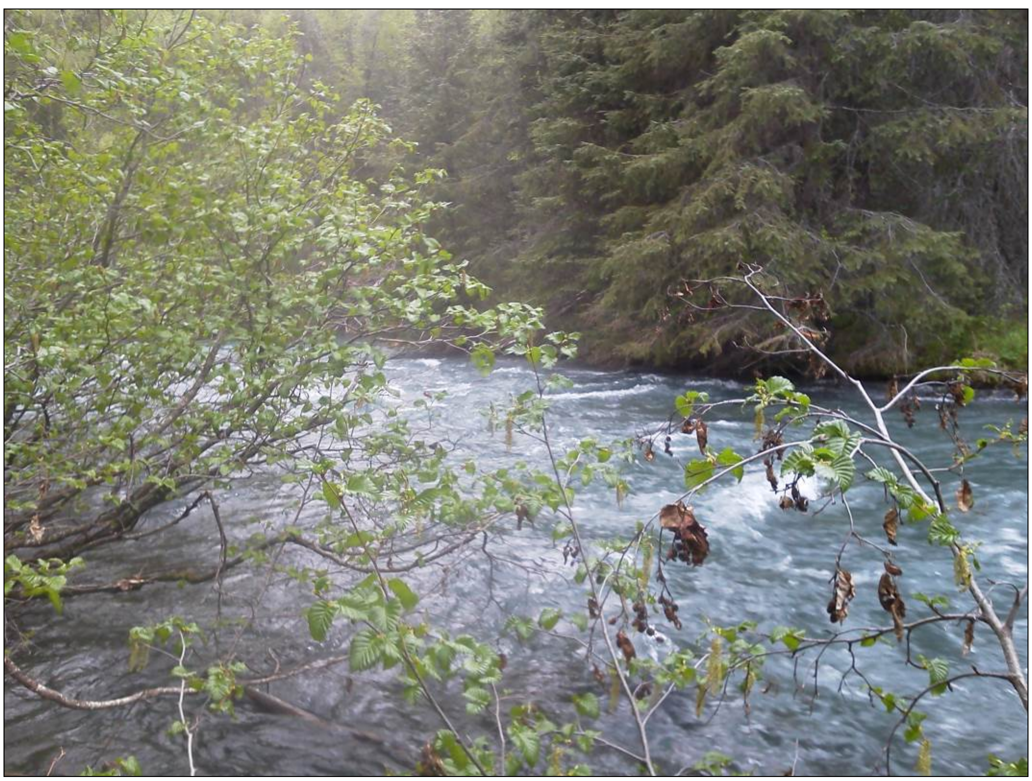

Figure A.1e-14. Transect 310 at 706 cfs.

Figure A.1e-15. Transect 320 at 706 cfs.

Figure A.1e-16. Transect 330 at 706 cfs.

Figure A.1e-17. Transect 330 side channel (merged) at 706 cfs.

Figure A.1e-18. Transect 330 at 706 cfs.

Figure A.1e-19. Transect 400 at 706 cfs.

Figure A.1e-20. Transect 410 at 706 cfs.

Figure A.1e-21. Transect 430 at 706 cfs.

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Appendix 2: HSC Curves

Appendix 2a. Habitat Availability and Utilization
Appendix 2b. HSC Curves

INTRODUCTION

As part of the Grant Creek Instream Flow Study, Kenai Hydro, LLC (KHL) collected habitat utilization and habitat availability data for Chinook, sockeye, and coho salmon spawning in Grant Creek. These curves, once referred to as preference curves, are now called habitat suitability criteria (HSC) curves.

HSC curve verification studies consist of three parts:

1. Determination of proportional habitat availability;
2. Determination of fish habitat utilization; and
3. Analysis of fish preference by determining ratio of habitat utilization to habitat availability.

Curve development follows guidelines present in WDFW/WDOE (2013), which draws from Orth, Jones, and Maughan (1981), Bovee (1986), Slauson (1988), and Beecher et al. (1993).

METHODS

KHL consultants surveyed Grant Creek looking for Chinook, sockeye, and coho salmon spawning. Only measurements of fish observed actually spawning were taken. In the case of aggregate spawning (as is often observed with sockeye salmon), measurement of two of the fish in the aggregate were taken. Measurements of mean column velocity, depth, and substrate were taken on both sides of each redd measured. These were measurements of habitat utilization. Location of the redds (relative to transects), time, and flow in Grant Creek were noted.

Once the locations of the fish were noted and measurements of utilization were taken, Grant Creek cross sections were taken downstream, upstream, and in the vicinity of the observed redds. If there were instream flow transects in the vicinity of the observed redds, the transect models were run at the flow at which spawning was observed. If there were no transects in the vicinity of the observed redds, measurements of depth and velocity were taken in Grant Creek below, across, and above the observed redds.

RESULTS

A total of 99 sockeye salmon, 47 coho salmon, and 3 Chinook salmon redds were measured. Due to long sample size, Chinook salmon data were not used; in this case and for rearing life history stages of all species in Grant Creek, literature curves based upon other sources (in Alaska, when available) were used.

Table A.2-1 summarized flows, species, and locations of spawning sockeye and coho salmon.

Table A.2-1. Summary of habitat utilization data for Grant Creek sockeye and coho salmon.

Date	8/30/13	8/31/13	9/2/13	9/3/13	9/10/13	9/24/13	10/11/14	10/12/14	10/21/14
Flow (cfs)	389	386	338	360	469	187	169	179	285
Transect	Sockeye	Sockeye	Sockeye	Sockeye	Sockeye	Sockeye	Coho	Coho	Coho
110								*	
120	*	*			*		*	*	
130	*	*			*		*	*	
140	*		*	*		*		*	
150	*	*	*	*		*	*	*	
160	*	*	*	*					
200									
210							*		
220	*	*	*	*			*	*	
230=MC	*	*	*	*				*	
300							*	*	
310		*	*	*			*		
320			*		*		*	*	
330-MC		*	*	*	*	*	*	*	
330-SC									
330-TC									
400	*	*	*	*			*		
410	*	*	*					*	
430			*				*	*	
510							*		
other							*	*	
Below Weir	*						*		*
Total	**30**	**23**	**18**	**16**	**7**	**5**	**22**	**21**	**4**

Sockeye and coho salmon spawning HSC curves are presented in Appendix 2a. Literature-based curves for Chinook salmon, rainbow trout, and Dolly Varden char spawning, and rearing curves for all salmonids species found in Grant Creek are presented in Appendix 2b.

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Appendix 2a. Habitat Availability and Utilization

This sub-appendix contains the following figures and tables:

Figure A.2a-1. Sockeye salmon spawning habitat availability, depth.
Figure A.2a-2. Sockeye salmon spawning habitat availability, velocity.
Figure A.2a-3. Sockeye salmon spawning depth utilization.
Figure A.2a-4. Sockeye salmon spawning velocity utilization.
Figure A.2a-5. Coho salmon spawning habitat availability, depth.
Figure A.2a-6. Coho salmon spawning habitat availability, velocity.
Figure A.2a-7. Coho salmon spawning depth utilization.
Figure A.2a-8. Coho salmon spawning velocity utilization

Table A.2a-1. Sockeye salmon spawning depth, observed vs expected.
Table A.2a-2. Sockeye salmon spawning velocity, observed vs expected.
Table A.2a-3. Coho salmon spawning depth, observed vs expected.
Table A.2a-4. Coho salmon spawning velocity, observed vs expected.

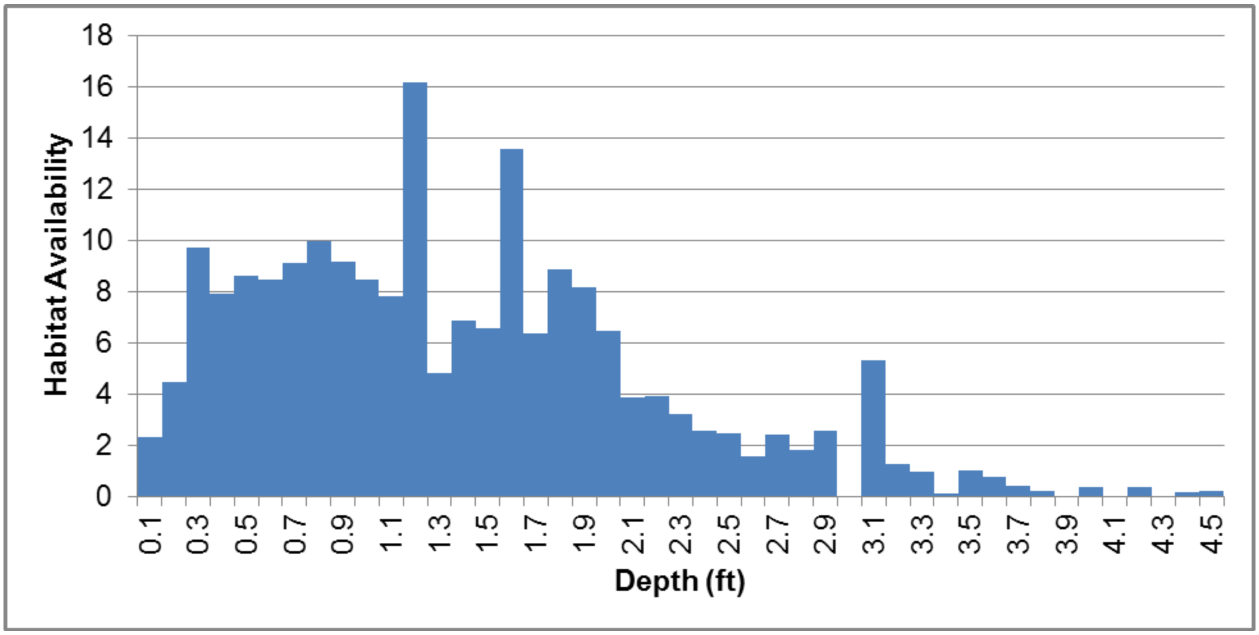

Figure A.2a-1. Sockeye salmon spawning habitat availability, depth.

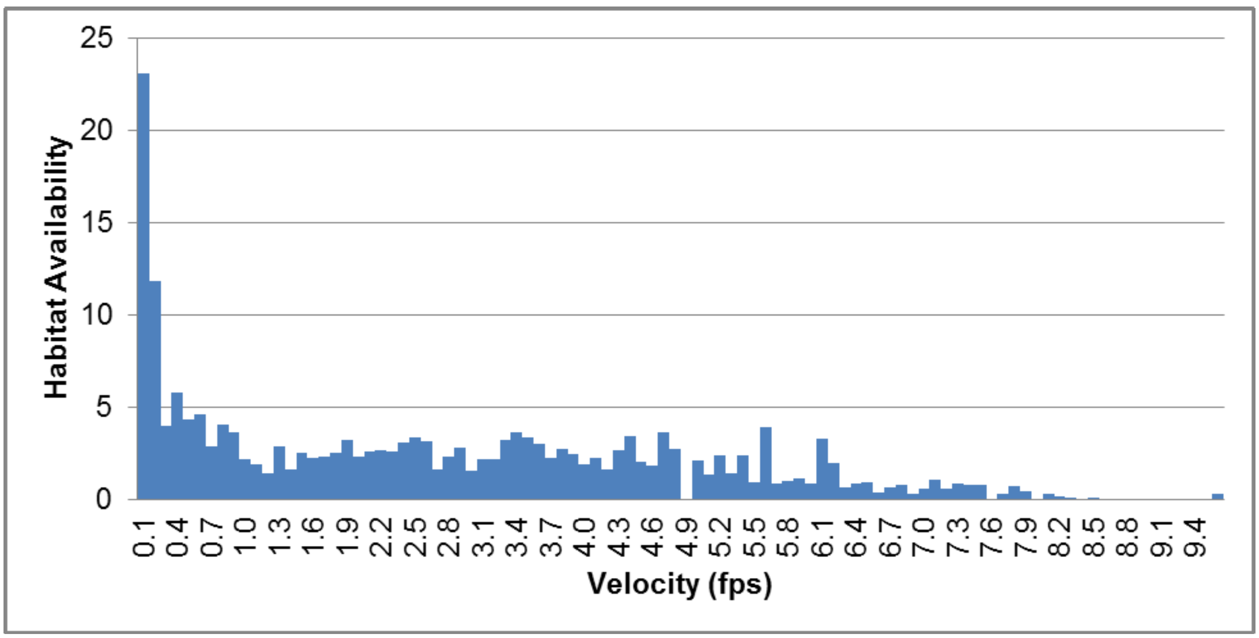

Figure A.2a-2. Sockeye salmon spawning habitat availability, velocity.

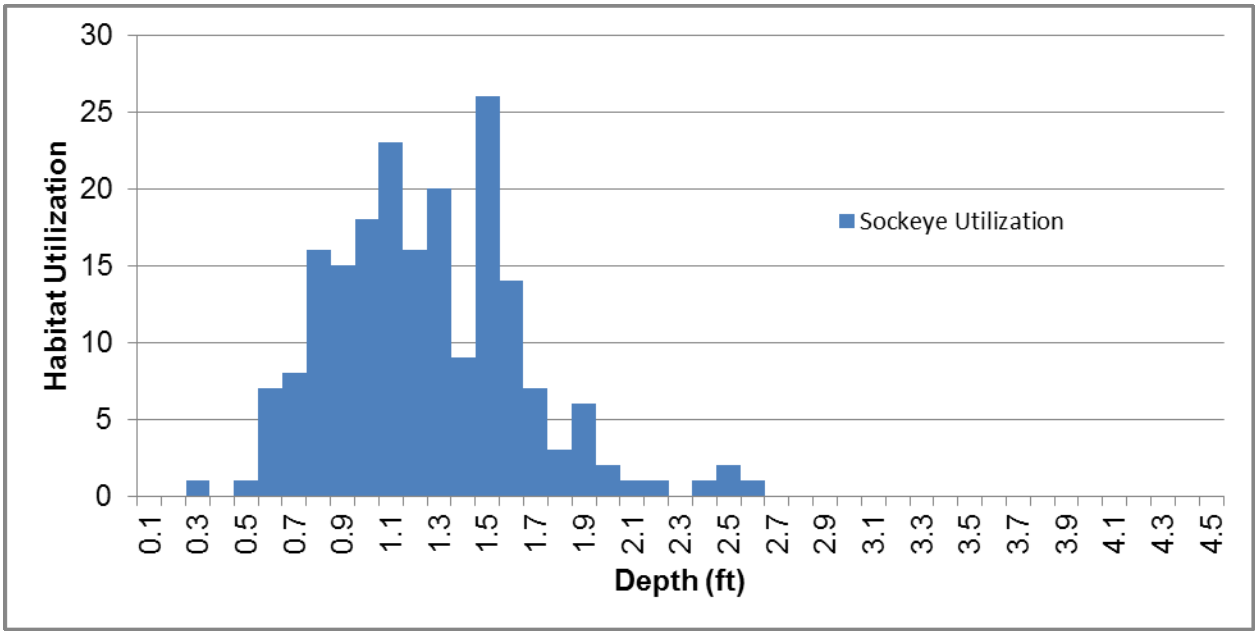

Figure A.2a-3. Sockeye salmon spawning depth utilization.

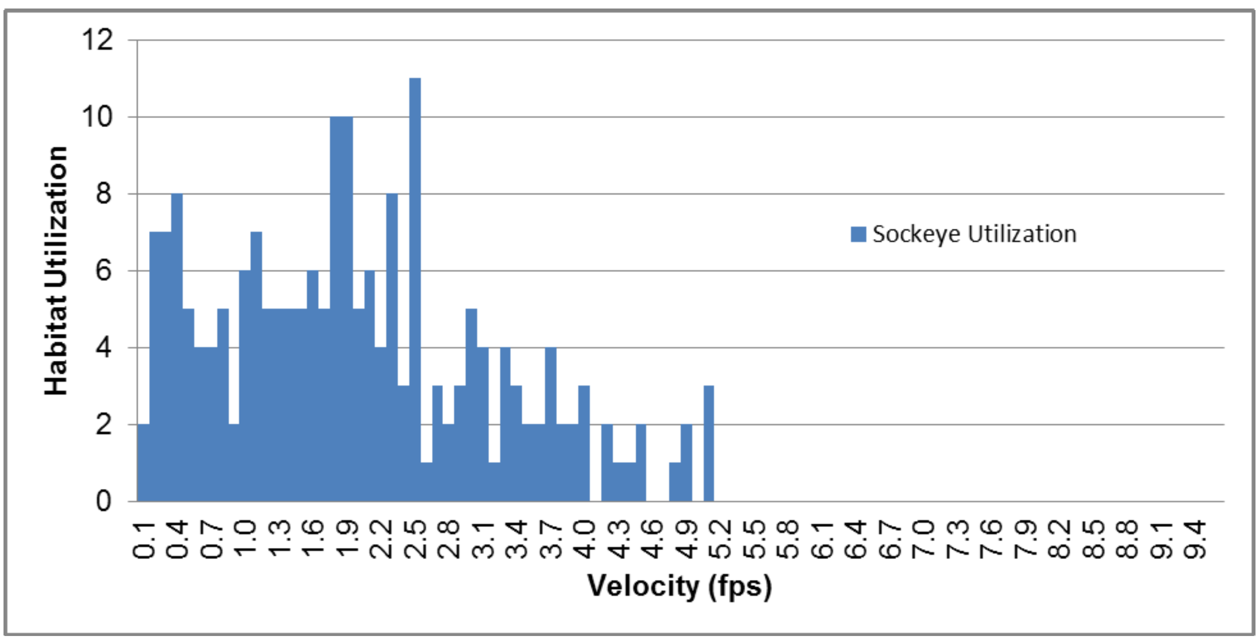

Figure A.2a-4. Sockeye salmon spawning velocity utilization.

Table A.2a-1. Sockeye salmon spawning depth, observed vs expected.

Depth Interval		O/E Ratio	Preference
Min	Max		
0	0.29	0.06	0.02
0.30	0.49	0.06	0.02
0.50	0.69	0.85	0.34
0.70	0.79	1.61	0.64
0.80	0.89	1.64	0.65
0.90	1.09	2.52	1.00
1.10	1.19	0.99	0.39
1.20	1.39	2.48	0.98
1.40	1.59	1.99	0.79
1.60	1.79	0.66	0.26
1.80	1.99	0.55	0.22
2.00	2.29	1.00	0.40
2.30	2.79	0.37	0.15
2.80	3.29	0.00	0.00
3.30	4.49	0.00	0.00

Table A.2a-2. Sockeye salmon spawning velocity, observed vs expected.

Velocity Interval		O/E Ratio	Preference
Min	Max		
0.00	0.09	0.09	0.03
0.10	0.19	0.59	0.21
0.20	0.49	1.43	0.52
0.50	0.79	1.13	0.41
0.80	1.29	2.11	0.76
1.30	1.79	2.77	1.00
1.80	2.19	2.34	0.84
2.20	2.59	1.90	0.69
2.60	3.09	1.63	0.59
3.10	3.49	0.81	0.29
3.50	3.89	0.97	0.35
3.90	4.39	0.59	0.21
4.40	4.79	0.29	0.11
4.80	5.49	0.48	0.17
5.50	6.09	0.00	0.00
6.10	7.49	0.00	0.00
7.50	9.59	0.00	0.00

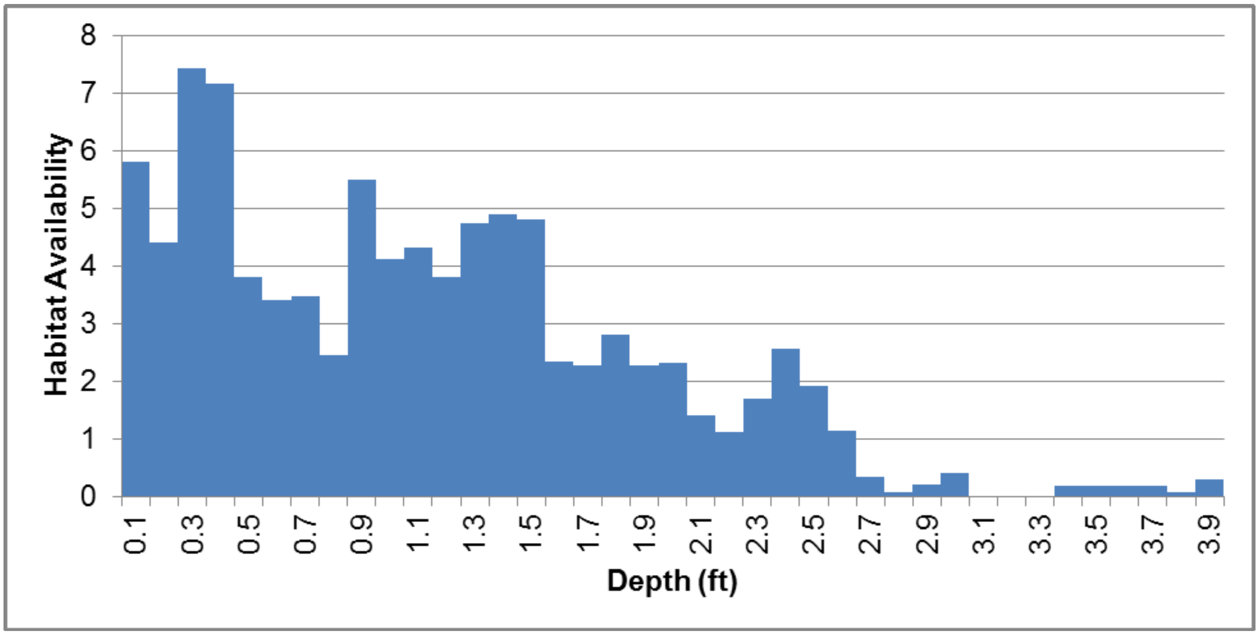

Figure A.2a-5. Coho salmon spawning habitat availability, depth.

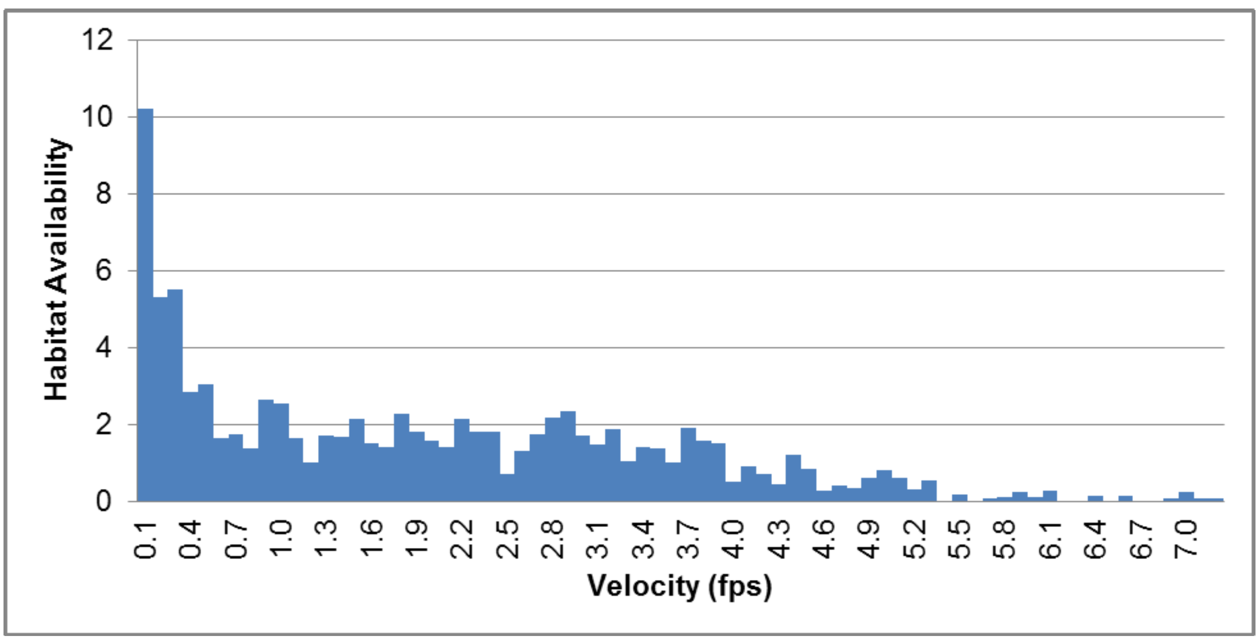

Figure A.2a-6. Coho salmon spawning habitat availability, velocity.

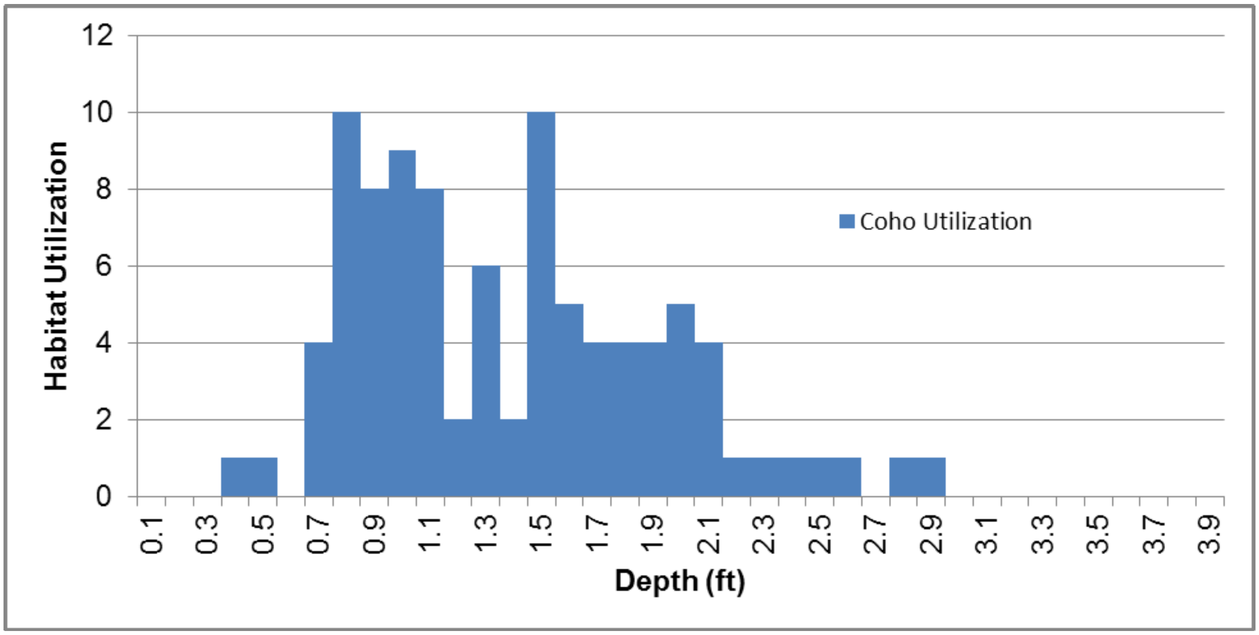

Figure A.2a-7. Coho salmon spawning depth utilization.

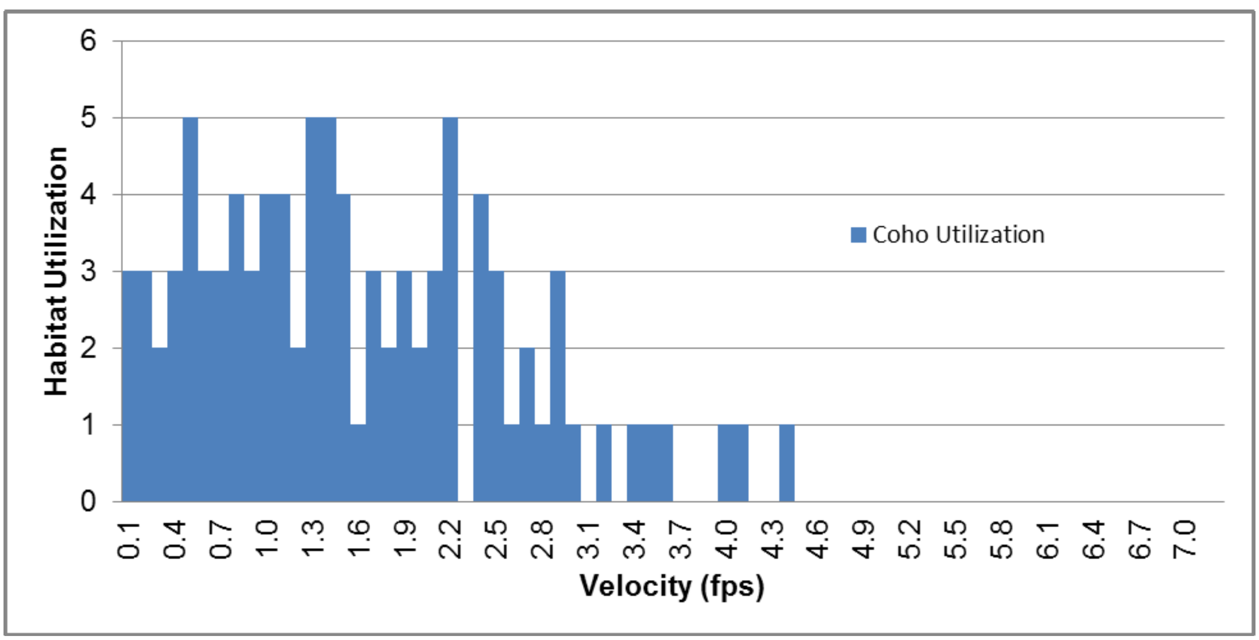

Figure A.2a-8. Coho salmon spawning velocity utilization

Table A.2a-3. Coho salmon spawning depth, observed vs expected.

Depth Interval			
Min	**Max**	**O/E Ratio**	**Preference**
0.00	0.09	0.00	0.00
0.10	0.29	0.00	0.00
0.30	0.39	0.14	0.05
0.40	0.59	0.14	0.05
0.60	0.79	2.37	0.80
0.80	1.09	2.96	1.00
1.10	1.29	0.94	0.32
1.30	1.49	1.24	0.42
1.50	1.79	1.75	0.59
1.80	2.09	2.16	0.73
2.10	2.39	0.56	0.19
2.40	3.89	0.78	0.26

Table A.2a-4. Coho salmon spawning velocity, observed vs expected.

Velocity Interval			
Min	**Max**	**O/E Ratio**	**Preference**
0.00	0.09	0.29	0.12
0.10	0.19	0.56	0.22
0.20	0.29	0.36	0.14
0.30	0.49	1.37	0.54
0.50	0.89	1.76	0.70
0.90	1.19	1.92	0.76
1.20	1.49	2.53	1.00
1.50	1.79	1.16	0.46
1.80	2.19	1.88	0.74
2.20	2.59	1.43	0.56
2.60	2.89	0.96	0.38
2.90	3.19	0.39	0.16
3.30	3.69	0.45	0.18
3.70	4.19	0.38	0.15
4.20	5.09	0.18	0.07
5.10	7.19	0.00	0.00

Appendix 2b. HSC Curves

This sub-appendix contains the following figures and tables:

Figure A.2b-1. Final HSC curve for sockeye salmon spawning, depth.
Figure A.2b-2. Final HSC curve for sockeye salmon spawning, velocity.
Figure A.2b-3. Final HSC curve for coho salmon spawning, depth.
Figure A.2b-4. Final HSC curve for coho salmon spawning, velocity.
Figure A.2b-5. Proposed HSC curve for coho salmon juvenile rearing, depth.
Figure A.2b-6. Proposed HSC curve for coho salmon juvenile rearing, velocity.
Figure A.2b-7. Proposed HSC curve for coho salmon fry rearing, depth.
Figure A.2b-8. Proposed HSC curve for coho salmon fry rearing, velocity.
Figure A.2b-9. Proposed HSC curve for Chinook salmon spawning, depth.
Figure A.2b-10. Proposed HSC curve for Chinook salmon spawning, velocity.
Figure A.2b-11. Proposed HSC curve for Chinook salmon juvenile rearing, depth.
Figure A.2b-12. Proposed HSC curve for Chinook salmon juvenile rearing, velocity.
Figure A.2b-13. Proposed HSC curve for Chinook salmon fry rearing, depth.
Figure A.2b-14. Proposed HSC curve for Chinook salmon fry rearing, velocity.
Figure A.2b-15. Proposed HSC curve for Dolly Varden spawning, depth.
Figure A.2b-16. Proposed HSC curve for Dolly Varden spawning, velocity.
Figure A.2b-17. Proposed HSC curve for Dolly Varden juvenile rearing, depth.
Figure A.2b-18. Proposed HSC curve for Dolly Varden juvenile rearing, velocity.
Figure A.2b-19. Proposed HSC curve for Dolly Varden fry rearing, depth.
Figure A.2b-20. Proposed HSC curve for Dolly Varden fry rearing, velocity.
Figure A.2b-21. Proposed HSC curve for Dolly Varden adult rearing, depth.
Figure A.2b-22. Proposed HSC curve for Dolly Varden adult rearing, velocity.
Figure A.2b-23. Proposed HSC curve for rainbow trout spawning, depth.
Figure A.2b-24. Proposed HSC curve for rainbow trout spawning, velocity.
Figure A.2b-25. Proposed HSC curve for rainbow trout juvenile rearing, depth.
Figure A.2b-26. Proposed HSC curve for rainbow trout juvenile rearing, velocity.
Figure A.2b-27. Proposed HSC curve for rainbow trout fry rearing, depth.
Figure A.2b-28. Proposed HSC curve for rainbow trout fry rearing, velocity.
Figure A.2b-29. Proposed HSC curve for rainbow trout adult rearing, depth.
Figure A.2b-30. Proposed HSC curve for rainbow trout adult rearing, velocity.

Table A.2b-1. Final HSC curve for sockeye salmon spawning depth.
Table A.2b-2. Final HSC curve for sockeye salmon spawing, velocity.
Table A.2b-3. Final HSC curve for coho salmon spawing, depth.
Table A.2b-4. Final HSC curve for coho salmon spawning, velocity.
Table A.2b-5. Proposed HSC curve for coho salmon juvenile rearing, depth.
Table A.2b-6. Proposed HSC curve for coho salmon juvenile rearing, velocity.
Table A.2b-7. Proposed HSC curve for coho salmon fry rearing, depth.
Table A.2b-8. Proposed HSC curve for coho salmon fry rearing, velocity.
Table A.2b-9. Proposed HSC curve for Chinook salmon spawning, depth.
Table A.2b-10. Proposed HSC curve for Chinook salmon spawning, velocity.
Table A.2b-11. Proposed HSC curve for Chinook salmon juvenile rearing, depth.
Table A.2b-12. Proposed HSC curve for Chinook salmon juvenile rearing, velocity.
Table A.2b-13. Proposed HSC curve for Chinook salmon fry rearing, depth.
Table A.2b-14. Proposed HSC curve for Chinook salmon fry rearing, velocity.
Table A.2b-15. Proposed HSC curve for Dolly Varden spawning, depth.
Table A.2b-16. Proposed HSC curve for Dolly Varden spawning, velocity.
Table A.2b-17. Proposed HSC curve for Dolly Varden juvenile rearing, depth.
Table A.2b-18. Proposed HSC curve for Dolly Varden juvenile rearing, velocity.
Table A.2b-19. Proposed HSC curve for Dolly Varden fry rearing, depth.
Table A.2b-20. Proposed HSC curve for Dolly Varden fry rearing, velocity.
Table A.2b-21. Proposed HSC curve for Dolly Varden adult rearing, depth.
Table A.2b-22. Proposed HSC curve for Dolly Varden adult rearing, velocity.
Table A.2b-23. Proposed HSC curve for rainbow trout spawning, depth.
Table A.2b-24. Proposed HSC curve for rainbow trout spawning, velocity.
Table A.2b-25. Proposed HSC curve for rainbow trout juvenile rearing, depth.
Table A.2b-26. Proposed HSC curve for rainbow trout juvenile rearing, velocity.
Table A.2b-27. Proposed HSC curve for rainbow trout fry rearing, depth.
Table A.2b-28. Proposed HSC curve for rainbow trout fry rearing, velocity.
Table A.2b-29. Proposed HSC curve for rainbow trout adult rearing, depth.
Table A.2b-30. Proposed HSC curve for rainbow trout adult rearing, velocity.
Table A.2b-31. Substrate classification and HSC values.
Table A.2b-32. Cover classification and HSC values.

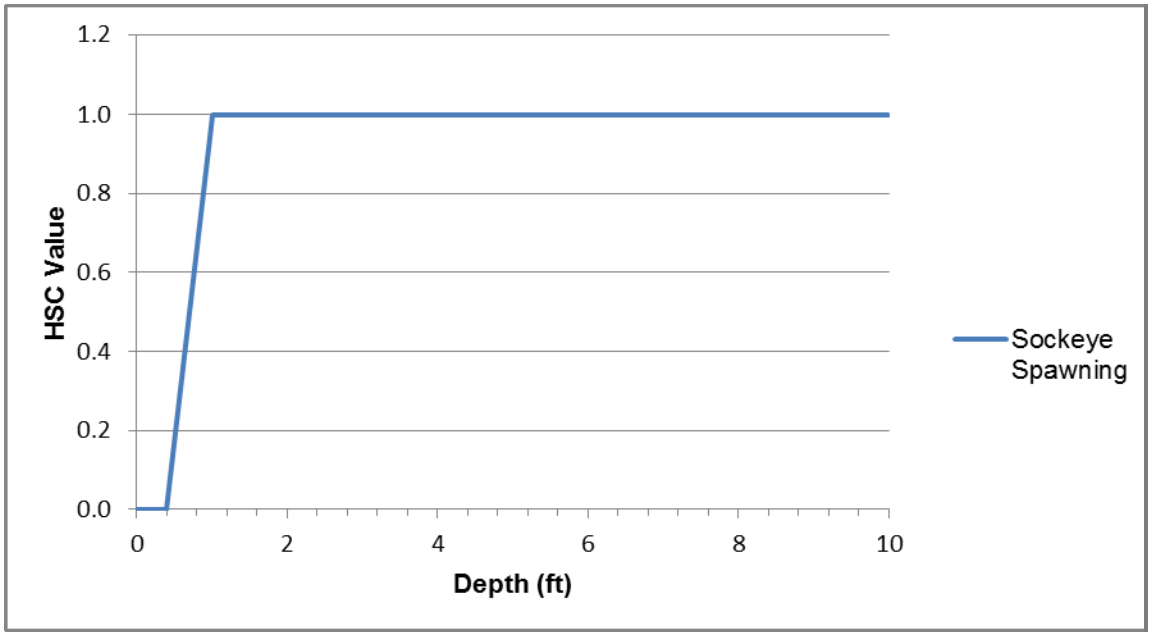

Figure A.2b-1. Final HSC curve for sockeye salmon spawning, depth.

Table A.2b-1. Final HSC curve for sockeye salmon spawning depth.

Depth	Pref
0.00	0.00
0.40	0.00
1.00	1.00
10.00	1.00

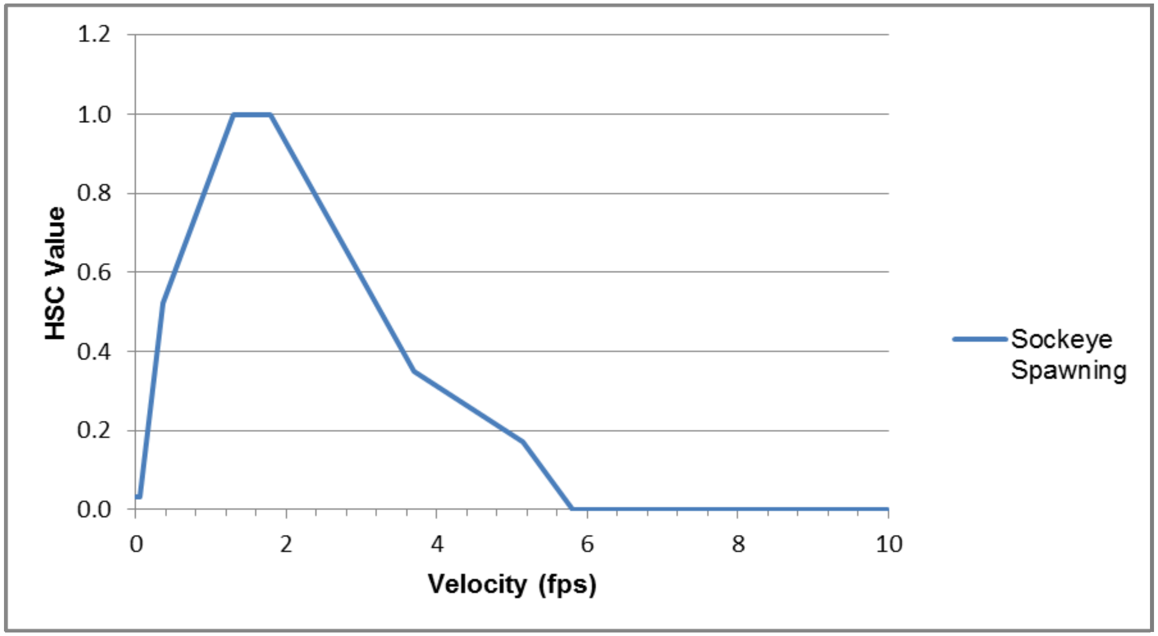

Figure A.2b-2. Final HSC curve for sockeye salmon spawning, velocity.

Table A.2b-2. Final HSC curve for sockeye salmon spawing, velocity.

Velocity	Pref
0.00	0.03
0.05	0.03
0.35	0.52
1.30	1.00
1.79	1.00
3.70	0.35
5.15	0.17
5.80	0.00
10.00	0.00

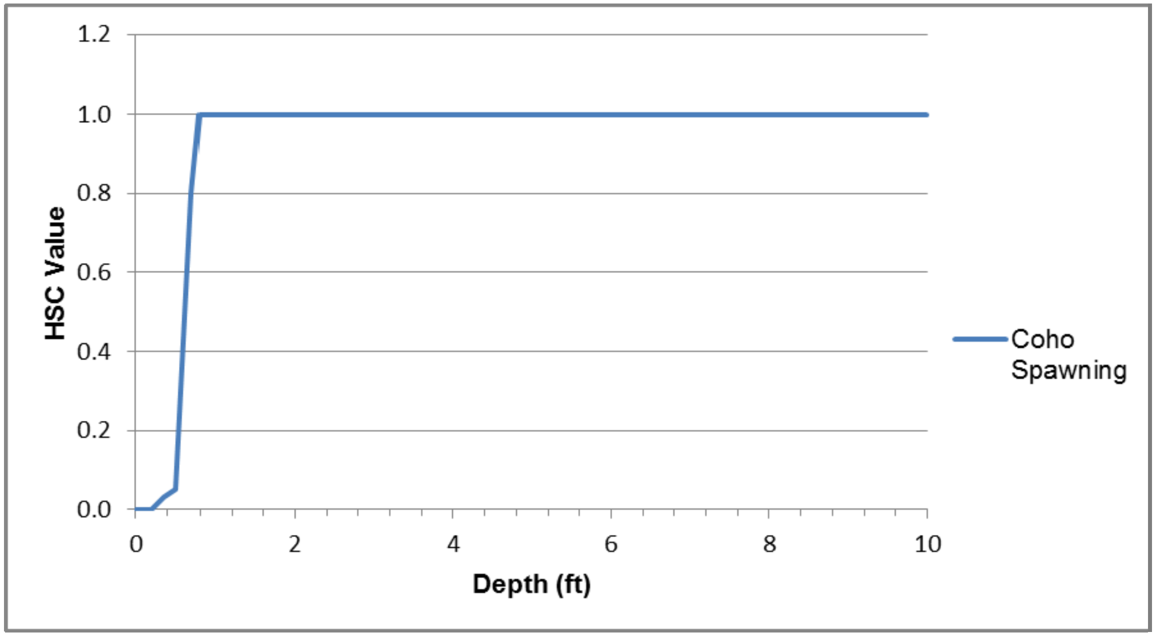

Figure A.2b-3. Final HSC curve for coho salmon spawning, depth.

Table A.2b-3. Final HSC curve for coho salmon spawing, depth.

Depth	Pref
0.00	0.00
0.20	0.00
0.35	0.03
0.50	0.05
0.70	0.80
0.80	1.00
10.00	1.00

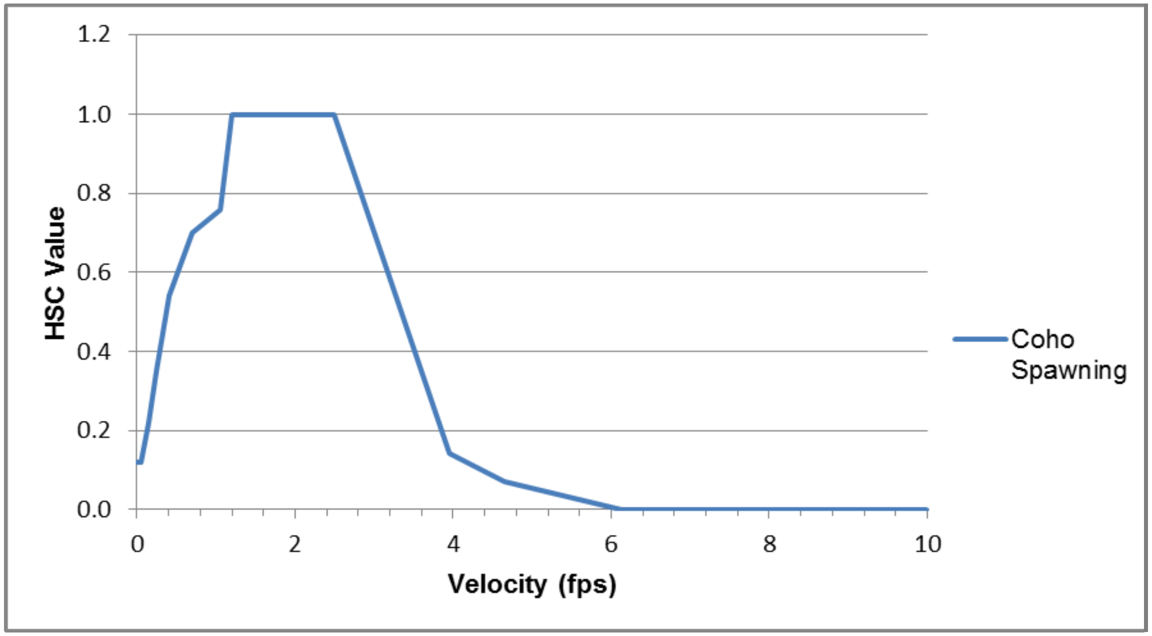

Figure A.2b-4. Final HSC curve for coho salmon spawning, velocity.

Table A.2b-4. Final HSC curve for coho salmon spawning, velocity.

Velocity	Pref
0.00	0.03
0.05	0.03
0.35	0.52
1.30	1.00
1.79	1.00
3.70	0.35
5.15	0.17
5.80	0.00
10.00	0.00

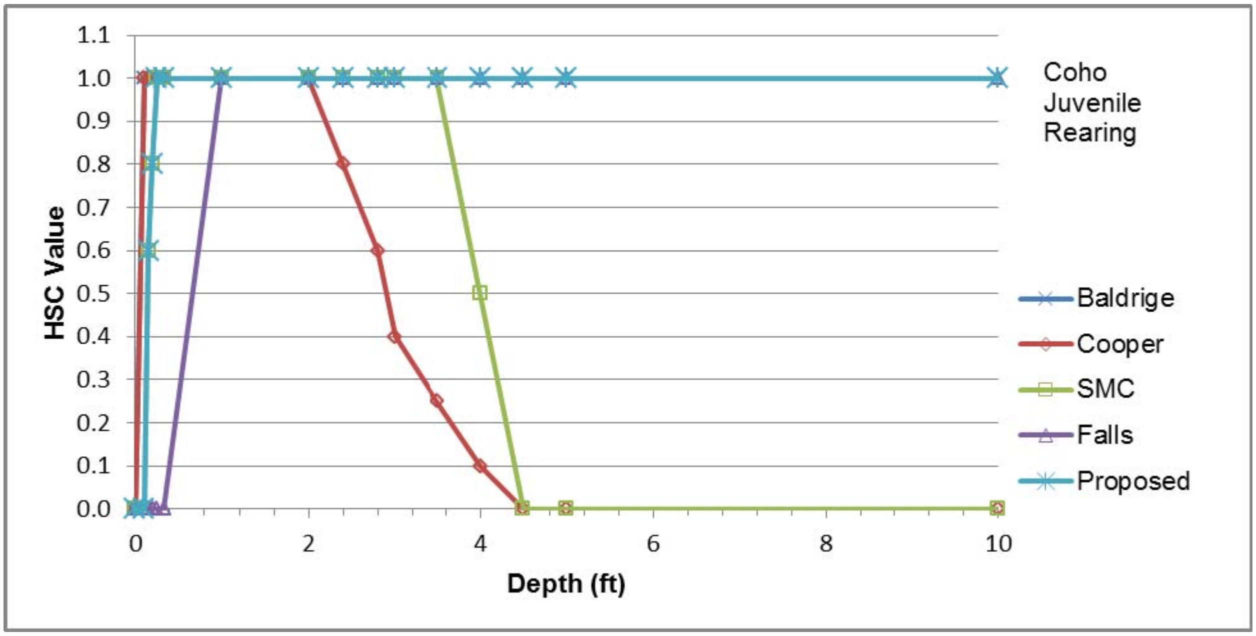

Figure A.2b-5. Proposed HSC curve for coho salmon juvenile rearing, depth.

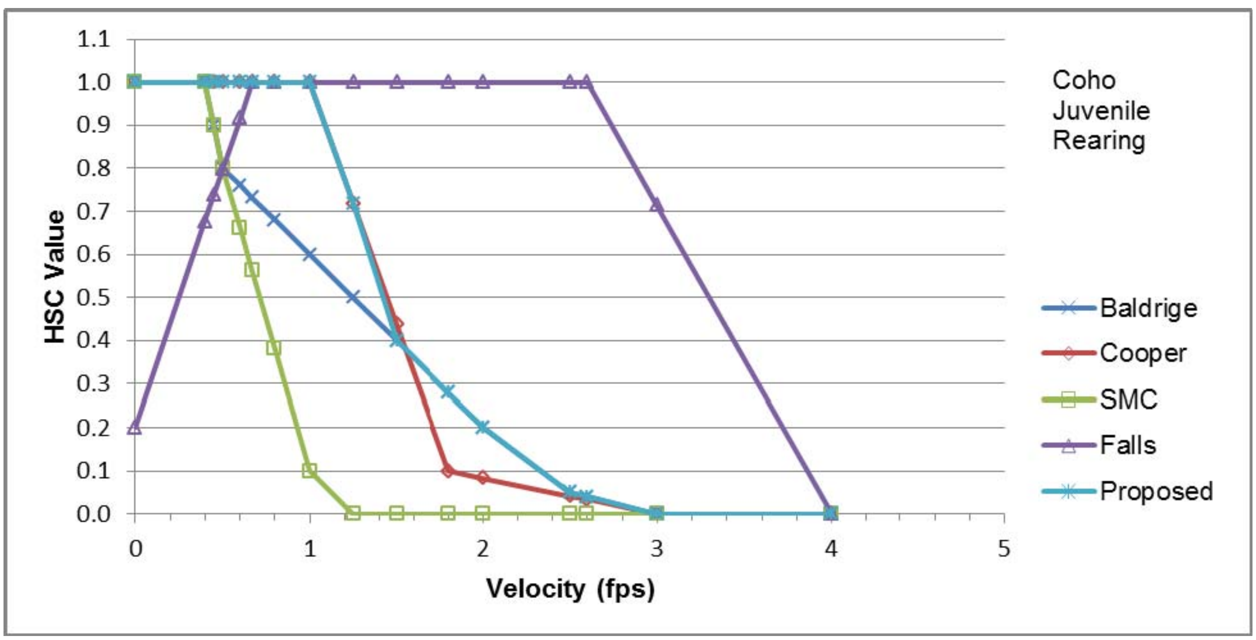

Figure A.2b-6. Proposed HSC curve for coho salmon juvenile rearing, velocity.

Table A.2b-5. Proposed HSC curve for coho salmon juvenile rearing, depth.

Depth	Baldrige	Cooper	SMC	Falls	Proposed
0.00	0.00	0.00	0.00	0.00	0.00
0.10	1.00	1.00	0.00	0.00	0.00
0.15	1.00	1.00	0.60	0.00	0.60
0.20	1.00	1.00	0.80	0.00	0.80
0.25	1.00	1.00	1.00	0.00	1.00
0.33	1.00	1.00	1.00	0.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00
2.00	1.00	1.00	1.00	1.00	1.00
2.40	1.00	0.80	1.00	1.00	1.00
2.80	1.00	0.60	1.00	1.00	1.00
3.00	1.00	0.40	1.00	1.00	1.00
3.50	1.00	0.25	1.00	1.00	1.00
4.00	1.00	0.10	0.50	1.00	1.00
4.50	1.00	0.00	0.00	1.00	1.00
5.00	1.00	0.00	0.00	1.00	1.00
10.00	1.00	0.00	0.00	1.00	1.00

Table A.2b-6. Proposed HSC curve for coho salmon juvenile rearing, velocity.

Velocity	Baldrige	Cooper	SMC	Falls	Proposed
0.00	1.00	1.00	1.00	0.20	1.00
0.40	1.00	1.00	1.00	0.68	1.00
0.45	0.90	1.00	0.90	0.74	1.00
0.50	0.80	1.00	0.80	0.80	1.00
0.60	0.76	1.00	0.66	0.92	1.00
0.67	0.73	1.00	0.56	1.00	1.00
0.80	0.68	1.00	0.38	1.00	1.00
1.00	0.60	1.00	0.10	1.00	1.00
1.25	0.50	0.72	0.00	1.00	0.72
1.50	0.40	0.44	0.00	1.00	0.40
1.80	0.28	0.10	0.00	1.00	0.28
2.00	0.20	0.08	0.00	1.00	0.20
2.50	0.05	0.04	0.00	1.00	0.05
2.60	0.04	0.03	0.00	1.00	0.04
3.00	0.00	0.00	0.00	0.71	0.00
4.00	0.00	0.00	0.00	0.00	0.00

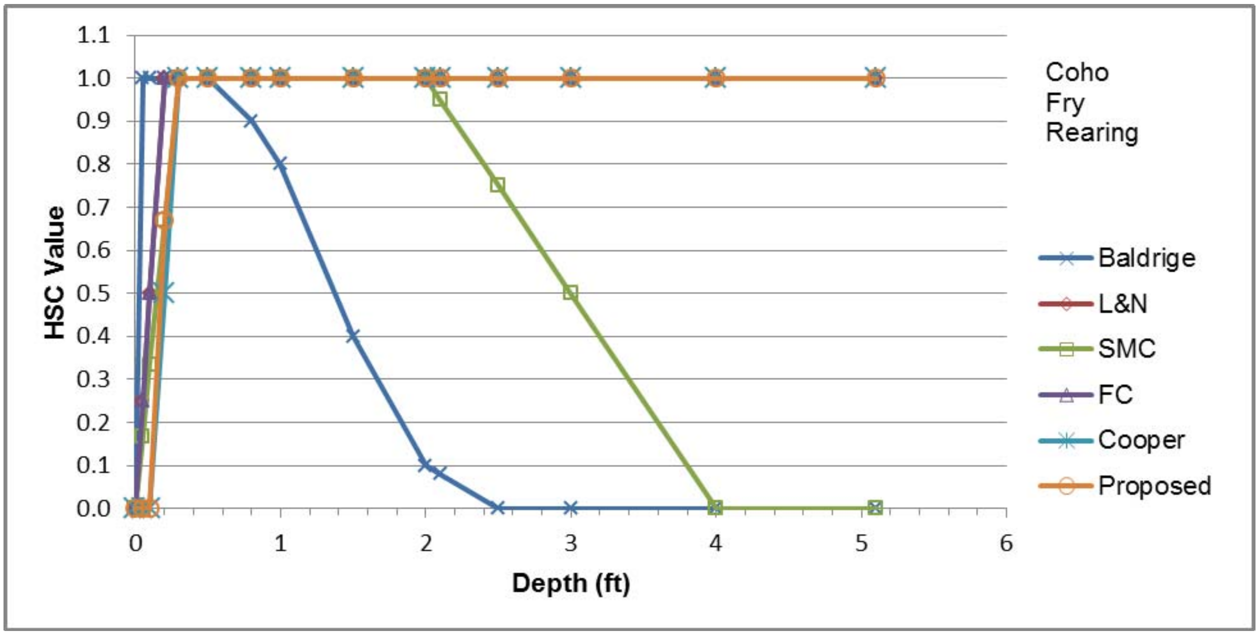

Figure A.2b-7. Proposed HSC curve for coho salmon fry rearing, depth.

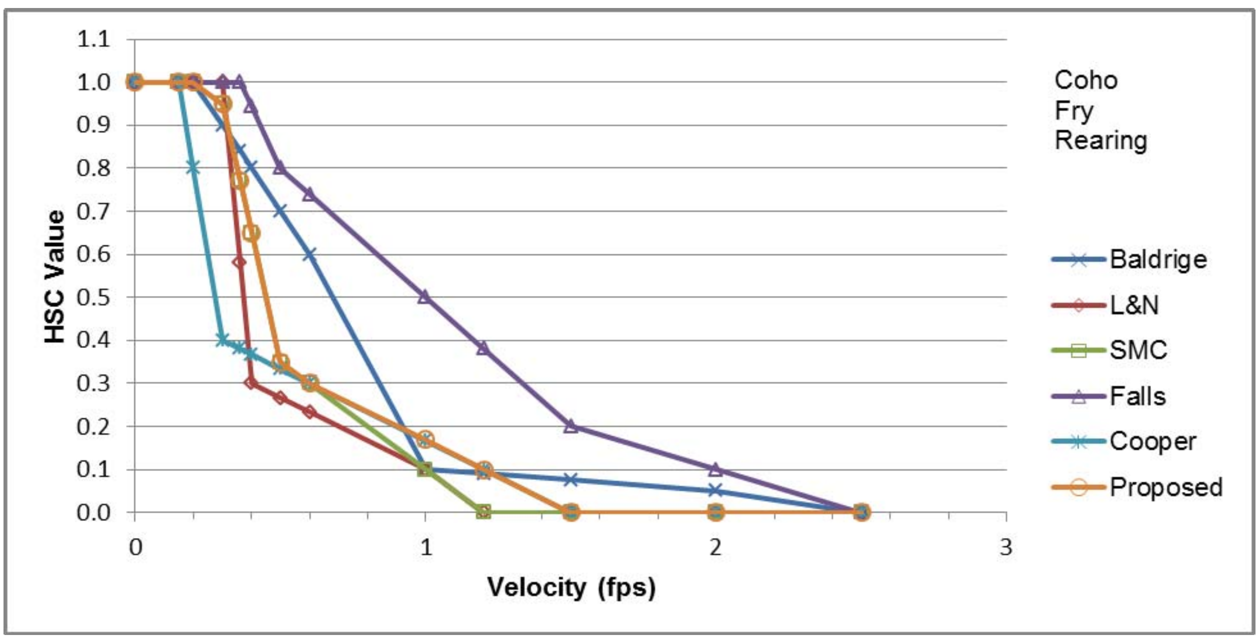

Figure A.2b-8. Proposed HSC curve for coho salmon fry rearing, velocity.

Table A.2b-7. Proposed HSC curve for coho salmon fry rearing, depth.

Depth	Baldrige	L&N	SMC	FC	Cooper	Proposed
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.05	1.00	0.25	0.17	0.25	0.00	0.00
0.10	1.00	0.50	0.34	0.50	0.00	0.00
0.20	1.00	1.00	0.67	1.00	0.50	0.67
0.30	1.00	1.00	1.00	1.00	1.00	1.00
0.50	1.00	1.00	1.00	1.00	1.00	1.00
0.80	0.90	1.00	1.00	1.00	1.00	1.00
1.00	0.80	1.00	1.00	1.00	1.00	1.00
1.50	0.40	1.00	1.00	1.00	1.00	1.00
2.00	0.10	1.00	1.00	1.00	1.00	1.00
2.10	0.08	1.00	0.95	1.00	1.00	1.00
2.50	0.00	1.00	0.75	1.00	1.00	1.00
3.00	0.00	1.00	0.50	1.00	1.00	1.00
4.00	0.00	1.00	0.00	1.00	1.00	1.00
5.10	0.00	1.00	0.00	1.00	1.00	1.00

Table A.2b-8. Proposed HSC curve for coho salmon fry rearing, velocity.

Velocity	Baldrige	L&N	SMC	Falls	Cooper	Proposed
0.00	1.00	1.00	1.00	1.00	1.00	1.00
0.15	1.00	1.00	1.00	1.00	1.00	1.00
0.20	1.00	1.00	1.00	1.00	0.80	1.00
0.30	0.90	1.00	0.95	1.00	0.40	0.95
0.36	0.84	0.58	0.77	1.00	0.38	0.77
0.40	0.80	0.30	0.65	0.94	0.37	0.65
0.50	0.70	0.27	0.35	0.80	0.33	0.35
0.60	0.60	0.23	0.30	0.74	0.30	0.30
1.00	0.10	0.10	0.10	0.50	0.17	0.17
1.20	0.09	0.00	0.00	0.38	0.10	0.10
1.50	0.08	0.00	0.00	0.20	0.00	0.00
2.00	0.05	0.00	0.00	0.10	0.00	0.00
2.50	0.00	0.00	0.00	0.00	0.00	0.00

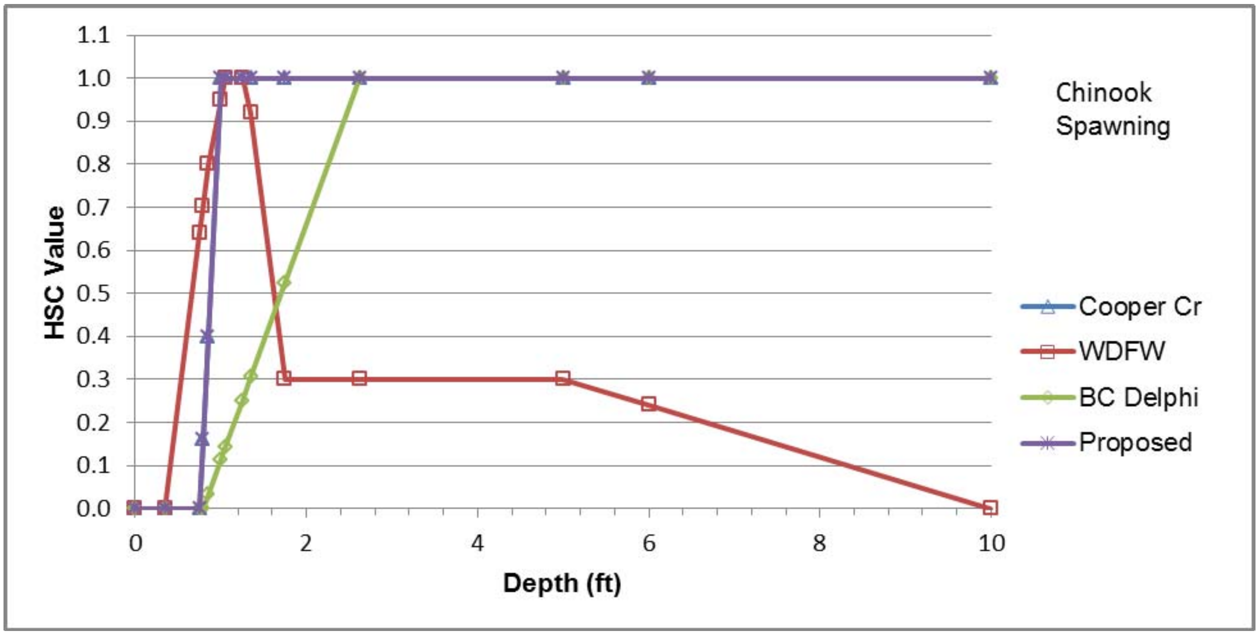

Figure A.2b-9. Proposed HSC curve for Chinook salmon spawning, depth.

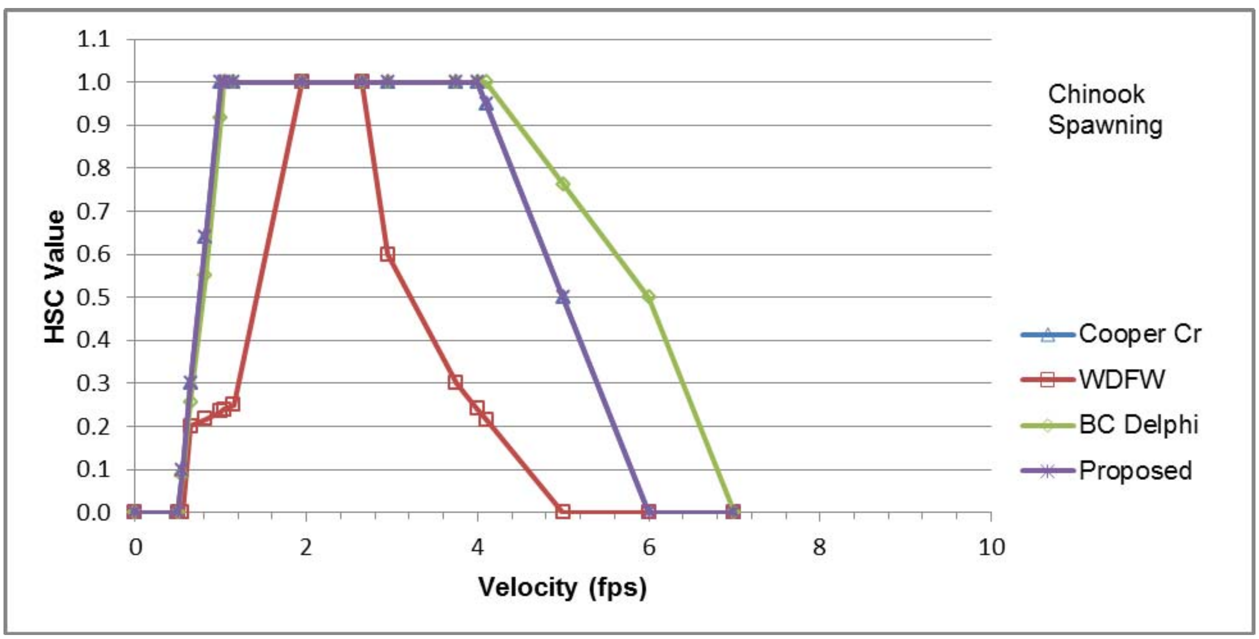

Figure A.2b-10. Proposed HSC curve for Chinook salmon spawning, velocity.

Table A.2b-9. Proposed HSC curve for Chinook salmon spawning, depth.

Depth	Cooper Cr	WDFW	BC Delphi	Proposed
0.00	0.00	0.00	0.00	0.00
0.35	0.00	0.00	0.00	0.00
0.75	0.00	0.64	0.00	0.00
0.79	0.16	0.70	0.00	0.16
0.85	0.40	0.80	0.03	0.40
1.00	1.00	0.95	0.11	1.00
1.05	1.00	1.00	0.14	1.00
1.25	1.00	1.00	0.25	1.00
1.35	1.00	0.92	0.31	1.00
1.75	1.00	0.30	0.52	1.00
2.62	1.00	0.30	1.00	1.00
5.00	1.00	0.30	1.00	1.00
6.00	1.00	0.24	1.00	1.00
10.00	1.00	0.00	1.00	1.00

Table A.2b-10. Proposed HSC curve for Chinook salmon spawning, velocity.

Velocity	Cooper Cr	WDFW	BC Delphi	Proposed
0.00	0.00	0.00	0.00	0.00
0.50	0.00	0.00	0.00	0.00
0.55	0.10	0.00	0.09	0.10
0.65	0.30	0.20	0.26	0.30
0.82	0.64	0.22	0.55	0.64
1.00	1.00	0.24	0.92	1.00
1.04	1.00	0.24	1.00	1.00
1.15	1.00	0.25	1.00	1.00
1.95	1.00	1.00	1.00	1.00
2.65	1.00	1.00	1.00	1.00
2.95	1.00	0.60	1.00	1.00
3.75	1.00	0.30	1.00	1.00
4.00	1.00	0.24	1.00	1.00
4.10	0.95	0.22	1.00	0.95
5.00	0.50	0.00	0.76	0.50
6.00	0.00	0.00	0.50	0.00
7.00	0.00	0.00	0.00	0.00

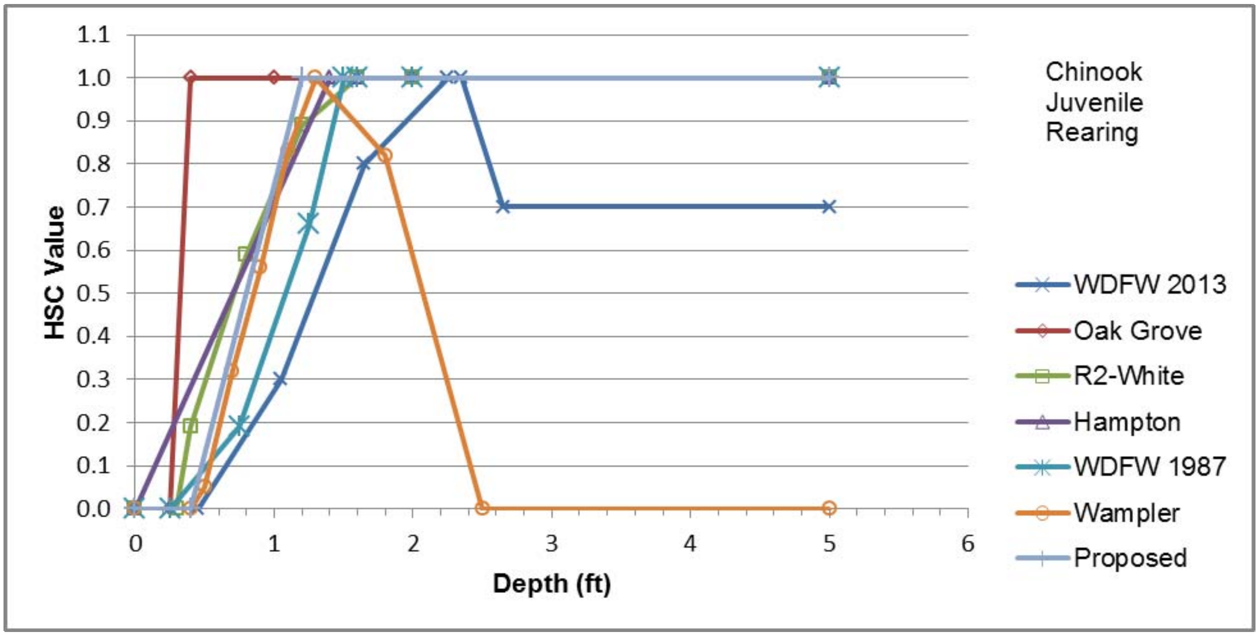

Figure A.2b-11. Proposed HSC curve for Chinook salmon juvenile rearing, depth.

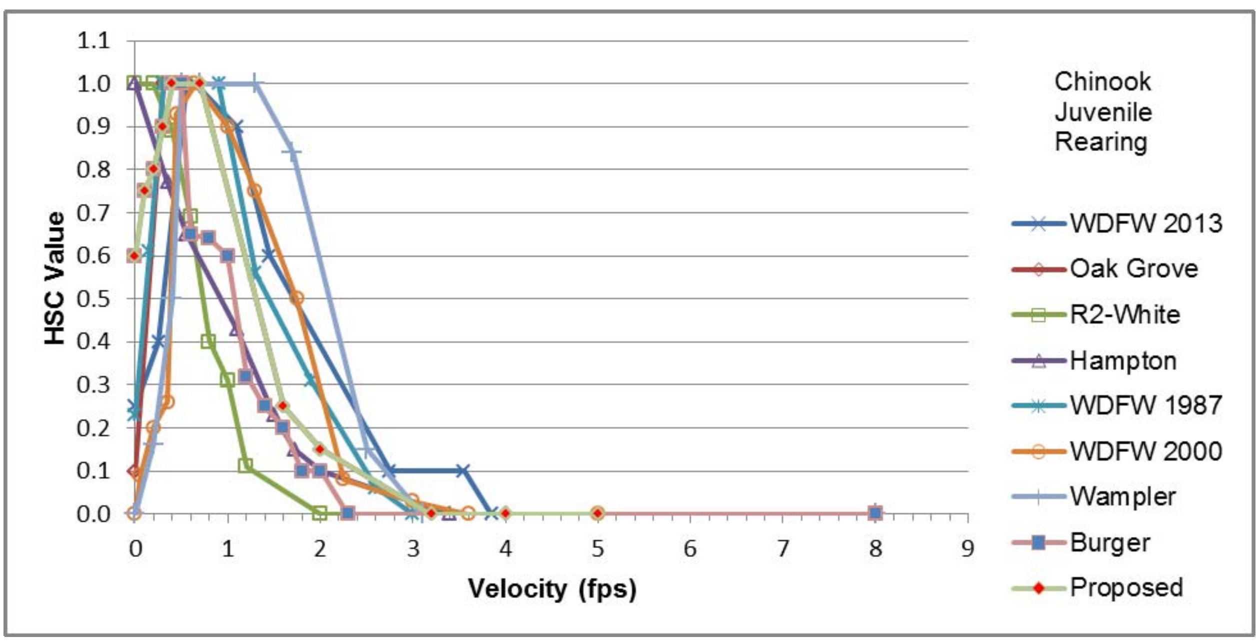

Figure A.2b-12. Proposed HSC curve for Chinook salmon juvenile rearing, velocity.

Table A.2b-11. Proposed HSC curve for Chinook salmon juvenile rearing, depth.

Depth	WDFW 2013	Oak Grove	R2-White	Hampton	WDFW 1987	Wampler	Proposed
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.25		0.00			0.00		
0.30			0.00				
0.40		1.00	0.19			0.00	0.00
0.45	0.00						
0.50						0.05	
0.70						0.32	
0.75					0.19		
0.80			0.59				
0.90						0.56	
1.00		1.00					
1.05	0.30						
1.10						0.83	
1.20			0.89				1.00
1.25					0.66		
1.30						1.00	
1.40				1.00			
1.50					1.00		
1.60			1.00	1.00	1.00		
1.65	0.80						
1.80						0.82	
2.00		1.00	1.00		1.00		
2.25	1.00						
2.35	1.00						
2.50						0.00	
2.65	0.70						
5.00	0.70	1.00	1.00	1.00	1.00	0.00	1.00

Table A.2b-12. Proposed HSC curve for Chinook salmon juvenile rearing, velocity.

Velocity	WDFW 2013	Oak Grove	R2-White	Hampton	WDFW 1987	WDFW 2000	Wampler	Burger	Proposed
0.00	0.25	0.10	1.00	1.00	0.23	0.00	0.00	0.60	0.60
0.05						0.09			
0.10								0.75	0.75
0.15					0.61				
0.20			1.00			0.20	0.16	0.80	0.80
0.25	0.40								
0.30		1.00			1.00			0.90	0.90

Velocity	WDFW 2013	Oak Grove	R2-White	Hampton	WDFW 1987	WDFW 2000	Wampler	Burger	Proposed
0.35				0.77		0.26			
0.40			0.89				0.50	1.00	1.00
0.45						0.93			
0.50							1.00	1.00	
0.55	1.00			0.65					
0.60			0.69					0.65	
0.65	1.00					1.00			
0.70		1.00					1.00		1.00
0.80			0.40					0.64	
0.90					1.00				
1.00			0.31			0.90		0.60	
1.10	0.90			0.43					
1.20			0.11					0.32	
1.30					0.56	0.75	1.00		
1.40								0.25	
1.45	0.60								
1.50				0.23					
1.60		0.25						0.20	0.25
1.70							0.84		
1.72				0.15					
1.75						0.50			
1.80								0.10	
1.90					0.31				
2.00		0.15	0.00					0.10	0.15
2.01				0.10					
2.25						0.08			
2.30								0.00	
2.50							0.15		
2.60					0.06				
2.75	0.10								
3.00					0.00	0.03			
3.10							0.00		
3.20		0.00							0.00
3.55	0.10								
3.40				0.00					
3.60						0.00			
3.85	0.00								
4.00		0.00							0.00
5.00		0.00				0.00			0.00
8.00	0.00		0.00	0.00	0.00		0.00	0.00	

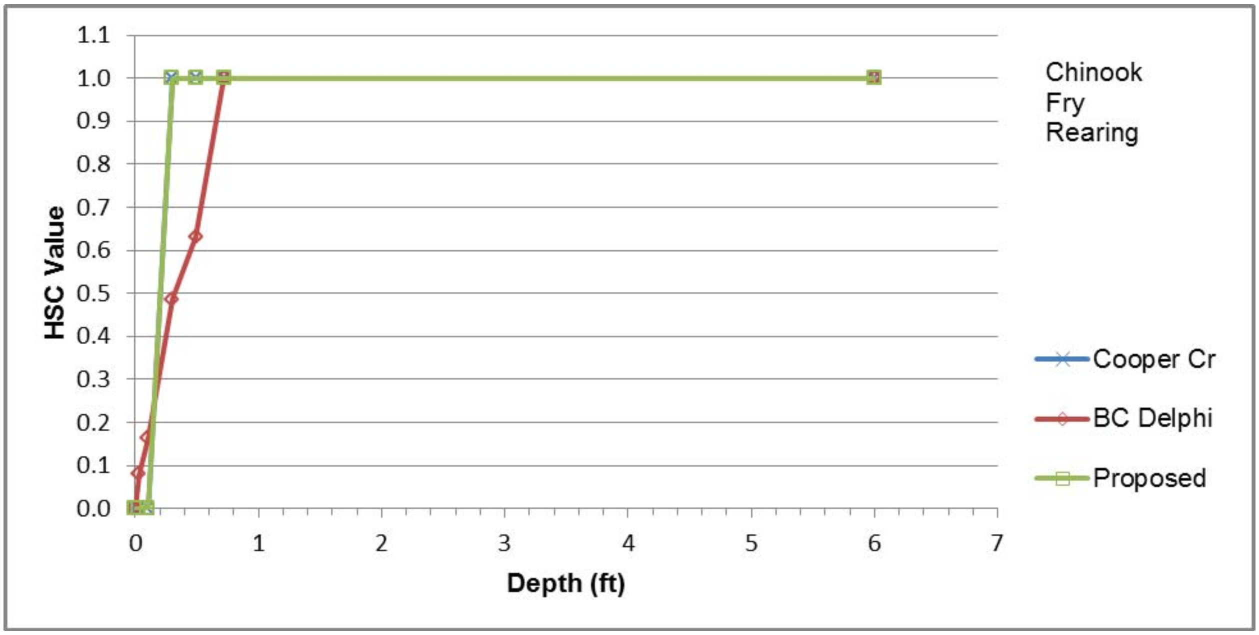

Figure A.2b-13. Proposed HSC curve for Chinook salmon fry rearing, depth.

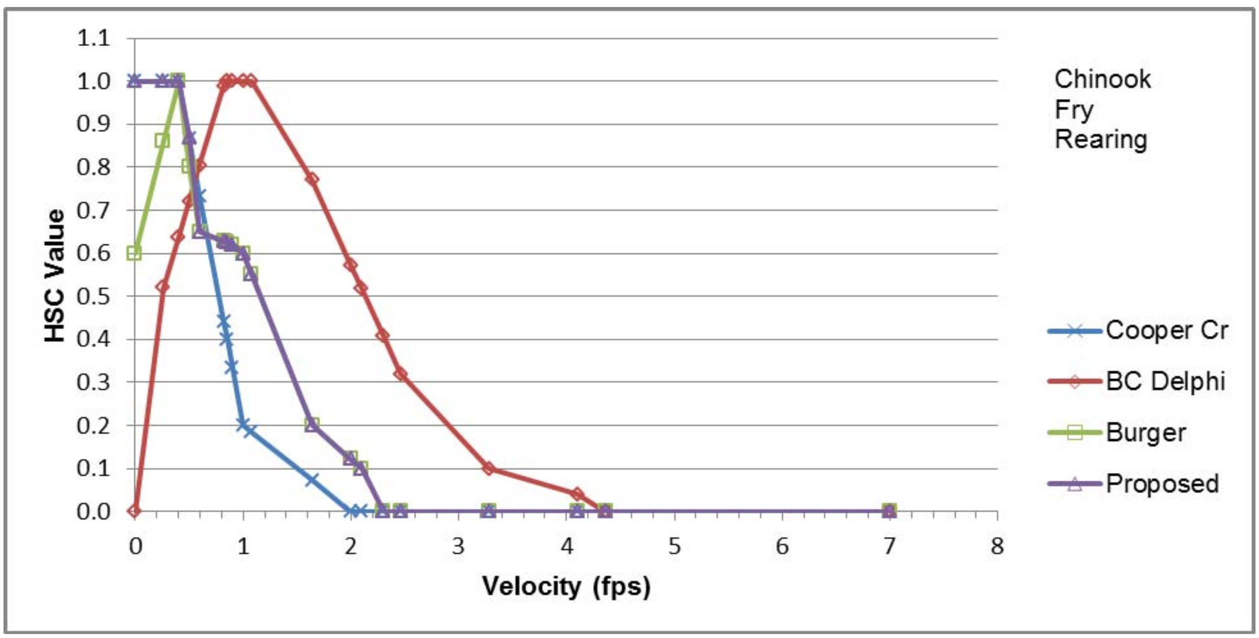

Figure A.2b-14. Proposed HSC curve for Chinook salmon fry rearing, velocity.

Table A.2b-13. Proposed HSC curve for Chinook salmon fry rearing, depth.

Depth	Cooper Cr	BC Delphi	Proposed
0.00	0.00	0.00	0.00
0.03	0.00	0.08	0.00
0.10	0.00	0.16	0.00
0.30	1.00	0.49	1.00
0.49	1.00	0.63	1.00
0.72	1.00	1.00	1.00
6.00	1.00	1.00	1.00

Table A.2b-14. Proposed HSC curve for Chinook salmon fry rearing, velocity.

Velocity	Cooper Cr	BC Delphi	Burger	Proposed
0.00	1.00	0.00	0.60	1.00
0.26	1.00	0.52	0.86	1.00
0.40	1.00	0.64	1.00	1.00
0.50	0.87	0.72	0.80	0.87
0.60	0.73	0.81	0.65	0.65
0.82	0.44	0.99	0.63	0.63
0.85	0.40	1.00	0.63	0.63
0.90	0.33	1.00	0.62	0.62
1.00	0.20	1.00	0.60	0.60
1.08	0.18	1.00	0.55	0.55
1.64	0.07	0.77	0.20	0.20
2.00	0.00	0.57	0.12	0.12
2.10	0.00	0.52	0.10	0.10
2.30	0.00	0.41	0.00	0.00
2.46	0.00	0.32	0.00	0.00
3.28	0.00	0.10	0.00	0.00
4.10	0.00	0.04	0.00	0.00
4.36	0.00	0.00	0.00	0.00
7.00	0.00	0.00	0.00	0.00

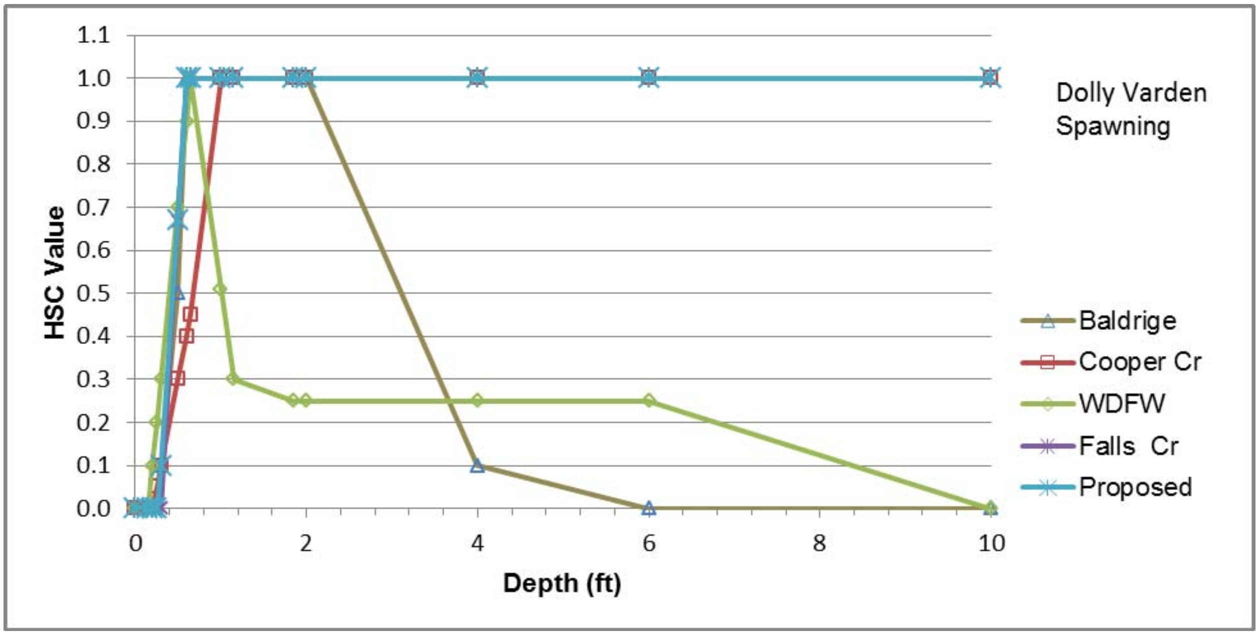

Figure A.2b-15. Proposed HSC curve for Dolly Varden spawning, depth.

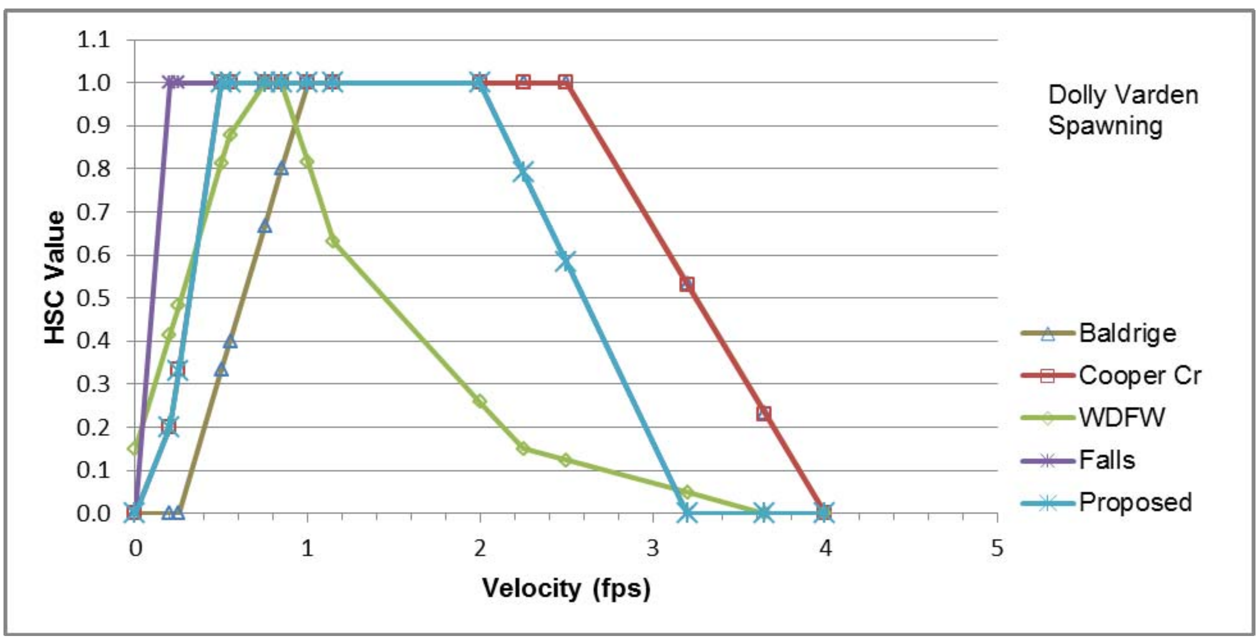

Figure A.2b-16. Proposed HSC curve for Dolly Varden spawning, velocity.

Table A.2b-15. Proposed HSC curve for Dolly Varden spawning, depth.

Depth	Baldrige	Cooper Cr	WDFW	Falls Cr	Proposed
0.00	0.00	0.00	0.00	0.00	0.00
0.15	0.00	0.00	0.00	0.00	0.00
0.20	0.00	0.00	0.10	0.00	0.00
0.25	0.00	0.05	0.20	0.00	0.00
0.30	0.10	0.10	0.30	0.00	0.10
0.50	0.50	0.30	0.70	0.67	0.67
0.60	1.00	0.40	0.90	1.00	1.00
0.65	1.00	0.45	1.00	1.00	1.00
1.00	1.00	1.00	0.51	1.00	1.00
1.15	1.00	1.00	0.30	1.00	1.00
1.85	1.00	1.00	0.25	1.00	1.00
2.00	1.00	1.00	0.25	1.00	1.00
4.00	0.10	1.00	0.25	1.00	1.00
6.00	0.00	1.00	0.25	1.00	1.00
10.00	0.00	1.00	0.00	1.00	1.00

Table A.2b-16. Proposed HSC curve for Dolly Varden spawning, velocity.

Velocity	Baldrige	Cooper Cr	WDFW	Falls	Proposed
0.00	0.00	0.00	0.15	0.00	0.00
0.20	0.00	0.20	0.42	1.00	0.20
0.25	0.00	0.33	0.48	1.00	0.33
0.50	0.33	1.00	0.81	1.00	1.00
0.55	0.40	1.00	0.88	1.00	1.00
0.75	0.67	1.00	1.00	1.00	1.00
0.85	0.80	1.00	1.00	1.00	1.00
1.00	1.00	1.00	0.82	1.00	1.00
1.15	1.00	1.00	0.63	1.00	1.00
2.00	1.00	1.00	0.26	1.00	1.00
2.25	1.00	1.00	0.15	0.79	0.79
2.50	1.00	1.00	0.12	0.58	0.58
3.20	0.53	0.53	0.05	0.00	0.00
3.65	0.23	0.23	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00

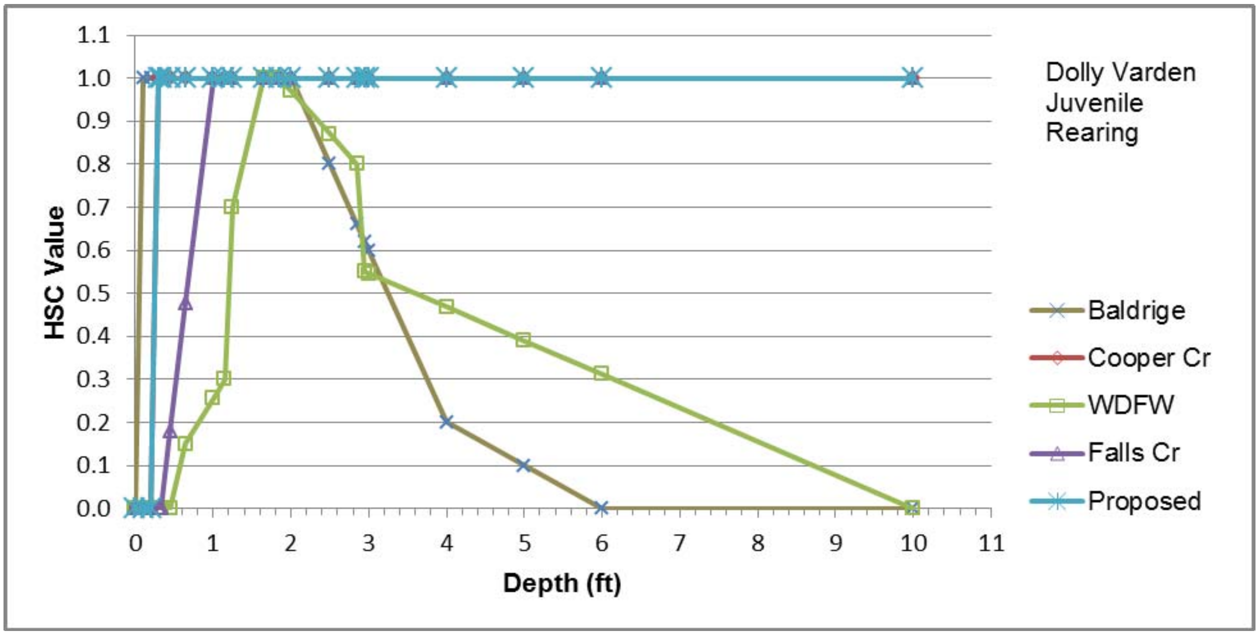

Figure A.2b-17. Proposed HSC curve for Dolly Varden juvenile rearing, depth.

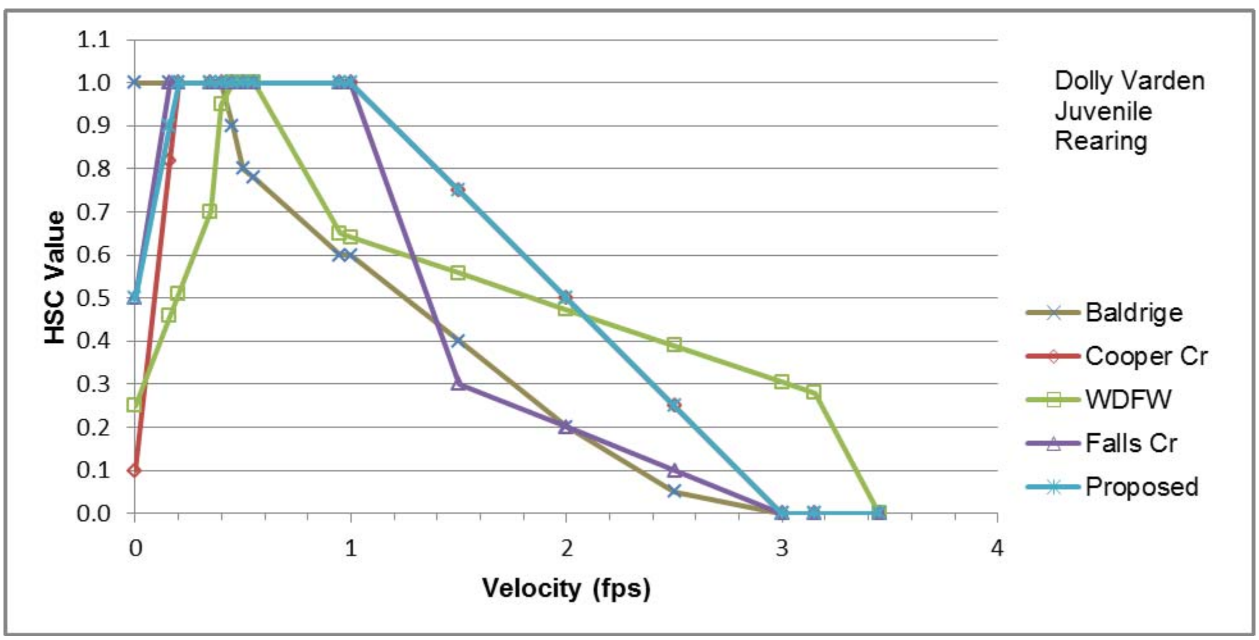

Figure A.2b-18. Proposed HSC curve for Dolly Varden juvenile rearing, velocity.

Table A.2b-17. Proposed HSC curve for Dolly Varden juvenile rearing, depth.

Depth	Baldrige	Cooper Cr	WDFW	Falls Cr	Proposed
0.00	0.00	0.00	0.00	0.00	0.00
0.10	1.00	0.00	0.00	0.00	0.00
0.20	1.00	0.00	0.00	0.00	0.00
0.30	1.00	1.00	0.00	0.00	1.00
0.33	1.00	1.00	0.00	0.00	1.00
0.45	1.00	1.00	0.00	0.18	1.00
0.65	1.00	1.00	0.15	0.48	1.00
1.00	1.00	1.00	0.26	1.00	1.00
1.15	1.00	1.00	0.30	1.00	1.00
1.25	1.00	1.00	0.70	1.00	1.00
1.65	1.00	1.00	1.00	1.00	1.00
1.85	1.00	1.00	1.00	1.00	1.00
2.00	1.00	1.00	0.97	1.00	1.00
2.50	0.80	1.00	0.87	1.00	1.00
2.85	0.66	1.00	0.80	1.00	1.00
2.95	0.62	1.00	0.55	1.00	1.00
3.00	0.60	1.00	0.55	1.00	1.00
4.00	0.20	1.00	0.47	1.00	1.00
5.00	0.10	1.00	0.39	1.00	1.00
6.00	0.00	1.00	0.31	1.00	1.00
10.00	0.00	1.00	0.00	1.00	1.00

Table A.2b-18. Proposed HSC curve for Dolly Varden juvenile rearing, velocity.

Velocity	Baldrige	Cooper Cr	WDFW	Falls Cr	Proposed
0.00	1.00	0.10	0.25	0.50	0.50
0.16	1.00	0.82	0.46	1.00	0.90
0.20	1.00	1.00	0.51	1.00	1.00
0.35	1.00	1.00	0.70	1.00	1.00
0.40	1.00	1.00	0.95	1.00	1.00
0.45	0.90	1.00	1.00	1.00	1.00
0.50	0.80	1.00	1.00	1.00	1.00
0.55	0.78	1.00	1.00	1.00	1.00
0.95	0.60	1.00	0.65	1.00	1.00
1.00	0.60	1.00	0.64	1.00	1.00
1.50	0.40	0.75	0.56	0.30	0.75
2.00	0.20	0.50	0.47	0.20	0.50
2.50	0.05	0.25	0.39	0.10	0.25
3.00	0.00	0.00	0.31	0.00	0.00
3.15	0.00	0.00	0.28	0.00	0.00
3.45	0.00	0.00	0.00	0.00	0.00

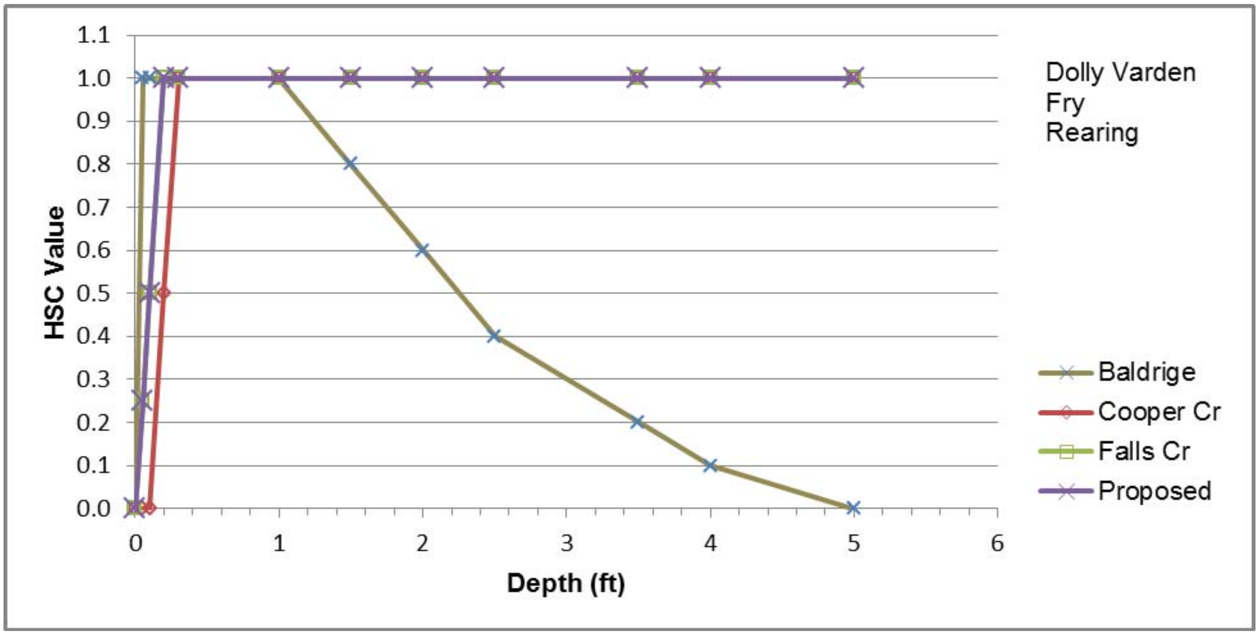

Figure A.2b-19. Proposed HSC curve for Dolly Varden fry rearing, depth.

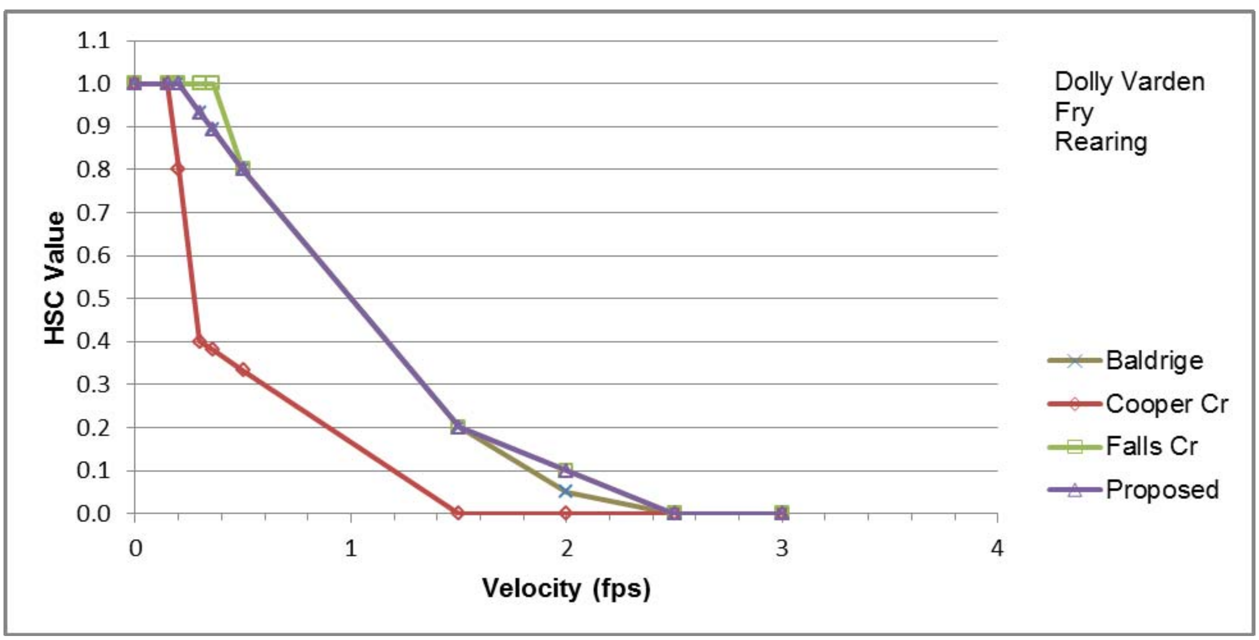

Figure A.2b-20. Proposed HSC curve for Dolly Varden fry rearing, velocity.

Table A.2b-19. Proposed HSC curve for Dolly Varden fry rearing, depth.

Depth	Baldrige	Cooper Cr	Falls Cr	Proposed
0.00	0.00	0.00	0.00	0.00
0.05	1.00	0.00	0.25	0.25
0.10	1.00	0.00	0.50	0.50
0.20	1.00	0.50	1.00	1.00
0.30	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00
1.50	0.80	1.00	1.00	1.00
2.00	0.60	1.00	1.00	1.00
2.50	0.40	1.00	1.00	1.00
3.50	0.20	1.00	1.00	1.00
4.00	0.10	1.00	1.00	1.00
5.00	0.00	1.00	1.00	1.00

Table A.2b-20. Proposed HSC curve for Dolly Varden fry rearing, velocity.

Velocity	Baldrige	Cooper Cr	Falls Cr	Proposed
0.00	1.00	1.00	1.00	1.00
0.15	1.00	1.00	1.00	1.00
0.20	1.00	0.80	1.00	1.00
0.30	0.93	0.40	1.00	0.93
0.36	0.89	0.38	1.00	0.89
0.50	0.80	0.33	0.80	0.80
1.50	0.20	0.00	0.20	0.20
2.00	0.05	0.00	0.10	0.10
2.50	0.00	0.00	0.00	0.00
3.00	0.00	0.00	0.00	0.00

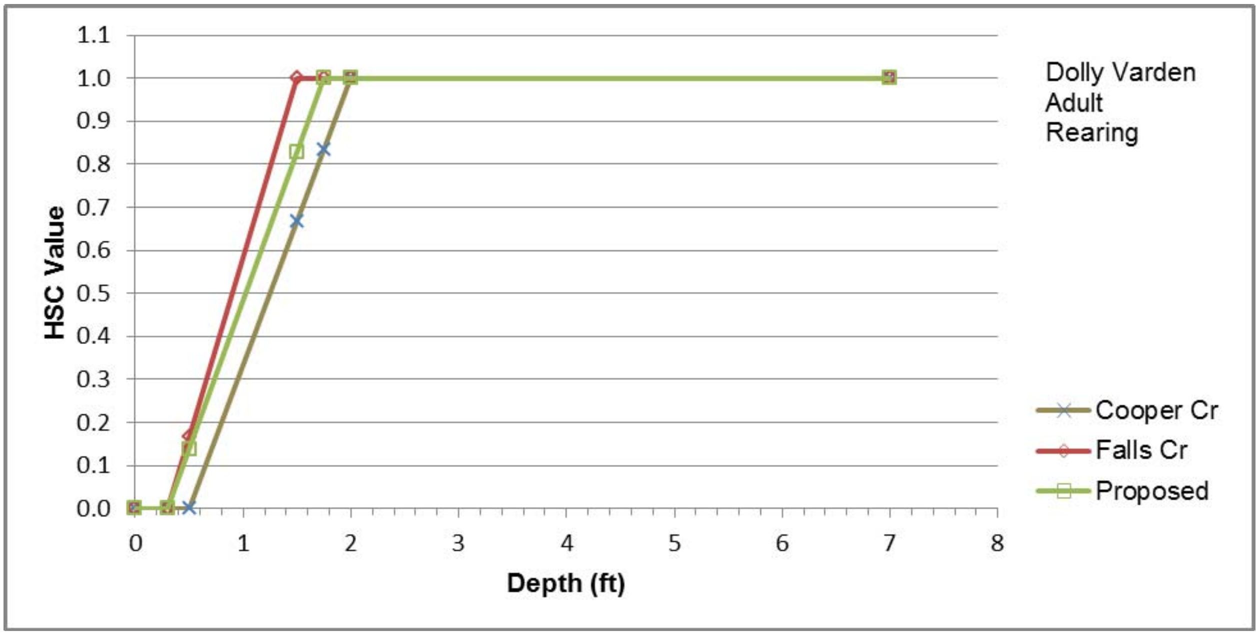

Figure A.2b-21. Proposed HSC curve for Dolly Varden adult rearing, depth.

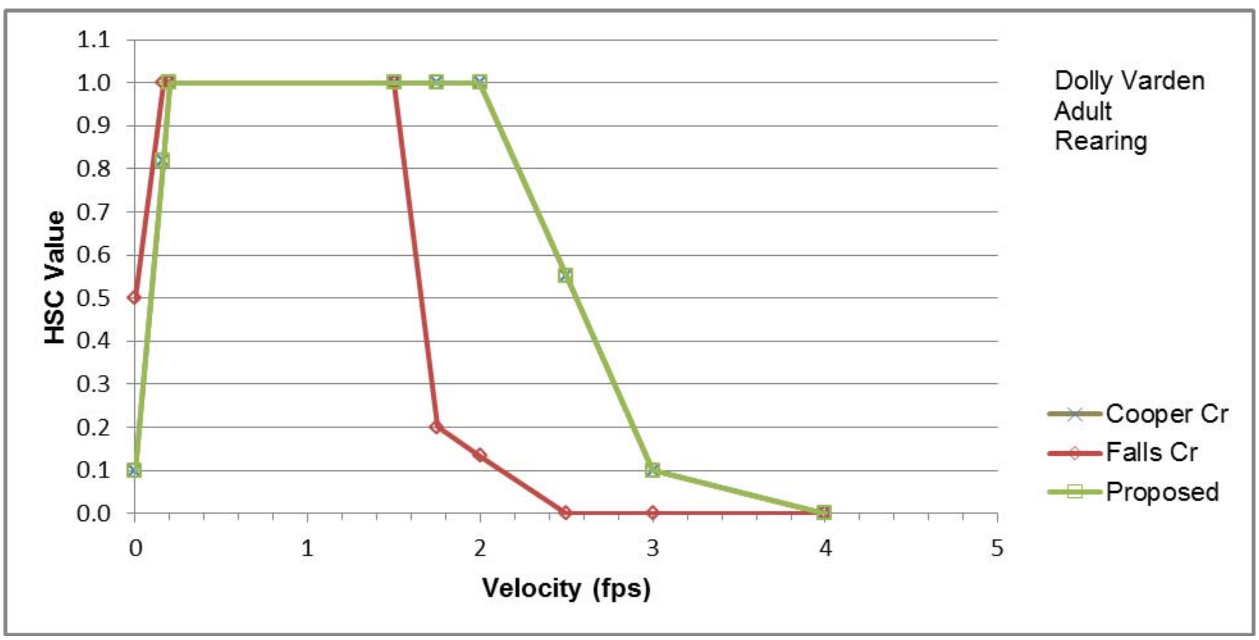

Figure A.2b-22. Proposed HSC curve for Dolly Varden adult rearing, velocity.

Table A.2b-21. Proposed HSC curve for Dolly Varden adult rearing, depth.

Depth	Cooper Cr	Falls Cr	Proposed
0.00	0.00	0.00	0.00
0.30	0.00	0.00	0.00
0.50	0.00	0.17	0.14
1.50	0.67	1.00	0.83
1.75	0.83	1.00	1.00
2.00	1.00	1.00	1.00
7.00	1.00	1.00	1.00

Table A.2b-22. Proposed HSC curve for Dolly Varden adult rearing, velocity.

Velocity	Cooper Cr	Falls Cr	Proposed
0.00	0.10	0.50	0.10
0.16	0.82	1.00	0.82
0.20	1.00	1.00	1.00
1.50	1.00	1.00	1.00
1.75	1.00	0.20	1.00
2.00	1.00	0.13	1.00
2.50	0.55	0.00	0.55
3.00	0.10	0.00	0.10
4.00	0.00	0.00	0.00

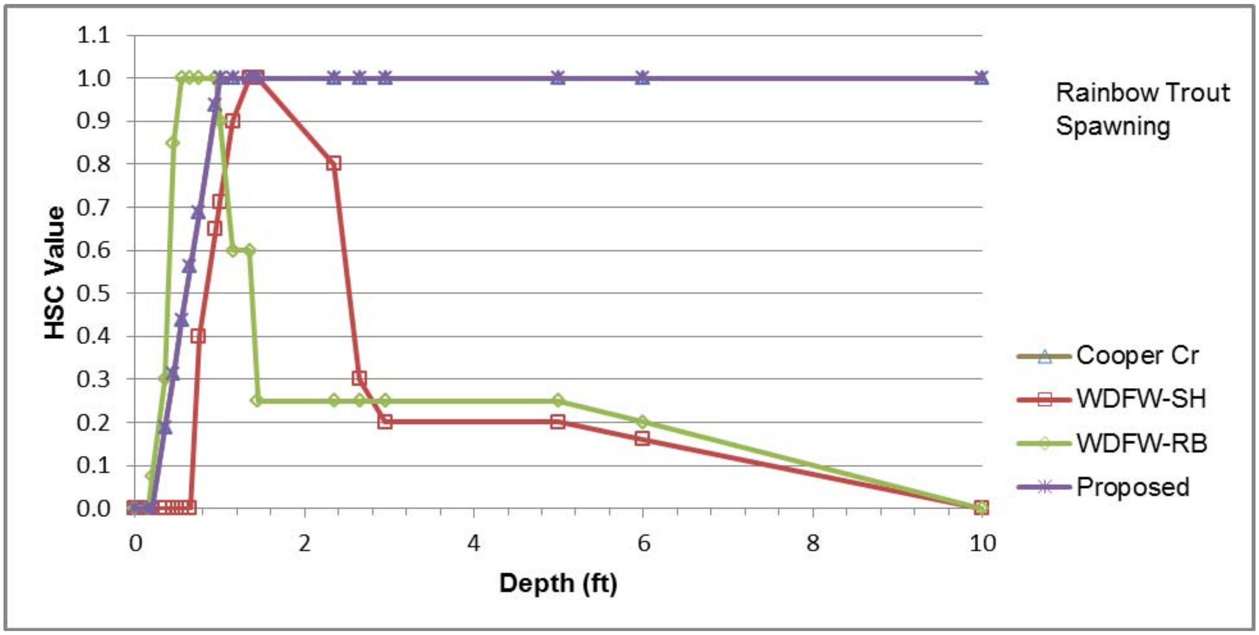

Figure A.2b-23. Proposed HSC curve for rainbow trout spawning, depth.

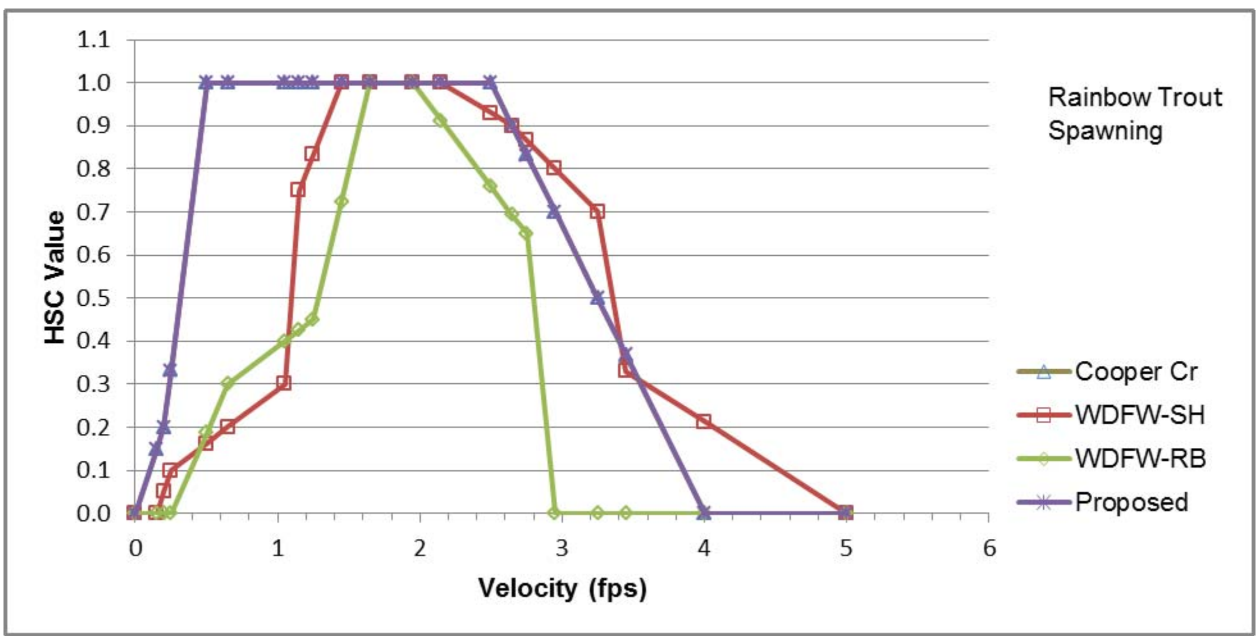

Figure A.2b-24. Proposed HSC curve for rainbow trout spawning, velocity.

Table A.2b-23. Proposed HSC curve for rainbow trout spawning, depth.

Depth	Cooper Cr	WDFW-SH	WDFW-RB	Proposed
0.00	0.00	0.00	0.00	0.00
0.15	0.00	0.00	0.00	0.00
0.20	0.00	0.00	0.08	0.00
0.35	0.19	0.00	0.30	0.19
0.45	0.31	0.00	0.85	0.31
0.55	0.44	0.00	1.00	0.44
0.65	0.56	0.00	1.00	0.56
0.75	0.69	0.40	1.00	0.69
0.95	0.94	0.65	1.00	0.94
1.00	1.00	0.71	0.90	1.00
1.15	1.00	0.90	0.60	1.00
1.35	1.00	1.00	0.60	1.00
1.45	1.00	1.00	0.25	1.00
2.35	1.00	0.80	0.25	1.00
2.65	1.00	0.30	0.25	1.00
2.95	1.00	0.20	0.25	1.00
5.00	1.00	0.20	0.25	1.00
6.00	1.00	0.16	0.20	1.00
10.00	1.00	0.00	0.00	1.00

Table A.2b-24. Proposed HSC curve for rainbow trout spawning, velocity.

Velocity	Cooper Cr	WDFW-SH	WDFW-RB	Proposed
0.00	0.00	0.00	0.00	0.00
0.15	0.15	0.00	0.00	0.15
0.20	0.20	0.05	0.00	0.20
0.25	0.33	0.10	0.00	0.33
0.50	1.00	0.16	0.19	1.00
0.65	1.00	0.20	0.30	1.00
1.05	1.00	0.30	0.40	1.00
1.15	1.00	0.75	0.43	1.00
1.25	1.00	0.83	0.45	1.00
1.45	1.00	1.00	0.73	1.00
1.65	1.00	1.00	1.00	1.00
1.95	1.00	1.00	1.00	1.00
2.15	1.00	1.00	0.91	1.00
2.50	1.00	0.93	0.76	1.00
2.65	0.90	0.90	0.69	0.90
2.75	0.83	0.87	0.65	0.83
2.95	0.70	0.80	0.00	0.70
3.25	0.50	0.70	0.00	0.50
3.45	0.37	0.33	0.00	0.37
4.00	0.00	0.21	0.00	0.00
5.00	0.00	0.00	0.00	0.00

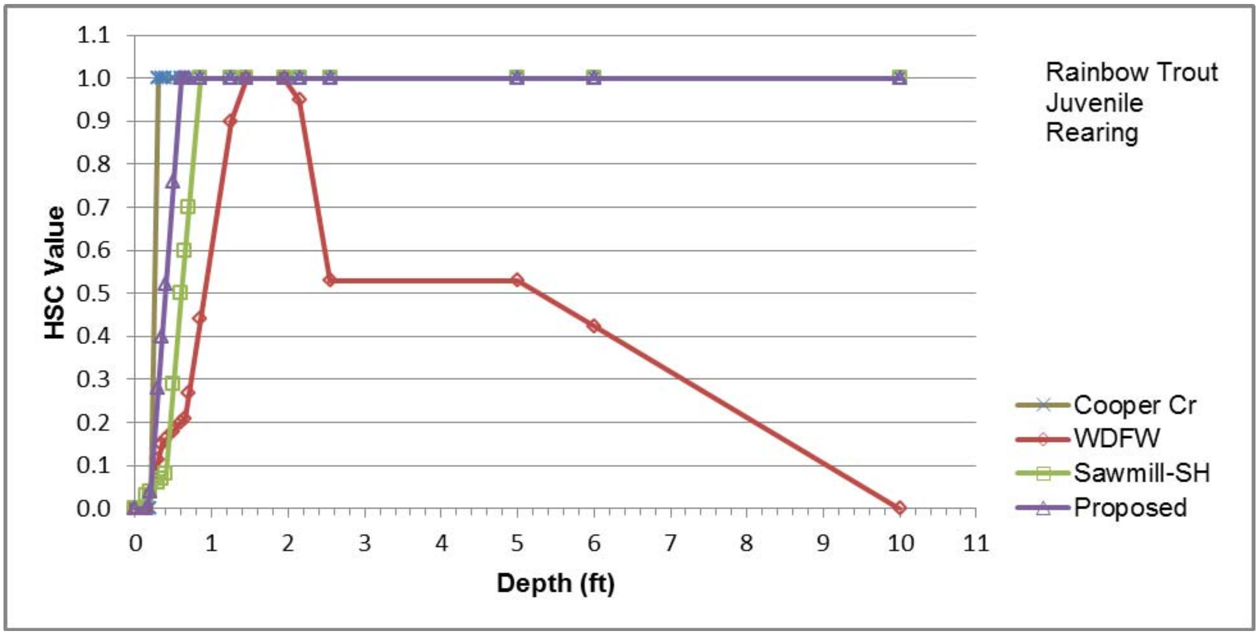

Figure A.2b-25. Proposed HSC curve for rainbow trout juvenile rearing, depth.

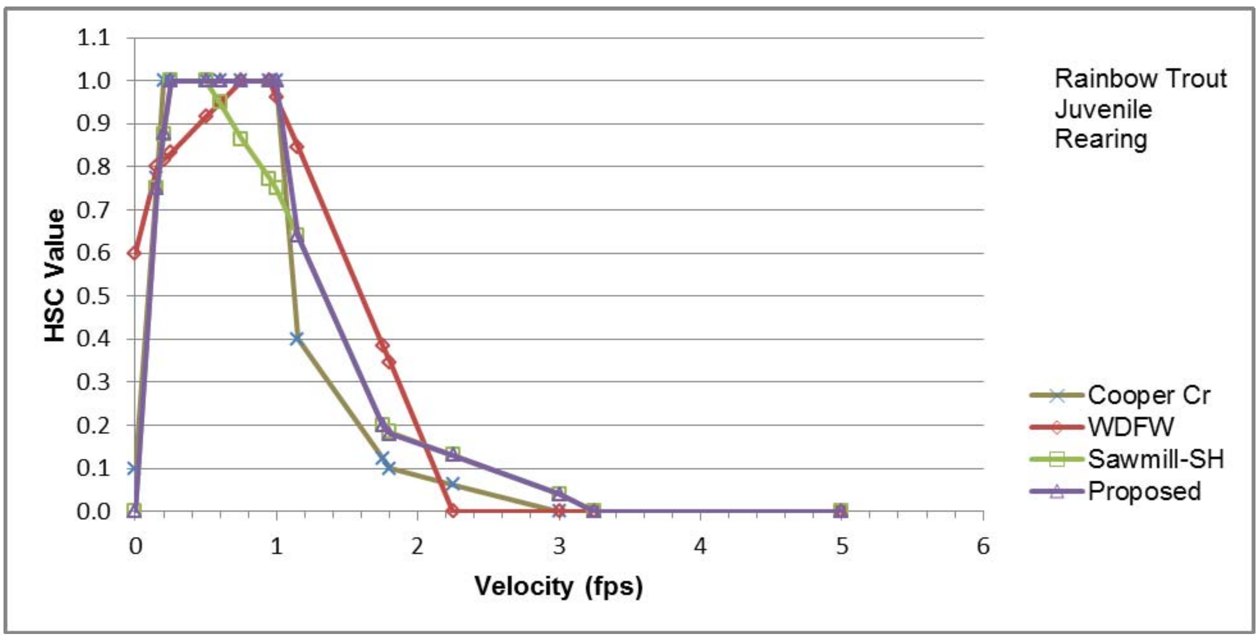

Figure A.2b-26. Proposed HSC curve for rainbow trout juvenile rearing, velocity.

Table A.2b-25. Proposed HSC curve for rainbow trout juvenile rearing, depth.

Depth	Cooper Cr	WDFW	Sawmill-SH	Proposed
0.00	0.00	0.00	0.00	0.00
0.15	0.00	0.00	0.03	0.00
0.20	0.00	0.04	0.04	0.04
0.30	1.00	0.11	0.06	0.28
0.35	1.00	0.15	0.07	0.40
0.40	1.00	0.16	0.08	0.52
0.50	1.00	0.18	0.29	0.76
0.60	1.00	0.20	0.50	1.00
0.65	1.00	0.21	0.60	1.00
0.70	1.00	0.27	0.70	1.00
0.85	1.00	0.44	1.00	1.00
1.25	1.00	0.90	1.00	1.00
1.45	1.00	1.00	1.00	1.00
1.95	1.00	1.00	1.00	1.00
2.15	1.00	0.95	1.00	1.00
2.55	1.00	0.53	1.00	1.00
5.00	1.00	0.53	1.00	1.00
6.00	1.00	0.42	1.00	1.00
10.00	1.00	0.00	1.00	1.00

Table A.2b-26. Proposed HSC curve for rainbow trout juvenile rearing, velocity.

Velocity	Cooper Cr	WDFW	Sawmill-SH	Proposed
0.00	0.10	0.60	0.00	0.00
0.15	0.78	0.80	0.75	0.75
0.20	1.00	0.82	0.88	0.88
0.25	1.00	0.83	1.00	1.00
0.50	1.00	0.92	1.00	1.00
0.60	1.00	0.95	0.95	1.00
0.75	1.00	1.00	0.86	1.00
0.95	1.00	1.00	0.77	1.00
1.00	1.00	0.96	0.75	1.00
1.15	0.40	0.85	0.64	0.64
1.75	0.12	0.38	0.20	0.20
1.80	0.10	0.35	0.18	0.18
2.25	0.06	0.00	0.13	0.13
3.00	0.00	0.00	0.04	0.04
3.25	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00

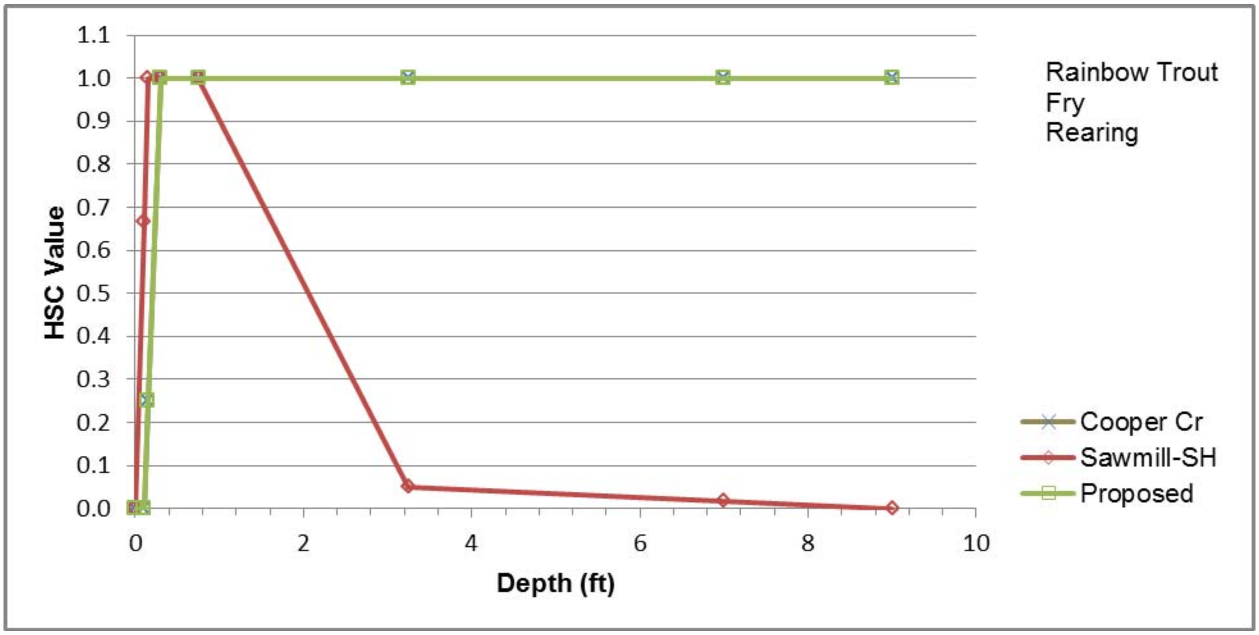

Figure A.2b-27. Proposed HSC curve for rainbow trout fry rearing, depth.

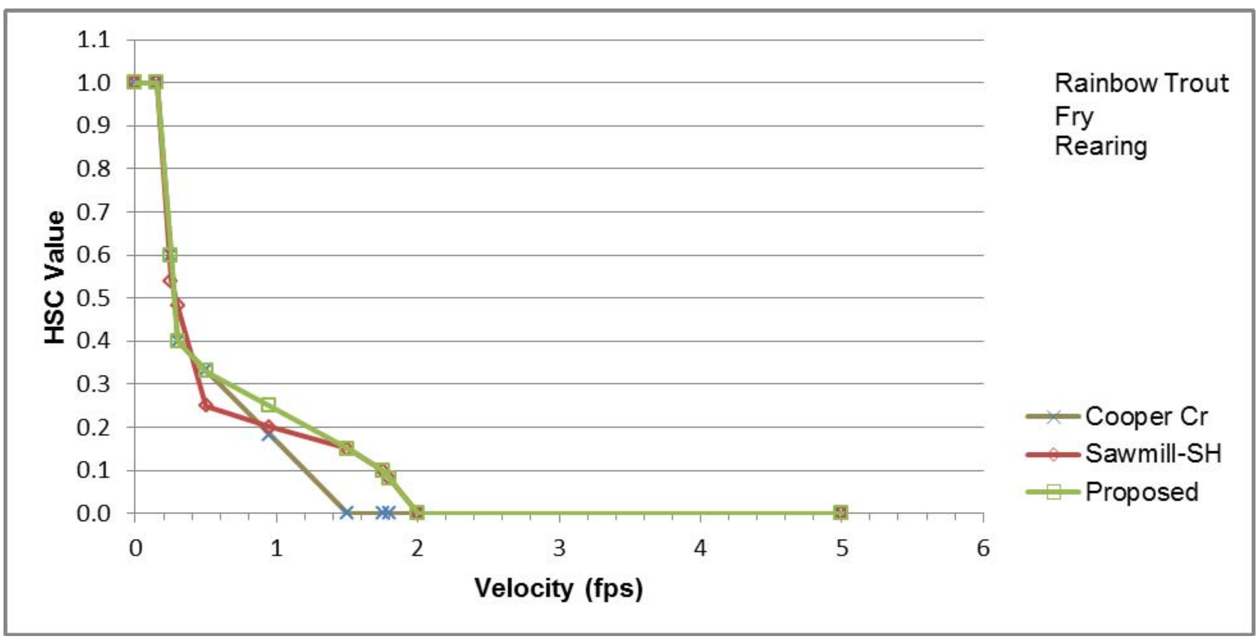

Figure A.2b-28. Proposed HSC curve for rainbow trout fry rearing, velocity.

Table A.2b-27. Proposed HSC curve for rainbow trout fry rearing, depth.

Depth	Cooper Cr	Sawmill-SH	Proposed
0.00	0.00	0.00	0.00
0.10	0.00	0.67	0.00
0.15	0.25	1.00	0.25
0.30	1.00	1.00	1.00
0.75	1.00	1.00	1.00
3.25	1.00	0.05	1.00
7.00	1.00	0.02	1.00
9.00	1.00	0.00	1.00

Table A.2b-28. Proposed HSC curve for rainbow trout fry rearing, velocity.

Velocity	Cooper Cr	Sawmill-SH	Proposed
0.00	1.00	1.00	1.00
0.15	1.00	1.00	1.00
0.25	0.60	0.54	0.60
0.30	0.40	0.48	0.40
0.50	0.33	0.25	0.33
0.95	0.18	0.20	0.25
1.50	0.00	0.15	0.15
1.75	0.00	0.10	0.10
1.80	0.00	0.08	0.08
2.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00

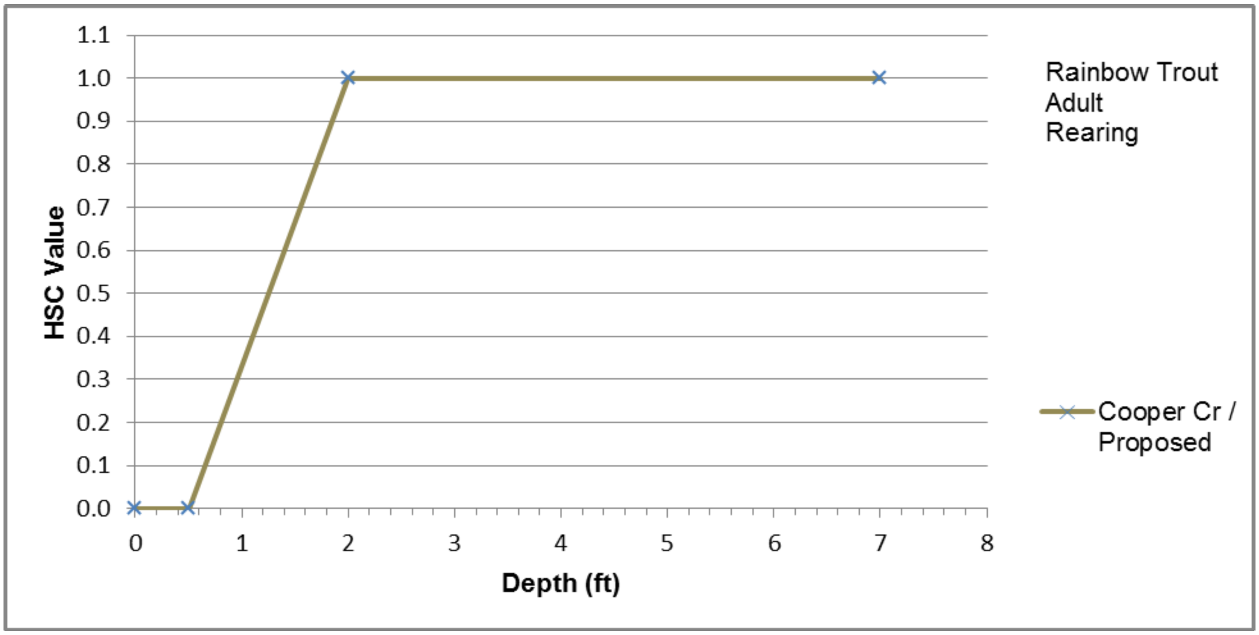

Figure A.2b-29. Proposed HSC curve for rainbow trout adult rearing, depth.

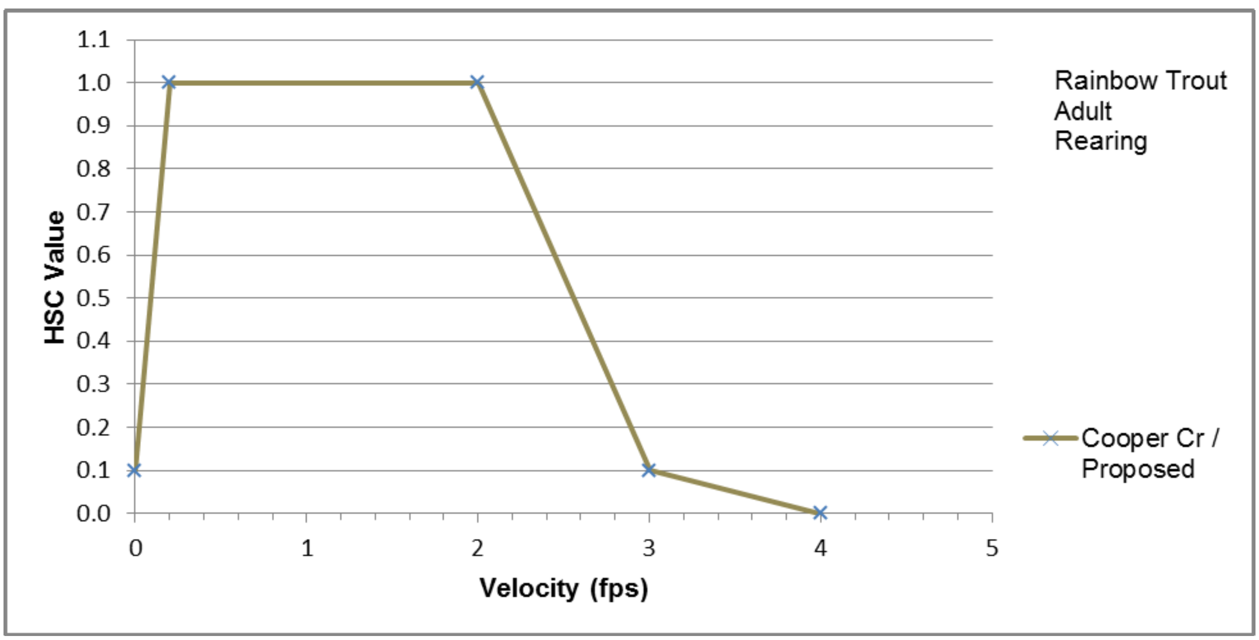

Figure A.2b-30. Proposed HSC curve for rainbow trout adult rearing, velocity.

Table A.2b-29. Proposed HSC curve for rainbow trout adult rearing, depth.

Depth	Cooper Cr / Proposed
0.00	0.00
0.50	0.00
2.00	1.00
7.00	1.00

Table A.2b-30. Proposed HSC curve for rainbow trout adult rearing, velocity.

Velocity	Cooper Cr / Proposed
0.00	0.10
0.20	1.00
2.00	1.00
3.00	0.10
4.00	0.00

Table A.2b-31. Substrate classification and HSC values.

Material	Size (mm)	Spawning				Rearing
		Chinook	Coho	Sockeye	RB/DV	All
Organic	Organic	0.00	0.00	0.00	0.00	1.00
Sand/Silt	< 2	0.00	0.00	0.00	0.00	1.00
Small Gravel	2 - 8	0.30	0.40	0.40	0.50	1.00
Med Gravel	8 - 32	1.00	1.00	1.00	1.00	1.00
Large Gravel	32 - 64	1.00	1.00	1.00	1.00	1.00
Small Cobble	64-128	1.00	0.70	0.70	1.00	1.00
Large Cobble	128-256	0.50	0.00	0.00	0.50	1.00
Boulder	> 266	0.00	0.00	0.00	0.00	1.00
Bedrock	Bedrock	0.00	0.00	0.00	0.00	1.00

Table A.2b-32. Cover classification and HSC values.

Type of Cover	Fry	Juvenile
Undercut Bank	1.00	1.00
Overhanging Vegetation	1.00	1.00
Rootwad (including partly undercut)	1.00	1.00
Log Jam/submerged brush pile	1.00	1.00
Logs(s) parallel to bank/rip-rap	0.30	0.80
Aquatic Vegetation	1.00	0.80
Short (<1') terrestrial grass	0.40	0.10
Tall (>3') dense grass	0.70	0.70
Vegetation beyond the bank-full waters edge	0.20	0.20

Appendix 3: Calibration Details

This appendix contains the following tables:

Table A.3-1. Velocity Adjustment Factors (VAF), original and revised, for T100 and T110.
Table A.3-2. Velocity Adjustment Factors (VAF), original and revised, for T120, T130, and T140.
Table A.3-3. Velocity Adjustment Factors (VAF), original and revised, for T150 and T160.
Table A.3-4. Velocity Adjustment Factors (VAF), original and revised, for T200 and T300.
Table A.3-5. Velocity Adjustment Factors (VAF), original and revised, for T220 and T230.
Table A.3-6. Velocity Adjustment Factor (VAF), original and revised, for T310 and T330, Main.
Table A.3-7. Velocity Adjustment Factors (VAF), original and revised, for T330, Secondary and Tertiary Channels.
Table A.3-8. Velocity Adjustment Factors (VAF), original and revised, for T400, T410, and T430.
Table A.3-9. Changes to original data decks, Grant Creek.
Table A.3-10. Summary of calibration details for original and revised input decks, Grant Creek, Transect 100.
Table A.3-11. Summary of calibration details for original and revised input decks, Grant Creek, Transect 100, high flows.
Table A.3-12. Summary of calibration details for original and revised input decks, Grant Creek, Transect 110.
Table A.3-13. Summary of calibration details for original and revised input decks, Grant Creek, Transect 110, high flows.
Table A.3- 14. Summary of calibration details for original and revised input decks, Grant Creek, Transect 120.
Table A.3-15. Summary of calibration details for original and revised input decks, Grant Creek, Transect 120, high flows.
Table A.3-16. Summary of calibration details for original and revised input decks, Grant Creek, Transect 130.
Table A.3-17. Summary of calibration details for original and revised input decks, Grant Creek, Transect 130, high flows.
Table A.3-18. Summary of calibration details for original and revised input decks, Grant Creek, Transect 140.
Table A.3-19. Summary of calibration details for original and revised input decks, Grant Creek, Transect 140, high flows.
Table A.3-20. Summary of calibration details for original and revised input decks, Grant Creek, Transect 150.
Table A.3-21. Summary of calibration details for original and revised input decks, Grant Creek, Transect 150, high flows.
Table A.3-22. Summary of calibration details for original and revised input decks, Grant Creek, Transect 160.
Table A.3-23. Summary of calibration details for original and revised input decks, Grant Creek, Transect T160, high flows.
Table A.3-24. Summary of calibration details for original and revised input decks, Grant Creek, Transect 200.

Table A.3-25. Summary of calibration details for original and revised input decks, Grant Creek, Transect 200, high flows.
Table A.3-26. Summary of calibration details for original and revised input decks, Grant Creek, Transect 210.
Table A.3-27. Summary of calibration details for original and revised input decks, Grant Creek, Transect 220.
Table A.3-28. Summary of calibration details for original and revised input decks, Grant Creek, Transect 220, high flows.
Table A.3-29. Summary of calibration details for original and revised input decks, Grant Creek, Transect 230, side channel.
Table A.3-30. Summary of calibration details for original and revised input decks, Grant Creek, Transect 230, main channel.
Table A.3-31. Summary of calibration details for original and revised input decks, Grant Creek, Transect 230 main channel, high flows.
Table A.3-32. Summary of calibration details for original and revised input decks, Grant Creek, Transect 300.
Table A.3-33. Summary of calibration details for original and revised input decks, Grant Creek, Transect 300, high flows.
Table A.3-34. Summary of calibration details for original and revised input decks, Grant Creek, Transect 310.
Table A.3-35. Summary of calibration details for original and revised input decks, Grant Creek, Transect 310, high flows.
Table A.3-36. Summary of calibration details for original and revised input decks, Grant Creek, Transect 320.
Table A.3-37. Summary of calibration details for original and revised input decks, Grant Creek, Transect 320, high flows.
Table A.3-38. Summary of calibration details for original and revised input decks, Grant Creek, Transect 330, secondary channel.
Table A.3-39. Summary of calibration details for original and revised input decks, Grant Creek, Transect 330, second channel, high flows.
Table A.3-40. Summary of calibration details for original and revised input decks, Grant Creek, Transect 330, tertiary channel.
Table A.3-41. Summary of calibration details for original and revised input decks, Grant Creek, Transect 330, tertiary channel, high flows.
Table A.3-42. Summary of calibration details for original and revised input decks, Grant Creek, Transect 230, main channel.
Table A.3-43. Summary of calibration details for original and revised input decks, Grant Creek, Transect 230, main channel, high flows.
Table A.3-44. Summary of calibration details for original and revised input decks, Grant Creek, Transect 400.
Table A.3-45. Summary of calibration details for original and revised input decks, Grant Creek, Transect 400, high flows.
Table A.3-46. Summary of calibration details for original and revised input decks, Grant Creek, Transect 410.
Table A.3-47. Summary of calibration details for original and revised input decks, Grant Creek, Transect 410, high flows.

Table A.3-48. Summary of calibration details for original and revised input decks, Grant Creek, Transect 430.
Table A.3-49. Summary of calibration details for original and revised input decks, Grant Creek, Transect 430, high flows.
Table A.3-50. Summary of calibration details, Grant Creek.
Table A.3-51. Summary of calibration details, Grant Creek.
Table A.3-52. Summary of calibration details, Grant Creek.

Table A.3-1. Velocity Adjustment Factors (VAF), original and revised, for T100 and T110.

	T100			T110		
Flow (cfs)	**Orig**	**Rev 1V**	**Depth**	**Orig**	**Rev 1V**	**Depth**
0.10	0.8797	0.8797		1.5192	1.5192	
0.20	1.0328	1.0327		1.3787	1.3787	
0.30	1.1118	1.1114		1.2772	1.2772	
0.40	1.1556	1.1551		1.2156	1.2156	
0.50	1.1868	1.1861		1.1758	1.1758	
0.60	1.2114	1.2104		1.1480	1.1480	
0.70	1.2282	1.2270		1.1273	1.1273	
0.80	1.2396	1.2382		1.1074	1.1084	
0.90	1.2471	1.2456		1.0905	1.0933	
1.00	1.2520	1.2503		1.0762	1.0808	
1.09	1.2553	1.2535		1.0651	1.0714	
1.19	1.2580	1.2560		1.0543	1.0624	
1.29	1.2599	1.2576		1.0450	1.0548	
1.39	1.2564	1.2540		1.0367	1.0482	
1.49	1.2512	1.2486		1.0295	1.0425	
1.59	1.2453	1.2425		1.0231	1.0375	
1.69	1.2390	1.2360		1.0171	1.0331	
1.79	1.2327	1.2294		1.0114	1.0290	
1.89	1.2257	1.2222		1.0062	1.0253	
1.99	1.2170	1.2133	0.4715	1.0015	1.0221	0.2325
2.24	1.1986	1.1877	0.4579	0.9914	1.0128	0.2292
2.49	1.1826	1.1781	0.4462	0.9825	1.0095	0.2264
2.74	1.1669	1.1607	0.4345	0.9750	1.0047	0.2241
2.99	1.1531	1.1452	0.4242	0.9687	1.0008	0.2221
3.23	1.1415	1.1323	0.4157	0.9634	0.9976	0.2204
3.48	1.1308	1.1203	0.4074	0.9586	0.9949	0.2189
3.73	1.1213	1.1098	0.4002	0.9545	0.9926	0.2176
3.98	1.1129	1.1006	0.3938	0.9509	0.9905	0.2164
4.48	1.0985	1.0845	0.3832	0.9448	0.9865	0.2142
4.98	1.0866	1.0700	0.3746	0.9400	0.9827	0.2121
5.47	1.0772	1.0576	0.3677	0.9361	0.9793	0.2102
5.97	1.0695	1.0467	0.3619	0.9329	0.9758	0.2084
6.47	1.0631	1.0372	0.3570	0.9302	0.9722	0.2067
6.97	1.0576	1.0281	0.3523	0.9280	0.9685	0.2050
7.46	1.0530	1.0194	0.3479	0.9261	0.9648	0.2035
7.96	1.0490	1.0111	0.3437	0.9245	0.9610	0.2020
8.46	1.0457	1.0033	0.3398	0.9231	0.9574	0.2007
8.96	1.0430	0.9960	0.3362	0.9219	0.9539	0.1994
9.46	1.0406	0.9892	0.3328	0.9206	0.9500	0.1980
9.95	1.0385	0.9827	0.3296	0.9196	0.9462	0.1966

Table A.3-2. Velocity Adjustment Factors (VAF), original and revised, for T120, T130, and T140.

	T120			T130			T140		
Flow (cfs)	**Orig**	**Rev 1V**	**Depth**	**Orig**	**Rev 1V**	**Depth**	**Orig**	**Rev 1V**	**Depth**
10	0.2078	0.2078		0.4185	0.4185		0.6020	0.6021	
20	0.3195	0.3195		0.5610	0.5610		0.7870	0.7921	
30	0.4015	0.4015		0.6564	0.6564		0.8795	0.8940	
40	0.4684	0.4684		0.7293	0.7293		0.9394	0.9656	
50	0.5252	0.5253		0.7881	0.7881		0.9722	1.0140	
60	0.5746	0.5750		0.8377	0.8377		0.9958	1.0540	
70	0.6188	0.6197		0.8809	0.8809		1.0109	1.0866	
80	0.6588	0.6605		0.9194	0.9194		1.0195	1.1104	
90	0.6956	0.6983		0.9541	0.9541		1.0239	1.1280	
100	0.7297	0.7335		0.9858	0.9858		1.0241	1.1396	
110	0.7616	0.7667		1.0151	1.0151		1.0181	1.1420	
120	0.7916	0.7979		1.0422	1.0422		1.0095	1.1396	
130	0.8198	0.8275		1.0671	1.0671		0.9963	1.1298	
140	0.8466	0.8559		1.0893	1.0893		0.9829	1.1184	
150	0.8723	0.8831		1.1084	1.1084		0.9696	1.1061	
160	0.8970	0.9092		1.1241	1.1241		0.9570	1.0939	
170	0.9209	0.9345		1.1368	1.1368		0.9451	1.0819	
180	0.9437	0.9588		1.1471	1.1471		0.9341	1.0704	
190	0.9659	0.9824		1.1553	1.1555		0.9240	1.0595	
200	0.9874	1.0053	0.8831	1.1620	1.1625	1.2983	0.9146	1.0490	3.3867
225	1.0388	1.0596	0.9276	1.1743	1.1752	1.3026	0.8941	1.0231	3.3228
250	1.0872	1.1106	0.9690	1.1808	1.1820	1.3023	0.8774	1.0006	3.2674
275	1.1331	1.1586	1.0073	1.1833	1.1847	1.2991	0.8636	0.9815	3.2204
300	1.1770	1.2043	1.0435	1.1837	1.1852	1.2947	0.8522	0.9653	3.1786
325	1.2190	1.2479	1.0780	1.1832	1.1847	1.2901	0.8426	0.9514	3.1381
350	1.2594	1.2897	1.1108	1.1822	1.1838	1.2858	0.8345	0.9394	3.1005
375	1.2984	1.3300	1.1423	1.1810	1.1826	1.2817	0.8276	0.9290	3.0662
400	1.3362	1.3689	1.1727	1.1798	1.1814	1.2781	0.8217	0.9199	3.0349
450	1.4084	1.4432	1.2292	1.1764	1.1780	1.2709	0.8123	0.9051	2.9812
497	1.4728	1.5093	1.2813	1.1706	1.1722	1.2629	0.8056	0.8941	2.9363
546	1.5369	1.5750	1.3308	1.1641	1.1656	1.2549	0.8004	0.8850	2.8985
591	1.5934	1.6328	1.3771	1.1581	1.1596	1.2481	0.7966	0.8782	2.8671
638	1.6504	1.6908	1.4224	1.1516	1.1530	1.2411	0.7937	0.8724	2.8395
685	1.7053	1.7469	1.4660	1.1447	1.1461	1.2341	0.7914	0.8677	2.8148
732	1.7586	1.8011	1.5081	1.1380	1.1394	1.2276	0.7897	0.8638	2.7923
779	1.8103	1.8537	1.5487	1.1312	1.1325	1.2209	0.7884	0.8606	2.7704
826	1.8605	1.9047	1.5872	1.1248	1.1261	1.2146	0.7875	0.8579	2.7511
873	1.9095	1.9544	1.6255	1.1190	1.1202	1.2090	0.7870	0.8557	2.7329
920	1.9573	2.0029	1.6626	1.1136	1.1148	1.2040	0.7867	0.8538	2.7156
967	2.0039	2.0502	1.6988	1.1088	1.1099	1.1995	0.7866	0.8523	2.6998

Table A.3-3. Velocity Adjustment Factors (VAF), original and revised, for T150 and T160.

	T150			T160		
Flow (cfs)	**Orig**	**Rev 1V**	**Depth**	**Orig**	**Rev 1V**	**Depth**
10	0.4628	0.4626		0.2103	0.2083	
20	0.6124	0.6116		0.3170	0.3179	
30	0.7003	0.6990		0.3987	0.4023	
40	0.7609	0.7591		0.4664	0.4723	
50	0.8068	0.8047		0.5248	0.5329	
60	0.8420	0.8397		0.5745	0.5852	
70	0.8694	0.8671		0.6180	0.6310	
80	0.8889	0.8863		0.6567	0.6719	
90	0.9050	0.9024		0.6905	0.7082	
100	0.9187	0.9161		0.7214	0.7409	
110	0.9305	0.9280		0.7497	0.7710	
120	0.9382	0.9364		0.7762	0.7988	
130	0.9451	0.9440		0.8009	0.8248	
140	0.9515	0.9510		0.8243	0.8493	
150	0.9575	0.9575		0.8465	0.8726	
160	0.9632	0.9637		0.8676	0.8946	
170	0.9686	0.9696		0.8878	0.9157	
180	0.9737	0.9752		0.9069	0.9358	
190	0.9787	0.9806		0.9252	0.9550	
200	0.9835	0.9859	2.0941	0.9426	0.9733	1.2472
225	0.9949	0.9983	2.1285	0.9834	1.0160	1.3055
250	1.0057	1.0099	2.1593	1.0210	1.0551	1.3588
275	1.0159	1.0208	2.1868	1.0558	1.0912	1.4080
300	1.0257	1.0312	2.2117	1.0885	1.1250	1.4537
325	1.0350	1.0410	2.2346	1.1194	1.1569	1.4968
350	1.0441	1.0505	2.2559	1.1488	1.1871	1.5376
375	1.0528	1.0596	2.2759	1.1769	1.2159	1.5764
400	1.0612	1.0684	2.2947	1.2038	1.2435	1.6135
450	1.0773	1.0850	2.3275	1.2547	1.2955	1.6819
497	1.0916	1.0995	2.3532	1.2995	1.3411	1.7443
546	1.1057	1.1136	2.3744	1.3436	1.3858	1.8028
591	1.1180	1.1258	2.3913	1.3820	1.4247	1.8571
638	1.1303	1.1379	2.4064	1.4204	1.4636	1.9098
685	1.1421	1.1494	2.4198	1.4572	1.5007	1.9601
732	1.1535	1.1604	2.4310	1.4926	1.5363	2.0083
779	1.1644	1.1709	2.4404	1.5267	1.5706	2.0547
826	1.1749	1.1810	2.4485	1.5596	1.6037	2.0984
873	1.1851	1.1907	2.4560	1.5915	1.6357	2.1415
920	1.1949	1.2000	2.4621	1.6224	1.6667	2.1833
967	1.2045	1.2089	2.4671	1.6523	1.6966	2.2233

Table A.3-4. Velocity Adjustment Factors (VAF), original and revised, for T200 and T300.

	T200				T300		
Flow (cfs)	Orig	Rev 1V	Depth	Flow (cfs)	Orig	Rev 1V	Depth
0.89	0.7584	0.7159		0.17	0.5388	0.5388	
1.79	0.7828	0.7485		0.34	0.5726	0.5726	
2.68	0.8155	0.7841		0.51	0.6109	0.6109	
3.57	0.8498	0.8195		0.68	0.6462	0.6462	
4.47	0.8833	0.8536		0.85	0.6780	0.6780	
5.36	0.9126	0.8832		1.02	0.7065	0.7065	
6.26	0.9412	0.9120		1.19	0.7321	0.7321	
7.15	0.9681	0.9389		1.36	0.7551	0.7551	
8.04	0.9934	0.9642		1.53	0.7760	0.7760	
8.94	1.0174	0.9882		1.71	0.7962	0.7962	
9.83	1.0402	1.0108		1.88	0.8138	0.8138	
10.72	1.0620	1.0326		2.05	0.8303	0.8303	
11.62	1.0832	1.0537		2.22	0.8459	0.8459	
12.51	1.1035	1.0737		2.39	0.8606	0.8606	
13.40	1.1230	1.0931		2.56	0.8747	0.8747	
14.30	1.1422	1.1111		2.73	0.8881	0.8881	
15.19	1.1606	1.1282		2.90	0.9010	0.9010	
16.08	1.1786	1.1446		3.07	0.9135	0.9135	
16.98	1.1963	1.1605		3.24	0.9254	0.9254	
17.87	1.2134	1.1750	0.0829	3.41	0.9370	0.9370	0.0220
20.11	1.2548	1.2082	0.0851	3.84	0.9648	0.9648	0.0225
22.34	1.2940	1.2363	0.0872	4.26	0.9902	0.9902	0.0230
24.57	1.3316	1.2606	0.0891	4.69	1.0146	1.0146	0.0234
26.81	1.3678	1.2819	0.0910	5.12	1.0375	1.0375	0.0239
29.04	1.4025	1.2998	0.0927	5.54	1.0587	1.0587	0.0243
31.28	1.4363	1.3134	0.0943	5.97	1.0795	1.0795	0.0247
33.51	1.4689	1.3258	0.0959	6.40	1.0993	1.0993	0.0250
35.74	1.5004	1.3371	0.0973	6.82	1.1179	1.1179	0.0254
40.21	1.5609	1.3576	0.1002	7.67	1.1536	1.1536	0.0260
44.68	1.6182	1.3763	0.1028	8.53	1.1874	1.1874	0.0267
49.15	1.6726	1.3938	0.1053	9.38	1.2188	1.2188	0.0273
53.61	1.7246	1.4104	0.1077	10.23	1.2485	1.2485	0.0278
58.08	1.7744	1.4264	0.1100	11.09	1.2770	1.2770	0.0283
62.55	1.8223	1.4419	0.1122	11.94	1.3037	1.3037	0.0288
67.02	1.8685	1.4569	0.1143	12.79	1.3292	1.3292	0.0293
71.49	1.9132	1.4716	0.1164	13.64	1.3537	1.3537	0.0297
75.95	1.9563	1.4859	0.1184	14.50	1.3776	1.3776	0.0302
80.42	1.9983	1.4992	0.1203	15.35	1.4003	1.4003	0.0306
84.89	2.0391	1.5121	0.1221	16.20	1.4222	1.4222	0.0310
89.36	2.0788	1.5248	0.1239	17.06	1.4436	1.4436	0.0314

Table A.3-5. Velocity Adjustment Factors (VAF), original and revised, for T220 and T230.

	T220			T230		
Flow (cfs)	**Orig**	**Rev 1V**	**Depth**	**Orig**	**Rev 1V**	**Depth**
10	0.3592	0.3592		0.6917	0.2325	
20	0.5091	0.5091		0.8112	0.3487	
30	0.6111	0.6111		0.8749	0.4374	
40	0.6876	0.6876		0.9180	0.5117	
50	0.7497	0.7497		0.9506	0.5767	
60	0.8026	0.8025		0.9767	0.6351	
70	0.8489	0.8489		0.9985	0.6884	
80	0.8904	0.8903		1.0173	0.7378	
90	0.9275	0.9274		1.0338	0.7840	
100	0.9615	0.9614		1.0484	0.8274	
110	0.9927	0.9925		1.0616	0.8686	
120	1.0216	1.0215		1.0736	0.9078	
130	1.0488	1.0486		1.0847	0.9452	
140	1.0742	1.0740		1.0949	0.9811	
150	1.0984	1.0981		1.1044	1.0155	
160	1.1209	1.1207		1.1133	1.0486	
170	1.1419	1.1416		1.1217	1.0805	
180	1.1618	1.1614		1.1296	1.1114	
190	1.1807	1.1804		1.1371	1.1414	
200	1.2019	1.2016	2.2476	1.1442	1.1703	1.3622
225	1.2443	1.2439	2.3169	1.1605	1.2389	1.4308
250	1.2830	1.2825	2.3802	1.1752	1.3030	1.4929
275	1.3187	1.3182	2.4388	1.1885	1.3633	1.5500
300	1.3520	1.3514	2.4933	1.2007	1.4204	1.6031
325	1.3832	1.3826	2.5446	1.2119	1.4748	1.6528
350	1.4127	1.4120	2.5931	1.2224	1.5268	1.6997
375	1.4407	1.4399	2.6391	1.2322	1.5767	1.7442
400	1.4673	1.4665	2.6830	1.2413	1.6246	1.7865
450	1.5171	1.5163	2.7652	1.2581	1.7155	1.8659
500	1.5632	1.5622	2.8413	1.2733	1.8007	1.9391
550	1.6060	1.6050	2.9124	1.2871	1.8812	2.0074
600	1.6462	1.6451	2.9792	1.2997	1.9575	2.0717
650	1.6842	1.6830	3.0424	1.3114	2.0303	2.1326
700	1.7202	1.7189	3.1023	1.3223	2.0999	2.1904
750	1.7544	1.7531	3.1595	1.3325	2.1668	2.2457
800	1.7872	1.7858	3.2142	1.3421	2.2311	2.2986
850	1.8186	1.8171	3.2667	1.3511	2.2932	2.3494
900	1.8487	1.8472	3.3171	1.3597	2.3533	2.3983
950	1.8777	1.8762	3.3658	1.3678	2.4115	2.4455
1000	1.9057	1.9042	3.4128	1.3756	2.4680	2.4911

Table A.3-6. Velocity Adjustment Factor (VAF), original and revised, for T310 and T330, Main.

T310				T330-MC			
Flow (cfs)	**Orig**	**Rev 1V**	**Depth**	**Flow (cfs)**	**Orig**	**Rev 1V**	**Depth**
8.42	0.2676	0.2676		1.51	0.3384	0.3296	
16.84	0.3536	0.3536		3.01	0.4659	0.4534	
25.26	0.4196	0.4196		4.52	0.5433	0.5285	
33.67	0.4757	0.4757		6.03	0.5980	0.5815	
42.90	0.5297	0.5252		7.53	0.6395	0.6219	
50.51	0.5702	0.5702		9.04	0.6733	0.6546	
58.93	0.6117	0.6117		10.54	0.7012	0.6817	
67.35	0.6504	0.6505		12.05	0.7252	0.7050	
75.77	0.6868	0.6870		13.56	0.7460	0.7252	
84.19	0.7214	0.7216		15.06	0.7640	0.7427	
92.60	0.7543	0.7545		16.57	0.7802	0.7583	
101.20	0.7865	0.7861		18.08	0.7947	0.7723	
109.44	0.8161	0.8165		19.58	0.8078	0.7849	
117.86	0.8453	0.8457		21.09	0.8198	0.7964	
126.28	0.8736	0.8740		22.60	0.8308	0.8069	
134.70	0.9009	0.9015		24.10	0.8410	0.8165	
143.12	0.9275	0.9281		25.61	0.8505	0.8255	
151.54	0.9533	0.9541		27.12	0.8594	0.8337	
159.95	0.9785	0.9793		28.62	0.8677	0.8414	
168.37	1.0030	1.0040	0.9164	30.13	0.8756	0.8484	0.5800
189.42	1.0620	1.0635	0.9573	33.89	0.8933	0.8643	0.5789
210.47	1.1181	1.1200	0.9959	37.66	0.9091	0.8782	0.5771
231.51	1.1715	1.1740	1.0325	41.43	0.9232	0.8904	0.5747
252.56	1.2228	1.2258	1.0674	45.19	0.9359	0.9012	0.5718
273.61	1.2721	1.2757	1.1008	48.96	0.9475	0.9109	0.5687
294.65	1.3196	1.3239	1.1329	52.72	0.9582	0.9197	0.5655
315.70	1.3656	1.3705	1.1639	56.49	0.9681	0.9277	0.5621
336.75	1.4102	1.4158	1.1937	60.26	0.9773	0.9350	0.5587
378.84	1.4958	1.5028	1.2506	67.79	0.9940	0.9480	0.5520
420.93	1.5770	1.5855	1.3044	75.32	1.0088	0.9593	0.5456
463.02	1.6546	1.6646	1.3555	82.85	1.0222	0.9693	0.5397
505.12	1.7290	1.7405	1.4044	90.38	1.0343	0.9782	0.5343
547.21	1.8005	1.8135	1.4512	97.92	1.0455	0.9863	0.5294
589.30	1.8696	1.8841	1.4963	105.45	1.0558	0.9934	0.5238
631.40	1.9365	1.9525	1.5398	112.98	1.0653	0.9999	0.5188
673.49	2.0013	2.0188	1.5820	120.51	1.0742	1.0059	0.5143
715.58	2.0643	2.0833	1.6228	128.05	1.0826	1.0116	0.5102
757.68	2.1257	2.1461	1.6624	135.58	1.0905	1.0169	0.5065
799.77	2.1855	2.2074	1.7010	143.11	1.0979	1.0219	0.5031
841.86	2.2438	2.2673	1.7384	150.64	1.1050	1.0266	0.5000

Table A.3-7. Velocity Adjustment Factors (VAF), original and revised, for T330, Secondary and Tertiary Channels.

T330-2C				T330-3C			
Flow (cfs)	**Orig**	**Rev 1V**	**Depth**	**Flow (cfs)**	**Orig**	**Rev 1V**	**Depth**
0.13	0.2014	0.2015		0.03	0.0573	0.1370	
0.25	0.2629	0.2630		0.07	0.1269	0.3049	
0.38	0.3102	0.3104		0.10	0.1736	0.4184	
0.51	0.3485	0.3487		0.13	0.2155	0.5213	
0.64	0.3812	0.3814		0.16	0.2530	0.6139	
0.76	0.4082	0.4083		0.20	0.2966	0.7224	
0.89	0.4347	0.4347		0.23	0.3250	0.7933	
1.02	0.4590	0.4591		0.26	0.3499	0.8560	
1.15	0.4816	0.4816		0.30	0.3784	0.9277	
1.27	0.5012	0.5012		0.33	0.3966	0.9736	
1.40	0.5213	0.5213		0.36	0.4124	1.0132	
1.53	0.5398	0.5401		0.40	0.4300	1.0575	
1.65	0.5559	0.5566		0.43	0.4410	1.0848	
1.78	0.5727	0.5736		0.46	0.4503	1.1078	
1.91	0.5887	0.5899		0.49	0.4580	1.1267	
2.04	0.6041	0.6056		0.53	0.4662	1.1464	
2.16	0.6178	0.6195		0.56	0.4709	1.1576	
2.29	0.6322	0.6347		0.59	0.4745	1.1658	
2.42	0.6461	0.6481		0.63	0.4777	1.1731	
2.54	0.6584	0.6606	0.2792	0.66	0.4791	1.1759	0.3555
2.86	0.6896	0.6925	0.2911	0.74	0.4787	1.1731	0.3598
3.18	0.7179	0.7217	0.3020	0.82	0.4737	1.1594	0.3605
3.50	0.7437	0.7487	0.3120	0.91	0.4641	1.1351	0.3583
3.82	0.7678	0.7740	0.3214	0.99	0.4521	1.1085	0.3542
4.14	0.7904	0.7979	0.3303	1.07	0.4366	1.0787	0.3488
4.45	0.8110	0.8199	0.3384	1.15	0.4209	1.0470	0.3424
4.77	0.8313	0.8416	0.3464	1.24	0.4032	1.0102	0.3343
5.73	0.8867	0.8623	0.3541	1.32	0.3876	0.9772	0.3267
5.90	0.8958	0.9010	0.3685	1.37	0.3791	0.9121	0.3108
6.36	0.9195	0.9354	0.3816	1.48	0.3579	0.8452	0.2934
7.00	0.9505	0.9678	0.3941	1.81	0.3034	0.7851	0.2770
7.63	0.9785	0.9976	0.4056	1.98	0.2796	0.7222	0.2595
8.27	1.0048	1.0257	0.4165	2.14	0.2597	0.6574	0.2417
8.91	1.0297	1.0523	0.4269	2.31	0.2409	0.5910	0.2228
9.54	1.0529	1.0773	0.4367	2.47	0.2251	0.5343	0.2058
10.18	1.0753	1.1015	0.4463	2.64	0.2100	0.4810	0.1888
10.82	1.0968	1.1247	0.4554	2.80	0.1972	0.4278	0.1710
11.45	1.1171	1.1466	0.4641	2.97	0.1850	0.3814	0.1550
12.09	1.1369	1.1680	0.4726	3.13	0.1746	0.3450	0.1419
12.72	1.1558	1.1884	0.4807	3.30	0.1640	0.3108	0.1296

Table A.3-8. Velocity Adjustment Factors (VAF), original and revised, for T400, T410, and T430.

	T400			T410			T430		
Flow (cfs)	**Orig**	**Rev 1V**	**Depth**	**Orig**	**Rev 1V**	**Depth**	**Orig**	**Rev 1V**	**Depth**
10	0.2620	0.2645		0.8073	0.8112		0.2099	0.2099	
20	0.3531	0.3573		0.9298	0.9382		0.3408	0.3408	
30	0.4199	0.4255		0.9985	1.0111		0.4400	0.4400	
40	0.4733	0.4800		1.0348	1.0503		0.5206	0.5206	
50	0.5199	0.5274		1.0322	1.0522		0.5887	0.5887	
60	0.5614	0.5699		1.0245	1.0458		0.6475	0.6475	
70	0.5993	0.6085		1.0206	1.0430		0.6993	0.6993	
80	0.6337	0.6437		1.0192	1.0426		0.7454	0.7454	
90	0.6657	0.6764		1.0194	1.0438		0.7868	0.7868	
100	0.6956	0.7070		1.0198	1.0453		0.8244	0.8244	
110	0.7233	0.7358		1.0192	1.0465		0.8585	0.8585	
120	0.7491	0.7620		1.0189	1.0471		0.8890	0.8889	
130	0.7734	0.7870		1.0193	1.0486		0.9165	0.9164	
140	0.7968	0.8108		1.0204	1.0507		0.9416	0.9414	
150	0.8192	0.8337		1.0220	1.0533		0.9647	0.9645	
160	0.8406	0.8558		1.0241	1.0563		0.9856	0.9857	
170	0.8609	0.8765		1.0262	1.0596		1.0049	1.0053	
180	0.8806	0.8965		1.0287	1.0632		1.0229	1.0236	
190	0.8997	0.9160		1.0314	1.0669		1.0396	1.0406	
200	0.9180	0.9347	2.2569	1.0343	1.0707	1.8494	1.0552	1.0561	1.6095
225	0.9614	0.9790	2.3662	1.0375	1.0772	1.8700	1.0903	1.0908	1.6519
250	1.0021	1.0203	2.4678	1.0428	1.0837	1.8811	1.1207	1.1209	1.6872
275	1.0407	1.0594	2.5631	1.0496	1.0915	1.8862	1.1475	1.1473	1.7170
300	1.0776	1.0966	2.6535	1.0572	1.1000	1.8867	1.1714	1.1707	1.7424
325	1.1130	1.1323	2.7396	1.0653	1.1088	1.8845	1.1928	1.1916	1.7641
350	1.1471	1.1667	2.8223	1.0737	1.1179	1.8806	1.2122	1.2105	1.7829
375	1.1801	1.2000	2.9020	1.0824	1.1272	1.8764	1.2299	1.2277	1.7995
400	1.2122	1.2322	2.9791	1.0913	1.1366	1.8720	1.2461	1.2434	1.8137
450	1.2737	1.2941	3.1266	1.1091	1.1554	1.8634	1.2748	1.2711	1.8369
500	1.3324	1.3530	3.2666	1.1270	1.1742	1.8556	1.2996	1.2949	1.8554
550	1.3885	1.4093	3.4003	1.1446	1.1926	1.8490	1.3215	1.3159	1.8705
600	1.4426	1.4636	3.5287	1.1620	1.2108	1.8434	1.3410	1.3346	1.8833
650	1.4948	1.5159	3.6526	1.1791	1.2285	1.8390	1.3587	1.3514	1.8943
700	1.5453	1.5666	3.7723	1.1958	1.2459	1.8352	1.3748	1.3665	1.9032
750	1.5944	1.6159	3.8885	1.2121	1.2629	1.8321	1.3896	1.3803	1.9110
800	1.6422	1.6637	4.0014	1.2281	1.2795	1.8301	1.4033	1.3931	1.9179
850	1.6887	1.7104	4.1114	1.2437	1.2957	1.8287	1.4161	1.4049	1.9240
900	1.7342	1.7560	4.2187	1.2589	1.3116	1.8281	1.4280	1.4159	1.9295
950	1.7786	1.8005	4.3236	1.2739	1.3272	1.8284	1.4393	1.4262	1.9345
1000	1.8221	1.8441	4.4262	1.2886	1.3424	1.8293	1.4498	1.4358	1.9391

Table A.3-9. Changes to original data decks, Grant Creek.

		Middle Flow		Manning N		Elevation		
Trans	**Station**	**Orig**	**Rev**	**Orig**	**Rev**	**Orig**	**Rev**	**Other**
120	7.2			-1.7040	-0.4000			
	69.9					96.57	96.90	
	72.2					95.89	96.90	
	86.1			0.2227	0.1500			
	86.7					96.51	96.86	
	90.0					96.04	97.04	
130	80.4					97.07	97.08	
	81.9					97.01	97.15	
140	13.1			0.3023	0.13			
	36.6			0.0114	0.015			
	39.2			0.0082	0.01			
	41.4					97.21	98.25	
	43.0					97.53	98.20	
	90.3			3.3253	0.3			
	120.0					98.45	98.45	
150	1.8					94.68	96.03	
	4.5			0.0089	0.0100			
	65.5			1.2671	0.2000			
	120.0					95.15	95.23	
	121.7					94.91	95.33	
160	11.5	0.00	0.10			95.43	95.44	
	11.9	0.00	0.10	0.0608	0.1200			
	13.5	0.00	0.10	0.0608	0.1200			
	14.0	0.00	0.10			95.43	95.44	
	15.7	0.00	0.10			95.43	95.44	
	17.6	0.00	0.10			95.43	95.44	
	20.2	0.00	0.10			95.43	95.44	
	22.0	0.00	0.10			95.43	95.44	

		Middle Flow		Manning N		Elevation		
Trans	**Station**	**Orig**	**Rev**	**Orig**	**Rev**	**Orig**	**Rev**	**Other**
220	6.0			0.1783	0.1250			
230-MC	2.5			-0.3713	-0.2500			
	61.5			-1.2458	-0.1500			
310	2.1					96.42	96.44	
	3.1					96.42	96.44	
	3.9			-0.4277	-0.2000			
	61.2			-0.6336	-0.1500			
400	4.2					93.70	93.97	
	5.2					93.28	93.96	
	6.5					92.93	93.95	
	10.0			2.1653	0.1800			
	26.0					93.91	93.90	
	86.6			2.9033	0.2000			
	87.8			1.5390	0.1000			
410	6.5					94.20	95.30	
	7.0					94.71	95.25	
	7.7					95.14	95.11	
	9.9					94.92	95.25	
	11.0					94.53	95.26	
	13.5					94.82	95.30	
	14.1					94.46	95.30	
	15.0					94.55	95.28	
	16.5					94.51	95.25	
	18.0					94.64	95.23	
	19.5					93.63	95.24	
	21.0					94.78	95.78	
	22.5					94.73	95.73	
	24.0					94.96	95.96	
	25.5					95.19	95.24	
	36.0					94.48	95.48	
	99.3					94.88	95.25	
	115.2					95.20	95.25	
	116.5					94.77	95.30	

		Middle Flow		Manning N		Elevation		
Trans	**Station**	**Orig**	**Rev**	**Orig**	**Rev**	**Orig**	**Rev**	**Other**
	117.8					94.64	95.35	
	119.0					94.69	95.40	
430	60.9					89.60	89.75	
	80.7					89.68	89.75	
	81.5			-0.5542	0.1700			
100	7.5					96.76	96.94	
	8.5					96.57	96.95	
	9.5					96.60	96.94	
	11.0					96.70	96.95	
	18.7			0.4967	0.3000			
	40.2			2.0161	0.1600			
110	9.0	0.00	0.10	0.5866	0.3000			
	10.0	0.00	0.10					
	11.0	0.00	0.10					
	12.0	0.00	0.10					
	38.0	0.00	0.10					
	39.0	0.00	0.10					
	40.0	0.00	0.10					
	41.0	0.00	0.10					
	42.0	0.00	0.10					
	43.0	0.00	0.10					
	44.0	0.00	0.10	0.2534	0.1200			
200	9.0			-3.3253	0.2000			
	42.0			0.5878	0.4500			
300								No changes
210								No changes
230								No changes
320	12.4			0.5568	0.2100			
	41.6					95.58	96.23	
	47.0					95.96	96.32	

		Middle Flow		Manning N		Elevation		
Trans	**Station**	**Orig**	**Rev**	**Orig**	**Rev**	**Orig**	**Rev**	**Other**
	49.0					95.94	96.23	
	49.3			-0.5292	0.1400			
	50.0					95.98	96.25	
	51.0					96.19	96.25	
330-MC	30.1			10.6096	0.8000			
	30.3			9.8409	0.8000			
	30.5			10.6096	1.0000			
	31.2			10.7510	1.0000			
	32.2			11.5538	1.0000			
	33.4			11.8336	1.0000			
	34.3			12.0305	1.0000			
	35.5			11.2299	1.0000			
	60.3			4.8380	0.8000			
	60.7			6.4423	0.8000			
	61.7			7.2237	0.8000			
	64.2			6.1714	0.8000			
	65.2			5.3203	0.8000			
330-2nd	90.70	0.00	0.10					
	91.70	0.00	0.10					
	92.20	0.00	0.10	0.2534	0.1500			
	106.20			0.2520	0.1000	96.60	96.49	
	106.50					96.38	96.51	
	106.80					96.28	96.55	
	109.20					96.17	96.65	
330-3rd	109.20					96.17	96.65	
	112.20					95.98	96.55	
	125.20					95.37	97.00	

Table A.3-10. Summary of calibration details for original and revised input decks, Grant Creek, Transect 100.

			WSE (ft)	**95.93**		**96.02**		**96.88**					**97.46**	
			Disch (cfs)	**0.01**		**0.25**		**5.9**					**14.75**	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	1	0.00	99.25											
	2	0.10	98.83											
	3	2.00	98.82											
	4	4.00	98.55											
	5	5.50	98.20											
	6	7.00	97.84											
	7	7.20	97.10										0.08	0.12
*	8	7.50	96.76						0.04				0.12	0.15
*	9	8.50	96.57						0.07				0.14	0.15
*	10	9.50	96.60						0.07				0.14	0.15
*	11	11.00	96.70						0.05				0.13	0.15
	12	11.90	96.99										0.09	0.14
	13	12.20	97.13										0.07	0.11
	14	13.50	97.16										0.07	0.10
	15	15.50	96.92										0.10	0.15
	16	16.00	96.52						0.08		0.13		0.15	0.22
	17	16.50	96.52						0.08		0.13		0.15	0.22
	18	17.50	96.22						0.12		0.20		0.18	0.27
	19	17.70	96.92										0.10	0.15
	20	18.50	96.92										0.10	0.15
*	21	18.70	95.92	0.01	0.01	0.04	0.06	***0.15***	0.16		0.25		0.21	0.31
	22	19.00	96.42					***0.28***	0.28		0.28		0.47	0.43
	23	19.50	96.12					***0.38***	0.39		0.38		0.55	0.50
	24	20.00	96.22					***0.44***	0.45		0.44		0.66	0.60
	25	20.50	96.32					***0.50***	0.51		0.50		0.79	0.72
	26	21.00	96.17					***0.35***	0.36		0.35		0.52	0.47
	27	21.50	95.82	0.08	0.08	0.15	0.15	***0.43***	0.45		0.44		0.58	0.52
	28	22.00	95.77	0.12	0.12	0.20	0.20	***0.50***	0.52		0.51		0.67	0.60
	29	22.50	95.72	0.13	0.13	0.21	0.21	***0.48***	0.50		0.49		0.63	0.57
	30	23.00	95.72	0.13	0.13	0.20	0.20	***0.46***	0.48		0.47		0.61	0.55
	31	23.50	95.72	0.17	0.17	0.26	0.26	***0.60***	0.63		0.61		0.79	0.72
	32	24.00	95.92	0.03	0.03	0.14	0.14	***0.61***	0.63		0.62		0.84	0.76
	33	24.50	95.72	0.16	0.16	0.25	0.25	***0.58***	0.61		0.59		0.77	0.69
	34	25.00	95.72	0.20	0.20	0.31	0.31	***0.71***	0.75		0.74		0.95	0.86
	35	25.50	95.72	0.17	0.17	0.26	0.26	***0.61***	0.64		0.62		0.81	0.73
	36	26.00	96.02			0.01	0.01	***0.57***	0.59		0.58		0.80	0.73
	37	26.50	96.02			0.01	0.01	***0.50***	0.52		0.51		0.71	0.64
	38	27.00	95.97			0.07	0.07	***0.44***	0.46		0.45		0.61	0.56
	39	27.50	96.07					***0.51***	0.53		0.52		0.73	0.66
	40	28.00	96.22					***0.49***	0.50		0.49		0.74	0.67

			WSE (ft)	**95.93**		**96.02**		**96.88**					**97.46**	
			Disch (cfs)	**0.01**		**0.25**		**5.9**					**14.75**	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	41	28.50	96.32					***0.42***	0.43		0.42		0.66	0.60
	42	29.00	96.12					***0.33***	0.34		0.33		0.48	0.44
	43	29.80	96.17					***0.22***	0.23		0.22		0.33	0.30
	44	30.60	96.42					***0.26***	0.26		0.26		0.44	0.40
	45	31.40	96.52					***0.21***	0.21		0.20		0.38	0.35
	46	32.20	96.32					***0.01***	0.01		0.01		0.02	0.01
	47	33.00	96.17					***0.01***	0.01		0.01		0.01	0.01
	48	33.80	96.42						0.01		0.01		0.01	0.01
	49	34.60	96.32						0.01		0.01		0.01	0.01
	50	35.40	96.62					***0.01***	0.01		0.01		0.02	0.02
	51	36.20	96.42					***0.10***	0.10		0.10		0.17	0.15
	52	37.00	96.32					***0.20***	0.20		0.20		0.32	0.29
	53	37.80	96.32					***0.28***	0.28		0.28		0.44	0.40
	54	38.60	96.32					***0.37***	0.38		0.37		0.59	0.53
	55	39.40	96.32					***0.33***	0.34		0.33		0.52	0.47
*	56	40.20	96.52					***0.02***	0.02		0.24		0.04	0.42
	57	41.00	96.72						0.01		0.14		0.03	0.36
	58	42.00	96.72						0.01		0.14		0.03	0.36
	59	43.00	96.77								0.11		0.03	0.34
	60	43.50	96.92										0.03	0.29
	61	45.00	97.19										0.02	0.18
	62	47.00	97.45										0.00	0.02
	63	49.00	97.74											
	64	51.00	98.06											
	65	53.00	98.07											
	66	55.00	98.01											
	67	58.00	98.36											
	68	60.10	98.62											
	69	60.10	99.19											
	Total								0	*	0	*		

Note:
An * means the modeled velocity exceeds the measured velocity by 0.2 ft/sec or 20%.

Table A.3-11. Summary of calibration details for original and revised input decks, Grant Creek, Transect 100, high flows.

			WSE (ft)		**96.88**			**97.46**		**97.72**
			Disch (cfs)		**5.9**			**15**		**20**
Rv	**Pt**	**Sta**	**Elev**	**Meas**	**1 Vel**	**Depth**	**1 Vel**	**Depth**	**1 Vel**	**Depth**
	1	0.00	99.25							
	2	0.10	98.83							
	3	2.00	98.82							
	4	4.00	98.55							
	5	5.50	98.20							
	6	7.00	97.84							
	7	7.20	97.10				0.12	0.19	0.16	0.26
	8	7.50	96.76				0.15	0.25	0.19	0.31
	9	8.50	96.57				0.15	0.24	0.19	0.31
	10	9.50	96.60				0.15	0.25	0.19	0.31
	11	11.00	96.70				0.15	0.25	0.19	0.31
	12	11.90	96.99				0.14	0.23	0.18	0.30
	13	12.20	97.13				0.11	0.18	0.16	0.26
	14	13.50	97.16				0.10	0.17	0.15	0.25
	15	15.50	96.92				0.15	0.25	0.19	0.31
	16	16.00	96.52		0.13	0.23	0.22	0.37	0.25	0.41
	17	16.50	96.52		0.13	0.23	0.22	0.37	0.25	0.41
	18	17.50	96.22		0.20	0.34	0.27	0.44	0.29	0.48
	19	17.70	96.92				0.15	0.25	0.19	0.31
	20	18.50	96.92				0.15	0.25	0.19	0.31
	21	18.70	95.92	***0.15***	0.25	0.44	0.31	0.51	0.33	0.54
	22	19.00	96.42	***0.28***	0.28	0.27	0.43	0.39	0.48	0.44
	23	19.50	96.12	***0.38***	0.38	0.37	0.50	0.46	0.54	0.50
	24	20.00	96.22	***0.44***	0.44	0.34	0.60	0.44	0.66	0.48
	25	20.50	96.32	***0.50***	0.50	0.30	0.72	0.42	0.79	0.46
	26	21.00	96.17	***0.35***	0.35	0.36	0.47	0.45	0.51	0.49
	27	21.50	95.82	***0.43***	0.44	0.47	0.52	0.53	0.56	0.56
	28	22.00	95.77	***0.50***	0.51	0.48	0.60	0.54	0.64	0.57
	29	22.50	95.72	***0.48***	0.49	0.50	0.57	0.55	0.61	0.58
	30	23.00	95.72	***0.46***	0.47	0.50	0.55	0.55	0.58	0.58
	31	23.50	95.72	***0.60***	0.61	0.50	0.72	0.55	0.76	0.58
	32	24.00	95.92	***0.61***	0.62	0.44	0.76	0.51	0.82	0.54
	33	24.50	95.72	***0.58***	0.59	0.50	0.69	0.55	0.74	0.58
	34	25.00	95.72	***0.71***	0.74	0.50	0.86	0.55	0.91	0.58
	35	25.50	95.72	***0.61***	0.62	0.50	0.73	0.55	0.77	0.58
	36	26.00	96.02	***0.57***	0.58	0.41	0.73	0.49	0.79	0.52
	37	26.50	96.02	***0.50***	0.51	0.41	0.64	0.49	0.69	0.52
	38	27.00	95.97	***0.44***	0.45	0.42	0.56	0.50	0.60	0.53
	39	27.50	96.07	***0.51***	0.52	0.39	0.66	0.48	0.72	0.51
	40	28.00	96.22	***0.49***	0.49	0.34	0.67	0.44	0.74	0.48

		WSE (ft)		96.88			97.46		97.72	
		Disch (cfs)		5.9			15		20	
Rv	**Pt**	**Sta**	**Elev**	**Meas**	**1 Vel**	**Depth**	**1 Vel**	**Depth**	**1 Vel**	**Depth**
	41	28.50	96.32	***0.42***	0.42	0.30	0.60	0.42	0.67	0.46
	42	29.00	96.12	***0.33***	0.33	0.37	0.44	0.46	0.47	0.50
	43	29.80	96.17	***0.22***	0.22	0.36	0.30	0.45	0.32	0.49
	44	30.60	96.42	***0.26***	0.26	0.27	0.40	0.39	0.44	0.44
	45	31.40	96.52	***0.21***	0.20	0.23	0.35	0.37	0.39	0.41
	46	32.20	96.32	***0.01***	0.01	0.30	0.01	0.42	0.02	0.46
	47	33.00	96.17	***0.01***	0.01	0.36	0.01	0.45	0.01	0.49
	48	33.80	96.42		0.01	0.27	0.01	0.39	0.01	0.44
	49	34.60	96.32		0.01	0.30	0.01	0.42	0.01	0.46
	50	35.40	96.62	***0.01***	0.01	0.18	0.02	0.34	0.02	0.39
	51	36.20	96.42	***0.10***	0.10	0.27	0.15	0.39	0.17	0.44
	52	37.00	96.32	***0.20***	0.20	0.30	0.29	0.42	0.32	0.46
	53	37.80	96.32	***0.28***	0.28	0.30	0.40	0.42	0.45	0.46
	54	38.60	96.32	***0.37***	0.37	0.30	0.53	0.42	0.59	0.46
	55	39.40	96.32	***0.33***	0.33	0.30	0.47	0.42	0.52	0.46
	56	40.20	96.52	***0.02***	0.24	0.08	0.42	0.14	0.47	0.15
	57	41.00	96.72		0.14	0.05	0.36	0.12	0.42	0.14
	58	42.00	96.72		0.14	0.05	0.36	0.12	0.42	0.14
	59	43.00	96.77		0.11	0.04	0.34	0.11	0.40	0.13
	60	43.50	96.92				0.29	0.09	0.36	0.12
	61	45.00	97.19				0.18	0.06	0.27	0.09
	62	47.00	97.45				0.02	0.01	0.17	0.06
	63	49.00	97.74							
	64	51.00	98.06							
	65	53.00	98.07							
	66	55.00	98.01							
	67	58.00	98.36							
	68	60.10	98.62							
	69	60.10	99.19							

Table A.3-12. Summary of calibration details for original and revised input decks, Grant Creek, Transect 110.

			WSE (ft)	98.22		98.29		99.4					99.84	
			Disch (cfs)	0.1		0.25		8.69					14.75	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	1	0.00	102.77											
	2	0.10	102.29											
	3	1.30	101.38											
	4	2.60	100.08											
	5	3.80	99.79										0.04	0.03
	6	4.80	99.68										0.08	0.07
	7	6.90	99.55										0.12	0.10
	8	8.00	99.50										0.14	0.11
	9	8.50	99.46										0.15	0.12
	10	8.60	99.43										0.16	0.12
*	11	9.00	98.73						0.22	*	0.18		0.30	0.24
*	12	10.00	98.63						0.24	*	0.09		0.32	0.12
*	13	11.00	98.43						0.28	*	0.09		0.35	0.11
*	14	12.00	98.43						0.28	*	0.09		0.35	0.11
	15	13.00	98.43					0.31	0.28		0.29		0.35	0.36
	16	14.00	98.23					0.65	0.59		0.61		0.72	0.72
	17	15.00	98.23			0.08	0.08	0.46	0.42		0.43		0.51	0.51
	18	16.00	98.13	0.25	0.25	0.33	0.33	1.00	0.91		0.94		1.09	1.09
	19	17.00	98.33					0.01	0.01		0.01		0.01	0.01
	20	18.00	98.23			0.01	0.01		0.03		0.03		0.03	0.03
	21	19.00	98.23			0.01	0.01		0.03		0.03		0.03	0.03
	22	20.00	98.28			0.00	0.00	0.03	0.03		0.03		0.03	0.03
	23	21.00	98.23			0.04	0.04	0.23	0.21		0.22		0.25	0.25
	24	22.00	98.23			0.05	0.05	0.28	0.25		0.26		0.31	0.31
	25	23.00	98.13	0.07	0.07	0.09	0.09	0.28	0.25		0.26		0.31	0.31
	26	24.00	98.13	0.05	0.05	0.07	0.07	0.21	0.19		0.20		0.23	0.23
	27	25.00	98.23			0.04	0.04	0.22	0.20		0.21		0.24	0.24
	28	26.00	98.13	0.08	0.08	0.10	0.10	0.32	0.29		0.30		0.35	0.35
	29	27.00	98.23			0.06	0.06	0.31	0.28		0.29		0.34	0.34
	30	28.00	98.23			0.07	0.07	0.37	0.34		0.35		0.41	0.41
	31	29.00	98.13	0.12	0.12	0.15	0.15	0.47	0.43		0.44		0.51	0.51
	32	30.00	98.13	0.18	0.18	0.23	0.23	0.70	0.64		0.66		0.76	0.77
	33	31.00	98.13	0.13	0.13	0.17	0.17	0.53	0.48		0.50		0.58	0.58
	34	32.00	98.03	0.23	0.23	0.25	0.25	0.58	0.53		0.55		0.63	0.63
	35	33.00	97.98	0.01	0.01	0.01	0.01	0.03	0.03		0.03		0.03	0.03
	36	34.00	98.33					0.02	0.02		0.02		0.02	0.02
	37	35.00	98.38						0.02		0.02		0.02	0.02
	38	36.00	99.43										0.01	0.01
	39	37.00	99.43										0.01	0.01
*	40	38.00	99.03						0.01		0.09		0.01	0.15

			WSE (ft)	98.22		98.29		99.4					99.84	
			Disch (cfs)	0.1		0.25		8.69					14.75	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
*	41	39.00	98.93						0.01		0.09		0.02	0.14
*	42	40.00	98.93						0.01		0.09		0.02	0.14
*	43	41.00	98.93						0.01		0.09		0.02	0.14
*	44	42.00	99.13						0.01		0.09		0.01	0.16
*	45	43.00	99.13						0.01		0.09		0.01	0.16
*	46	44.00	99.23						0.01		0.18		0.01	0.41
	47	44.60	99.43										0.01	0.31
	48	45.10	99.47										0.01	0.29
	49	46.90	99.99											
	50	48.70	100.31											
	51	50.80	100.84											
	52	50.90	101.20											
	Total								4	*	0	*		

Note:
An * means the modeled velocity exceeds the measured velocity by 0.2 ft/sec or 20%.

Table A.3-13. Summary of calibration details for original and revised input decks, Grant Creek, Transect 110, high flows.

			WSE (ft)	99.4			99.84			
			Disch (cfs)	8.69			14.75		20	
Rv	Pt	Sta	Elev	Meas	1 Vel	Depth	1 Vel	Depth	1 Vel	Depth
	1	0.00	102.77							
	2	0.10	102.29							
	3	1.30	101.38							
	4	2.60	100.08						0.04	0.04
	5	3.80	99.79				0.03	0.03	0.11	0.11
	6	4.80	99.68				0.07	0.07	0.13	0.13
	7	6.90	99.55				0.10	0.10	0.16	0.16
	8	8.00	99.50				0.11	0.11	0.16	0.17
	9	8.50	99.46				0.12	0.12	0.17	0.17
	10	8.60	99.43				0.12	0.13	0.18	0.18
	11	9.00	98.73		0.18	0.19	0.24	0.25	0.27	0.28
	12	10.00	98.63		0.09	0.21	0.12	0.26	0.13	0.29
	13	11.00	98.43		0.09	0.24	0.11	0.29	0.13	0.32
	14	12.00	98.43		0.09	0.24	0.11	0.29	0.13	0.32
	15	13.00	98.43	***0.31***	0.29	0.24	0.36	0.29	0.39	0.32
	16	14.00	98.23	***0.65***	0.61	0.28	0.72	0.32	0.78	0.34
	17	15.00	98.23	***0.46***	0.43	0.28	0.51	0.32	0.55	0.34
	18	16.00	98.13	***1.00***	0.94	0.29	1.09	0.33	1.17	0.35
	19	17.00	98.33	***0.01***	0.01	0.26	0.01	0.30	0.01	0.33
	20	18.00	98.23		0.03	0.28	0.03	0.32	0.04	0.34
	21	19.00	98.23		0.03	0.28	0.03	0.32	0.04	0.34
	22	20.00	98.28	***0.03***	0.03	0.27	0.03	0.31	0.04	0.34
	23	21.00	98.23	***0.23***	0.22	0.28	0.25	0.32	0.27	0.34
	24	22.00	98.23	***0.28***	0.26	0.28	0.31	0.32	0.33	0.34
	25	23.00	98.13	***0.28***	0.26	0.29	0.31	0.33	0.33	0.35
	26	24.00	98.13	***0.21***	0.20	0.29	0.23	0.33	0.25	0.35
	27	25.00	98.23	***0.22***	0.21	0.28	0.24	0.32	0.26	0.34
	28	26.00	98.13	***0.32***	0.30	0.29	0.35	0.33	0.38	0.35
	29	27.00	98.23	***0.31***	0.29	0.28	0.34	0.32	0.37	0.34
	30	28.00	98.23	***0.37***	0.35	0.28	0.41	0.32	0.44	0.34
	31	29.00	98.13	***0.47***	0.44	0.29	0.51	0.33	0.55	0.35
	32	30.00	98.13	***0.70***	0.66	0.29	0.77	0.33	0.82	0.35
	33	31.00	98.13	***0.53***	0.50	0.29	0.58	0.33	0.62	0.35
	34	32.00	98.03	***0.58***	0.55	0.31	0.63	0.34	0.67	0.36
	35	33.00	97.98	***0.03***	0.03	0.31	0.03	0.35	0.03	0.37
	36	34.00	98.33	***0.02***	0.02	0.26	0.02	0.30	0.02	0.33
	37	35.00	98.38		0.02	0.25	0.02	0.30	0.02	0.32
	38	36.00	99.43				0.01	0.13	0.01	0.18
	39	37.00	99.43				0.01	0.13	0.01	0.18
	40	38.00	99.03		0.09	0.13	0.15	0.20	0.17	0.24

			WSE (ft)	99.4			99.84			
			Disch (cfs)	8.69			14.75		20	
Rv	**Pt**	**Sta**	**Elev**	**Meas**	**1 Vel**	**Depth**	**1 Vel**	**Depth**	**1 Vel**	**Depth**
	41	39.00	98.93		0.09	0.15	0.14	0.22	0.16	0.25
	42	40.00	98.93		0.09	0.15	0.14	0.22	0.16	0.25
	43	41.00	98.93		0.09	0.15	0.14	0.22	0.16	0.25
	44	42.00	99.13		0.09	0.10	0.16	0.18	0.20	0.22
	45	43.00	99.13		0.09	0.10	0.16	0.18	0.20	0.22
	46	44.00	99.23		0.18	0.08	0.41	0.17	0.51	0.21
	47	44.60	99.43				0.31	0.13	0.44	0.18
	48	45.10	99.47				0.29	0.12	0.42	0.17
	49	46.90	99.99						0.17	0.07
	50	48.70	100.31							
	51	50.80	100.84							
	52	50.90	101.20							

Table A.3- 14. Summary of calibration details for original and revised input decks, Grant Creek, Transect 120.

			WSE (ft)	**95.43**		**96.46**		**96.82**					**97.84**	
			Disch (cfs)	**10**		**100**		**182**					**700**	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	1	0.00	98.51											
	2	2.40	97.72										-0.02	-0.08
	3	4.50	98.44											
	4	5.50	98.09											
	5	5.60	96.87										-0.07	-0.32
*	6	7.20	96.29			-0.01	-0.04	***-0.03***	-0.03		-0.12		-0.10	-0.44
	7	7.60	96.25			0.05	0.05	***0.14***	0.13		0.13		0.46	0.47
	8	8.50	96.79					***0.32***	0.19		0.19		3.38	3.46
	9	9.00	95.87			-0.02	-0.02	***-0.03***	-0.03		-0.03		-0.08	-0.08
	10	11.10	95.69			-0.02	-0.02	***-0.04***	-0.04		-0.04		-0.10	-0.11
	11	12.00	95.19	0.00	0.00	-0.02	-0.02	***-0.03***	-0.03		-0.03		-0.07	-0.07
	12	13.50	94.73	0.14	0.14	0.90	0.91	***1.42***	1.33		1.35		3.15	3.23
	13	15.00	94.09	0.08	0.08	0.41	0.41	***0.62***	0.58		0.59		1.31	1.34
	14	16.00	94.39	0.08	0.08	0.42	0.42	***0.65***	0.61		0.62		1.40	1.43
	15	17.30	93.20	0.23	0.23	1.06	1.06	***1.57***	1.47		1.50		3.16	3.24
	16	18.50	93.19	0.39	0.39	1.74	1.75	***2.58***	2.43		2.47		5.21	5.33
	17	20.10	92.99	0.44	0.44	1.96	1.97	***2.89***	2.72		2.77		5.79	5.93
	18	20.70	94.40	0.47	0.47	2.65	2.66	***4.09***	3.83		3.90		8.81	9.02
	19	21.30	92.95	0.51	0.51	2.28	2.29	***3.36***	3.17		3.22		6.72	6.88
	20	24.00	93.41	0.46	0.46	2.11	2.12	***3.14***	2.96		3.00		6.39	6.55
	21	26.70	93.84	0.31	0.31	1.53	1.53	***2.30***	2.16		2.20		4.78	4.90
	22	30.10	94.81	0.22	0.22	1.51	1.52	***2.40***	2.25		2.28		5.37	5.50
	23	32.80	95.33	0.08	0.08	1.45	1.45	***2.43***	2.27		2.30		5.83	5.97
	24	35.90	95.50			1.10	1.10	***1.90***	1.77		1.80		4.71	4.82
	25	39.00	95.68			0.83	0.83	***1.50***	1.39		1.42		3.87	3.97
	26	41.20	95.68			0.77	0.77	***1.39***	1.29		1.31		3.59	3.68
	27	42.70	95.68			0.62	0.62	***1.12***	1.04		1.06		2.89	2.96
	28	43.20	96.40			0.08	0.08	***0.41***	0.37		0.37		1.52	1.55
	29	44.00	95.77			0.62	0.63	***1.16***	1.08		1.09		3.07	3.14
	30	47.10	96.01			0.48	0.48	***1.00***	0.92		0.94		2.88	2.95
	31	48.90	96.11			0.86	0.86	***1.96***	1.80		1.83		5.91	6.05
	32	50.10	95.84			0.51	0.51	***0.97***	0.90		0.91		2.62	2.69
	33	53.00	95.94			0.77	0.78	***1.55***	1.43		1.45		4.34	4.44
	34	55.70	96.26			0.19	0.19	***0.55***	0.50		0.51		1.81	1.85
	35	59.00	96.39			0.12	0.12	***0.57***	0.51		0.52		2.09	2.14
	36	61.90	96.50					***0.30***	0.26		0.27		1.25	1.28
	37	65.30	96.48					***0.24***	0.21		0.22		0.97	0.99
	38	68.20	96.48					***0.36***	0.32		0.32		1.46	1.49
*	39	69.90	96.57						0.26	*			1.39	1.16
*	40	72.70	95.89			0.34			0.62	*			1.85	1.16

			WSE (ft)	**95.43**		**96.46**		**96.82**					**97.84**	
			Disch (cfs)	**10**		**100**		**182**					**700**	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	41	73.50	95.81			0.29	0.29	***0.55***	0.51		0.52		1.47	1.51
	42	75.60	95.43	0.00	0.00	0.53	0.53	***0.90***	0.84		0.85		2.20	2.25
	43	78.50	95.48			0.86	0.87	***1.49***	1.39		1.41		3.67	3.76
	44	81.50	95.51			0.66	0.66	***1.14***	1.06		1.08		2.83	2.90
	45	84.60	95.44			0.46	0.46	***0.78***	0.73		0.74		1.91	1.96
*	46	86.10	95.79			0.19	0.28	***0.35***	0.32		0.49		0.93	1.42
*	47	86.70	96.31			0.07			0.20				0.77	0.86
*	48	96.00	96.04			0.14			0.27	*			0.85	0.75
	49	142.70	101.45											
	Total								3	*	0	*		

Note:
An * means the modeled velocity exceeds the measured velocity by 0.2 ft/sec or 20%.

Table A.3-15. Summary of calibration details for original and revised input decks, Grant Creek, Transect 120, high flows.

		WSE (ft)		96.82			97.84		98.16	
		Disch (cfs)		182			700		1000	
Rv	**Pt**	**Sta**	**Elev**	**Meas**	**1 Vel**	**Depth**	**1 Vel**	**Depth**	**1 Vel**	**Depth**
	1	0.00	98.51							
	2	2.40	97.72				-0.08	0.44	-0.22	1.23
	3	4.50	98.44							
	4	5.50	98.09						-0.07	0.36
	5	5.60	96.87				-0.32	1.79	-0.46	2.53
	6	7.20	96.29	***-0.03***	-0.12	0.69	-0.44	2.46	-0.59	3.24
	7	7.60	96.25	***0.14***	0.13	0.73	0.47	2.50	0.63	3.29
	8	8.50	96.79	***0.32***	0.19	0.11	3.46	1.89	4.89	2.63
	9	9.00	95.87	***-0.03***	-0.03	1.02	-0.08	2.89	-0.11	3.72
	10	11.10	95.69	***-0.04***	-0.04	1.15	-0.11	3.06	-0.14	3.91
	11	12.00	95.19	***-0.03***	-0.03	1.46	-0.07	3.52	-0.09	4.42
	12	13.50	94.73	***1.42***	1.35	1.73	3.23	3.92	4.07	4.87
	13	15.00	94.09	***0.62***	0.59	2.07	1.34	4.44	1.67	5.46
	14	16.00	94.39	***0.65***	0.62	1.91	1.43	4.20	1.80	5.19
	15	17.30	93.20	***1.57***	1.50	2.50	3.24	5.13	4.00	6.24
	16	18.50	93.19	***2.58***	2.47	2.50	5.33	5.13	6.58	6.24
	17	20.10	92.99	***2.89***	2.77	2.59	5.93	5.28	7.31	6.41
	18	20.70	94.40	***4.09***	3.90	1.91	9.02	4.19	11.31	5.18
	19	21.30	92.95	***3.36***	3.22	2.61	6.88	5.31	8.48	6.44
	20	24.00	93.41	***3.14***	3.00	2.40	6.55	4.97	8.10	6.06
	21	26.70	93.84	***2.30***	2.20	2.19	4.90	4.64	6.09	5.68
	22	30.10	94.81	***2.40***	2.28	1.68	5.50	3.85	6.95	4.79
	23	32.80	95.33	***2.43***	2.30	1.38	5.97	3.40	7.64	4.28
	24	35.90	95.50	***1.90***	1.80	1.27	4.82	3.24	6.20	4.11
	25	39.00	95.68	***1.50***	1.42	1.15	3.97	3.07	5.14	3.92
	26	41.20	95.68	***1.39***	1.31	1.15	3.68	3.07	4.76	3.92
	27	42.70	95.68	***1.12***	1.06	1.15	2.96	3.07	3.84	3.92
	28	43.20	96.40	***0.41***	0.37	0.59	1.55	2.34	2.10	3.11
	29	44.00	95.77	***1.16***	1.09	1.09	3.14	2.98	4.09	3.82
	30	47.10	96.01	***1.00***	0.94	0.92	2.95	2.75	3.88	3.56
	31	48.90	96.11	***1.96***	1.83	0.84	6.05	2.65	8.01	3.45
	32	50.10	95.84	***0.97***	0.91	1.04	2.69	2.92	3.50	3.75
	33	53.00	95.94	***1.55***	1.45	0.97	4.44	2.82	5.83	3.64
	34	55.70	96.26	***0.55***	0.51	0.72	1.85	2.49	2.48	3.28
	35	59.00	96.39	***0.57***	0.52	0.60	2.14	2.35	2.89	3.13
	36	61.90	96.50	***0.30***	0.27	0.49	1.28	2.23	1.74	3.00
	37	65.30	96.48	***0.24***	0.22	0.51	0.99	2.25	1.35	3.02
	38	68.20	96.48	***0.36***	0.32	0.51	1.49	2.25	2.03	3.02
	39	69.90	96.57				1.16	1.76	1.67	2.49
	40	72.70	95.89				1.16	1.76	1.67	2.49

			WSE (ft)	**96.82**			**97.84**		**98.16**	
			Disch (cfs)	**182**			**700**		**1000**	
Rv	**Pt**	**Sta**	**Elev**	**Meas**	**1 Vel**	**Depth**	**1 Vel**	**Depth**	**1 Vel**	**Depth**
	41	73.50	95.81	***0.55***	0.52	1.06	1.51	2.94	1.97	3.78
	42	75.60	95.43	***0.90***	0.85	1.32	2.25	3.30	2.89	4.18
	43	78.50	95.48	***1.49***	1.41	1.28	3.76	3.26	4.84	4.13
	44	81.50	95.51	***1.14***	1.08	1.26	2.90	3.23	3.73	4.10
	45	84.60	95.44	***0.78***	0.74	1.31	1.96	3.29	2.51	4.17
	46	86.10	95.79	***0.35***	0.49	1.08	1.42	2.96	1.84	3.80
	47	86.70	96.31				0.86	1.81	1.23	2.54
	48	96.00	96.04				0.75	1.58	1.12	2.30
	49	142.70	101.45							

Table A.3-16. Summary of calibration details for original and revised input decks, Grant Creek, Transect 130.

		WSE (ft)		95.5		96.58		97.07					98.74	
		Disch (cfs)		10		100		182					700	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	1	0.0	102.04											
	2	0.1	101.89											
	3	1.2	99.86											
	4	3.1	98.88											
	5	5.4	97.07						0.00		0.00		0.29	0.29
	6	5.9	96.12			0.10	0.10	***0.18***	0.20		0.20		0.39	0.39
	7	6.5	95.22	0.02	0.02	0.16	0.16	***0.21***	0.24		0.24		0.36	0.36
	8	8.2	95.37	0.06	0.06	0.63	0.63	***0.83***	0.93		0.93		1.46	1.46
	9	9.1	94.97	0.27	0.27	1.32	1.32	***1.64***	1.84		1.84		2.71	2.71
	10	10.7	94.77	0.47	0.47	2.06	2.06	***2.50***	2.82		2.82		4.03	4.04
	11	12.4	94.47	0.53	0.53	2.03	2.03	***2.41***	2.72		2.72		3.77	3.77
	12	13.8	94.17	0.81	0.81	2.86	2.86	***3.34***	3.77		3.77		5.08	5.09
	13	15.4	94.47	0.88	0.88	3.35	3.35	***3.98***	4.49		4.49		6.22	6.22
	14	16.9	94.47	1.10	1.10	4.22	4.22	***5.01***	5.66		5.66		7.84	7.84
	15	17.9	94.67	0.80	0.80	3.29	3.29	***3.97***	4.48		4.48		6.33	6.34
	16	19.4	94.67	0.84	0.84	3.47	3.47	***4.18***	4.71		4.71		6.67	6.68
	17	21.0	94.62	0.55	0.55	2.22	2.22	***2.67***	3.01		3.01		4.24	4.24
	18	23.1	94.72	0.56	0.56	2.36	2.36	***2.86***	3.22		3.22		4.59	4.59
	19	24.4	94.97	0.38	0.38	1.91	1.91	***2.37***	2.66		2.66		3.92	3.92
	20	26.0	95.07	0.24	0.24	1.35	1.35	***1.69***	1.90		1.90		2.83	2.84
	21	28.3	95.27	0.14	0.14	1.05	1.05	***1.35***	1.51		1.51		2.33	2.33
	22	31.0	95.47	0.03	0.03	0.84	0.84	***1.12***	1.25		1.25		2.01	2.01
	23	33.7	95.77			0.74	0.74	***1.07***	1.19		1.19		2.05	2.05
	24	36.6	95.97			0.52	0.52	***0.82***	0.90		0.90		1.67	1.67
	25	39.3	96.07			0.55	0.55	***0.91***	1.00		1.00		1.92	1.92
	26	42.4	96.47			0.02	0.02	***0.07***	0.07		0.07		0.18	0.18
	27	43.4	96.77					***0.38***	0.38		0.38		1.33	1.33
	28	44.9	96.57			0.04	0.04	***0.64***	0.67		0.67		1.79	1.79
	29	45.9	96.62					***0.52***	0.54		0.54		1.52	1.52
	30	47.4	96.67					***0.31***	0.32		0.32		0.96	0.96
	31	50.0	96.97					***0.10***	0.08		0.08		0.55	0.55
	32	50.6	96.97					***0.01***	0.01		0.01		0.05	0.05
	33	53.1	97.02					***0.00***	0.01		0.01		0.05	0.05
	34	57.0	96.97					***0.01***	0.01		0.01		0.05	0.05
	35	60.6	96.97					***0.01***	0.01		0.01		0.05	0.05
	36	62.7	96.77					***0.04***	0.04		0.04		0.14	0.14
	37	65.3	96.77					***0.90***	0.90		0.90		3.15	3.15
	38	67.8	96.72					***1.08***	1.10		1.10		3.53	3.53
	39	72.0	96.87					***2.11***	1.99		1.99		8.80	8.81
	40	74.5	96.92					***1.44***	1.29		1.29		6.77	6.78

			WSE (ft)	**95.5**		**96.58**		**97.07**					**98.74**	
			Disch (cfs)	**10**		**100**		**182**					**700**	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	41	77.1	96.97					***0.60***	0.49		0.49		3.29	3.29
	42	79.9	97.02					***0.40***	0.26		0.26		2.72	2.72
*	43	80.4	97.07						0.02				2.66	2.66
*	44	81.9	97.01						0.29	*			2.73	2.58
	45	83.0	97.22										2.50	2.50
	46	84.9	97.19										2.53	2.54
	47	85.8	98.10										1.40	1.40
	48	87.6	97.48										2.20	2.21
	49	89.1	97.34										2.37	2.37
	50	92.0	97.26										2.46	2.46
	51	94.5	97.26										2.46	2.46
	52	96.7	97.38										2.32	2.32
	53	97.7	97.92										1.65	1.65
	54	100.2	98.06										1.46	1.46
	55	103.2	98.62										0.45	0.45
	56	106.8	98.80											
	57	109.5	98.18										1.28	1.28
	58	111.8	98.09										1.41	1.41
	59	114.7	97.94										1.62	1.63
	60	117.2	97.98										1.57	1.57
	61	120.3	97.94										1.62	1.63
	62	122.7	98.55										0.61	0.61
	63	125.8	98.18										1.28	1.28
	64	128.5	98.54										0.63	0.64
	65	131.7	98.86											
	66	134.6	99.32											
	67	135.6	100.92											
	Total								1	*	0	*		

Note:
An * means the modeled velocity exceeds the measured velocity by 0.2 ft/sec or 20%.

Table A.3-17. Summary of calibration details for original and revised input decks, Grant Creek, Transect 130, high flows.

		WSE (ft)		97.07			98.74		99.35	
		Disch (cfs)		182			700		1000	
Rv	**Pt**	**Sta**	**Elev**	**Meas**	**1 Vel**	**Depth**	**1 Vel**	**Depth**	**1 Vel**	**Depth**
	1	0.0	102.04							
	2	0.1	101.89							
	3	1.2	99.86							
	4	3.1	98.88						0.12	0.90
	5	5.4	97.07		0.00	0.02	0.29	2.15	0.34	2.58
	6	5.9	96.12	***0.18***	0.20	1.55	0.39	2.91	0.43	3.26
	7	6.5	95.22	***0.21***	0.24	2.42	0.36	3.55	0.39	3.84
	8	8.2	95.37	***0.83***	0.93	2.29	1.46	3.45	1.58	3.75
	9	9.1	94.97	***1.64***	1.84	2.64	2.71	3.72	2.91	4.00
	10	10.7	94.77	***2.50***	2.82	2.80	4.04	3.85	4.30	4.12
	11	12.4	94.47	***2.41***	2.72	3.04	3.77	4.04	4.00	4.30
	12	13.8	94.17	***3.34***	3.77	3.27	5.09	4.23	5.36	4.47
	13	15.4	94.47	***3.98***	4.49	3.04	6.22	4.04	6.59	4.30
	14	16.9	94.47	***5.01***	5.66	3.04	7.84	4.04	8.31	4.30
	15	17.9	94.67	***3.97***	4.48	2.88	6.34	3.92	6.74	4.18
	16	19.4	94.67	***4.18***	4.71	2.88	6.68	3.92	7.10	4.18
	17	21.0	94.62	***2.67***	3.01	2.92	4.24	3.95	4.51	4.21
	18	23.1	94.72	***2.86***	3.22	2.84	4.59	3.88	4.89	4.15
	19	24.4	94.97	***2.37***	2.66	2.64	3.92	3.72	4.20	4.00
	20	26.0	95.07	***1.69***	1.90	2.55	2.84	3.65	3.04	3.94
	21	28.3	95.27	***1.35***	1.51	2.38	2.33	3.52	2.52	3.81
	22	31.0	95.47	***1.12***	1.25	2.20	2.01	3.38	2.18	3.69
	23	33.7	95.77	***1.07***	1.19	1.91	2.05	3.17	2.25	3.49
	24	36.6	95.97	***0.82***	0.90	1.71	1.67	3.02	1.85	3.36
	25	39.3	96.07	***0.91***	1.00	1.60	1.92	2.95	2.13	3.29
	26	42.4	96.47	***0.07***	0.07	1.14	0.18	2.65	0.21	3.02
	27	43.4	96.77	***0.38***	0.38	0.72	1.33	2.41	1.55	2.81
	28	44.9	96.57	***0.64***	0.67	1.01	1.79	2.57	2.05	2.95
	29	45.9	96.62	***0.52***	0.54	0.94	1.52	2.53	1.75	2.91
	30	47.4	96.67	***0.31***	0.32	0.87	0.96	2.49	1.10	2.88
	31	50.0	96.97	***0.10***	0.08	0.35	0.55	2.24	0.65	2.66
	32	50.6	96.97	***0.01***	0.01	0.35	0.05	2.24	0.06	2.66
	33	53.1	97.02	***0.0***	0.01	0.22	0.05	2.20	0.06	2.62
	34	57.0	96.97	***0.01***	0.01	0.35	0.05	2.24	0.06	2.66
	35	60.6	96.97	***0.01***	0.01	0.35	0.05	2.24	0.06	2.66
	36	62.7	96.77	***0.04***	0.04	0.72	0.14	2.41	0.16	2.81
	37	65.3	96.77	***0.90***	0.90	0.72	3.15	2.41	3.66	2.81
	38	67.8	96.72	***1.08***	1.10	0.80	3.53	2.45	4.09	2.84
	39	72.0	96.87	***2.11***	1.99	0.55	8.81	2.32	10.32	2.73
	40	74.5	96.92	***1.44***	1.29	0.45	6.78	2.28	7.97	2.70

		WSE (ft)		97.07			98.74		99.35	
		Disch (cfs)		182			700		1000	
Rv	**Pt**	**Sta**	**Elev**	**Meas**	**1 Vel**	**Depth**	**1 Vel**	**Depth**	**1 Vel**	**Depth**
	41	77.1	96.97	***0.60***	0.49	0.35	3.29	2.24	3.89	2.66
	42	79.9	97.02	***0.40***	0.26	0.22	2.72	2.20	3.23	2.62
	43	80.4	97.07				2.66	2.14	3.18	2.58
	44	81.9	97.01				2.58	2.08	3.11	2.52
	45	83.0	97.22				2.50	2.02	3.04	2.47
	46	84.9	97.19				2.54	2.05	3.07	2.49
	47	85.8	98.10				1.40	1.13	2.13	1.73
	48	87.6	97.48				2.21	1.78	2.79	2.26
	49	89.1	97.34				2.37	1.91	2.93	2.37
	50	92.0	97.26				2.46	1.99	3.01	2.44
	51	94.5	97.26				2.46	1.99	3.01	2.44
	52	96.7	97.38				2.32	1.88	2.89	2.34
	53	97.7	97.92				1.65	1.33	2.33	1.89
	54	100.2	98.06				1.46	1.18	2.18	1.76
	55	103.2	98.62				0.45	0.36	1.49	1.21
	56	106.8	98.80						1.23	1.00
	57	109.5	98.18				1.28	1.03	2.04	1.65
	58	111.8	98.09				1.41	1.14	2.14	1.74
	59	114.7	97.94				1.63	1.31	2.31	1.87
	60	117.2	97.98				1.57	1.27	2.27	1.84
	61	120.3	97.94				1.63	1.31	2.31	1.87
	62	122.7	98.55				0.61	0.50	1.58	1.28
	63	125.8	98.18				1.28	1.03	2.04	1.65
	64	128.5	98.54				0.64	0.51	1.59	1.29
	65	131.7	98.86						1.14	0.92
	66	134.6	99.32						0.18	0.15
	67	135.6	100.92							

Table A.3-18. Summary of calibration details for original and revised input decks, Grant Creek, Transect 140.

		WSE (ft)		97.24		97.85		98.16					99.27	
		Disch (cfs)		10		100		182					700	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	1	0.00	101.83											
	2	0.00	101.08											
	3	3.60	100.62											
	4	7.00	100.61											
	5	9.80	100.12											
	6	11.00	99.85											
	7	12.50	98.14						0.02		0.04		0.21	0.54
	8	13.10	97.84			0.01	0.04	***0.11***	0.11		0.28		0.25	0.63
	9	14.00	97.44			0.55	0.62	***0.77***	0.73		0.84		1.16	1.27
	10	15.00	96.84	1.25	1.25	3.96	4.41	***4.57***	4.30		4.93		5.49	6.02
	11	16.50	97.34			4.28	4.76	***5.62***	5.32		6.10		8.01	8.78
	12	18.10	97.24	0.08	0.08	5.25	5.84	***6.62***	6.26		7.17		9.02	9.88
*	13	19.10	97.04	1.25	1.25	5.40	6.01	***6.45***	6.08		6.97		8.18	8.97
	14	20.50	96.74	1.95	1.95	5.66	6.30	***6.44***	6.06		6.94		7.57	8.29
	15	21.50	96.64	1.84	1.84	5.00	5.56	***5.62***	5.28		6.05		6.47	7.09
	16	23.10	96.64	1.37	1.37	3.72	4.13	***4.18***	3.93		4.50		4.81	5.27
	17	24.20	96.54	1.51	1.51	3.91	4.36	***4.36***	4.10		4.69		4.93	5.40
	18	25.50	96.64	1.79	1.79	4.86	5.41	***5.47***	5.14		5.89		6.30	6.90
	19	26.50	96.74	1.64	1.64	4.75	5.28	***5.40***	5.08		5.82		6.34	6.95
	20	28.40	96.94	1.17	1.17	4.18	4.65	***4.90***	4.62		5.29		6.04	6.62
	21	31.10	96.84	1.13	1.13	3.58	3.99	***4.13***	3.89		4.45		4.96	5.44
	22	34.10	97.34			1.00	1.11	***1.31***	1.24		1.42		1.87	2.05
*	23	36.60	97.74			1.57	1.32	***3.54***	3.40		2.96		6.87	5.72
*	24	39.20	97.64			3.32	3.03	***5.72***	5.47		5.13		9.97	8.95
*	25	41.40	97.21	0.61		6.98			8.22	*			11.69	6.53
*	26	43.00	97.53			4.43			6.25	*			10.44	6.74
	27	44.30	97.84			0.31	0.35	***2.33***	2.26		2.59		5.24	5.74
	28	47.20	97.54			1.71	1.91	***2.58***	2.46		2.81		4.14	4.54
	29	49.60	97.84			0.37	0.41	***2.76***	2.68		3.07		6.21	6.80
	30	53.90	97.84			0.50	0.56	***3.76***	3.65		4.18		8.46	9.27
	31	56.50	97.94					***1.57***	1.55		1.78		4.41	4.84
	32	59.30	97.84			0.48	0.53	***3.56***	3.46		3.96		8.01	8.77
	33	61.60	97.99					***1.29***	1.30		1.49		4.29	4.70
	34	63.70	97.94					***3.49***	3.46		3.96		9.81	10.75
	35	66.00	97.54		1.34	1.20	1.34	***1.81***	1.72		1.97		2.91	3.19
	36	70.00	96.74	1.22	1.22	3.54	3.94	***4.03***	3.79		4.34		4.73	5.19
	37	74.40	100.17											
	38	76.20	100.23											
	39	78.00	100.11											
	40	79.90	97.84			0.25	0.28	***1.89***	1.84		2.10		4.25	4.66

		WSE (ft)		97.24		97.85		98.16					99.27	
		Disch (cfs)		10		100		182					700	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	41	83.00	97.84			0.17	0.19	***1.29***	1.25		1.44		2.90	3.18
	42	86.00	97.84			0.13	0.14	***0.97***	0.94		1.08		2.18	2.39
	43	89.50	97.69			0.18	0.20	***0.34***	0.33		0.37		0.62	0.68
*	44	90.30	97.84			0.00	0.02	***0.01***	0.01		0.12		0.02	0.27
	45	93.40	97.84			0.00	0.02		0.01		0.12		0.02	0.27
	46	93.80	98.14						0.00		0.02		0.02	0.23
	47	96.00	99.33											
	48	99.50	99.52											
	49	102.70	99.24										0.00	0.02
	50	107.00	99.20										0.00	0.04
	51	110.10	98.80										0.01	0.13
	52	113.40	98.46										0.02	0.19
*	53	120.00	98.04						0.01				0.02	0.19
	54	123.70	98.45										0.02	0.19
	55	123.70	102.44											
	Total								2	*	0	*		

Note:
An * means the modeled velocity exceeds the measured velocity by 0.2 ft/sec or 20%.

Table A.3-19. Summary of calibration details for original and revised input decks, Grant Creek, Transect 140, high flows.

			WSE (ft)		**98.16**		**99.27**		**99.7**	
			Disch (cfs)		**182**		**700**		**1000**	
Rv	**Pt**	**Sta**	**Elev**	**Meas**	**1 Vel**	**Depth**	**1 Vel**	**Depth**	**1 Vel**	**Depth**
	1	0.0	101.83							
	2	0.0	101.08							
	3	3.6	100.62							
	4	7.0	100.61							
	5	9.8	100.12							
	6	11.0	99.85							
	7	12.5	98.14		0.04	0.30	0.54	3.78	0.66	4.51
	8	13.1	97.84	***0.11***	0.28	1.98	0.63	4.43	0.74	5.07
	9	14.0	97.44	***0.77***	0.84	3.42	1.27	5.22	1.44	5.78
	10	15.0	96.84	***4.57***	4.93	5.14	6.02	6.32	6.60	6.76
	11	16.5	97.34	***5.62***	6.10	3.73	8.78	5.41	9.89	5.95
	12	18.1	97.24	***6.62***	7.17	4.03	9.88	5.60	11.06	6.11
	13	19.1	97.04	***6.45***	6.97	4.60	8.97	5.97	9.93	6.44
	14	20.5	96.74	***6.44***	6.94	5.39	8.29	6.49	9.06	6.92
	15	21.5	96.64	***5.62***	6.05	5.64	7.09	6.66	7.72	7.08
	16	23.1	96.64	***4.18***	4.50	5.64	5.27	6.66	5.74	7.08
	17	24.2	96.54	***4.36***	4.69	5.89	5.40	6.83	5.86	7.23
	18	25.5	96.64	***5.47***	5.89	5.64	6.90	6.66	7.51	7.08
	19	26.5	96.74	***5.40***	5.82	5.39	6.95	6.49	7.60	6.92
	20	28.4	96.94	***4.90***	5.29	4.87	6.62	6.14	7.29	6.60
	21	31.1	96.84	***4.13***	4.45	5.14	5.44	6.32	5.97	6.76
	22	34.1	97.34	***1.31***	1.42	3.73	2.05	5.41	2.30	5.95
*	23	36.6	97.74	***3.54***	2.96	2.38	5.72	4.63	6.64	5.25
*	24	39.2	97.64	***5.72***	5.13	2.75	8.95	4.83	10.30	5.43
*	25	41.4	97.21				6.53	3.53	8.15	4.29
*	26	43.0	97.53				6.74	3.64	8.33	4.39
	27	44.3	97.84	***2.33***	2.59	1.98	5.74	4.43	6.74	5.07
	28	47.2	97.54	***2.58***	2.81	3.09	4.54	5.03	5.19	5.60
	29	49.6	97.84	***2.76***	3.07	1.98	6.80	4.43	7.99	5.07
	30	53.9	97.84	***3.76***	4.18	1.98	9.27	4.43	10.88	5.07
	31	56.5	97.94	***1.57***	1.78	1.54	4.84	4.22	5.75	4.89
	32	59.3	97.84	***3.56***	3.96	1.98	8.77	4.43	10.30	5.07
	33	61.6	97.99	***1.29***	1.49	1.30	4.70	4.11	5.61	4.79
	34	63.7	97.94	***3.49***	3.96	1.54	10.75	4.22	12.77	4.89
	35	66.0	97.54	***1.81***	1.97	3.09	3.19	5.03	3.64	5.60
	36	70.0	96.74	***4.03***	4.34	5.39	5.19	6.49	5.67	6.92
	37	74.4	100.17							
	38	76.2	100.23							
	39	78.0	100.11							
	40	79.9	97.84	***1.89***	2.10	1.98	4.66	4.43	5.47	5.07

			WSE (ft)	98.16			99.27		99.7	
			Disch (cfs)	182			700		1000	
Rv	Pt	Sta	Elev	Meas	1 Vel	Depth	1 Vel	Depth	1 Vel	Depth
	41	83.0	97.84	***1.29***	1.44	1.98	3.18	4.43	3.73	5.07
	42	86.0	97.84	***0.97***	1.08	1.98	2.39	4.43	2.81	5.07
	43	89.5	97.69	***0.34***	0.37	2.57	0.68	4.73	0.79	5.34
*	44	90.3	97.84	***0.01***	0.12	1.98	0.27	4.43	0.32	5.07
	45	93.4	97.84		0.12	1.98	0.27	4.43	0.32	5.07
	46	93.8	98.14		0.02	0.30	0.23	3.78	0.29	4.51
	47	96.0	99.33						0.11	1.73
	48	99.5	99.52						0.07	1.07
	49	102.7	99.24				0.02	0.32	0.13	1.99
	50	107.0	99.20				0.04	0.57	0.13	2.11
	51	110.1	98.80				0.13	2.10	0.20	3.12
	52	113.4	98.46				0.19	3.02	0.24	3.87
*	53	120.0	98.04				0.19	3.05	0.25	3.89
	54	123.7	98.45				0.19	3.05	0.25	3.89
	55	123.7	102.44							

Table A.3-20. Summary of calibration details for original and revised input decks, Grant Creek, Transect 150.

		WSE (ft)		**94.21**		**94.86**		**95.23**					**96.24**	
		Disch (cfs)		**10**		**100**		**200**					**700**	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	1	0.0	100.14											
*	2	1.8	94.68			0.26			0.56	*			1.32	0.35
	3	2.5	94.92					***0.38***	0.38		0.38		1.18	1.18
	4	3.0	94.72			0.44	0.44	***1.11***	1.10		1.10		2.68	2.70
	5	3.5	94.72		0.31		1.80	***2.51***		*	2.48			4.41
*	6	4.5	94.92					***3.72***	3.71		3.02		11.50	9.41
	7	5.7	94.32			1.66	1.65	***2.53***	2.50		2.51		4.82	4.85
	8	6.6	94.42			0.09	0.09	***0.15***	0.14		0.15		0.29	0.29
	9	7.3	94.32			2.04	2.04	***3.12***	3.08		3.09		5.94	5.98
	10	9.2	94.72			1.48	1.48	***3.74***	3.71		3.72		9.03	9.08
	11	11.3	94.52			1.66	1.66	***2.92***	2.89		2.90		6.11	6.15
	12	12.8	94.62			0.76	0.75	***1.51***	1.50		1.50		3.37	3.39
	13	14.3	94.92					***0.10***	0.10		0.10		0.31	0.31
	14	16.0	94.92					***1.15***	1.15		1.15		3.56	3.58
	15	17.9	94.77			0.95	0.95	***2.97***	2.95		2.95		7.52	7.57
	16	19.0	94.65			1.46	1.46	***3.08***	3.05		3.06		7.02	7.06
	17	20.3	94.62			1.79	1.79	***3.58***	3.54		3.55		7.98	8.03
	18	21.4	94.57			1.90	1.89	***3.52***	3.48		3.49		7.59	7.64
	19	22.7	94.52			0.74	0.74	***1.30***	1.29		1.29		2.72	2.74
	20	23.8	94.32			1.66	1.66	***2.54***	2.51		2.52		4.84	4.87
	21	25.1	94.12	0.22	0.22	1.74	1.74	***2.47***	2.44		2.44		4.39	4.42
	22	27.5	93.92	0.50	0.50	2.16	2.15	***2.91***	2.87		2.88		4.92	4.95
	23	29.4	93.92	0.42	0.42	1.81	1.80	***2.44***	2.41		2.41		4.12	4.15
	24	32.3	93.92	0.50	0.50	2.18	2.17	***2.94***	2.90		2.91		4.97	5.00
	25	34.8	94.12	0.35	0.35	2.78	2.77	***3.94***	3.89		3.90		7.01	7.05
	26	36.9	94.22			2.51	2.51	***3.68***	3.63		3.64		6.75	6.80
	27	39.2	94.07	0.40	0.40	2.49	2.48	***3.48***	3.43		3.44		6.10	6.14
	28	41.6	93.82	0.56	0.56	2.16	2.15	***2.86***	2.82		2.83		4.73	4.76
	29	44.3	93.72	0.68	0.68	2.38	2.37	***3.11***	3.07		3.07		5.05	5.08
	30	46.0	93.72	0.98	0.98	3.41	3.41	***4.46***	4.40		4.41		7.24	7.28
	31	48.2	93.52	0.57	0.57	1.76	1.75	***2.24***	2.21		2.21		3.52	3.54
	32	50.4	93.37	0.98	0.98	2.84	2.83	***3.57***	3.52		3.53		5.49	5.52
	33	52.5	93.47	0.98	0.98	2.97	2.96	***3.77***	3.72		3.73		5.88	5.91
	34	53.8	93.42	0.96	0.96	2.84	2.84	***3.59***	3.54		3.55		5.56	5.59
	35	55.7	93.42	1.12	1.12	3.32	3.31	***4.19***	4.13		4.14		6.49	6.53
	36	56.9	93.82	0.31	0.31	1.18	1.18	***1.57***	1.55		1.55		2.60	2.61
	37	57.6	93.97	0.65	0.64	3.07	3.06	***4.18***	4.12		4.13		7.14	7.19
	38	59.0	94.12	0.14	0.14	1.10	1.10	***1.56***	1.54		1.54		2.77	2.79
	39	60.5	94.32			2.46	2.45	***3.75***	3.70		3.71		7.14	7.18
	40	61.8	94.42			1.87	1.87	***3.03***	3.00		3.00		6.02	6.06

		WSE (ft)		94.21		94.86		95.23					96.24	
		Disch (cfs)		10		100		200					700	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	41	63.0	94.22			1.49	1.49	***2.18***	2.15		2.16		4.00	4.03
*	42	65.5	95.02					***0.02***	0.02		0.13		0.08	0.49
	43	67.1	95.02					***0.04***	0.04		0.13		0.15	0.49
	44	69.8	95.80										0.08	0.25
	45	72.2	95.88										0.07	0.22
	46	75.0	95.84										0.07	0.23
	47	78.0	95.86										0.07	0.22
	48	81.0	96.26											
	49	84.0	96.13										0.03	0.10
	50	87.0	96.49											
	51	90.0	96.47											
	52	93.0	96.57											
	53	96.0	96.61											
	54	99.0	96.07										0.04	0.13
	55	102.0	96.93											
	56	105.0	96.79											
	57	106.9	97.16											
	58	108.5	96.33											
	59	111.0	96.00										0.05	0.17
	60	114.0	95.67										0.09	0.29
	61	117.0	95.80										0.08	0.25
	62	119.0	95.51										0.11	0.35
*	63	120.0	95.15						0.02				0.14	0.43
*	64	121.7	94.91						0.05				0.16	0.40
	65	123.6	95.38										0.12	0.39
	66	125.9	97.23											
	67	125.9	97.45											
	Total								2	*		*		

Note:
An * means the modeled velocity exceeds the measured velocity by 0.2 ft/sec or 20%.

Table A.3-21. Summary of calibration details for original and revised input decks, Grant Creek, Transect 150, high flows.

			WSE (ft)	**95.23**			**96.24**		**96.65**	
			Disch (cfs)	**200**			**700**		**1000**	
Rv	**Pt**	**Sta**	**Elev**	**Meas**	**1 Vel**	**Depth**	**1 Vel**	**Depth**	**1 Vel**	**Depth**
	1	0.0	100.14							
	2	1.8	94.68				0.35	1.06	0.75	2.22
	3	2.5	94.92	***0.38***	0.38	1.18	1.18	3.62	1.49	4.42
	4	3.0	94.72	***1.11***	1.10	1.65	2.70	3.98	3.33	4.76
	5	3.5	94.72	***2.51***	2.48	2.90	4.41	5.09	5.20	5.81
	6	4.5	94.92	***3.72***	3.02	1.18	9.41	3.62	11.87	4.42
	7	5.7	94.32	***2.53***	2.51	2.43	4.85	4.66	5.81	5.40
	8	6.6	94.42	***0.15***	0.15	2.25	0.29	4.49	0.35	5.24
	9	7.3	94.32	***3.12***	3.09	2.43	5.98	4.66	7.16	5.40
	10	9.2	94.72	***3.74***	3.72	1.65	9.08	3.98	11.22	4.76
	11	11.3	94.52	***2.92***	2.90	2.06	6.15	4.33	7.47	5.08
	12	12.8	94.62	***1.51***	1.50	1.86	3.39	4.16	4.15	4.92
	13	14.3	94.92	***0.10***	0.10	1.18	0.31	3.62	0.39	4.42
	14	16.0	94.92	***1.15***	1.15	1.18	3.58	3.62	4.51	4.42
	15	17.9	94.77	***2.97***	2.95	1.54	7.57	3.90	9.39	4.67
	16	19.0	94.65	***3.08***	3.06	1.80	7.06	4.11	8.67	4.87
	17	20.3	94.62	***3.58***	3.55	1.86	8.03	4.16	9.83	4.92
	18	21.4	94.57	***3.52***	3.49	1.96	7.64	4.24	9.31	5.00
	19	22.7	94.52	***1.30***	1.29	2.06	2.74	4.33	3.33	5.08
	20	23.8	94.32	***2.54***	2.52	2.43	4.87	4.66	5.83	5.40
	21	25.1	94.12	***2.47***	2.44	2.78	4.42	4.98	5.24	5.71
	22	27.5	93.92	***2.91***	2.88	3.11	4.95	5.29	5.81	6.00
	23	29.4	93.92	***2.44***	2.41	3.11	4.15	5.29	4.87	6.00
	24	32.3	93.92	***2.94***	2.91	3.11	5.00	5.29	5.87	6.00
	25	34.8	94.12	***3.94***	3.90	2.78	7.05	4.98	8.36	5.71
	26	36.9	94.22	***3.68***	3.64	2.61	6.80	4.82	8.10	5.55
	27	39.2	94.07	***3.48***	3.44	2.87	6.14	5.06	7.26	5.78
	28	41.6	93.82	***2.86***	2.83	3.27	4.76	5.44	5.56	6.15
	29	44.3	93.72	***3.11***	3.07	3.42	5.08	5.59	5.91	6.30
	30	46.0	93.72	***4.46***	4.41	3.42	7.28	5.59	8.48	6.30
	31	48.2	93.52	***2.24***	2.21	3.72	3.54	5.88	4.09	6.58
	32	50.4	93.37	***3.57***	3.53	3.94	5.52	6.10	6.36	6.79
	33	52.5	93.47	***3.77***	3.73	3.79	5.91	5.95	6.83	6.65
	34	53.8	93.42	***3.59***	3.55	3.86	5.59	6.03	6.45	6.72
	35	55.7	93.42	***4.19***	4.14	3.86	6.53	6.03	7.53	6.72
	36	56.9	93.82	***1.57***	1.55	3.27	2.61	5.44	3.05	6.15
	37	57.6	93.97	***4.18***	4.13	3.03	7.19	5.21	8.46	5.93
	38	59.0	94.12	***1.56***	1.54	2.78	2.79	4.98	3.31	5.71
	39	60.5	94.32	***3.75***	3.71	2.43	7.18	4.66	8.61	5.40
	40	61.8	94.42	***3.03***	3.00	2.25	6.06	4.49	7.31	5.24

		WSE (ft)		95.23			96.24		96.65	
		Disch (cfs)		200			700		1000	
Rv	Pt	Sta	Elev	Meas	1 Vel	Depth	1 Vel	Depth	1 Vel	Depth
	41	63.0	94.22	***2.18***	2.16	2.61	4.03	4.82	4.80	5.55
	42	65.5	95.02	***0.02***	0.13	0.90	0.49	3.44	0.63	4.25
	43	67.1	95.02	***0.04***	0.13	0.90	0.49	3.44	0.63	4.25
	44	69.8	95.80				0.25	1.74	0.40	2.74
	45	72.2	95.88				0.22	1.52	0.38	2.57
	46	75.0	95.84				0.23	1.63	0.39	2.65
	47	78.0	95.86				0.22	1.57	0.39	2.61
	48	81.0	96.26						0.24	1.62
	49	84.0	96.13				0.10	0.69	0.29	1.97
	50	87.0	96.49						0.13	0.89
	51	90.0	96.47						0.14	0.96
	52	93.0	96.57						0.08	0.55
	53	96.0	96.61						0.05	0.34
	54	99.0	96.07				0.13	0.92	0.31	2.12
	55	102.0	96.93							
	56	105.0	96.79							
	57	106.9	97.16							
	58	108.5	96.33						0.21	1.42
	59	111.0	96.00				0.17	1.16	0.34	2.29
	60	114.0	95.67				0.29	2.07	0.45	3.02
	61	117.0	95.80				0.25	1.74	0.40	2.74
	62	119.0	95.51				0.35	2.44	0.49	3.34
	63	120.0	95.15				0.43	3.03	0.57	3.87
	64	121.7	94.91				0.40	2.83	0.54	3.69
	65	123.6	95.38				0.39	2.72	0.53	3.59
	66	125.9	97.23							
	67	125.9	97.45							

Table A.3-22. Summary of calibration details for original and revised input decks, Grant Creek, Transect 160.

			WSE (ft)	94.3		95.11		95.49					96.44	
			Disch (cfs)	**10**		**100**		**200**					**700**	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	1	0.0	99.27											
	2	0.0	98.61											
	3	1.3	98.35											
	4	2.6	97.76											
	5	5.5	97.44											
	6	8.3	97.24											
	7	11.1	96.65											
	8	11.2	95.69										1.52	0.77
*	9	11.5	95.43						0.23	*	0.09		1.84	0.94
*	10	11.9	95.33						0.38	*	0.18		1.96	1.01
*	11	13.5	95.33						0.38	*	0.18		1.96	1.01
*	12	14.0	95.43						0.23	*	0.17		1.84	1.85
*	13	15.7	95.43						0.23	*	0.17		1.84	1.85
*	14	17.6	95.43						0.23	*	0.17		1.84	1.85
*	15	20.2	95.43						0.23	*	0.17		1.84	1.85
*	16	22.0	95.43						0.23	*	0.17		1.84	1.85
	17	22.8	94.93			0.30	0.29	***0.77***	0.81		0.81		2.40	2.44
	18	23.5	95.13			0.01		***0.71***	0.80		0.79		2.83	2.88
	19	24.5	94.83			0.48	0.47	***1.06***	1.10		1.10		3.05	3.10
	20	25.5	94.83			0.42	0.42	***0.93***	0.96		0.97		2.67	2.72
	21	26.5	94.73			0.61	0.60	***1.22***	1.25		1.26		3.29	3.35
	22	27.7	94.83			0.53	0.52	***1.16***	1.20		1.21		3.33	3.40
	23	29.5	94.73			0.27	0.27	***0.55***	0.56		0.57		1.48	1.51
	24	31.0	94.83			0.72	0.71	***1.59***	1.65		1.66		4.57	4.66
	25	32.5	94.83			0.67	0.66	***1.47***	1.52		1.53		4.22	4.30
	26	34.5	94.83			0.55	0.54	***1.20***	1.24		1.25		3.45	3.51
	27	36.2	95.03			0.50	0.44	***1.74***	1.88		1.87		6.01	6.12
	28	37.5	94.93			0.59	0.56	***1.50***	1.58		1.58		4.67	4.75
	29	38.7	94.93			0.47	0.45	***1.21***	1.27		1.28		3.77	3.83
	30	40.6	95.03			0.47	0.42	***1.65***	1.78		1.78		5.70	5.80
	31	41.5	94.53			1.07	1.07	***1.94***	1.95		1.98		4.76	4.85
	32	42.5	94.53			1.18	1.19	***2.15***	2.16		2.19		5.27	5.38
	33	44.0	94.53			1.47	1.48	***2.67***	2.68		2.72		6.55	6.68
	34	45.3	94.83			1.12	1.10	***2.46***	2.55		2.56		7.07	7.20
	35	46.4	94.53			1.42	1.42	***2.57***	2.58		2.62		6.30	6.43
	36	47.4	94.13	0.10		1.12	1.14	***1.85***	1.82		1.86		4.02	4.11
	37	49.1	93.93	0.21	0.21	1.59	1.61	***2.55***	2.50		2.55		5.32	5.44
	38	50.0	93.73	0.26	0.26	1.67	1.70	***2.63***	2.57		2.62		5.31	5.43
	39	52.4	93.78	0.30	0.30	1.96	1.99	***3.10***	3.03		3.10		6.31	6.45
	40	54.5	93.53	0.33	0.33	1.87	1.91	***2.91***	2.83		2.90		5.72	5.85

			WSE (ft)	**94.3**		**95.11**		**95.49**					**96.44**	
			Disch (cfs)	**10**		**100**		**200**					**700**	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	41	57.0	93.03	0.46	0.45	2.20	2.25	***3.34***	3.23		3.31		6.24	6.39
	42	59.5	92.83	0.48	0.47	2.21	2.25	***3.32***	3.20		3.28		6.10	6.25
	43	61.8	92.83	0.41	0.41	1.92	1.96	***2.89***	2.79		2.86		5.31	5.44
	44	63.8	92.93	0.37	0.37	1.75	1.79	***2.65***	2.55		2.62		4.90	5.02
	45	66.0	93.03	0.35	0.35	1.68	1.71	***2.54***	2.45		2.52		4.74	4.86
	46	67.6	92.83	0.30	0.30	1.39	1.42	***2.09***	2.01		2.06		3.83	3.93
	47	69.1	93.03	0.33	0.33	1.60	1.64	***2.43***	2.35		2.41		4.54	4.65
	48	70.6	93.13	0.19	0.18	0.91	0.93	***1.39***	1.34		1.38		2.62	2.68
	49	72.8	93.53	0.26	0.26	1.47	1.49	***2.28***	2.22		2.27		4.48	4.59
	50	74.5	93.63	0.22	0.22	1.32	1.35	***2.07***	2.02		2.06		4.12	4.22
	51	76.7	94.03	0.12	0.12	1.08	1.09	***1.75***	1.72		1.76		3.72	3.81
	52	77.4	94.03	0.10	0.10	0.87	0.89	***1.42***	1.40		1.42		3.02	3.09
							-				-			
	53	78.2	94.43			-0.02	0.02	***-0.04***	-0.04		0.04		-0.09	-0.10
	54	79.0	94.78			0.86	0.84	***1.79***	1.84		1.86		4.97	5.07
	55	80.2	94.88			0.23	0.23	***0.55***	0.57		0.58		1.64	1.67
	56	81.6	95.03			0.22	0.20	***0.78***	0.84		0.84		2.69	2.74
	57	83.1	95.13			0.01		***0.44***	0.49		0.49		1.76	1.79
	58	84.6	95.68										1.23	1.24
	59	86.3	96.71											
	60	88.5	96.98											
	61	88.5	97.39											
	Total								8	*	0	*		

Note:
An * means the modeled velocity exceeds the measured velocity by 0.2 ft/sec or 20%.

Table A.3-23. Summary of calibration details for original and revised input decks, Grant Creek, Transect T160, high flows.

		WSE (ft)		95.49			96.44		96.78	
		Disch (cfs)		200			700		1000	
Rv	**Pt**	**Sta**	**Elev**	**Meas**	**1 Vel**	**Depth**	**1 Vel**	**Depth**	**1 Vel**	**Depth**
	1	0.0	99.27							
	2	0.0	98.61							
	3	1.3	98.35							
	4	2.6	97.76							
	5	5.5	97.44							
	6	8.3	97.24							
	7	11.1	96.65						0.28	0.72
	8	11.2	95.69				0.77	2.02	1.13	2.96
	9	11.5	95.43		0.09	0.22	0.94	2.45	1.30	3.39
	10	11.9	95.33		0.18	0.46	1.01	2.62	1.37	3.58
	11	13.5	95.33		0.18	0.46	1.01	2.62	1.37	3.58
	12	14.0	95.43		0.17	0.22	1.85	2.45	2.56	3.39
	13	15.7	95.43		0.17	0.22	1.85	2.45	2.56	3.39
	14	17.6	95.43		0.17	0.22	1.85	2.45	2.56	3.39
	15	20.2	95.43		0.17	0.22	1.85	2.45	2.56	3.39
	16	22.0	95.43		0.17	0.22	1.85	2.45	2.56	3.39
	17	22.8	94.93	***0.77***	0.81	1.06	2.44	3.23	3.18	4.21
	18	23.5	95.13	***0.71***	0.79	0.79	2.88	2.93	3.82	3.90
	19	24.5	94.83	***1.06***	1.10	1.18	3.10	3.37	4.01	4.36
	20	25.5	94.83	***0.93***	0.97	1.18	2.72	3.37	3.52	4.36
	21	26.5	94.73	***1.22***	1.26	1.29	3.35	3.51	4.31	4.51
	22	27.7	94.83	***1.16***	1.21	1.18	3.40	3.37	4.39	4.36
	23	29.5	94.73	***0.55***	0.57	1.29	1.51	3.51	1.94	4.51
	24	31.0	94.83	***1.59***	1.66	1.18	4.66	3.37	6.02	4.36
	25	32.5	94.83	***1.47***	1.53	1.18	4.30	3.37	5.57	4.36
	26	34.5	94.83	***1.20***	1.25	1.18	3.51	3.37	4.54	4.36
	27	36.2	95.03	***1.74***	1.87	0.93	6.12	3.08	8.04	4.06
	28	37.5	94.93	***1.50***	1.58	1.06	4.75	3.23	6.20	4.21
	29	38.7	94.93	***1.21***	1.28	1.06	3.83	3.23	5.00	4.21
	30	40.6	95.03	***1.65***	1.78	0.93	5.80	3.08	7.62	4.06
	31	41.5	94.53	***1.94***	1.98	1.51	4.85	3.78	6.16	4.80
	32	42.5	94.53	***2.15***	2.19	1.51	5.38	3.78	6.83	4.80
	33	44.0	94.53	***2.67***	2.72	1.51	6.68	3.78	8.48	4.80
	34	45.3	94.83	***2.46***	2.56	1.18	7.20	3.37	9.31	4.36
	35	46.4	94.53	***2.57***	2.62	1.51	6.43	3.78	8.16	4.80
	36	47.4	94.13	***1.85***	1.86	1.91	4.11	4.29	5.12	5.36
	37	49.1	93.93	***2.55***	2.55	2.09	5.44	4.54	6.74	5.62
	38	50.0	93.73	***2.63***	2.62	2.27	5.43	4.77	6.69	5.88
	39	52.4	93.78	***3.10***	3.10	2.22	6.45	4.72	7.95	5.82
	40	54.5	93.53	***2.91***	2.90	2.43	5.85	5.01	7.16	6.14

		WSE (ft)		95.49			96.44		96.78	
		Disch (cfs)		200			700		1000	
Rv	**Pt**	**Sta**	**Elev**	**Meas**	**1 Vel**	**Depth**	**1 Vel**	**Depth**	**1 Vel**	**Depth**
	41	57.0	93.03	***3.34***	3.31	2.83	6.39	5.57	7.74	6.76
	42	59.5	92.83	***3.32***	3.28	2.99	6.25	5.79	7.55	7.00
	43	61.8	92.83	***2.89***	2.86	2.99	5.44	5.79	6.57	7.00
	44	63.8	92.93	***2.65***	2.62	2.91	5.02	5.68	6.07	6.88
	45	66.0	93.03	***2.54***	2.52	2.83	4.86	5.57	5.88	6.76
	46	67.6	92.83	***2.09***	2.06	2.99	3.93	5.79	4.74	7.00
	47	69.1	93.03	***2.43***	2.41	2.83	4.65	5.57	5.63	6.76
	48	70.6	93.13	***1.39***	1.38	2.76	2.68	5.46	3.25	6.64
	49	72.8	93.53	***2.28***	2.27	2.43	4.59	5.01	5.61	6.14
	50	74.5	93.63	***2.07***	2.06	2.35	4.22	4.89	5.17	6.01
	51	76.7	94.03	***1.75***	1.76	2.00	3.81	4.41	4.73	5.49
	52	77.4	94.03	***1.42***	1.42	2.00	3.09	4.41	3.84	5.49
	53	78.2	94.43	***-0.04***	-0.04	1.61	-0.10	3.91	-0.12	4.94
	54	79.0	94.78	***1.79***	1.86	1.24	5.07	3.44	6.53	4.44
	55	80.2	94.88	***0.55***	0.58	1.12	1.67	3.30	2.17	4.29
	56	81.6	95.03	***0.78***	0.84	0.93	2.74	3.08	3.60	4.06
	57	83.1	95.13	***0.44***	0.49	0.79	1.79	2.93	2.37	3.90
	58	84.6	95.68				1.24	2.04	1.81	2.97
	59	86.3	96.71						0.29	0.48
	60	88.5	96.98							
	61	88.5	97.39							

Table A.3-24. Summary of calibration details for original and revised input decks, Grant Creek, Transect 200.

			WSE (ft)	**91.74**		**93.42**		**93.99**					**96.21**	
			Disch (cfs)	**0.89**		**8.93**		**14.83**					**63**	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	1	0.0	97.59											
	2	0.1	97.22											
	3	1.0	96.65											
	4	2.0	94.89										-0.05	-0.05
	5	6.0	94.40										-0.06	-0.06
	6	7.5	94.18										-0.07	-0.07
*	7	9.0	93.88					***-0.01***	-0.01		0.10		-0.07	-0.07
	8	10.0	93.28			0.02	0.02	***0.08***	0.08		0.08		0.32	0.32
	9	12.0	92.78			0.04	0.04	***0.06***	0.06		0.06		0.20	0.20
	10	16.0	91.88			0.04	0.04	***0.05***	0.05		0.05		0.14	0.14
	11	19.0	91.68	0.00	0.00	0.03	d	***0.04***	0.04		0.04		0.09	0.09
	12	21.0	91.68	0.00	0.00	0.02	0.02	***0.03***	0.03		0.03		0.08	0.08
	13	24.0	91.48	0.02	0.01	0.08	0.08	***0.10***	0.11		0.11		0.27	0.27
	14	27.0	91.48	0.01	0.01	0.05	0.05	***0.06***	0.07		0.06		0.16	0.16
	15	28.4	91.68	0.01	0.01	0.07	0.07	***0.09***	0.10		0.10		0.24	0.24
	16	30.4	91.58	0.01	0.01	0.04	0.04	***0.05***	0.05		0.05		0.13	0.13
	17	33.2	91.58	0.06	0.05	0.40	0.38	***0.49***	0.54		0.52		1.31	1.31
	18	36.0	90.98	0.12	0.11	0.35	0.34	***0.42***	0.46		0.45		1.05	1.05
	19	38.0	90.38	0.08	0.08	0.18	0.18	***0.21***	0.23		0.23		0.51	0.51
	20	40.0	90.18	0.08	0.08	0.19	0.18	***0.21***	0.23		0.23		0.50	0.50
*	21	42.0	90.38	0.12	0.15	0.27	0.34	***0.31***	0.35		0.44		0.75	0.75
	22	42.1	97.55											
	23	42.2	97.55											
	Total								0	*	0	*		

Note:
An * means the modeled velocity exceeds the measured velocity by 0.2 ft/sec or 20%.

Table A.3-25. Summary of calibration details for original and revised input decks, Grant Creek, Transect 200, high flows.

		WSE (ft)		93.99			96.21		96.93	
		Disch (cfs)		14.83			62.55		89.36	
Rv	**Pt**	**Sta**	**Elev**	**Meas**	**1 Vel**	**Depth**	**1 Vel**	**Depth**	**1 Vel**	**Depth**
	1	0.0	97.59							
	2	0.1	97.22							
	3	1.0	96.65						0.24	0.07
	4	2.0	94.89				0.65	0.17	0.92	0.25
	5	6.0	94.40				0.80	0.21	1.06	0.29
	6	7.5	94.18				0.86	0.22	1.12	0.30
	7	9.0	93.88	***-0.01***	0.10	0.02	0.95	0.25	1.20	0.33
	8	10.0	93.28	***0.08***	0.08	0.08	0.25	0.29	0.31	0.37
	9	12.0	92.78	***0.06***	0.06	0.11	0.16	0.32	0.19	0.40
	10	16.0	91.88	***0.05***	0.05	0.16	0.11	0.37	0.13	0.46
	11	19.0	91.68	***0.04***	0.04	0.17	0.08	0.38	0.09	0.47
	12	21.0	91.68	***0.03***	0.03	0.17	0.06	0.38	0.08	0.47
	13	24.0	91.48	***0.10***	0.11	0.18	0.21	0.39	0.24	0.48
	14	27.0	91.48	***0.06***	0.06	0.18	0.13	0.39	0.15	0.48
	15	28.4	91.68	***0.09***	0.10	0.17	0.19	0.38	0.23	0.47
	16	30.4	91.58	***0.05***	0.05	0.18	0.11	0.39	0.12	0.47
	17	33.2	91.58	***0.49***	0.52	0.18	1.04	0.39	1.21	0.47
	18	36.0	90.98	***0.42***	0.45	0.21	0.83	0.42	0.96	0.51
	19	38.0	90.38	***0.21***	0.23	0.23	0.40	0.45	0.46	0.54
	20	40.0	90.18	***0.21***	0.23	0.24	0.40	0.46	0.45	0.55
	21	42.0	90.38	***0.31***	0.44	0.23	0.78	0.45	0.89	0.54
	22	42.1	97.55							
	23	42.2	97.55							

Table A.3-26. Summary of calibration details for original and revised input decks, Grant Creek, Transect 210.

			WSE (ft)	**94.01**	**94.40**	**94.63**	**96.08**	**96.77**
			Disch (cfs)	**10**	**100**	**162**	**700**	**1000**
Rv	**Pt**	**Sta**	**Elev**	**Depth**	**Depth**	**Depth**	**Depth**	**Depth**
	1	0.0	96.61					0.16
	2	2.0	96.32					0.45
	3	5.0	96.18					0.59
	4	6.9	95.64				0.44	1.13
	5	9.0	95.03				1.05	1.74
	6	11.0	95.19				0.89	1.58
	7	13.0	95.16				0.92	1.61
	8	14.4	95.09				0.99	1.68
	9	15.3	95.32				0.76	1.45
	10	16.2	94.77				1.31	2.00
	11	17.1	94.56			0.07	1.52	2.21
	12	17.9	94.53			0.10	1.55	2.24
	13	18.1	94.51			0.12	1.57	2.26
	14	19.4	94.17		0.23	0.46	1.91	2.60
	15	20.8	94.21		0.19	0.42	1.87	2.56
	16	21.4	93.61	0.40	0.79	1.02	2.47	3.16
	17	22.0	94.04		0.36	0.59	2.04	2.73
	18	22.5	93.63	0.38	0.77	1.00	2.45	3.14
	19	23.1	94.08		0.32	0.55	2.00	2.69
	20	23.7	93.73	0.28	0.67	0.90	2.35	3.04
	21	24.5	93.97	0.04	0.43	0.66	2.11	2.80
	22	25.5	93.90	0.11	0.50	0.73	2.18	2.87
	23	26.5	94.10		0.30	0.53	1.98	2.67
	24	27.2	94.29		0.11	0.34	1.79	2.48
	25	27.9	94.52			0.11	1.56	2.25
	26	29.0	94.69				1.39	2.08
	27	30.0	95.06				1.02	1.71
	28	31.0	95.55				0.53	1.22
	29	32.0	96.02				0.06	0.75
	30	33.0	96.27					0.50
	31	34.0	96.62					0.15
	32	35.0	96.92					
	33	35.6	97.17					

Table A.3-27. Summary of calibration details for original and revised input decks, Grant Creek, Transect 220.

		WSE (ft)		94.6		95.24		95.52					96.46	
		Disch (cfs)		10		100		180					700	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	1	0.0	99.06											
	2	0.1	98.78											
	3	3.0	98.35											
	4	4.8	97.86											
	5	5.0	97.79											
	6	5.5	95.55										0.68	0.97
*	7	6.0	95.00			0.16	0.22	***0.28***	0.32		0.45		0.93	1.32
	8	6.9	94.70			0.34	0.34	***0.48***	0.55		0.55		1.35	1.35
	9	8.1	94.65			2.25	2.25	***3.10***	3.55		3.55		8.53	8.53
	10	10.0	94.30	0.50	0.50	2.84	2.84	***3.57***	4.11		4.11		8.87	8.87
	11	11.2	94.15	0.50	0.50	2.38	2.38	***2.92***	3.36		3.36		7.04	7.03
	12	12.0	94.05	0.79	0.79	3.51	3.50	***4.25***	4.90		4.90		10.06	10.05
	13	12.8	94.00	0.86	0.86	3.72	3.71	***4.48***	5.17		5.16		10.52	10.51
	14	14.5	94.15	0.65	0.65	3.10	3.10	***3.81***	4.39		4.39		9.18	9.17
	15	15.8	94.05	0.68	0.68	3.04	3.03	***3.68***	4.24		4.24		8.71	8.70
	16	17.0	93.85	0.62	0.62	2.51	2.51	***2.98***	3.44		3.44		6.84	6.84
	17	18.0	93.75	0.52	0.52	2.02	2.02	***2.38***	2.75		2.75		5.39	5.39
	18	19.5	93.75	0.97	0.97	3.74	3.74	***4.41***	5.09		5.09		9.99	9.98
	19	20.8	93.85	0.69	0.69	2.76	2.76	***3.28***	3.79		3.79		7.53	7.52
	20	23.2	93.85	0.75	0.75	3.03	3.03	***3.60***	4.16		4.15		8.26	8.26
	21	24.5	93.95	0.54	0.54	2.26	2.26	***2.71***	3.13		3.13		6.31	6.31
	22	25.9	94.05	0.27	0.27	1.19	1.19	***1.44***	1.66		1.66		3.41	3.41
	23	27.2	94.15	0.67	0.67	3.22	3.22	***3.95***	4.55		4.55		9.52	9.51
	24	28.6	93.95	0.42	0.42	1.78	1.78	***2.14***	2.47		2.47		4.98	4.98
	25	30.5	94.05	0.79	0.79	3.51	3.50	***4.25***	4.90		4.90		10.06	10.05
	26	32.4	94.05	0.62	0.62	2.75	2.75	***3.33***	3.84		3.84		7.88	7.88
	27	33.5	94.05	0.47	0.47	2.09	2.09	***2.53***	2.92		2.92		5.99	5.98
	28	35.1	94.25	0.36	0.36	1.93	1.93	***2.40***	2.76		2.76		5.90	5.90
	29	36.1	94.65			2.47	2.47	***3.40***	3.89		3.89		9.36	9.35
	30	37.5	94.65			1.83	1.83	***2.52***	2.88		2.88		6.94	6.93
	31	38.5	94.75			1.13	1.13	***1.63***	1.86		1.86		4.67	4.67
	32	39.9	94.85			0.78	0.78	***1.19***	1.35		1.35		3.58	3.58
	33	40.9	94.65			1.51	1.50	***2.07***	2.37		2.37		5.70	5.69
	34	42.6	94.95			0.64	0.64	***1.07***	1.21		1.21		3.42	3.42
	35	44.6	95.15			0.63	0.63	***1.74***	1.94		1.94		6.65	6.64
	36	46.5	95.25					***0.68***	0.75		0.75		2.99	2.98
	37	48.1	95.45					***0.32***	0.31		0.31		2.60	2.60
	38	49.7	95.45					***1.08***	1.04		1.04		8.78	8.77
	39	50.8	95.45					***0.41***	0.40		0.40		3.33	3.33
	40	53.5	94.90			0.16	0.16	***0.26***	0.30		0.30		0.81	0.81

			WSE (ft)	**94.6**		**95.24**		**95.52**					**96.46**	
			Disch (cfs)	**10**		**100**		**180**					**700**	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	41	55.0	94.85			0.25	0.25	***0.39***	0.44		0.44		1.17	1.17
	42	56.1	94.85			1.14	1.14	***1.74***	1.98		1.98		5.24	5.24
	43	58.5	94.65			1.32	1.32	***1.81***	2.07		2.07		4.98	4.98
	44	59.9	94.85			0.52	0.52	***0.80***	0.91		0.91		2.41	2.41
	45	61.0	94.65			0.46	0.46	***0.63***	0.72		0.72		1.73	1.73
	46	62.8	94.90			0.37	0.37	***0.59***	0.67		0.67			
	47	61.1	95.55										1.28	1.28
	48	62.9	97.12											
	49	65.9	97.28											
	50	65.9	97.90											
	Total								0	*	0	*		

Note:
An * means the modeled velocity exceeds the measured velocity by 0.2 ft/sec or 20%.

Table A.3-28. Summary of calibration details for original and revised input decks, Grant Creek, Transect 220, high flows.

WSE (ft)				95.52			96.46		96.8	
Disch (cfs)				182			700		1000	
Rv	**Pt**	**Sta**	**Elev**	**Meas**	**1 Vel**	**Depth**	**1 Vel**	**Depth**	**1 Vel**	**Depth**
	1	0.0	99.06							
	2	0.1	98.78							
	3	3.0	98.35							
	4	4.8	97.86							
	5	5.0	97.79							
	6	5.5	95.55				0.97	3.65	1.32	4.98
	7	6.0	95.00	***0.28***	0.45	1.76	1.32	5.01	1.69	6.35
	8	6.9	94.70	***0.48***	0.55	2.38	1.35	5.67	1.68	7.03
	9	8.1	94.65	***3.10***	3.55	2.47	8.53	5.78	10.61	7.14
	10	10.0	94.30	***3.57***	4.11	3.10	8.87	6.50	10.84	7.90
	11	11.2	94.15	***2.92***	3.36	3.35	7.03	6.80	8.55	8.21
	12	12.0	94.05	***4.25***	4.90	3.51	10.05	7.00	12.18	8.42
	13	12.8	94.00	***4.48***	5.16	3.59	10.51	7.09	12.71	8.52
	14	14.5	94.15	***3.81***	4.39	3.35	9.17	6.80	11.15	8.21
	15	15.8	94.05	***3.68***	4.24	3.51	8.70	7.00	10.54	8.42
	16	17.0	93.85	***2.98***	3.44	3.82	6.84	7.38	8.23	8.82
	17	18.0	93.75	***2.38***	2.75	3.97	5.39	7.57	6.47	9.02
	18	19.5	93.75	***4.41***	5.09	3.97	9.98	7.57	11.98	9.02
	19	20.8	93.85	***3.28***	3.79	3.82	7.52	7.38	9.06	8.82
	20	23.2	93.85	***3.60***	4.15	3.82	8.26	7.38	9.94	8.82
	21	24.5	93.95	***2.71***	3.13	3.67	6.31	7.19	7.61	8.62
	22	25.9	94.05	***1.44***	1.66	3.51	3.41	7.00	4.13	8.42
	23	27.2	94.15	***3.95***	4.55	3.35	9.51	6.80	11.56	8.21
	24	28.6	93.95	***2.14***	2.47	3.67	4.98	7.19	6.01	8.62
	25	30.5	94.05	***4.25***	4.90	3.51	10.05	7.00	12.18	8.42
	26	32.4	94.05	***3.33***	3.84	3.51	7.88	7.00	9.54	8.42
	27	33.5	94.05	***2.53***	2.92	3.51	5.98	7.00	7.25	8.42
	28	35.1	94.25	***2.40***	2.76	3.18	5.90	6.60	7.20	8.01
	29	36.1	94.65	***3.40***	3.89	2.47	9.35	5.78	11.64	7.14
	30	37.5	94.65	***2.52***	2.88	2.47	6.93	5.78	8.63	7.14
	31	38.5	94.75	***1.63***	1.86	2.28	4.67	5.56	5.85	6.92
	32	39.9	94.85	***1.19***	1.35	2.08	3.58	5.34	4.52	6.69
	33	40.9	94.65	***2.07***	2.37	2.47	5.69	5.78	7.09	7.14
	34	42.6	94.95	***1.07***	1.21	1.87	3.42	5.12	4.35	6.46
	35	44.6	95.15	***1.74***	1.94	1.40	6.64	4.66	8.60	5.99
	36	46.5	95.25	***0.68***	0.75	1.14	2.98	4.42	3.91	5.74
	37	48.1	95.45	***0.32***	0.31	0.48	2.60	3.92	3.50	5.24
	38	49.7	95.45	***1.08***	1.04	0.48	8.77	3.92	11.82	5.24
	39	50.8	95.45	***0.41***	0.40	0.48	3.33	3.92	4.49	5.24
	40	53.5	94.90	***0.26***	0.30	1.97	0.81	5.23	1.02	6.58

WSE (ft)				95.52			96.46		96.8	
Disch (cfs)				182			700		1000	
Rv	**Pt**	**Sta**	**Elev**	**Meas**	**1 Vel**	**Depth**	**1 Vel**	**Depth**	**1 Vel**	**Depth**
	41	55.0	94.85	***0.39***	0.44	2.08	1.17	5.34	1.48	6.69
	42	56.1	94.85	***1.74***	1.98	2.08	5.24	5.34	6.60	6.69
	43	58.5	94.65	***1.81***	2.07	2.47	4.98	5.78	6.20	7.14
	44	59.9	94.85	***0.80***	0.91	2.08	2.41	5.34	3.04	6.69
	45	61.0	94.65	***0.63***	0.72	2.47	1.73	5.78	2.16	7.14
	46	62.8	94.90	***0.59***	0.67	1.97				
	47	61.1	95.55				1.28	3.65	1.75	4.98
	48	62.9	97.12							
	49	65.9	97.28							
	50	65.9	97.90							

Table A.3-29. Summary of calibration details for original and revised input decks, Grant Creek, Transect 230, side channel.

WSE (ft)				94.02	94.40	94.63	96.08	96.77
		Disch (cfs)		10	100	162	700	1000
Rv	Pt	Sta	Elev	Depth	Depth	Depth	Depth	Depth
	1	81.6	99.93					
	2	85.9	98.87					
	3	91.5	95.95				0.13	0.82
	4	95.1	95.06				1.02	1.71
	5	96.2	94.49			0.14	1.59	2.28
	6	100.9	93.90	0.12	0.50	0.73	2.18	2.87
	7	102.2	93.54	0.48	0.86	1.09	2.54	3.23
	8	105.1	92.67	1.35	1.73	1.96	3.41	4.10
	9	108.4	91.52	2.50	2.88	3.11	4.56	5.25
	10	111.5	88.97	5.05	5.43	5.66	7.11	7.80
	11	112.9	88.30	5.72	6.10	6.33	7.78	8.47
	12	118.0	88.04	5.98	6.36	6.59	8.04	8.73
	13	121.7	89.63	4.39	4.77	5.00	6.45	7.14
	14	122.3	93.54	0.48	0.86	1.09	2.54	3.23
	15	133.4	93.71	0.31	0.69	0.92	2.37	3.06
	16	137.1	93.75	0.27	0.65	0.88	2.33	3.02
	17	140.3	94.17		0.23	0.46	1.91	2.60
	18	143.3	94.70				1.38	2.07
	19	145.9	97.86					
	20	146.0	99.24					
	21	146.0	100.00					

Table A.3-30. Summary of calibration details for original and revised input decks, Grant Creek, Transect 230, main channel.

WSE (ft)				**94.69**		**95.49**		**95.82**					**96.84**	
Disch (cfs)				**10**		**100**		**182**					**700**	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	1	0.0	100.75											
	2	0.1	99.41											
	3	2.2	95.85										-0.42	-0.62
	4	2.3	96.48										-0.21	-0.32
*	5	2.5	94.85			-0.12	-0.18	***-0.20***	-0.22		-0.33		-0.66	-0.99
	6	3.9	94.35	0.16	0.16	1.30	1.30	***1.89***	2.08		2.09		5.54	5.59
	7	5.8	94.00	0.17	0.17	1.02	1.02	***1.42***	1.57		1.57		3.95	3.98
	8	8.3	93.55	0.37	0.37	1.89	1.89	***2.56***	2.84		2.84		6.79	6.85
	9	11.2	93.45	0.44	0.44	2.16	2.16	***2.91***	3.22		3.23		7.65	7.71
	10	14.4	93.35	0.39	0.39	1.92	1.92	***2.57***	2.85		2.85		6.71	6.76
	11	17.1	93.25	0.29	0.29	1.37	1.37	***1.83***	2.02		2.02		4.73	4.76
	12	19.2	93.70	0.55	0.55	2.89	2.89	***3.95***	4.37		4.38		10.63	10.71
	13	21.1	93.85	0.56	0.56	3.12	3.12	***4.30***	4.76		4.76		11.75	11.85
	14	24.3	93.60	0.30	0.30	1.53	1.53	***2.07***	2.29		2.29		5.52	5.56
	15	26.2	93.85	0.28	0.28	1.55	1.55	***2.14***	2.37		2.37		5.85	5.90
	16	27.8	94.05	0.33	0.33	2.03	2.03	***2.84***	3.14		3.14		7.95	8.02
	17	30.8	94.20	0.17	0.17	1.12	1.12	***1.60***	1.77		1.77		4.58	4.61
	18	32.7	94.45	0.12	0.12	1.17	1.18	***1.73***	1.91		1.91		5.17	5.21
	19	34.0	94.55	0.08	0.08	1.00	1.00	***1.50***	1.65		1.65		4.58	4.62
	20	36.3	94.55	0.07	0.07	0.92	0.92	***1.38***	1.52		1.52		4.21	4.25
	21	37.1	94.55	0.04	0.04	0.50	0.50	***0.75***	0.83		0.83		2.29	2.31
	22	39.1	94.95			0.15	0.15	***0.26***	0.28		0.28		0.89	0.90
	23	39.9	95.05			0.32	0.32	***0.57***	0.62		0.62		2.05	2.06
	24	41.3	95.25			0.01	0.01	***0.02***	0.02		0.02		0.08	0.08
	25	41.8	95.15			-0.02	-0.02	***-0.03***	-0.03		-0.03		-0.11	-0.11
	26	42.7	95.45			0.02	0.02	***0.13***	0.14		0.14		0.63	0.63
	27	45.8	95.65						0.08		0.08		0.57	0.57
	28	49.0	95.65					***0.23***	0.23		0.23		1.61	1.62
	29	49.9	95.65					***0.22***	0.22		0.22		1.54	1.55
	30	52.6	95.85										1.36	1.37
	31	56.1	95.85										1.36	1.37
	32	59.1	95.85										1.36	1.37
*	33	61.5	95.65					***-0.02***	-0.02		-0.17		-0.14	-1.17
	34	63.4	95.85										-0.12	-1.04
	35	64.8	95.85										-0.12	-1.04
	36	65.2	95.92										-0.12	-0.99
	37	65.5	97.02											
	38	69.6	97.43											
	39	72.5	99.17											
	40	78.2	99.65											
	41	81.6	99.93											
	Total								0	*	0	*		

Note:
An * means the modeled velocity exceeds the measured velocity by 0.2 ft/sec or 20%.

Table A.3-31. Summary of calibration details for original and revised input decks, Grant Creek, Transect 230 main channel, high flows.

WSE (ft)				**95.82**			**96.84**		**97.2**	
Disch (cfs)				**182**			**700**		**1000**	
Rv	**Pt**	**Sta**	**Elev**	**Meas**	**1 Vel**	**Depth**	**1 Vel**	**Depth**	**1 Vel**	**Depth**
	1	0.0	100.75							
	2	0.1	99.41							
	3	2.2	95.85				-0.62	2.70	-0.90	3.78
	4	2.3	96.48				-0.32	1.38	-0.59	2.48
	5	2.5	94.85	**-0.20**	-0.33	1.59	-0.99	4.32	-1.30	5.48
	6	3.9	94.35	**1.89**	2.09	2.10	5.59	5.01	7.18	6.24
	7	5.8	94.00	**1.42**	1.57	2.42	3.98	5.48	5.07	6.74
	8	8.3	93.55	**2.56**	2.84	2.81	6.85	6.04	8.62	7.36
	9	11.2	93.45	**2.91**	3.23	2.89	7.71	6.16	9.70	7.50
	10	14.4	93.35	**2.57**	2.85	2.97	6.76	6.29	8.48	7.63
	11	17.1	93.25	**1.83**	2.02	3.05	4.76	6.41	5.97	7.76
	12	19.2	93.70	**3.95**	4.38	2.68	10.71	5.86	13.53	7.16
	13	21.1	93.85	**4.30**	4.76	2.55	11.85	5.67	15.01	6.95
	14	24.3	93.60	**2.07**	2.29	2.77	5.56	5.98	7.01	7.29
	15	26.2	93.85	**2.14**	2.37	2.55	5.90	5.67	7.47	6.95
	16	27.8	94.05	**2.84**	3.14	2.38	8.02	5.41	10.21	6.67
	17	30.8	94.20	**1.60**	1.77	2.24	4.61	5.21	5.90	6.46
	18	32.7	94.45	**1.73**	1.91	2.00	5.21	4.88	6.73	6.09
	19	34.0	94.55	**1.50**	1.65	1.90	4.62	4.74	5.98	5.94
	20	36.3	94.55	**1.38**	1.52	1.90	4.25	4.74	5.50	5.94
	21	37.1	94.55	**0.75**	0.83	1.90	2.31	4.74	2.99	5.94
	22	39.1	94.95	**0.26**	0.28	1.48	0.90	4.17	1.19	5.32
	23	39.9	95.05	**0.57**	0.62	1.36	2.06	4.02	2.74	5.16
	24	41.3	95.25	**0.02**	0.02	1.11	0.08	3.71	0.11	4.84
	25	41.8	95.15	**-0.03**	-0.03	1.24	-0.11	3.87	-0.15	5.00
	26	42.7	95.45	**0.13**	0.14	0.83	0.63	3.39	0.87	4.50
	27	45.8	95.65		0.08	0.49	0.57	3.06	0.80	4.15
	28	49.0	95.65	**0.23**	0.23	0.49	1.62	3.06	2.27	4.15
	29	49.9	95.65	**0.22**	0.22	0.49	1.55	3.06	2.18	4.15
	30	52.6	95.85				1.37	2.70	1.98	3.78
	31	56.1	95.85				1.37	2.70	1.98	3.78
	32	59.1	95.85				1.37	2.70	1.98	3.78
	33	61.5	95.65	**-0.02**	-0.17	0.49	-1.17	3.06	-1.64	4.15
	34	63.4	95.85				-1.04	2.70	-1.50	3.78
	35	64.8	95.85				-1.04	2.70	-1.50	3.78
	36	65.2	95.92				-0.99	2.58	-1.44	3.65
	37	65.5	97.02						-0.39	0.97
	38	69.6	97.43							
	39	72.5	99.17							
	40	78.2	99.65							
	41	81.6	99.93							

Table A.3-32. Summary of calibration details for original and revised input decks, Grant Creek, Transect 300.

WSE (ft)				**93.83**		**94.89**		**95.34**					**96.82**	
Disch (cfs)				**0.17**		**1.71**		**3.07**					**11.94**	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	1	0.0	99.49											
	2	0.1	99.49											
	3	0.8	99.18											
	4	1.2	98.59											
	5	1.9	98.31											
	6	3.2	97.68											
	7	4.8	97.25											
	8	5.5	96.83											
	9	6.0	96.62										0.01	0.01
	10	6.8	96.63										0.01	0.01
	11	7.1	96.49										0.01	0.01
	12	8.9	96.48										0.01	0.01
	13	9.0	95.81										0.02	0.02
	14	9.4	95.66										0.02	0.02
	15	11.0	95.64										0.02	0.02
	16	11.8	95.33						0.00		0.00		0.02	0.02
	17	13.0	95.13						0.00		0.00		0.02	0.02
	18	14.4	94.98						0.01		0.01		0.03	0.03
	19	15.9	94.83			0.00	0.00		0.01		0.01		0.03	0.03
	20	17.5	94.63			0.00	0.00		0.01		0.01		0.03	0.03
	21	19.0	94.63			0.00	0.00		0.01		0.01		0.03	0.03
	22	21.3	94.63			0.00	0.00		0.01		0.01		0.03	0.03
	23	23.0	94.90						0.01		0.01		0.03	0.03
	24	25.0	94.68			0.00	0.00		0.01		0.01		0.03	0.03
	25	27.0	94.58			0.00	0.00		0.01		0.01		0.03	0.03
	26	29.0	94.53			0.01	0.01		0.01		0.01		0.03	0.03
	27	31.0	94.38			0.01	0.01		0.01		0.01		0.03	0.03
	28	32.3	94.43			0.01	0.01		0.01		0.01		0.03	0.03
	29	33.0	93.48	0.00	0.00	0.01	0.01		0.02		0.02		0.04	0.04
	30	35.0	93.73	0.00	0.00	0.01	0.01		0.02		0.02		0.04	0.04
	31	36.4	93.53	0.00	0.00	0.01	0.01	***0.02***	0.02		0.02		0.04	0.04
	32	38.0	93.43	0.00	0.00	0.01	0.01	***0.02***	0.02		0.02		0.04	0.04
	33	39.0	93.93			0.01	0.01	***0.01***	0.01		0.01		0.02	0.02
	34	40.0	93.23	0.00	0.00	0.01	0.01	***0.01***	0.01		0.01		0.02	0.02
	35	42.0	93.08	0.00	0.00	0.01	0.01	***0.01***	0.01		0.01		0.02	0.02
	36	43.1	93.08	0.00	0.00	0.01	0.01	***0.01***	0.01		0.01		0.02	0.02
	37	44.5	93.13	0.00	0.00	0.01	0.01	***0.01***	0.01		0.01		0.02	0.02
	38	46.0	93.23	0.01	0.01	0.02	0.02	***0.03***	0.03		0.03		0.06	0.06
	39	47.5	93.03	0.01	0.01	0.02	0.02	***0.03***	0.03		0.03		0.05	0.05
	40	49.9	92.83	0.00	0.00	0.01	0.01	***0.02***	0.01		0.01		0.03	0.03

		WSE (ft)		**93.83**		**94.89**		**95.34**					**96.82**	
		Disch (cfs)		**0.17**		**1.71**		**3.07**					**11.94**	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	41	51.6	92.93	0.00	0.00	0.01	0.01	***0.02***	0.01		0.01		0.03	0.03
	42	54.6	93.23	0.00	0.00	0.01	0.01	***0.01***	0.01		0.01		0.02	0.02
	43	56.2	93.13	0.00	0.00	0.01	0.01	***0.02***	0.02		0.02		0.04	0.04
	44	58.4	93.43	0.07	0.07	0.23	0.23	***0.35***	0.32		0.32		0.67	0.67
	45	60.6	93.23	0.03	0.03	0.07	0.07	***0.11***	0.10		0.10		0.21	0.21
	46	63.3	93.59	0.01	0.01	0.06	0.06		0.09		0.09		0.19	0.19
	Total								0	*	0	*		

Note:
An * means the modeled velocity exceeds the measured velocity by 0.2 ft/sec or 20%.

Table A.3-33. Summary of calibration details for original and revised input decks, Grant Creek, Transect 300, high flows.

WSE (ft)				**95.34**			**96.82**		**97.35**	
Disch (cfs)				**3.07**			**11.94**		**17.06**	
Rv	**Pt**	**Sta**	**Elev**	**Meas**	**1 Vel**	**Depth**	**1 Vel**	**Depth**	**1 Vel**	**Depth**
	1	0.0	99.49							
	2	0.1	99.49							
	3	0.8	99.18							
	4	1.2	98.59							
	5	1.9	98.31							
	6	3.2	97.68							
	7	4.8	97.25						0.00	0.01
	8	5.5	96.83						0.01	0.03
	9	6.0	96.62				0.01	0.01	0.02	0.03
	10	6.8	96.63				0.01	0.01	0.02	0.03
	11	7.1	96.49				0.01	0.02	0.02	0.04
	12	8.9	96.48				0.01	0.02	0.02	0.04
	13	9.0	95.81				0.02	0.04	0.03	0.05
	14	9.4	95.66				0.02	0.04	0.03	0.06
	15	11.0	95.64				0.02	0.04	0.03	0.06
	16	11.8	95.33		0.00	0.00	0.02	0.05	0.03	0.06
	17	13.0	95.13		0.00	0.01	0.02	0.05	0.03	0.07
	18	14.4	94.98		0.01	0.01	0.03	0.05	0.03	0.07
	19	15.9	94.83		0.01	0.02	0.03	0.06	0.04	0.07
	20	17.5	94.63		0.01	0.02	0.03	0.06	0.04	0.08
	21	19.0	94.63		0.01	0.02	0.03	0.06	0.04	0.08
	22	21.3	94.63		0.01	0.02	0.03	0.06	0.04	0.08
	23	23.0	94.90		0.01	0.02	0.03	0.06	0.04	0.07
	24	25.0	94.68		0.01	0.02	0.03	0.06	0.04	0.08
	25	27.0	94.58		0.01	0.02	0.03	0.06	0.04	0.08
	26	29.0	94.53		0.01	0.02	0.03	0.06	0.04	0.08
	27	31.0	94.38		0.01	0.03	0.03	0.07	0.04	0.08
	28	32.3	94.43		0.01	0.03	0.03	0.06	0.04	0.08
	29	33.0	93.48		0.02	0.04	0.04	0.08	0.05	0.10
	30	35.0	93.73		0.02	0.04	0.04	0.08	0.05	0.09
	31	36.4	93.53	***0.02***	0.02	0.04	0.04	0.08	0.05	0.10
	32	38.0	93.43	***0.02***	0.02	0.04	0.04	0.08	0.05	0.10
	33	39.0	93.93	***0.01***	0.01	0.03	0.02	0.07	0.03	0.09
	34	40.0	93.23	***0.01***	0.01	0.04	0.02	0.08	0.02	0.10
	35	42.0	93.08	***0.01***	0.01	0.05	0.02	0.09	0.02	0.10
	36	43.1	93.08	***0.01***	0.01	0.05	0.02	0.09	0.02	0.10
	37	44.5	93.13	***0.01***	0.01	0.05	0.02	0.09	0.02	0.10
	38	46.0	93.23	***0.03***	0.03	0.04	0.06	0.08	0.07	0.10
	39	47.5	93.03	***0.03***	0.03	0.05	0.05	0.09	0.07	0.10
	40	49.9	92.83	***0.02***	0.01	0.05	0.03	0.09	0.03	0.11

WSE (ft)				95.34			96.82		97.35	
Disch (cfs)				**3.07**			**11.94**		**17.06**	
Rv	**Pt**	**Sta**	**Elev**	**Meas**	**1 Vel**	**Depth**	**1 Vel**	**Depth**	**1 Vel**	**Depth**
	41	51.6	92.93	***0.02***	0.01	0.05	0.03	0.09	0.03	0.11
	42	54.6	93.23	***0.01***	0.01	0.04	0.02	0.08	0.02	0.10
	43	56.2	93.13	***0.02***	0.02	0.05	0.04	0.09	0.04	0.10
	44	58.4	93.43	***0.35***	0.32	0.04	0.67	0.08	0.82	0.10
	45	60.6	93.23	***0.11***	0.10	0.04	0.21	0.08	0.25	0.10
	46	63.3	93.59		0.09	0.04	0.19	0.08	0.23	0.09

Table A.3-34. Summary of calibration details for original and revised input decks, Grant Creek, Transect 310.

		WSE (ft)		95.07		96.11		96.43					97.63	
		Disch (cfs)		10		100		165					700	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	1	0.0	100.50											
	2	0.0	99.99											
	3	0.8	99.55											
	4	1.8	98.45											
*	5	2.1	96.42						-0.01				-0.40	-0.86
	6	2.8	97.99											
*	7	3.1	96.42						-0.01				-0.40	-0.86
*	8	3.9	95.62			-0.08	-0.18	***-0.15***	-0.15		-0.32		-0.57	-1.22
	9	5.0	95.42			-0.04	-0.04	***-0.06***	-0.06		-0.06		-0.21	-0.21
	10	6.3	95.32			-0.04	-0.04	***-0.07***	-0.07		-0.07		-0.23	-0.24
	11	7.6	95.42			-0.05	-0.05	***-0.08***	-0.08		-0.08		-0.28	-0.28
	12	8.9	95.32			-0.04	-0.04	***-0.06***	-0.06		-0.06		-0.20	-0.20
	13	11.0	95.22			-0.05	-0.05	***-0.08***	-0.08		-0.08		-0.26	-0.26
	14	13.0	95.12			-0.09	-0.09	***-0.14***	-0.14		-0.14		-0.44	-0.45
	15	15.5	95.22			-0.15	-0.15	***-0.24***	-0.24		-0.24		-0.78	-0.79
	16	17.1	95.32			-0.24	-0.24	***-0.39***	-0.39		-0.39		-1.31	-1.32
	17	19.0	95.32			-0.28	-0.28	***-0.44***	-0.44		-0.44		-1.47	-1.49
	18	21.0	95.12			-0.03	-0.03	***-0.04***	-0.04		-0.04		-0.13	-0.13
	19	22.6	94.62	0.00	0.00	0.01	0.01	***0.01***	0.01		0.01		0.03	0.03
	20	23.6	94.52	0.01	0.01	0.07	0.07	***0.10***	0.10		0.10		0.28	0.29
	21	25.0	94.62	0.10	0.10	0.58	0.58	***0.84***	0.84		0.84		2.42	2.44
	22	26.0	94.62	0.10	0.10	0.62	0.62	***0.90***	0.90		0.90		2.59	2.61
	23	27.0	94.72	0.09	0.09	0.61	0.61	***0.90***	0.90		0.90		2.63	2.65
	24	29.0	94.32	0.23	0.23	1.10	1.10	***1.57***	1.56		1.56		4.34	4.38
	25	30.5	94.22	0.28	0.28	1.31	1.31	***1.86***	1.85		1.85		5.09	5.13
	26	31.9	94.12	0.34	0.34	1.53	1.53	***2.16***	2.15		2.15		5.85	5.90
	27	34.0	93.92	0.50	0.50	2.08	2.09	***2.92***	2.90		2.90		7.75	7.82
	28	36.0	93.82	0.52	0.52	2.13	2.13	***2.97***	2.96		2.96		7.83	7.90
	29	38.0	94.02	0.43	0.43	1.87	1.87	***2.62***	2.61		2.61		7.03	7.09
	30	40.0	94.02	0.63	0.63	2.73	2.73	***3.83***	3.81		3.82		10.27	10.36
	31	41.0	94.02	0.75	0.75	3.25	3.25	***4.56***	4.54		4.54		12.23	12.34
	32	42.4	93.92	0.53	0.53	2.23	2.23	***3.12***	3.11		3.11		8.29	8.37
	33	43.2	94.02	0.31	0.31	1.34	1.34	***1.88***	1.87		1.87		5.04	5.09
	34	43.7	94.62	0.37	0.37	2.26	2.27	***3.29***	3.28		3.28		9.47	9.55
	35	45.0	94.02	0.56	0.56	2.44	2.44	***3.42***	3.40		3.41		9.17	9.25
	36	46.0	94.52	0.46	0.46	2.53	2.53	***3.65***	3.64		3.64		10.36	10.45
	37	46.5	94.02	0.54	0.54	2.35	2.35	***3.30***	3.28		3.29		8.85	8.93
	38	48.3	94.52	0.30	0.30	1.64	1.64	***2.37***	2.36		2.36		6.72	6.78
	39	49.5	94.32	0.17	0.17	0.83	0.83	***1.18***	1.17		1.18		3.26	3.29
	40	50.9	94.52	0.38	0.38	2.11	2.11	***3.04***	3.03		3.03		8.63	8.70

		WSE (ft)		**95.07**		**96.11**		**96.43**					**97.63**	
		Disch (cfs)		**10**		**100**		**165**					**700**	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	41	51.5	94.62	0.33	0.33	2.02	2.02	***2.94***	2.93		2.93		8.46	8.54
	42	52.8	94.62	0.25	0.25	1.49	1.49	***2.16***	2.15		2.15		6.22	6.27
	43	53.7	95.02	0.04	0.04	0.77	0.77	***1.17***	1.17		1.17		3.62	3.65
	44	54.3	95.02	0.02	0.02	0.41	0.41	***0.62***	0.62		0.62		1.92	1.94
	45	55.3	95.22			1.16	1.16	***1.82***	1.82		1.82		5.92	5.97
	46	56.3	95.02	0.04	0.04	0.75	0.75	***1.13***	1.13		1.13		3.50	3.53
	47	57.3	95.52			0.62	0.62	***1.05***	1.05		1.05		3.79	3.82
	48	58.1	95.52			0.16	0.16	***0.28***	0.28		0.28		1.01	1.02
	49	59.1	95.82			0.08	0.08	***0.17***	0.17		0.17		0.73	0.73
	50	60.0	96.02			0.04	0.04	***0.14***	0.14		0.14		0.73	0.73
*	51	61.2	96.22					***-0.04***	-0.04		-0.17		-0.30	-1.29
	52	62.4	96.32						-0.03		-0.11		-0.29	-1.22
	53	63.7	96.55										-0.25	-1.07
	54	65.1	96.93										-0.19	-0.80
	55	66.3	98.91											
	56	68.6	98.61											
	57	71.2	99.21											
	58	73.0	98.94											
	59	75.6	98.94											
	60	78.0	98.73											
	61	80.0	99.43											
	62	82.0	98.95											
	63	84.0	98.28											
	64	86.0	97.88											
	65	88.0	97.74											
	66	90.0	97.70											
	67	92.0	98.09											
	68	94.0	98.40											
	69	96.6	98.21											
	70	96.6	100.84											
	Total								0	*	0	*		

<u>Note</u>:
An * means the modeled velocity exceeds the measured velocity by 0.2 ft/sec or 20%.

Table A.3-35. Summary of calibration details for original and revised input decks, Grant Creek, Transect 310, high flows.

WSE (ft)				96.43			97.63		98.00	
Disch (cfs)				165			700		1000	
Rv	Pt	Sta	Elev	Meas	1 Vel	Depth	1 Vel	Depth	1 Vel	Depth
	1	0.0	100.50							
	2	0.0	99.99							
	3	0.8	99.55							
	4	1.8	98.45							
	5	2.1	96.42				-0.86	2.25	-1.24	3.14
	6	2.8	97.99						-0.04	0.09
	7	3.1	96.42				-0.86	2.25	-1.24	3.14
	8	3.9	95.62	***-0.15***	-0.32	0.98	-1.22	3.20	-1.65	4.17
	9	5.0	95.42	***-0.06***	-0.06	1.14	-0.21	3.41	-0.28	4.40
	10	6.3	95.32	***-0.07***	-0.07	1.21	-0.24	3.51	-0.32	4.51
	11	7.6	95.42	***-0.08***	-0.08	1.14	-0.28	3.41	-0.37	4.40
	12	8.9	95.32	***-0.06***	-0.06	1.21	-0.20	3.51	-0.27	4.51
	13	11.0	95.22	***-0.08***	-0.08	1.29	-0.26	3.61	-0.35	4.63
	14	13.0	95.12	***-0.14***	-0.14	1.36	-0.45	3.71	-0.59	4.74
	15	15.5	95.22	***-0.24***	-0.24	1.29	-0.79	3.61	-1.05	4.63
	16	17.1	95.32	***-0.39***	-0.39	1.21	-1.32	3.51	-1.76	4.51
	17	19.0	95.32	***-0.44***	-0.44	1.21	-1.49	3.51	-1.98	4.51
	18	21.0	95.12	***-0.04***	-0.04	1.36	-0.13	3.71	-0.17	4.74
	19	22.6	94.62	***0.01***	0.01	1.69	0.03	4.19	0.04	5.27
	20	23.6	94.52	***0.10***	0.10	1.75	0.29	4.28	0.37	5.38
	21	25.0	94.62	***0.84***	0.84	1.69	2.44	4.19	3.18	5.27
	22	26.0	94.62	***0.90***	0.90	1.69	2.61	4.19	3.41	5.27
	23	27.0	94.72	***0.90***	0.90	1.62	2.65	4.10	3.47	5.17
	24	29.0	94.32	***1.57***	1.56	1.87	4.38	4.47	5.67	5.58
	25	30.5	94.22	***1.86***	1.85	1.93	5.13	4.56	6.63	5.68
	26	31.9	94.12	***2.16***	2.15	1.99	5.90	4.65	7.61	5.78
	27	34.0	93.92	***2.92***	2.90	2.10	7.82	4.82	10.04	5.98
	28	36.0	93.82	***2.97***	2.96	2.15	7.90	4.91	10.13	6.08
	29	38.0	94.02	***2.62***	2.61	2.04	7.09	4.73	9.12	5.88
	30	40.0	94.02	***3.83***	3.82	2.04	10.36	4.73	13.34	5.88
	31	41.0	94.02	***4.56***	4.54	2.04	12.34	4.73	15.88	5.88
	32	42.4	93.92	***3.12***	3.11	2.10	8.37	4.82	10.75	5.98
	33	43.2	94.02	***1.88***	1.87	2.04	5.09	4.73	6.55	5.88
	34	43.7	94.62	***3.29***	3.28	1.69	9.55	4.19	12.45	5.27
	35	45.0	94.02	***3.42***	3.41	2.04	9.25	4.73	11.91	5.88
	36	46.0	94.52	***3.65***	3.64	1.75	10.45	4.28	13.58	5.38
	37	46.5	94.02	***3.30***	3.29	2.04	8.93	4.73	11.49	5.88
	38	48.3	94.52	***2.37***	2.36	1.75	6.78	4.28	8.82	5.38
	39	49.5	94.32	***1.18***	1.18	1.87	3.29	4.47	4.26	5.58
	40	50.9	94.52	***3.04***	3.03	1.75	8.70	4.28	11.31	5.38

WSE (ft)				96.43			97.63		98.00	
Disch (cfs)				165			700		1000	
Rv	**Pt**	**Sta**	**Elev**	**Meas**	**1 Vel**	**Depth**	**1 Vel**	**Depth**	**1 Vel**	**Depth**
	41	51.5	94.62	***2.94***	2.93	1.69	8.54	4.19	11.13	5.27
	42	52.8	94.62	***2.16***	2.15	1.69	6.27	4.19	8.17	5.27
	43	53.7	95.02	***1.17***	1.17	1.43	3.65	3.81	4.82	4.85
	44	54.3	95.02	***0.62***	0.62	1.43	1.94	3.81	2.55	4.85
	45	55.3	95.22	***1.82***	1.82	1.29	5.97	3.61	7.93	4.63
	46	56.3	95.02	***1.13***	1.13	1.43	3.53	3.81	4.65	4.85
	47	57.3	95.52	***1.05***	1.05	1.06	3.82	3.30	5.14	4.28
	48	58.1	95.52	***0.28***	0.28	1.06	1.02	3.30	1.37	4.28
	49	59.1	95.82	***0.17***	0.17	0.81	0.73	2.98	1.00	3.93
	50	60.0	96.02	***0.14***	0.14	0.62	0.73	2.75	1.01	3.68
	51	61.2	96.22	***-0.04***	-0.17	0.40	-1.29	2.52	-1.81	3.43
	52	62.4	96.32		-0.11	0.25	-1.22	2.40	-1.74	3.30
	53	63.7	96.55				-1.07	2.11	-1.58	2.99
	54	65.1	96.93				-0.80	1.57	-1.29	2.44
	55	66.3	98.91							
	56	68.6	98.61							
	57	71.2	99.21							
	58	73.0	98.94							
	59	75.6	98.94							
	60	78.0	98.73							
	61	80.0	99.43							
	62	82.0	98.95							
	63	84.0	98.28							
	64	86.0	97.88						-0.29	0.56
	65	88.0	97.74						-0.50	0.94
	66	90.0	97.70						-0.55	1.04
	67	92.0	98.09							
	68	94.0	98.40							
	69	96.6	98.21							
	70	96.6	100.84							

Table A.3-36. Summary of calibration details for original and revised input decks, Grant Creek, Transect 320.

		WSE (ft)		**95.83**		**96.15**		**96.21**					**96.81**	
		Disch (cfs)		**1.58**		**15.81**		**20.96**					**111**	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	1	0.0	100.50											
	2	0.0	100.03											
	3	2.0	99.32											
	4	5.0	98.70											
	5	7.4	97.81											
	6	10.0	97.58											
	7	11.3	96.99											
*	8	12.1	95.37	0.02	0.05	0.10	0.26	***0.12***	0.12		0.31		0.34	0.89
	9	14.6	95.11	0.10	0.10	0.49	0.48	***0.59***	0.58		0.58		1.58	1.54
	10	16.8	94.89	0.32	0.32	1.53	1.51	***1.83***	1.81		1.79		4.72	4.60
	11	17.5	95.01	0.34	0.33	1.64	1.62	***1.97***	1.95		1.93		5.19	5.05
	12	18.7	95.02	0.25	0.24	1.20	1.19	***1.45***	1.43		1.42		3.82	3.73
	13	20.6	95.91			0.17	0.17	***0.24***	0.23		0.23		0.99	0.96
	14	21.4	95.49	0.35	0.34	2.12	2.10	***2.63***	2.59		2.57		7.89	7.69
	15	22.3	95.86			0.20	0.20	***0.27***	0.26		0.26		1.04	1.02
	16	22.9	95.23	0.16	0.16	0.85	0.84	***1.03***	1.02		1.01		2.84	2.77
	17	24.0	95.44	-0.03	-0.03	-0.18	-0.18	***-0.22***	-0.22		-0.21		-0.65	-0.63
	18	25.2	95.35	0.03	0.03	0.18	0.18	***0.22***	0.22		0.22		0.63	0.61
	19	26.2	95.59	0.22	0.21	1.50	1.48	***1.88***	1.85		1.83		5.91	5.75
	20	27.1	95.60	0.25	0.25	1.77	1.75	***2.22***	2.19		2.16		7.01	6.83
	21	28.3	95.85			1.60	1.59	***2.15***	2.10		2.08		8.22	8.01
	22	29.9	95.43	0.22	0.22	1.26	1.25	***1.56***	1.54		1.52		4.57	4.46
	23	31.3	95.35	0.06	0.06	0.32	0.32	***0.39***	0.39		0.38		1.11	1.08
	24	33.0	95.49	0.05	0.05	0.31	0.31	***0.39***	0.38		0.38		1.17	1.14
	25	33.5	95.83			0.44	0.43	***0.58***	0.57		0.56		2.17	2.11
	26	35.0	95.29	0.14	0.14	0.75	0.75	***0.92***	0.91		0.90		2.58	2.51
	27	37.8	95.61	0.14	0.14	0.98	0.98	***1.24***	1.22		1.21		3.94	3.84
	28	37.8	95.59	0.02	0.02	0.17	0.17	***0.21***	0.21		0.20		0.66	0.64
	29	39.0	95.57	0.01	0.01	0.06	0.06	***0.07***	0.07		0.07		0.22	0.21
*	30	41.6	95.58	0.01		0.06			0.07				0.22	0.13
	31	42.8	95.78	0.00	0.00	0.06	0.06	***0.08***	0.08		0.08		0.29	0.28
	32	43.3	95.89			0.02	0.02	***0.03***	0.03		0.03		0.12	0.12
	33	43.6	96.74										0.02	0.02
	34	45.9	96.70										0.03	0.03
	35	46.0	96.19						-0.01		0.00		-0.24	0.09
	36	46.8	95.99				-0.04	***-0.06***			-0.06			-0.28
*	37	47.0	95.96			-0.04			-0.06				-0.29	-0.22
*	38	49.0	95.94			-0.05			-0.07				-0.30	-0.21
*	39	49.3	95.94			-0.04	0.16	***-0.06***	-0.06		0.22		-0.26	0.95
*	40	50.0	95.98			-0.04			-0.05				-0.25	0.71

		WSE (ft)		**95.83**		**96.15**		**96.21**					**96.81**	
		Disch (cfs)		**1.58**		**15.81**		**20.96**					**111**	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
*	41	51.0	96.16						-0.02				-0.21	0.71
	42	51.3	96.55										-0.12	0.43
	43	53.5	96.59										-0.10	0.38
	44	55.1	96.77										-0.03	0.12
	45	57.3	96.93											
	46	58.8	97.33											
	47	59.8	97.51											
	48	60.4	97.37											
	49	60.4	98.68											
	Total								0	*	0	*		

Note:
An * means the modeled velocity exceeds the measured velocity by 0.2 ft/sec or 20%.

Table A.3-37. Summary of calibration details for original and revised input decks, Grant Creek, Transect 320, high flows.

		WSE (ft)		20.98			96.81		97.01	
		Disch (cfs)		20.98			111		158.14	
Rv	**Pt**	**Sta**	**Elev**	**Meas**	**1 Vel**	**Depth**	**1 Vel**	**Depth**	**1 Vel**	**Depth**
	1	0.0	100.50							
	2	0.0	100.03							
	3	2.0	99.32							
	4	5.0	98.70							
	5	7.4	97.81							
	6	10.0	97.58							
	7	11.3	96.99						0.05	0.14
	8	12.1	95.37	***0.12***	0.31	0.95	0.89	2.61	1.10	3.16
	9	14.6	95.11	***0.59***	0.58	1.14	1.54	2.91	1.88	3.49
	10	16.8	94.89	***1.83***	1.79	1.28	4.60	3.16	5.57	3.75
	11	17.5	95.01	***1.97***	1.93	1.20	5.05	3.03	6.14	3.61
	12	18.7	95.02	***1.45***	1.42	1.20	3.73	3.01	4.53	3.60
	13	20.6	95.91	***0.24***	0.23	0.48	0.96	1.90	1.25	2.42
	14	21.4	95.49	***2.63***	2.57	0.85	7.69	2.46	9.56	3.00
	15	22.3	95.86	***0.27***	0.26	0.53	1.02	1.97	1.31	2.49
	16	22.9	95.23	***1.03***	1.01	1.05	2.77	2.77	3.40	3.34
	17	24.0	95.44	***-0.22***	-0.21	0.89	-0.63	2.52	-0.78	3.07
	18	25.2	95.35	***0.22***	0.22	0.96	0.61	2.63	0.75	3.19
	19	26.2	95.59	***1.88***	1.83	0.77	5.75	2.33	7.21	2.87
	20	27.1	95.60	***2.22***	2.16	0.76	6.83	2.32	8.56	2.85
	21	28.3	95.85	***2.15***	2.08	0.54	8.01	1.99	10.28	2.50
	22	29.9	95.43	***1.56***	1.52	0.90	4.46	2.53	5.52	3.08
	23	31.3	95.35	***0.39***	0.38	0.96	1.08	2.63	1.34	3.19
	24	33.0	95.49	***0.39***	0.38	0.85	1.14	2.46	1.42	3.00
	25	33.5	95.83	***0.58***	0.56	0.56	2.11	2.01	2.71	2.53
	26	35.0	95.29	***0.92***	0.90	1.01	2.51	2.70	3.09	3.26
	27	37.8	95.61	***1.24***	1.21	0.76	3.84	2.31	4.81	2.84
	28	37.8	95.59	***0.21***	0.20	0.77	0.64	2.33	0.81	2.87
	29	39.0	95.57	***0.07***	0.07	0.79	0.21	2.36	0.27	2.90
	30	41.6	95.58				0.13	1.42	0.18	1.92
	31	42.8	95.78	***0.08***	0.08	0.61	0.28	2.08	0.35	2.60
	32	43.3	95.89	***0.03***	0.03	0.50	0.12	1.93	0.15	2.45
	33	43.6	96.74				0.02	0.35	0.06	0.94
	34	45.9	96.70				0.03	0.47	0.06	1.03
	35	46.0	96.19		0.00	0.08	0.09	1.48	0.12	1.98
	36	46.8	95.99	***-0.06***	-0.06	0.39	-0.28	1.79	-0.36	2.30
	37	47.0	95.96				-0.22	1.42	-0.30	1.92
	38	49.0	95.94				-0.21	1.39	-0.30	1.88
	39	49.3	95.94	***-0.06***	0.22	0.44	0.95	1.86	1.24	2.37
	40	50.0	95.98				0.71	1.39	0.98	1.88

WSE (ft)				20.98			96.81		97.01	
Disch (cfs)				20.98			111		158.14	
Rv	**Pt**	**Sta**	**Elev**	**Meas**	**1 Vel**	**Depth**	**1 Vel**	**Depth**	**1 Vel**	**Depth**
	41	51.0	96.16				0.71	1.39	0.98	1.88
	42	51.3	96.55				0.43	0.83	0.70	1.34
	43	53.5	96.59				0.38	0.74	0.66	1.26
	44	55.1	96.77				0.12	0.24	0.45	0.86
	45	57.3	96.93						0.21	0.40
	46	58.8	97.33							
	47	59.8	97.51							
	48	60.4	97.37							
	49	60.4	98.68							

Table A.3-38. Summary of calibration details for original and revised input decks, Grant Creek, Transect 330, secondary channel.

		WSE (ft)		95.67		96.05		96.49					96.67	
		Disch (cfs)		0.13		1.27		5.71					8.90	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	1	82.2	97.95											
	2	85.2	98.04											
	3	88.2	97.76											
*	4	90.7	96.48						0.06		0.03		0.38	0.19
	5	91.2	96.60										0.20	0.10
*	6	91.7	96.28						0.35	*	0.17		0.62	0.30
*	7	92.2	96.28						0.35	*	0.17		0.62	0.30
	8	92.7	96.18					***0.50***	0.46		0.46		0.72	0.73
	9	93.2	96.28					***0.10***	0.09		0.09		0.16	0.17
	10	93.7	95.73			0.04	0.04		0.13		0.13		0.17	0.18
	11	94.2	95.73			0.04	0.04		0.13		0.13		0.17	0.18
	12	95.2	95.48	0.01	0.01	0.06	0.06		0.16		0.16		0.20	0.21
	13	95.7	95.68			0.04	0.04	***0.15***	0.13		0.14		0.18	0.18
	14	96.2	95.58	0.01	0.01	0.10	0.10	***0.30***	0.27		0.27		0.35	0.36
	15	96.7	95.58	0.03	0.03	0.22	0.22	***0.68***	0.61		0.62		0.80	0.82
	16	97.2	95.48	0.03	0.03	0.17	0.17	***0.50***	0.45		0.45		0.58	0.59
	17	97.7	95.58	0.02	0.02	0.18	0.18	***0.56***	0.50		0.51		0.66	0.67
	18	98.1	95.68			0.15	0.15	***0.52***	0.47		0.47		0.62	0.63
	19	98.7	95.58	0.02	0.02	0.17	0.17	***0.53***	0.47		0.48		0.62	0.64
	20	99.0	95.48	0.03	0.03	0.18	0.18	***0.53***	0.47		0.48		0.61	0.63
	21	99.4	95.18	0.09	0.09	0.32	0.32	***0.84***	0.75		0.76		0.95	0.97
	22	99.8	95.08	0.08	0.08	0.29	0.29	***0.74***	0.66		0.67		0.83	0.85
	23	100.2	95.48	0.05	0.05	0.25	0.25	***0.73***	0.65		0.66		0.85	0.86
	24	100.5	95.48	0.05	0.05	0.25	0.25	***0.74***	0.66		0.67		0.86	0.88
	25	100.8	95.23	0.11	0.11	0.42	0.42	***1.11***	0.99		1.01		1.26	1.29
	26	101.2	95.28	0.11	0.11	0.44	0.44	***1.18***	1.05		1.07		1.34	1.37
	27	101.5	95.23	0.13	0.13	0.50	0.50	***1.33***	1.19		1.21		1.51	1.54
	28	101.9	95.48	0.08	0.08	0.42	0.42	***1.22***	1.09		1.11		1.41	1.45
	29	102.2	95.48	0.05	0.05	0.25	0.25	***0.73***	0.65		0.66		0.85	0.86
	30	102.5	95.28	0.05	0.05	0.21	0.21	***0.57***	0.51		0.52		0.65	0.66
	31	102.9	95.28	0.03	0.03	0.13	0.13	***0.34***	0.30		0.31		0.39	0.40
	32	103.2	95.18	0.03	0.03	0.10	0.10	***0.27***	0.24		0.24		0.31	0.31
	33	103.5	95.18	0.02	0.02	0.08	0.08	***0.20***	0.18		0.18		0.23	0.23
	34	103.9	95.33	0.01	0.01	0.02	0.02	***0.06***	0.05		0.05		0.07	0.07
	35	104.2	95.43	0.01	0.01	0.03	0.03	***0.08***	0.07		0.07		0.09	0.09
	36	105.2	96.08					***0.16***	0.15		0.15		0.21	0.22
*	37	106.2	96.06						0.15		0.02		0.22	0.25
*	38	106.5	96.38						0.06				0.13	0.23
*	39	106.8	96.48					***0.10***	0.02				0.10	0.19
	40	107.0	97.31											
*	41	109.2	96.17											
	Total								2	*	0	*		

Note:
An * means the modeled velocity exceeds the measured velocity by 0.2 ft/sec or 20%.

Table A.3-39. Summary of calibration details for original and revised input decks, Grant Creek, Transect 330, second channel, high flows.

WSE (ft)				**96.49**			**96.67**		**96.84**	
Disch (cfs)				**5.71**			**8.90**		**12.72**	
Rv	**Pt**	**Sta**	**Elev**	**Meas**	**1 Vel**	**Depth**	**1 Vel**	**Depth**	**1 Vel**	**Depth**
	1	82.2	97.95							
	2	85.2	98.04							
	3	88.2	97.76							
	4	90.7	96.48		0.03	0.03	0.19	0.18	0.32	0.30
	5	91.2	96.60				0.10	0.09	0.24	0.23
	6	91.7	96.28		0.17	0.16	0.30	0.28	0.43	0.40
	7	92.2	96.28		0.17	0.16	0.30	0.28	0.43	0.40
	8	92.7	96.18	***0.50***	0.46	0.21	0.73	0.33	1.01	0.45
	9	93.2	96.28	***0.10***	0.09	0.16	0.17	0.28	0.24	0.40
	10	93.7	95.73		0.13	0.38	0.18	0.51	0.22	0.64
	11	94.2	95.73		0.13	0.38	0.18	0.51	0.22	0.64
	12	95.2	95.48		0.16	0.46	0.21	0.60	0.25	0.73
	13	95.7	95.68	***0.15***	0.14	0.40	0.18	0.53	0.23	0.66
	14	96.2	95.58	***0.30***	0.27	0.43	0.36	0.56	0.45	0.70
	15	96.7	95.58	***0.68***	0.62	0.43	0.82	0.56	1.01	0.70
	16	97.2	95.48	***0.50***	0.45	0.46	0.59	0.60	0.73	0.73
	17	97.7	95.58	***0.56***	0.51	0.43	0.67	0.56	0.83	0.70
	18	98.1	95.68	***0.52***	0.47	0.40	0.63	0.53	0.79	0.66
	19	98.7	95.58	***0.53***	0.48	0.43	0.64	0.56	0.79	0.70
	20	99.0	95.48	***0.53***	0.48	0.46	0.63	0.60	0.77	0.73
	21	99.4	95.18	***0.84***	0.76	0.55	0.97	0.69	1.18	0.84
	22	99.8	95.08	***0.74***	0.67	0.58	0.85	0.72	1.02	0.87
	23	100.2	95.48	***0.73***	0.66	0.46	0.86	0.60	1.07	0.73
	24	100.5	95.48	***0.74***	0.67	0.46	0.88	0.60	1.08	0.73
	25	100.8	95.23	***1.11***	1.01	0.53	1.29	0.68	1.56	0.82
	26	101.2	95.28	***1.18***	1.07	0.52	1.37	0.66	1.67	0.80
	27	101.5	95.23	***1.33***	1.21	0.53	1.54	0.68	1.87	0.82
	28	101.9	95.48	***1.22***	1.11	0.46	1.45	0.60	1.78	0.73
	29	102.2	95.48	***0.73***	0.66	0.46	0.86	0.60	1.07	0.73
	30	102.5	95.28	***0.57***	0.52	0.52	0.66	0.66	0.81	0.80
	31	102.9	95.28	***0.34***	0.31	0.52	0.40	0.66	0.48	0.80
	32	103.2	95.18	***0.27***	0.24	0.55	0.31	0.69	0.38	0.84
	33	103.5	95.18	***0.20***	0.18	0.55	0.23	0.69	0.28	0.84
	34	103.9	95.33	***0.06***	0.05	0.51	0.07	0.65	0.09	0.79
	35	104.2	95.43	***0.08***	0.07	0.48	0.09	0.61	0.12	0.75
	36	105.2	96.08	***0.16***	0.15	0.33	0.22	0.45	0.29	0.58
	37	106.2	96.06		0.02	0.25	0.25	0.37	0.44	0.50
	38	106.5	96.38			0.26	0.23	0.38	0.42	0.50
	39	106.8	96.48	***0.10***		0.11	0.19	0.23	0.38	0.35
	40	107.0	97.31			0.03		0.18		0.30
	41	109.2	96.17							

Table A.3-40. Summary of calibration details for original and revised input decks, Grant Creek, Transect 330, tertiary channel.

		WSE (ft)		95.67		96.05		96.49					96.67	
		Disch (cfs)		0.13		1.27		5.71					8.90	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	1	107.0	97.31											
*	2	109.2	96.17						0.13				0.17	0.16
*	3	112.2	95.98						0.19				0.20	0.22
	4	112.6	96.45										0.11	0.27
	5	112.8	95.85			0.06	0.15	***0.66***	0.22	*	0.57		0.22	0.53
	6	113.0	95.75	0.01	0.01	0.06	0.15	***0.40***	0.14	*	0.35		0.13	0.31
	7	113.2	96.05					***0.24***	0.08		0.21		0.09	0.22
	8	113.4	96.05					***0.24***	0.08		0.21		0.09	0.22
	9	113.6	96.05					***0.24***	0.08		0.21		0.09	0.22
	10	113.7	96.45										0.00	0.00
	11	115.2	96.97											
	12	117.4	96.64										0.00	0.00
	13	117.7	96.45										0.00	0.00
	14	117.8	95.65	0.00	0.00	0.00	0.00		0.00		0.01		0.00	0.01
	15	118.0	95.65	0.00	0.00	0.00	0.00	***0.01***	0.00		0.01		0.00	0.01
	16	118.2	95.65	0.00	0.00	0.00	0.00	***0.01***	0.00		0.01		0.00	0.01
	17	118.4	95.55	0.00	0.00	0.00	0.01	***0.01***	0.00		0.01		0.00	0.01
	18	118.6	95.55	0.00	0.00	0.00	0.01	***0.01***	0.00		0.01		0.00	0.01
	19	118.8	95.45	0.00	0.00	0.00	0.01	***0.01***	0.00		0.01		0.00	0.01
	20	119.0	95.40	0.00	0.00	0.00	0.01	***0.01***	0.00		0.01		0.00	0.01
	21	119.2	95.35	0.01	0.01	0.04	0.09		0.05		0.13		0.04	0.11
	22	119.4	95.45	0.00	0.01	0.03	0.08		0.05		0.12		0.04	0.10
	23	119.5	95.30	0.01	0.01	0.04	0.10		0.05		0.13		0.04	0.11
	24	119.6	95.45	0.00	0.01	0.03	0.08		0.05		0.12		0.04	0.10
	25	119.8	95.45	0.00	0.01	0.03	0.08	***0.14***	0.05		0.12		0.04	0.10
	26	120.0	95.45	0.01	0.02	0.06	0.15	***0.25***	0.08		0.22		0.07	0.18
	27	120.2	95.45	0.01	0.02	0.08	0.19	***0.32***	0.11	*	0.28		0.09	0.23
	28	120.4	95.50	0.01	0.02	0.08	0.18	***0.33***	0.11	*	0.29		0.10	0.24
	29	120.6	95.55	0.02	0.04	0.14	0.34	***0.63***	0.21	*	0.55		0.19	0.47
	30	120.7	95.42	0.02	0.05	0.17	0.42	***0.76***	0.23	*	0.66		0.20	0.56
	31	120.8	95.50	0.02	0.05	0.17	0.44	***0.82***	0.26	*	0.71		0.23	0.61
	32	121.0	95.55	0.02	0.06	0.18	0.48	***0.91***	0.28	*	0.79		0.25	0.67
	33	121.2	95.55	0.02	0.07	0.20	0.55	***1.03***	0.31	*	0.89		0.27	0.76
	34	121.4	95.55	0.03	0.05	0.22	0.43	***0.92***	0.35	*	0.80		0.31	0.70
	35	121.6	95.65	0.02	0.05	0.18	0.46	***0.99***	0.31	*	0.86		0.28	0.75
	36	121.8	95.65	0.02	0.02	0.19	0.26	***0.68***	0.33	*	0.59		0.31	0.53
	37	122.0	95.75	0.01	0.02	0.10	0.21	***0.67***	0.23	*	0.58		0.22	0.53
	38	122.2	95.80	0.01		0.09			0.23	*			0.22	
*	39	125.2	95.37	0.03		0.24			0.32	*			0.28	
	40	128.2	97.48											

		WSE (ft)		95.67		96.05		96.49					96.67	
		Disch (cfs)		0.13		1.27		5.71					8.90	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	41	131.2	97.66											
	42	134.2	97.53											
	43	137.2	97.68											
	44	140.2	97.98											
	45	143.2	98.02											
	46	144.8	98.24											
	47	144.8	100.28											
	Total								15	*	0	*		

<u>Note</u>:
An * means the modeled velocity exceeds the measured velocity by 0.2 ft/sec or 20%.

Table A.3-41. Summary of calibration details for original and revised input decks, Grant Creek, Transect 330, tertiary channel, high flows.

		WSE (ft)		96.45			96.80		97.34	
		Disch (cfs)			1.6		97		97.34	
Rv	Pt	Sta	Elev	Meas	1 Vel	Depth	1 Vel	Depth	1 Vel	Depth
	1	107.0	97.31						0.03	0.02
	2	109.2	96.17				0.16	0.08	0.23	0.13
	3	112.2	95.98				0.22	0.11	0.25	0.14
	4	112.6	96.45				0.27	0.14	0.27	0.15
	5	112.8	95.85	***0.66***	0.57	0.26	0.53	0.27	0.38	0.21
	6	113.0	95.75	***0.40***	0.35	0.29	0.31	0.29	0.22	0.22
	7	113.2	96.05	***0.24***	0.21	0.20	0.22	0.23	0.16	0.19
	8	113.4	96.05	***0.24***	0.21	0.20	0.22	0.23	0.16	0.19
	9	113.6	96.05	***0.24***	0.21	0.20	0.22	0.23	0.16	0.19
	10	113.7	96.45				0.00	0.14	0.00	0.15
	11	115.2	96.97						0.00	0.08
	12	117.4	96.64				0.00	0.08	0.00	0.13
	13	117.7	96.45				0.00	0.14	0.00	0.15
	14	117.8	95.65		0.01	0.32	0.01	0.30	0.01	0.23
	15	118.0	95.65	***0.01***	0.01	0.32	0.01	0.30	0.01	0.23
	16	118.2	95.65	***0.01***	0.01	0.32	0.01	0.30	0.01	0.23
	17	118.4	95.55	***0.01***	0.01	0.35	0.01	0.32	0.00	0.24
	18	118.6	95.55	***0.01***	0.01	0.35	0.01	0.32	0.00	0.24
	19	118.8	95.45	***0.01***	0.01	0.37	0.01	0.34	0.00	0.25
	20	119.0	95.40	***0.01***	0.01	0.38	0.01	0.35	0.00	0.25
	21	119.2	95.35		0.13	0.40	0.11	0.36	0.07	0.26
	22	119.4	95.45		0.12	0.37	0.10	0.34	0.07	0.25
	23	119.5	95.30		0.13	0.41	0.11	0.36	0.07	0.26
	24	119.6	95.45		0.12	0.37	0.10	0.34	0.07	0.25
	25	119.8	95.45	***0.14***	0.12	0.37	0.10	0.34	0.07	0.25
	26	120.0	95.45	***0.25***	0.22	0.37	0.18	0.34	0.12	0.25
	27	120.2	95.45	***0.32***	0.28	0.37	0.23	0.34	0.15	0.25
	28	120.4	95.50	***0.33***	0.29	0.36	0.24	0.33	0.16	0.24
	29	120.6	95.55	***0.63***	0.55	0.35	0.47	0.32	0.31	0.24
	30	120.8	95.50	***0.76***	0.66	0.36	0.56	0.33	0.37	0.24
	31	121.0	95.55	***0.82***	0.71	0.35	0.61	0.32	0.41	0.24
	32	121.2	95.55	***0.91***	0.79	0.35	0.67	0.32	0.45	0.24
	33	121.4	95.55	***1.03***	0.89	0.35	0.76	0.32	0.51	0.24
	34	121.6	95.65	***0.92***	0.80	0.32	0.70	0.30	0.47	0.23
	35	121.8	95.65	***0.99***	0.86	0.32	0.75	0.30	0.51	0.23
	36	122.0	95.75	***0.68***	0.59	0.29	0.53	0.29	0.37	0.22
	37	122.2	95.80	***0.67***	0.58	0.28	0.53	0.28	0.37	0.21
	38	122.1	96.79						0.14	0.08
	39	122.2	95.33							
	40	125.2	95.37							

WSE (ft)				96.45			96.80		97.34	
Disch (cfs)				1.6			97		97.34	
Rv	**Pt**	**Sta**	**Elev**	**Meas**	**1 Vel**	**Depth**	**1 Vel**	**Depth**	**1 Vel**	**Depth**
	41	128.2	97.48							
	42	131.2	97.66							
	43	134.2	97.53							
	44	137.2	97.68							
	45	140.2	97.98							
	46	143.2	98.02							
	47	144.8	98.24							
	48	144.8	100.28							

Table A.3-42. Summary of calibration details for original and revised input decks, Grant Creek, Transect 230, main channel.

WSE (ft)				96.44		97.04		97.94					98.57	
Disch (cfs)				**1.5**		**15.06**		**59.41**					**105**	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	1	7.0	99.17											
	2	1.7	98.55										0.00	0.01
	3	2.7	98.49										0.00	0.02
	4	4.2	98.13										0.00	0.06
	5	5.2	98.00										0.01	0.07
	6	6.2	97.88						0.00		0.02		0.01	0.08
	7	7.2	97.72						0.00		0.04		0.01	0.10
	8	8.2	97.63						0.00		0.05		0.01	0.10
	9	9.2	97.52						0.00		0.06		0.01	0.11
	10	10.2	97.55						0.00		0.05		0.01	0.11
	11	11.2	97.36						0.01		0.07		0.01	0.12
	12	12.2	97.32						0.01		0.07		0.01	0.12
	13	13.2	97.28						0.01		0.08		0.01	0.13
	14	14.2	97.35						0.01		0.07		0.01	0.12
	15	15.2	97.21						0.01		0.08		0.01	0.13
	16	16.2	97.16						0.01		0.08		0.01	0.13
	17	17.2	97.05						0.01		0.09		0.01	0.14
	18	18.2	97.17						0.01		0.08		0.01	0.13
	19	19.7	97.26						0.01		0.08		0.01	0.13
	20	20.7	97.28						0.01		0.08		0.01	0.13
	21	26.2	98.50										0.00	0.02
	22	26.2	97.97										0.01	0.08
	23	27.7	97.80						0.00		0.03		0.01	0.09
	24	29.4	97.68						0.00		0.04		0.01	0.10
*	25	30.1	96.47			0.00	0.05	***0.01***	0.01		0.13		0.01	0.17
*	26	30.3	96.43	0.00	0.00	0.00	0.06	***0.01***	0.01		0.13		0.01	0.18
*	27	30.5	96.25	0.00	0.01	0.00	0.07	***0.01***	0.01		0.14		0.01	0.19
*	28	31.2	96.22	0.00	0.01	0.00	0.07	***0.01***	0.01		0.14		0.01	0.19
*	29	32.2	96.02	0.00	0.02	0.00	0.08	***0.01***	0.01		0.15		0.01	0.20
*	30	33.4	95.95	0.00	0.02	0.01	0.08	***0.01***	0.01		0.16		0.01	0.20
*	31	34.3	95.90	0.00	0.02	0.01	0.09	***0.01***	0.01		0.16		0.01	0.20
*	32	35.5	96.10	0.00	0.02	0.00	0.08	***0.01***	0.01		0.15		0.01	0.19
	33	36.9	96.52			0.02	0.02	***0.05***	0.05		0.05		0.07	0.06
	34	38.5	96.81			0.01	0.01	***0.02***	0.02		0.02		0.03	0.03
	35	39.1	96.56			0.02	0.02	***0.06***	0.06		0.06		0.08	0.08
	36	40.7	96.48			0.02	0.02	***0.05***	0.05		0.05		0.07	0.06
	37	42.2	96.54			0.08	0.07	***0.20***	0.19		0.19		0.27	0.25
	38	44.2	96.36	0.03	0.03	0.25	0.24	***0.57***	0.56		0.53		0.75	0.71
	39	46.2	96.39	0.05	0.05	0.57	0.56	***1.35***	1.32		1.26		1.79	1.68
	40	48.3	96.34	0.12	0.11	0.95	0.92	***2.18***	2.13		2.03		2.87	2.70

		WSE (ft)		**96.44**		**97.04**				**97.94**			**98.57**	
		Disch (cfs)		**1.5**		**15.06**				**59.41**			**105**	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	41	48.7	96.29	0.16	0.16	1.07	1.04	***2.40***	2.34		2.24		3.14	2.96
	42	49.2	96.24	0.20	0.19	1.12	1.09	***2.45***	2.39		2.29		3.19	3.00
	43	49.7	96.26	0.18	0.18	1.09	1.06	***2.41***	2.35		2.25		3.15	2.96
	44	50.2	96.09	0.29	0.29	1.29	1.25	***2.65***	2.58		2.47		3.40	3.20
	45	50.7	96.14	0.29	0.28	1.36	1.32	***2.85***	2.78		2.66		3.67	3.46
	46	51.2	96.13	0.30	0.29	1.37	1.33	***2.85***	2.78		2.66		3.67	3.45
	47	51.7	96.09	0.30	0.29	1.32	1.28	***2.71***	2.64		2.53		3.48	3.27
	48	52.2	95.89	0.40	0.39	1.49	1.45	***2.89***	2.82		2.70		3.65	3.43
	49	52.7	95.94	0.38	0.37	1.47	1.43	***2.88***	2.81		2.69		3.65	3.43
	50	53.2	96.08	0.36	0.35	1.56	1.52	***3.20***	3.12		2.99		4.10	3.86
	51	53.7	95.94	0.41	0.40	1.56	1.52	***3.06***	2.98		2.86		3.88	3.65
	52	54.2	95.94	0.38	0.37	1.46	1.42	***2.86***	2.79		2.67		3.62	3.41
	53	54.7	95.89	0.36	0.35	1.33	1.30	***2.58***	2.52		2.41		3.26	3.06
	54	55.2	95.88	0.35	0.34	1.28	1.24	***2.47***	2.41		2.30		3.12	2.93
	55	55.7	95.79	0.32	0.31	1.12	1.09	***2.11***	2.06		1.97		2.64	2.49
	56	56.2	95.57	0.34	0.34	1.11	1.07	***2.00***	1.95		1.87		2.47	2.32
	57	56.7	95.79	0.28	0.27	0.98	0.96	***1.86***	1.81		1.74		2.33	2.19
	58	57.2	95.69	0.31	0.30	1.03	1.00	***1.91***	1.86		1.78		2.38	2.24
	59	57.9	95.75	0.27	0.27	0.94	0.91	***1.76***	1.72		1.64		2.20	2.07
	60	58.2	96.34	0.05	0.05	0.44	0.42	***1.00***	0.97		0.93		1.32	1.24
	61	59.2	96.45			0.11	0.11	***0.27***	0.26		0.25		0.36	0.34
*	62	60.3	97.42					***0.01***	0.01		0.06		0.02	0.12
*	63	60.7	97.14					***0.01***	0.01		0.09		0.02	0.13
*	64	61.7	96.99			0.00	0.01	***0.01***	0.01		0.10		0.01	0.14
	65	63.2	96.89			0.16	0.16	***0.79***	0.77		0.74		1.14	1.07
*	66	64.2	97.19					***0.01***	0.01		0.08		0.02	0.13
*	67	65.2	97.34					***0.01***	0.01		0.07		0.02	0.12
	68	66.0	97.89						0.00		0.01		0.01	0.08
	Total								0	*	0	*		

<u>Note</u>:
An * means the modeled velocity exceeds the measured velocity by 0.2 ft/sec or 20%.

Table A.3-43. Summary of calibration details for original and revised input decks, Grant Creek, Transect 230, main channel, high flows.

		WSE (ft)		97.94			98.57		99.07	
		Disch (cfs)		59.41			105		150.64	
Rv	Pt	Sta	Elev	Meas	1 Vel	Depth	1 Vel	Depth	1 Vel	Depth
	1	7.00	99.17							
	2	1.70	98.55				0.01	0.05	0.07	0.40
	3	2.70	98.49				0.02	0.12	0.08	0.43
	4	4.20	98.13				0.06	0.38	0.11	0.60
	5	5.20	98.00				0.07	0.45	0.11	0.65
	6	6.20	97.88		0.02	0.11	0.08	0.51	0.12	0.70
	7	7.20	97.72		0.04	0.26	0.10	0.58	0.13	0.76
	8	8.20	97.63		0.05	0.32	0.10	0.63	0.14	0.79
	9	9.20	97.52		0.06	0.39	0.11	0.67	0.15	0.83
	10	10.20	97.55		0.05	0.37	0.11	0.66	0.14	0.82
	11	11.20	97.36		0.07	0.48	0.12	0.74	0.16	0.89
	12	12.20	97.32		0.07	0.51	0.12	0.76	0.16	0.90
	13	13.20	97.28		0.08	0.53	0.13	0.77	0.16	0.92
	14	14.20	97.35		0.07	0.49	0.12	0.74	0.16	0.89
	15	15.20	97.21		0.08	0.56	0.13	0.80	0.17	0.94
	16	16.20	97.16		0.08	0.59	0.13	0.82	0.17	0.96
	17	17.20	97.05		0.09	0.64	0.14	0.86	0.18	1.00
	18	18.20	97.17		0.08	0.59	0.13	0.82	0.17	0.96
	19	19.70	97.26		0.08	0.54	0.13	0.78	0.16	0.92
	20	20.70	97.28		0.08	0.53	0.13	0.77	0.16	0.92
	21	26.20	98.50				0.02	0.11	0.08	0.43
	22	26.20	97.97				0.08	0.46	0.12	0.66
	23	27.70	97.80		0.03	0.19	0.09	0.55	0.13	0.73
	24	29.40	97.68		0.04	0.28	0.10	0.60	0.14	0.78
	25	30.10	96.47	0.01	0.13	0.90	0.17	1.07	0.21	1.18
	26	30.30	96.43	0.01	0.13	0.92	0.18	1.08	0.21	1.19
	27	30.50	96.25	0.01	0.14	0.99	0.19	1.14	0.22	1.24
	28	31.20	96.22	0.01	0.14	1.00	0.19	1.15	0.22	1.25
	29	32.20	96.02	0.01	0.15	1.08	0.20	1.22	0.23	1.31
	30	33.40	95.95	0.01	0.16	1.10	0.20	1.24	0.23	1.33
	31	34.30	95.90	0.01	0.16	1.12	0.20	1.26	0.24	1.35
	32	35.50	96.10	0.01	0.15	1.05	0.19	1.19	0.23	1.29
	33	36.90	96.52	0.05	0.05	0.88	0.06	1.05	0.08	1.16
	34	38.50	96.81	0.02	0.02	0.76	0.03	0.95	0.03	1.07
	35	39.10	96.56	0.06	0.06	0.86	0.08	1.04	0.09	1.15
	36	40.70	96.48	0.05	0.05	0.90	0.06	1.07	0.08	1.18
	37	42.20	96.54	0.20	0.19	0.87	0.25	1.05	0.30	1.16
	38	44.20	96.36	0.57	0.53	0.95	0.71	1.11	0.84	1.21
	39	46.20	96.39	1.35	1.26	0.93	1.68	1.10	2.00	1.20
	40	48.30	96.34	2.18	2.03	0.95	2.70	1.11	3.20	1.22

WSE (ft)				97.94			98.57		99.07	
Disch (cfs)				59.41			105		150.64	
Rv	**Pt**	**Sta**	**Elev**	**Meas**	**1 Vel**	**Depth**	**1 Vel**	**Depth**	**1 Vel**	**Depth**
	41	48.70	96.29	2.40	2.24	0.97	2.96	1.13	3.49	1.23
	42	49.20	96.24	2.45	2.29	0.99	3.00	1.15	3.53	1.25
	43	49.70	96.26	2.41	2.25	0.99	2.96	1.14	3.49	1.24
	44	50.20	96.09	2.65	2.47	1.05	3.20	1.20	3.74	1.29
	45	50.70	96.14	2.85	2.66	1.03	3.46	1.18	4.05	1.28
	46	51.20	96.13	2.85	2.66	1.04	3.45	1.18	4.04	1.28
	47	51.70	96.09	2.71	2.53	1.05	3.27	1.20	3.82	1.29
	48	52.20	95.89	2.89	2.70	1.13	3.43	1.26	3.98	1.35
	49	52.70	95.94	2.88	2.69	1.11	3.43	1.24	3.99	1.33
	50	53.20	96.08	3.20	2.99	1.05	3.86	1.20	4.51	1.29
	51	53.70	95.94	3.06	2.86	1.11	3.65	1.24	4.24	1.33
	52	54.20	95.94	2.86	2.67	1.11	3.41	1.24	3.96	1.33
	53	54.70	95.89	2.58	2.41	1.13	3.06	1.26	3.55	1.35
	54	55.20	95.88	2.47	2.30	1.13	2.93	1.26	3.40	1.35
	55	55.70	95.79	2.11	1.97	1.16	2.49	1.29	2.87	1.38
	56	56.20	95.57	2.00	1.87	1.24	2.32	1.36	2.66	1.44
	57	56.70	95.79	1.86	1.74	1.16	2.19	1.29	2.53	1.38
	58	57.20	95.69	1.91	1.78	1.20	2.24	1.32	2.57	1.40
	59	57.90	95.75	1.76	1.64	1.18	2.07	1.30	2.39	1.39
	60	58.20	96.34	1.00	0.93	0.95	1.24	1.11	1.47	1.22
	61	59.20	96.45	0.27	0.25	0.91	0.34	1.08	0.40	1.18
	62	60.30	97.42	0.01	0.06	0.45	0.12	0.72	0.15	0.87
	63	60.70	97.14	0.01	0.09	0.60	0.13	0.83	0.17	0.97
	64	61.70	96.99	0.01	0.10	0.67	0.14	0.88	0.18	1.02
	65	63.20	96.89	0.79	0.74	0.72	1.07	0.92	1.32	1.05
	66	64.20	97.19	0.01	0.08	0.58	0.13	0.81	0.17	0.95
	67	65.20	97.34	0.01	0.07	0.50	0.12	0.75	0.16	0.90
	68	66.00	97.89		0.01	0.10	0.08	0.50	0.12	0.69

Table A.3-44. Summary of calibration details for original and revised input decks, Grant Creek, Transect 400.

		WSE (ft)		**92.95**		**93.64**		**93.915**					**94.49**	
		Disch (cfs)		**10**		**100**		**200**					**700**	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	1	0.0	97.67											
	2	0.0	97.29											
	3	1.0	97.09											
	4	2.0	96.68											
	5	3.0	96.05											
	6	3.7	93.97										0.03	0.33
*	7	4.2	93.70						0.01				0.05	0.33
*	8	5.2	93.28			0.01			0.02				0.06	0.34
*	9	6.5	92.93	0.00		0.02			0.03				0.07	0.34
	10	7.1	93.92										0.04	0.36
	11	8.0	93.87						0.00		0.03		0.04	0.38
	12	9.0	93.82						0.01		0.06		0.04	0.40
*	13	10.0	93.47			0.01	0.07	***0.02***	0.02		0.18		0.05	0.53
	14	11.0	93.12			0.17	0.17	***0.33***	0.30		0.31		0.73	0.74
	15	12.0	93.32			0.16	0.16	***0.34***	0.31		0.31		0.82	0.83
	16	13.0	93.52			0.21	0.20	***0.64***	0.59		0.59		1.80	1.81
	17	14.0	93.52			0.22	0.21	***0.67***	0.61		0.61		1.88	1.89
	18	15.0	93.57			0.15	0.14	***0.59***	0.54		0.54		1.75	1.76
	19	16.0	93.67					***0.42***	0.38		0.38		1.44	1.46
	20	17.0	93.67					***0.21***	0.19		0.19		0.72	0.73
	21	18.0	93.91						0.21	*			6.20	6.35
	22	19.0	93.91						0.21	*			6.20	6.35
	23	20.0	93.90						0.36	*	0.12		6.28	6.43
	24	21.0	93.82					***1.23***	1.11		1.05		6.83	7.01
	25	22.0	93.77					***1.01***	0.92		0.89		4.48	4.56
	26	23.0	93.82					***0.23***	0.21		0.20		1.28	1.31
	27	24.0	93.82					***0.21***	0.19		0.18		1.17	1.20
	28	25.0	93.82					***1.69***	1.53		1.45		9.38	9.64
*	29	26.0	93.91					***0.02***	0.02		0.01		0.47	0.26
	30	27.1	93.52			0.53	0.51	***1.64***	1.50		1.50		4.60	4.64
	31	28.0	93.42			0.92	0.91	***2.23***	2.04		2.05		5.75	5.79
	32	29.0	93.52			0.90	0.86	***2.76***	2.53		2.53		7.75	7.80
	33	30.0	93.72					***2.32***	2.12		2.08		8.88	8.99
	34	31.5	93.52			1.14	1.10	***3.52***	3.22		3.23		9.88	9.95
	35	32.7	93.42			1.08	1.07	***2.63***	2.41		2.42		6.79	6.83
	36	34.0	93.27			1.31	1.31	***2.71***	2.48		2.50		6.40	6.45
	37	35.5	93.22			1.97	1.97	***3.93***	3.60		3.63		9.07	9.14
	38	37.0	92.97			1.98	2.00	***3.57***	3.27		3.31		7.57	7.63
	39	38.8	92.92	0.09	0.08	1.95	1.97	***3.47***	3.18		3.22		7.27	7.33
	40	40.5	93.22			1.67	1.67	***3.33***	3.05		3.08		7.69	7.74

WSE (ft)				**92.95**		**93.64**		**93.915**					**94.49**	
Disch (cfs)				**10**		**100**		**200**					**700**	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	41	42.0	93.22			1.92	1.92	***3.83***	3.51		3.54		8.84	8.91
	42	43.5	92.92	0.08	0.08	1.80	1.82	***3.20***	2.93		2.97		6.70	6.76
	43	45.0	92.82	0.23	0.23	2.12	2.14	***3.68***	3.37		3.42		7.54	7.60
	44	48.0	92.92	0.12	0.11	2.64	2.66	***4.69***	4.30		4.35		9.82	9.90
	45	50.0	92.82	0.33	0.32	2.98	3.01	***5.18***	4.75		4.81		10.61	10.70
	46	52.0	92.32	0.36	0.36	1.56	1.58	***2.54***	2.33		2.36		4.82	4.87
	47	54.0	92.62	0.46	0.46	2.60	2.63	***4.37***	4.01		4.06		8.63	8.70
	48	56.0	92.42	0.77	0.78	3.59	3.63	***5.90***	5.41		5.49		11.33	11.43
	49	58.0	92.12	0.90	0.91	3.61	3.66	***5.79***	5.31		5.39		10.77	10.88
	50	60.0	92.02	0.93	0.94	3.60	3.65	***5.74***	5.27		5.34		10.59	10.69
	51	64.0	91.52	0.61	0.61	2.11	2.13	***3.28***	3.01		3.06		5.85	5.91
	52	67.0	91.92	0.46	0.46	1.71	1.73	***2.71***	2.49		2.52		4.96	5.01
	53	70.0	93.02			1.32	1.33	***2.41***	2.21		2.23		5.18	5.22
	54	72.5	93.67					***2.19***	2.00		1.98		7.53	7.60
	55	75.1	93.62			0.00	0.00	***0.01***	0.01		0.01		0.03	0.03
	56	77.4	93.32			0.95	0.95	***2.04***	1.87		1.88		4.94	4.98
	57	79.0	93.82					***0.82***	0.74		0.70		4.55	4.68
	58	81.0	93.37			0.37	0.37	***0.84***	0.77		0.77		2.10	2.11
	59	83.5	93.52			0.15	0.14	***0.46***	0.42		0.42		1.29	1.30
	60	85.3	93.72					***0.06***	0.05		0.05		0.23	0.23
*	61	86.6	93.67					***0.01***	0.01		0.15		0.03	0.56
*	62	87.8	93.82					***0.01***	0.01		0.13		0.06	0.88
	63	88.1	93.92										0.05	0.79
	64	89.7	94.08										0.04	0.62
	65	90.1	94.25										0.03	0.43
	66	90.1	95.23											
	67	92.0	95.42											
	68	93.5	95.62											
	69	95.0	95.99											
	70	97.0	95.75											
	71	98.2	95.47											
	72	99.0	94.83											
	73	100.0	94.80											
	74	101.0	95.80											
	75	102.5	96.02											
	76	103.8	95.96											
	77	103.8	97.29											
	Total								3	*	0	*		

Note:
An * means the modeled velocity exceeds the measured velocity by 0.2 ft/sec or 20%.

Table A.3-45. Summary of calibration details for original and revised input decks, Grant Creek, Transect 400, high flows.

WSE (ft)				93.9			94.47		94.66	
Disch (cfs)				200			700		1000	
Rv	Pt	Sta	Elev	Meas	1 Vel	Depth	1 Vel	Depth	1 Vel	Depth
	1	0.0	97.67							
	2	0.0	97.29							
	3	1.0	97.09							
	4	2.0	96.68							
	5	3.0	96.05							
	6	3.7	93.97				0.33	2.96	0.49	4.28
	7	4.2	93.70				0.33	2.96	0.49	4.28
	8	5.2	93.28				0.34	3.00	0.49	4.32
	9	6.5	92.93				0.34	3.04	0.50	4.37
	10	7.1	93.92				0.36	3.15	0.51	4.49
	11	8.0	93.87		0.03	0.29	0.38	3.34	0.53	4.69
	12	9.0	93.82		0.06	0.53	0.40	3.52	0.56	4.89
	13	10.0	93.47	***0.02***	0.18	1.60	0.53	4.69	0.70	6.17
	14	11.0	93.12	***0.33***	0.31	2.38	0.74	5.74	0.95	7.34
	15	12.0	93.32	***0.34***	0.31	1.95	0.83	5.15	1.08	6.68
	16	13.0	93.52	***0.64***	0.59	1.47	1.81	4.54	2.40	6.00
	17	14.0	93.52	***0.67***	0.61	1.47	1.89	4.54	2.51	6.00
	18	15.0	93.57	***0.59***	0.54	1.34	1.76	4.38	2.35	5.82
	19	16.0	93.67	***0.42***	0.38	1.06	1.46	4.04	1.97	5.46
	20	17.0	93.67	***0.21***	0.19	1.06	0.73	4.04	0.99	5.46
	21	18.0	93.91				6.35	3.19	9.05	4.53
	22	19.0	93.91				6.35	3.19	9.05	4.53
	23	20.0	93.90		0.12	0.06	6.43	3.23	9.13	4.57
	24	21.0	93.82	***1.23***	1.05	0.53	7.01	3.52	9.76	4.89
	25	22.0	93.77	***1.01***	0.89	0.73	4.56	3.70	6.28	5.08
	26	23.0	93.82	***0.23***	0.20	0.53	1.31	3.52	1.83	4.89
	27	24.0	93.82	***0.21***	0.18	0.53	1.20	3.52	1.67	4.89
	28	25.0	93.82	***1.69***	1.45	0.53	9.64	3.52	13.42	4.89
	29	26.0	93.91	***0.02***	0.01	0.16	0.26	3.26	0.37	4.61
	30	27.1	93.52	***1.64***	1.50	1.47	4.64	4.54	6.15	6.00
	31	28.0	93.42	***2.23***	2.05	1.72	5.79	4.85	7.61	6.35
	32	29.0	93.52	***2.76***	2.53	1.47	7.80	4.54	10.35	6.00
	33	30.0	93.72	***2.32***	2.08	0.90	8.99	3.87	12.27	5.27
	34	31.5	93.52	***3.52***	3.23	1.47	9.95	4.54	13.20	6.00
	35	32.7	93.42	***2.63***	2.42	1.72	6.83	4.85	8.97	6.35
	36	34.0	93.27	***2.71***	2.50	2.06	6.45	5.30	8.36	6.85
	37	35.5	93.22	***3.93***	3.63	2.17	9.14	5.45	11.80	7.01
	38	37.0	92.97	***3.57***	3.31	2.68	7.63	6.16	9.72	7.81
	39	38.8	92.92	***3.47***	3.22	2.77	7.33	6.29	9.30	7.96
	40	40.5	93.22	***3.33***	3.08	2.17	7.74	5.45	10.00	7.01

WSE (ft)				93.9			94.47		94.66	
Disch (cfs)				200			700		1000	
Rv	Pt	Sta	Elev	Meas	1 Vel	Depth	1 Vel	Depth	1 Vel	Depth
	41	42.0	93.22	***3.83***	3.54	2.17	8.91	5.45	11.50	7.01
	42	43.5	92.92	***3.20***	2.97	2.77	6.76	6.29	8.58	7.96
	43	45.0	92.82	***3.68***	3.42	2.96	7.60	6.56	9.61	8.27
	44	48.0	92.92	***4.69***	4.35	2.77	9.90	6.29	12.57	7.96
	45	50.0	92.82	***5.18***	4.81	2.96	10.70	6.56	13.52	8.27
	46	52.0	92.32	***2.54***	2.36	3.81	4.87	7.83	6.05	9.71
	47	54.0	92.62	***4.37***	4.06	3.31	8.70	7.08	10.92	8.86
	48	56.0	92.42	***5.90***	5.49	3.65	11.43	7.59	14.26	9.43
	49	58.0	92.12	***5.79***	5.39	4.13	10.88	8.31	13.47	10.26
	50	60.0	92.02	***5.74***	5.34	4.28	10.69	8.55	13.22	10.53
	51	64.0	91.52	***3.28***	3.06	5.01	5.91	9.68	7.25	11.83
	52	67.0	91.92	***2.71***	2.52	4.43	5.01	8.78	6.18	10.80
	53	70.0	93.02	***2.41***	2.23	2.58	5.22	6.02	6.67	7.65
	54	72.5	93.67	***2.19***	1.98	1.06	7.60	4.04	10.29	5.46
	55	75.1	93.62	***0.01***	0.01	1.20	0.03	4.21	0.04	5.64
	56	77.4	93.32	***2.04***	1.88	1.95	4.98	5.15	6.48	6.68
	57	79.0	93.82	***0.82***	0.70	0.53	4.68	3.52	6.51	4.89
	58	81.0	93.37	***0.84***	0.77	1.84	2.11	5.00	2.76	6.52
	59	83.5	93.52	***0.46***	0.42	1.47	1.30	4.54	1.72	6.00
	60	85.3	93.72	***0.06***	0.05	0.90	0.23	3.87	0.32	5.27
	61	86.6	93.67	***0.01***	0.15	1.06	0.56	4.04	0.76	5.46
	62	87.8	93.82	***0.01***	0.13	0.53	0.88	3.52	1.22	4.89
	63	88.1	93.92				0.79	3.15	1.12	4.49
	64	89.7	94.08				0.62	2.51	0.95	3.81
	65	90.1	94.25				0.43	1.72	0.76	3.02
	66	90.1	95.23							
	67	92.0	95.42							
	68	93.5	95.62							
	69	95.0	95.99							
	70	97.0	95.75							
	71	98.2	95.47							
	72	99.0	94.83							
	73	100.0	94.80							
	74	101.0	95.80							
	75	102.5	96.02							
	76	103.8	95.96							
	77	103.8	97.29							

Table A.3-46. Summary of calibration details for original and revised input decks, Grant Creek, Transect 410.

		WSE (ft)		93.67		94.71		95.21					96.46	
		Disch (cfs)		10		100		200					700	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	1	0.0	98.93											
	2	0.0	98.58											
	3	1.0	97.64											
	4	2.0	96.63											
	5	3.0	95.99										0.55	0.53
	6	3.5	95.24										1.03	1.05
	7	4.3	95.43										0.92	0.93
	8	4.6	94.89					***0.33***	0.36		0.36		1.22	1.25
	9	5.7	95.04					***0.52***	0.61		0.58		2.93	3.00
*	10	6.5	94.20			0.53			0.85	*			1.69	1.10
*	11	7.0	94.71						0.53	*			1.43	1.13
*	12	7.7	95.14						0.14		0.16		1.18	1.22
	13	9.3	95.04					***0.22***	0.26		0.24		1.24	1.27
*	14	9.9	94.92						0.05				0.18	0.15
*	15	11.0	94.53			0.04			0.09				0.21	0.15
	16	12.0	95.14						0.02		0.02		0.16	0.16
	17	12.5	95.24										0.15	0.16
*	18	13.5	94.82						0.06				0.19	0.15
*	19	14.1	94.46			0.04			0.10				0.21	0.15
*	20	15.0	94.55			0.03			0.09				0.21	0.15
*	21	16.5	94.51			0.04			0.09				0.21	0.15
*	22	18.0	94.64			0.02			0.08				0.20	0.16
*	23	19.5	93.63	0.01		0.12			0.16				0.27	0.16
*	24	21.0	94.78						0.07				0.19	0.10
*	25	22.5	94.73						0.07				0.19	0.11
*	26	24.0	94.96						0.05				0.18	0.08
*	27	25.5	95.19						0.01				0.16	0.16
	28	26.8	95.27										0.15	0.15
	29	29.0	95.35										0.14	0.15
	30	32.0	95.26										0.15	0.15
	31	34.0	95.26										0.15	0.15
*	32	36.0	94.48			0.04			0.09				0.21	0.13
	33	38.0	95.32										0.15	0.15
	34	40.0	95.52										0.13	0.13
	35	42.0	95.58										0.12	0.12
	36	45.0	95.47										0.13	0.13
	37	47.0	95.42										0.14	0.14
	38	47.4	95.24										0.15	0.16
	39	48.0	94.84						0.06		0.06		0.18	0.19
	40	48.8	95.04					***0.03***	0.04		0.03		0.17	0.17

		WSE (ft)		93.67		94.71		95.21					96.46	
		Disch (cfs)		10		100		200					700	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	41	50.0	94.84					***0.07***	0.08		0.08		0.24	0.24
	42	52.0	94.74					***0.13***	0.14		0.14		0.39	0.40
	43	54.5	94.84					***0.39***	0.43		0.42		1.33	1.36
	44	55.3	94.64			0.52	0.45	***2.00***	2.14		2.16		5.39	5.53
	45	56.6	94.34			1.54	1.54	***2.63***	2.78		2.83		5.84	6.01
	46	57.6	94.74					***4.35***	4.70		4.71		12.95	13.28
	47	59.0	94.34			1.94	1.94	***3.30***	3.49		3.56		7.33	7.54
	48	60.0	93.64	0.13	0.13	1.92	1.96	***2.41***	2.52		2.59		4.32	4.46
	49	62.0	94.04			1.72	1.74	***2.41***	2.53		2.59		4.77	4.91
	50	63.5	93.94			2.58	2.62	***3.49***	3.66		3.75		6.70	6.91
	51	64.5	94.04			0.35	0.35	***0.49***	0.51		0.53		0.97	1.00
	52	66.0	94.04			2.07	2.10	***2.91***	3.06		3.13		5.76	5.93
	53	66.7	93.94			1.59	1.61	***2.15***	2.25		2.31		4.13	4.26
	54	69.0	93.74			1.96	1.99	***2.51***	2.63		2.70		4.59	4.74
	55	71.0	94.24			2.32	2.33	***3.63***	3.83		3.91		7.71	7.94
	56	72.5	94.14			3.67	3.71	***5.40***	5.68		5.81		11.04	11.37
	57	74.0	94.24			4.18	4.21	***6.54***	6.89		7.04		13.89	14.30
	58	77.0	93.44	0.73	0.73	2.92	2.97	***3.54***	3.69		3.80		6.12	6.32
	59	79.0	93.34	0.93	0.93	3.04	3.10	***3.64***	3.80		3.91		6.19	6.40
	60	81.5	93.24	1.18	1.18	3.39	3.46	***4.01***	4.18		4.31		6.72	6.95
	61	83.5	95.24										4.28	4.36
	62	85.0	93.14	1.65	1.66	4.32	4.41	***5.06***	5.27		5.43		8.37	8.66
	63	86.0	93.04	0.61	0.62	1.49	1.52	***1.73***	1.80		1.86		2.83	2.93
	64	89.0	92.94	0.97	0.97	2.21	2.25	***2.54***	2.64		2.73		4.11	4.25
	65	91.0	92.84	1.49	1.49	3.23	3.30	***3.69***	3.84		3.96		5.90	6.11
	66	94.6	92.74	0.87	0.87	1.81	1.85	***2.05***	2.13		2.20		3.25	3.36
	67	95.0	92.74	0.96	0.97	2.01	2.05	***2.28***	2.37		2.45		3.61	3.74
	68	96.4	94.64			0.07	0.06	***0.27***	0.29		0.29		0.73	0.75
	69	97.9	94.69			0.01	0.00	***0.10***	0.11		0.11		0.28	0.29
*	70	99.3	94.88						0.08				0.26	0.22
	71	99.5	95.40										0.20	0.20
	72	99.5	96.15										0.09	0.08
	73	101.0	95.90										0.13	0.13
	74	102.5	96.41										0.03	0.01
	75	105.2	96.04										0.11	0.10
	76	107.7	96.15										0.09	0.08
	77	110.0	96.33										0.05	0.04
	78	111.9	96.06										0.10	0.10
	79	112.1	95.61										0.17	0.17
	80	113.6	95.45										0.19	0.20

		WSE (ft)		93.67		94.71		95.21					96.46	
		Disch (cfs)		10		100		200					700	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
*	81	115.2	95.20						0.01				0.22	0.22
*	82	116.5	94.77						0.10				0.27	0.22
*	83	117.8	94.64			0.03			0.11				0.29	0.21
*	84	119.0	94.69			0.01			0.11				0.28	0.20
	85	119.2	95.49										0.19	0.19
	86	122.5	95.85										0.14	0.14
	87	126.0	96.06										0.10	0.10
	88	129.0	96.60											
	89	133.0	96.94											
	90	135.0	97.70											
	91	136.2	97.71											
	92	136.2	98.74											
	Total								2	*		*		

Note:
An * means the modeled velocity exceeds the measured velocity by 0.2 ft/sec or 20%.

Table A.3-47. Summary of calibration details for original and revised input decks, Grant Creek, Transect 410, high flows.

WSE (ft)				95.19			96.42		96.87	
Disch (cfs)				200			700		1000	
Rv	**Pt**	**Sta**	**Elev**	**Meas**	**1 Vel**	**Depth**	**1 Vel**	**Depth**	**1 Vel**	**Depth**
	1	0.0	98.93							
	2	0.0	98.58							
	3	1.0	97.64							
	4	2.0	96.63						0.39	0.87
	5	3.0	95.99				0.53	1.29	0.93	2.08
	6	3.5	95.24				1.05	2.54	1.41	3.15
	7	4.3	95.43				0.93	2.26	1.30	2.90
	8	4.6	94.89	***0.33***	0.36	1.02	1.25	3.03	1.60	3.59
	9	5.7	95.04	***0.52***	0.58	0.64	3.00	2.82	3.90	3.40
	10	6.5	94.20				1.10	2.45	1.49	3.07
	11	7.0	94.71				1.13	2.53	1.52	3.14
	12	7.7	95.14		0.16	0.42	1.22	2.73	1.61	3.31
	13	9.3	95.04	***0.22***	0.24	0.64	1.27	2.82	1.65	3.40
	14	9.9	94.92				0.15	2.53	0.21	3.14
	15	11.0	94.53				0.15	2.51	0.21	3.12
	16	12.0	95.14		0.02	0.30	0.16	2.68	0.22	3.28
	17	12.5	95.24				0.16	2.54	0.21	3.15
	18	13.5	94.82				0.15	2.45	0.20	3.07
	19	14.1	94.46				0.15	2.45	0.20	3.07
	20	15.0	94.55				0.15	2.48	0.20	3.10
	21	16.5	94.51				0.15	2.53	0.21	3.14
	22	18.0	94.64				0.16	2.56	0.21	3.16
	23	19.5	93.63				0.16	2.54	0.21	3.15
	24	21.0	94.78				0.10	1.68	0.16	2.40
	25	22.5	94.73				0.11	1.77	0.16	2.48
	26	24.0	94.96				0.08	1.35	0.14	2.13
	27	25.5	95.19				0.16	2.54	0.21	3.15
	28	26.8	95.27				0.15	2.50	0.21	3.11
	29	29.0	95.35				0.15	2.38	0.20	3.00
	30	32.0	95.26				0.15	2.51	0.21	3.12
	31	34.0	95.26				0.15	2.51	0.21	3.12
	32	36.0	94.48				0.13	2.18	0.19	2.83
	33	38.0	95.32				0.15	2.42	0.20	3.04
	34	40.0	95.52				0.13	2.12	0.18	2.77
	35	42.0	95.58				0.12	2.02	0.18	2.69
	36	45.0	95.47				0.13	2.20	0.19	2.84
	37	47.0	95.42				0.14	2.27	0.19	2.91
	38	47.4	95.24				0.16	2.54	0.21	3.15
	39	48.0	94.84		0.06	1.13	0.19	3.09	0.24	3.65
	40	48.8	95.04	***0.03***	0.03	0.64	0.17	2.82	0.23	3.40

WSE (ft)				95.19			96.42		96.87	
Disch (cfs)				200			700		1000	
Rv	**Pt**	**Sta**	**Elev**	**Meas**	**1 Vel**	**Depth**	**1 Vel**	**Depth**	**1 Vel**	**Depth**
	41	50.0	94.84	***0.07***	0.08	1.13	0.24	3.09	0.31	3.65
	42	52.0	94.74	***0.13***	0.14	1.34	0.40	3.22	0.50	3.77
	43	54.5	94.84	***0.39***	0.42	1.13	1.36	3.09	1.73	3.65
	44	55.3	94.64	***2.00***	2.16	1.54	5.53	3.35	6.94	3.88
	45	56.6	94.34	***2.63***	2.83	2.06	6.01	3.72	7.39	4.23
	46	57.6	94.74	***4.35***	4.72	1.34	13.28	3.22	16.79	3.77
	47	59.0	94.34	***3.30***	3.56	2.06	7.54	3.72	9.27	4.23
	48	60.0	93.64	***2.41***	2.59	3.08	4.46	4.52	5.31	4.98
	49	62.0	94.04	***2.41***	2.59	2.52	4.91	4.07	5.95	4.56
	50	63.5	93.94	***3.49***	3.75	2.66	6.91	4.18	8.33	4.67
	51	64.5	94.04	***0.49***	0.53	2.52	1.00	4.07	1.21	4.56
	52	66.0	94.04	***2.91***	3.13	2.52	5.93	4.07	7.18	4.56
	53	66.7	93.94	***2.15***	2.31	2.66	4.26	4.18	5.13	4.67
	54	69.0	93.74	***2.51***	2.70	2.94	4.74	4.41	5.67	4.88
	55	71.0	94.24	***3.63***	3.91	2.22	7.94	3.84	9.70	4.34
	56	72.5	94.14	***5.40***	5.81	2.37	11.37	3.95	13.83	4.45
	57	74.0	94.24	***6.54***	7.04	2.22	14.30	3.84	17.48	4.34
	58	77.0	93.44	***3.54***	3.80	3.34	6.32	4.73	7.49	5.19
	59	79.0	93.34	***3.64***	3.91	3.47	6.40	4.84	7.56	5.29
	60	81.5	93.24	***4.01***	4.31	3.59	6.95	4.94	8.19	5.39
	61	83.5	95.24				4.36	2.54	5.84	3.15
	62	85.0	93.14	***5.06***	5.43	3.71	8.66	5.05	10.17	5.48
	63	86.0	93.04	***1.73***	1.86	3.83	2.93	5.15	3.43	5.58
	64	89.0	92.94	***2.54***	2.73	3.95	4.25	5.25	4.97	5.68
	65	91.0	92.84	***3.69***	3.96	4.07	6.11	5.35	7.13	5.78
	66	94.6	92.74	***2.05***	2.20	4.18	3.36	5.45	3.91	5.87
	67	95.0	92.74	***2.28***	2.45	4.18	3.74	5.45	4.35	5.87
	68	96.4	94.64	***0.27***	0.29	1.54	0.75	3.35	0.94	3.88
	69	97.9	94.69	***0.10***	0.11	1.44	0.29	3.29	0.36	3.83
	70	99.3	94.88				0.22	2.53	0.30	3.14
	71	99.5	95.40				0.20	2.30	0.28	2.94
	72	99.5	96.15				0.08	0.94	0.17	1.82
	73	101.0	95.90				0.13	1.46	0.21	2.22
	74	102.5	96.41				0.01	0.08	0.13	1.35
	75	105.2	96.04				0.10	1.18	0.19	2.00
	76	107.7	96.15				0.08	0.94	0.17	1.82
	77	110.0	96.33				0.04	0.44	0.14	1.50
	78	111.9	96.06				0.10	1.14	0.19	1.97
	79	112.1	95.61				0.17	1.97	0.25	2.65
	80	113.6	95.45				0.20	2.23	0.27	2.87

WSE (ft)				95.19			96.42		96.87	
Disch (cfs)				200			700		1000	
Rv	**Pt**	**Sta**	**Elev**	**Meas**	**1 Vel**	**Depth**	**1 Vel**	**Depth**	**1 Vel**	**Depth**
	81	115.2	95.20				0.22	2.53	0.30	3.14
	82	116.5	94.77				0.22	2.45	0.29	3.07
	83	117.8	94.64				0.21	2.38	0.29	3.00
	84	119.0	94.69				0.20	2.30	0.28	2.94
	85	119.2	95.49				0.19	2.17	0.27	2.82
	86	122.5	95.85				0.14	1.56	0.22	2.30
	87	126.0	96.06				0.10	1.14	0.19	1.97
	88	129.0	96.60						0.09	0.94
	89	133.0	96.94							
	90	135.0	97.70							
	91	136.2	97.71							
	92	136.2	98.74							

Table A.3-48. Summary of calibration details for original and revised input decks, Grant Creek, Transect 430.

		WSE (ft)		**88.76**		**89.39**		**89.72**					**90.99**	
		Disch (cfs)		**10**		**100**		**182**					**700**	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	1	0.0	94.46											
	2	0.1	94.08											
	3	1.7	92.43											
	4	4.9	91.95											
	5	5.6	90.32										0.49	0.49
	6	7.5	90.22										0.54	0.54
	7	9.0	90.30										0.50	0.50
	8	9.1	90.63										0.32	0.32
	9	9.4	90.31										0.50	0.50
	10	11.9	90.09										0.60	0.60
	11	13.0	89.60						0.11		0.11		0.81	0.80
	12	13.2	89.50						0.17		0.17		0.84	0.84
	13	13.8	90.14										0.58	0.58
	14	14.6	89.60						0.11		0.11		0.81	0.80
	15	16.0	89.50					***0.16***	0.17		0.17		0.84	0.84
	16	17.0	89.50					***0.03***	0.03		0.03		0.16	0.16
	17	18.0	89.40					***0.03***	0.03		0.03		0.13	0.13
	18	18.7	89.45					***0.47***	0.50		0.50		2.18	2.17
	19	19.0	90.00										0.02	0.02
	20	19.4	89.20			0.00	0.00	***0.01***	0.01		0.01		0.03	0.03
	21	20.5	89.00			0.12	0.12	***0.21***	0.22		0.22		0.58	0.58
	22	22.0	88.50	0.12	0.12	1.06	1.06	***1.58***	1.64		1.64		3.54	3.52
	23	24.4	88.10	0.19	0.19	1.17	1.17	***1.65***	1.71		1.71		3.37	3.35
	24	26.0	87.90	0.13	0.13	0.71	0.71	***0.98***	1.01		1.01		1.93	1.92
	25	27.0	87.80	0.31	0.31	1.68	1.68	***2.30***	2.37		2.38		4.47	4.45
	26	28.0	87.80	0.39	0.39	2.15	2.15	***2.94***	3.04		3.04		5.72	5.68
	27	29.4	87.70	0.48	0.48	2.59	2.59	***3.52***	3.63		3.64		6.75	6.71
	28	31.0	87.70	0.50	0.50	2.65	2.65	***3.61***	3.73		3.73		6.92	6.88
	29	31.9	87.40	0.37	0.37	1.88	1.88	***2.52***	2.60		2.60		4.67	4.64
	30	33.0	87.30	0.48	0.48	2.37	2.37	***3.16***	3.26		3.26		5.79	5.76
	31	35.2	87.30	0.56	0.56	2.77	2.77	***3.69***	3.80		3.81		6.77	6.72
	32	36.5	87.40	0.54	0.54	2.72	2.72	***3.64***	3.75		3.76		6.74	6.70
	33	38.0	87.50	0.51	0.51	2.60	2.60	***3.50***	3.61		3.61		6.55	6.51
	34	39.8	87.90	0.43	0.43	2.41	2.41	***3.33***	3.44		3.44		6.57	6.53
	35	42.0	88.20	0.40	0.40	2.61	2.61	***3.70***	3.83		3.83		7.71	7.66
	36	44.7	88.60	0.19	0.19	2.15	2.15	***3.27***	3.39		3.39		7.56	7.51
	37	46.7	88.40	0.33	0.33	2.57	2.57	***3.76***	3.89		3.90		8.20	8.15
	38	47.5	88.30	0.29	0.29	1.99	1.99	***2.86***	2.96		2.96		6.09	6.05
	39	49.2	88.20	0.18	0.18	1.19	1.19	***1.69***	1.75		1.75		3.52	3.50
	40	51.0	88.30	0.29	0.29	2.04	2.04	***2.94***	3.04		3.04		6.26	6.22

WSE (ft)				**88.76**		**89.39**		**89.72**					**90.99**	
Disch (cfs)				**10**		**100**		**182**					**700**	
Rv	**Pt**	**Sta**	**Elev**	**Orig**	**Rev**	**Orig**	**Rev**	**Meas**	**Orig**	*****	**Rev**	*****	**Orig**	**Rev**
	41	52.8	88.30	0.18	0.18	1.24	1.24	***1.79***	1.85		1.85		3.81	3.79
	42	54.2	88.50	0.16	0.16	1.41	1.41	***2.09***	2.16		2.17		4.68	4.66
	43	56.0	88.50	0.11	0.11	1.02	1.02	***1.52***	1.57		1.58		3.41	3.39
	44	57.0	88.90			0.90	0.90	***1.52***	1.58		1.58		3.97	3.95
	45	58.0	89.45					***0.94***	1.01		1.01		4.37	4.34
*	46	60.9	89.60						0.58	*			4.08	3.75
	47	62.0	89.45					***0.75***	0.80		0.80		3.48	3.46
	48	63.0	89.45					***0.95***	1.02		1.02		4.41	4.39
	49	65.5	89.05			0.97	0.97	***1.84***	1.92		1.92		5.26	5.23
	50	67.2	89.40					***0.70***	0.74		0.75		2.94	2.92
	51	68.3	89.45					***0.79***	0.85		0.85		3.67	3.65
	52	70.5	89.30			0.13	0.13	***0.43***	0.45		0.45		1.55	1.54
											-			-
	53	71.5	89.50					***-0.03***	-0.03		0.03		-0.16	0.16
	54	72.2	89.40					***0.18***	0.19		0.19		0.76	0.75
	55	73.3	89.30	0.07			0.07	***0.24***	0.25		0.25		0.87	0.86
	56	75.2	89.50					***0.23***	0.25		0.25		1.21	1.21
*	57	80.7	89.40					***-0.06***	-0.06		0.21		-0.25	0.82
*	58	81.5	89.68						-0.02				-0.22	0.69
	59	83.3	90.90										-0.04	0.12
	60	85.4	91.00											
	61	88.3	92.16											
	62	90.0	93.43											
	63	90.2	93.64											
	64	92.0	95.14											
	65	93.7	97.29											
	66	96.1	98.09											
	67	96.1	98.35											
	Total								1	*	0	*		

<u>Note</u>:
An * means the modeled velocity exceeds the measured velocity by 0.2 ft/sec or 20%.

Table A.3-49. Summary of calibration details for original and revised input decks, Grant Creek, Transect 430, high flows.

		WSE (ft)		89.72			90.99		91.51	
		Disch (cfs)		182			700		1000	
Rv	**Pt**	**Sta**	**Elev**	**Meas**	**1 Vel**	**Depth**	**1 Vel**	**Depth**	**1 Vel**	**Depth**
	1	0.0	94.46							
	2	0.1	94.08							
	3	1.7	92.43							
	4	4.9	91.95							
	5	5.6	90.32				0.49	1.80	0.76	2.70
	6	7.5	90.22				0.54	1.98	0.80	2.85
	7	9.0	90.30				0.50	1.84	0.77	2.73
	8	9.1	90.63				0.32	1.19	0.62	2.21
	9	9.4	90.31				0.50	1.82	0.76	2.72
	10	11.9	90.09				0.60	2.20	0.85	3.04
	11	13.0	89.60		0.11	0.46	0.80	2.94	1.04	3.71
	12	13.2	89.50		0.17	0.70	0.84	3.08	1.08	3.84
	13	13.8	90.14				0.58	2.12	0.83	2.97
	14	14.6	89.60		0.11	0.46	0.80	2.94	1.04	3.71
	15	16.0	89.50	0.16	0.17	0.70	0.84	3.08	1.08	3.84
	16	17.0	89.50	0.03	0.03	0.70	0.16	3.08	0.20	3.84
	17	18.0	89.40	0.03	0.03	0.90	0.13	3.22	0.16	3.97
	18	18.7	89.45	0.47	0.50	0.81	2.17	3.15	2.77	3.90
	19	19.0	90.00				0.02	2.34	0.03	3.17
	20	19.4	89.20	0.01	0.01	1.25	0.03	3.49	0.04	4.22
	21	20.5	89.00	0.21	0.22	1.56	0.58	3.75	0.71	4.46
	22	22.0	88.50	1.58	1.64	2.23	3.52	4.35	4.20	5.03
	23	24.4	88.10	1.65	1.71	2.69	3.35	4.81	3.93	5.47
	24	26.0	87.90	0.98	1.01	2.91	1.92	5.03	2.24	5.69
	25	27.0	87.80	2.30	2.38	3.02	4.45	5.14	5.17	5.79
	26	28.0	87.80	2.94	3.04	3.02	5.68	5.14	6.61	5.79
	27	29.4	87.70	3.52	3.64	3.12	6.71	5.25	7.78	5.90
	28	31.0	87.70	3.61	3.73	3.12	6.88	5.25	7.98	5.90
	29	31.9	87.40	2.52	2.60	3.43	4.64	5.56	5.34	6.20
	30	33.0	87.30	3.16	3.26	3.53	5.76	5.67	6.61	6.30
	31	35.2	87.30	3.69	3.81	3.53	6.72	5.67	7.72	6.30
	32	36.5	87.40	3.64	3.76	3.43	6.70	5.56	7.71	6.20
	33	38.0	87.50	3.50	3.61	3.33	6.51	5.46	7.51	6.10
	34	39.8	87.90	3.33	3.44	2.91	6.53	5.03	7.62	5.69
	35	42.0	88.20	3.70	3.83	2.58	7.66	4.70	9.02	5.37
	36	44.7	88.60	3.27	3.39	2.10	7.51	4.23	9.00	4.92
	37	46.7	88.40	3.76	3.90	2.35	8.15	4.47	9.68	5.15
	38	47.5	88.30	2.86	2.96	2.47	6.05	4.58	7.16	5.26
	39	49.2	88.20	1.69	1.75	2.58	3.50	4.70	4.12	5.37
	40	51.0	88.30	2.94	3.04	2.47	6.22	4.58	7.36	5.26

WSE (ft)				89.72			90.99		91.51	
Disch (cfs)				182			700		1000	
Rv	Pt	Sta	Elev	Meas	1 Vel	Depth	1 Vel	Depth	1 Vel	Depth
	41	52.8	88.30	1.79	1.85	2.47	3.79	4.58	4.48	5.26
	42	54.2	88.50	2.09	2.17	2.23	4.66	4.35	5.55	5.03
	43	56.0	88.50	1.52	1.58	2.23	3.39	4.35	4.04	5.03
	44	57.0	88.90	1.52	1.58	1.70	3.95	3.87	4.82	4.58
	45	58.0	89.45	0.94	1.01	0.81	4.34	3.15	5.54	3.90
	46	60.9	89.60				3.75	2.73	4.98	3.51
	47	62.0	89.45	0.75	0.80	0.81	3.46	3.15	4.42	3.90
	48	63.0	89.45	0.95	1.02	0.81	4.39	3.15	5.60	3.90
	49	65.5	89.05	1.84	1.92	1.49	5.23	3.68	6.44	4.40
	50	67.2	89.40	0.70	0.75	0.90	2.92	3.22	3.71	3.97
	51	68.3	89.45	0.79	0.85	0.81	3.65	3.15	4.66	3.90
	52	70.5	89.30	0.43	0.45	1.09	1.54	3.36	1.94	4.09
	53	71.5	89.50	-0.03	-0.03	0.70	-0.16	3.08	-0.20	3.84
	54	72.2	89.40	0.18	0.19	0.90	0.75	3.22	0.95	3.97
	55	73.3	89.30	0.24	0.25	1.09	0.86	3.36	1.08	4.09
	56	75.2	89.50	0.23	0.25	0.70	1.21	3.08	1.55	3.84
	57	80.7	89.40	-0.06	0.21	0.90	0.82	3.22	1.04	3.97
	58	81.5	89.68				0.69	2.73	0.92	3.51
	59	83.3	90.90				0.12	0.46	0.45	1.72
	60	85.4	91.00						0.40	1.53
	61	88.3	92.16							
	62	90.0	93.43							
	63	90.2	93.64							
	64	92.0	95.14							
	65	93.7	97.29							
	66	96.1	98.09							
	67	96.1	98.35							

Table A.3-50. Summary of calibration details, Grant Creek.

Trans No.	100	110	120	130	140	150	160	200
DISCHARGE								
Meas./ Given	0.01 0.25 4.31 5.90	0.0 0.3 4.3 5.9 8.7	17.0 131.6 182 694	17.0 63.6 131.6 182 694	17.0 131.6 182.0 770	17.0 131.6 200.0 693	17.0 63.6 200.0 693	1.5 5.7 11.8 14.8 63.1
Calc.	0.01 1.01 1.09 0.92	0.0 0.3 3.8 6.1 9.0	17 123 192.5 693.54	17 60 131.6 158.41 676	17 136 176.2 695	17 133 198.0 693	17 68 179.8 724	1.5 5.7 11.3 17.2 55.1
Stage (given)	95.82 96.02 96.69 96.92	98.1 98.3 98.9 99.2 99.4	95.63 96.58 96.86 97.83	95.67 96.24 96.79 97.14 98.68	97.33 98.00 98.14 99.26	94.31 95.00 95.22 96.23	94.40 94.93 95.43 96.47	92.0 93.0 93.7 94.2 96.1
Plotting Stage (given)	0.06 0.26 0.93 1.16	0.03 0.19 0.82 1.06	1.77 2.72 3.00 3.97	0.87 1.44 1.99 2.34 3.88	0.39 1.06 1.20 2.32	0.47 1.16 1.38 2.39	0.86 1.39 1.89 2.93	1.82 2.81 3.50 4.00 5.89
Ratio of Modeled vs Predicted Discharge (given) based on Stage-Discharge Relationship	0.9876 1.0125 1.0873 9198	1.0307 0.9180 1.1287 0.972 0.9633	0.9875 1.0707 0.9456 1.0002	1.0263 0.9812 1.0002 0.9297 1.0263	1.0024 0.9675 1.0332 0.9979	1.0020 0.9879 1.0100 1.0002	0.9998 0.9396 1.1124 0.9569	1.0368 0.9955 1.0376 0.8603 1.0854
Mean Error of Stage/Discharge Relationship	4.8107	6.0003	3.4120	3.6822	1.7553	0.6098	5.2644	6.3472
Stage/Discharge Relationship (S vs Q) S=A*QB+SZF**								
A=	4.643	5.464	1.264	24.384	120.526	94.997	23.779	0.222
B=	2.178	1.806	4.575	2.454	2.082	2.281	3.178	3.141
SZF=	95.760	98.110	93.860	94.800	96.940	93.840	93.540	90.180

Table A.3-51. Summary of calibration details, Grant Creek.

Trans No.	210	220	230-MC	230-SC	300	310	210	320
DISCHARGE								
Meas./ Given	133 440 705.0	17.0 63.6 182.0 706	17.0 63.6 182.0 706	133 440 705.0	0.29 1.08 2.2 3.07 9.82	63.6 131.6 165.6	133 440 705.0	1.36 12.43 20.98 113.84
Calc.	133.019 439.778 705.256	17 62 190.6 691.868	17 62 190.5 691.424	133.014 439.84 705.184	0.29 1.054 2.341 3.041 9.716	63 134 163.2	133.019 439.778 705.256	1.36 12.10 21.78 112.68
Stage (given)	94.515 95.42 96.09	94.71 95.06 95.55 96.45	94.83 95.27 95.85 96.83	94.515 95.42 96.09	94 94.59 95.12 95.33 96.545	95.85 96.29 96.42	94.515 95.42 96.09	95.82 96.09 96.22 96.82
Plotting Stage (given)	0.58 1.48 2.15	0.52 0.88 1.36 2.27	0.84 1.28 1.86 2.84	0.57 1.48 2.15	0.99 1.58 2.11 2.32 3.54	2.03 2.47 2.60	0.58 1.48 2.15	0.17 0.45 0.58 1.18
Ratio of Modeled vs Predicted Discharge (given) based on Stage-Discharge Relationship	0.9999 1.0005 0.9996	0.9550 1.0285 0.9977 1.0204	0.9991 1.0262 0.9552 1.0211	0.9999 1.0004 0.9997	0.9991 1.0248 0.9571 1.0096 1.0107	1.0039 0.9815 1.0149	0.9999 1.0005 0.9996	1.0005 1.0270 0.9634 1.0103
Mean Error of Stage/Discharge Relationship	0.0337	2.4282	2.3468	0.0242	1.8023	1.2495	0.0337	1.8738
Stage/Discharge Relationship (S vs Q) S=A*QB+SZF**								
A=	267.874	85.619	29.381	268.342	0.298	4.232	267.874	76.852
B=	1.265	2.542	3.026	1.263	2.758	3.822	1.265	2.314
SZF=	93.940	94.180	93.990	93.941	93.010	93.820	93.940	95.640

Table A.3-52. Summary of calibration details, Grant Creek.

Trans No.	320	330-MC	330-2nd	330-3rd	400	410	430
DISCHARGE							
Meas./ Given	1.36 12.43 20.98 113.84	1.36 15.87 59.4 113.84	0.47 1.27 5.7 10.74	0.06 0.1 1.6	17.0 57.6 131.6 200 706	17.0 57.6 200.0 706	17.0 131.6 182.0 706
Calc.	1.36 12.10 21.78 112.68	1.359 15.896 59.462 113.651	0.47 1.287 5.492 11.023	0.059 0.103 1.593	17 58 132.1 205.75 688.489	17 60 197.9 699.07	17 135 177.3 706.36
Stage (given)	95.82 96.09 96.22 96.82	96.43 97.06 97.945 98.67	95.85 96.05 96.48 96.77	95.85 95.86 96.445	93.08 93.45 93.74 93.915 94.465	93.83 94.40 95.19 96.42	88.85 89.54 89.70 91
Plotting Stage (given)	0.17 0.45 0.58 1.18	0.23 0.86 1.74 2.47	0.52 0.72 1.15 1.44	0.01 0.02 0.60	1.56 1.93 2.22 2.40 2.95	1.09 1.66 2.45 3.68	0.34 1.04 1.20 2.50
Ratio of Modeled vs Predicted Discharge (given) based on Stage-Discharge Relationship	1.0005 1.0270 0.9634 1.0103	1.0009 0.9984 0.9991 1.0017	1.0006 0.9865 1.0397 0.9743	1.0231 0.9729 1.0047	1.0190 0.9878 0.9967 0.9721 1.0254	1.0289 0.9521 1.0107 1.01	1.0030 0.9719 1.0263 0.9996
Mean Error of Stage/Discharge Relationship	1.8738	0.1261	1.9699	1.8365	1.7569	2.4706	1.4519
Stage/Discharge Relationship (S vs Q) S=A*QB+SZF**							
A=	76.852	21.064	3.563	2.388	1.251	12.669	125.861
B=	2.314	1.864	3.098	0.802	5.843	3.081	1.883
SZF=	95.640	96.200	95.330	95.840	91.520	92.740	88.500

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Appendix 4: Cross Sections, WSE and Flow Hydraulics

Appendix 4a.	Reach 1 Main Channel
Appendix 4b.	Reach 1 Side Channel
Appendix 4c.	Reach 2
Appendix 4d.	Reach 3 Main Channel
Appendix 4e.	Reach 3 Side Channel
Appendix 4f	Reach 4

Appendix 4a Reach 1 Main Channel

This sub-appendix contains the following figures:

Figure A.4a-1. Transect T120 bed profile and Water Surface Elevation (WSE), 10–1,000 cfs.
Figure A.4a-2. Transect T130 bed profile and WSE, 10–1,000 cfs.
Figure A.4a-3. Transect T140 bed profile and WSE, 10-1,000 cfs.
Figure A.4a-4. Transect T150 bed profile and WSE, 10-1,000 cfs.
Figure A.4a-5. Transect T160 bed profile and WSE, 10-1,000 cfs.
Figure A.4a-6. Reach 1 main channel wetted perimeter vs flow.
Figure A.4a-7. Reach 1 main channel wetted width vs flow.
Figure A.4a-8. Reach 1 main channel hydraulic radius vs flow.
Figure A.4a-9. Reach 1 main channel average depth vs flow.

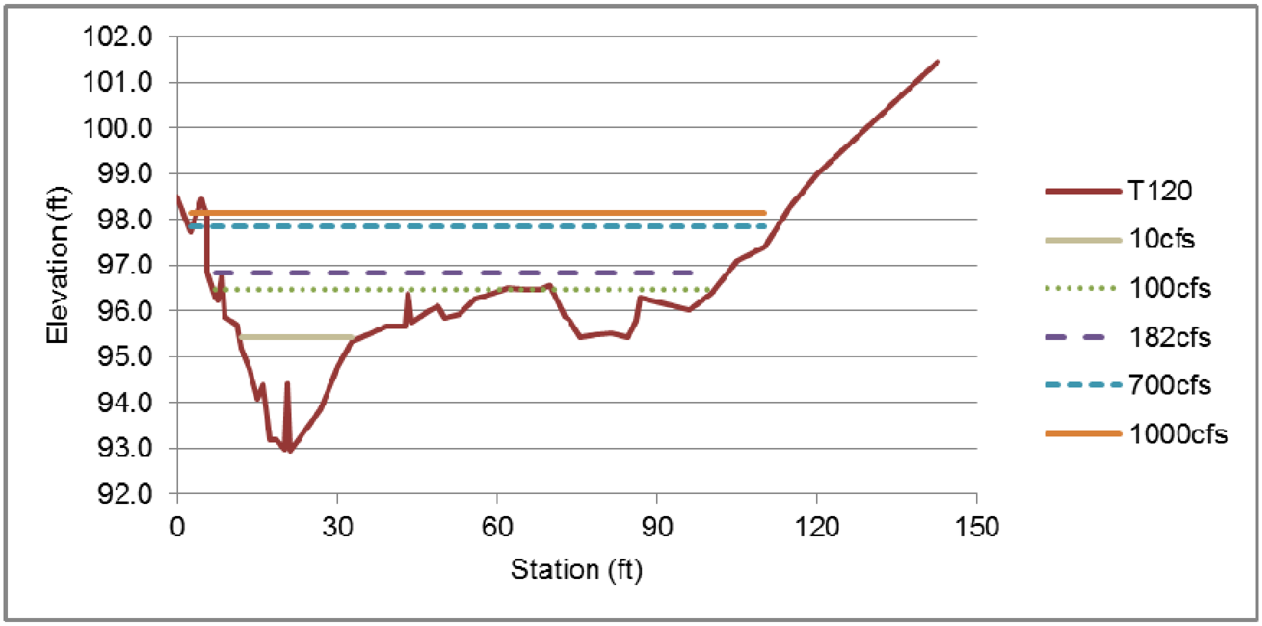

Figure A.4a-1. Transect T120 bed profile and Water Surface Elevation (WSE), 10–1,000 cfs.

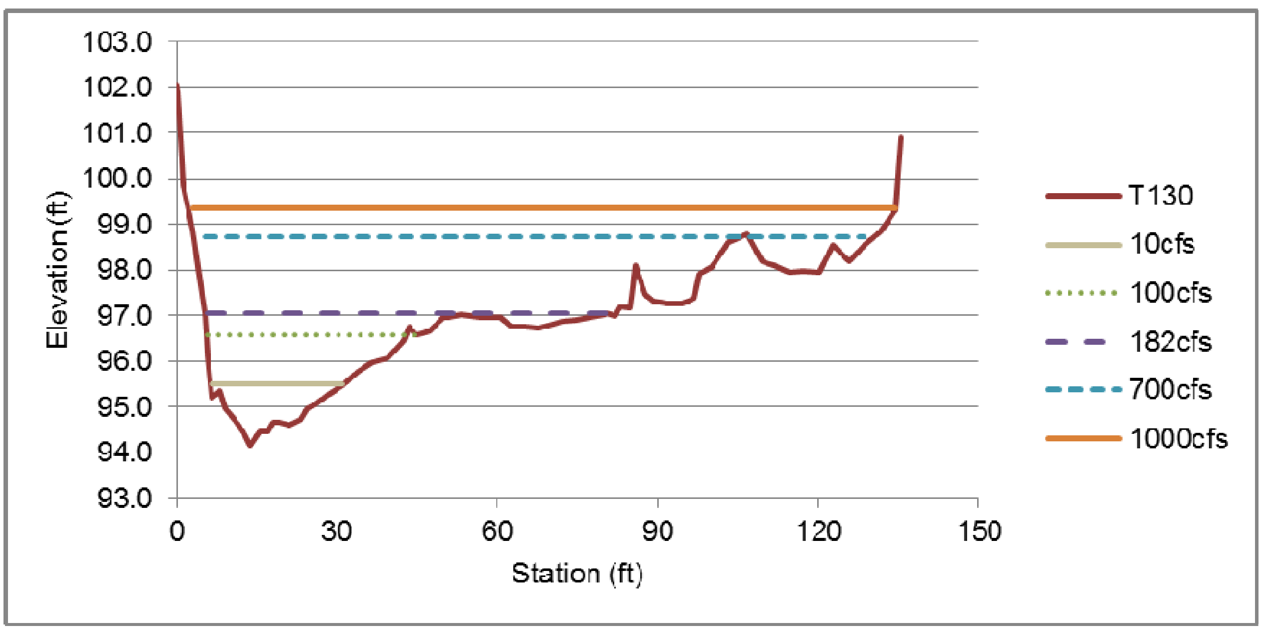

Figure A.4a-2. Transect T130 bed profile and WSE, 10–1,000 cfs.

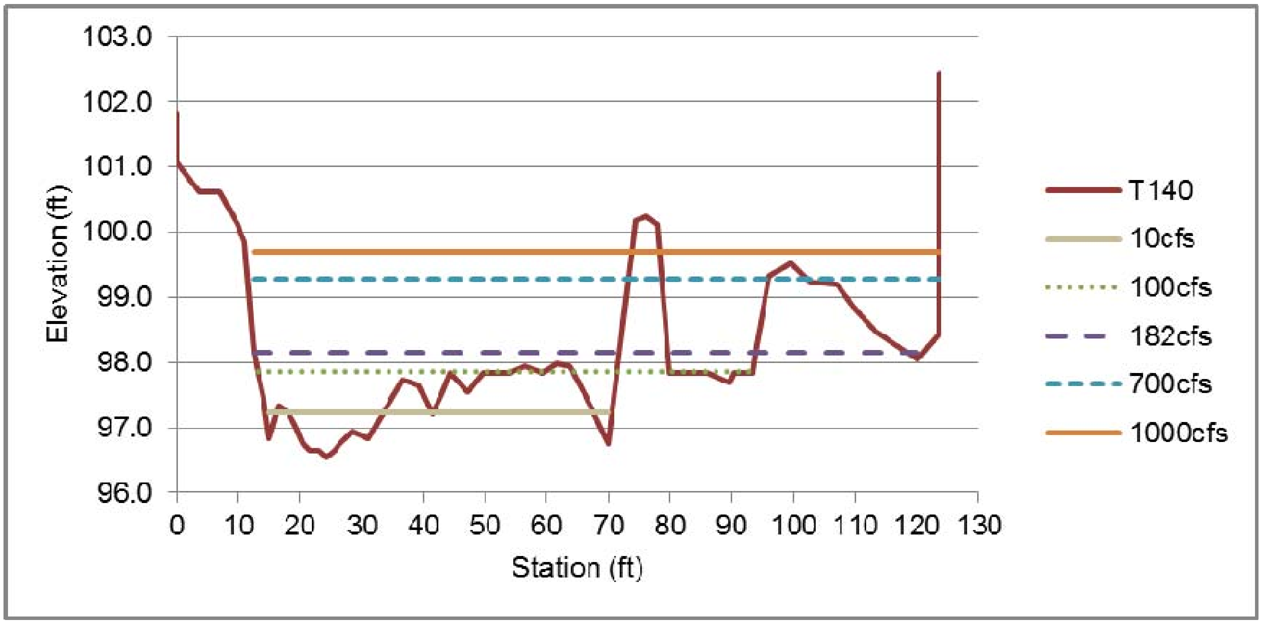

Figure A.4a-3. Transect T140 bed profile and WSE, 10-1,000 cfs.

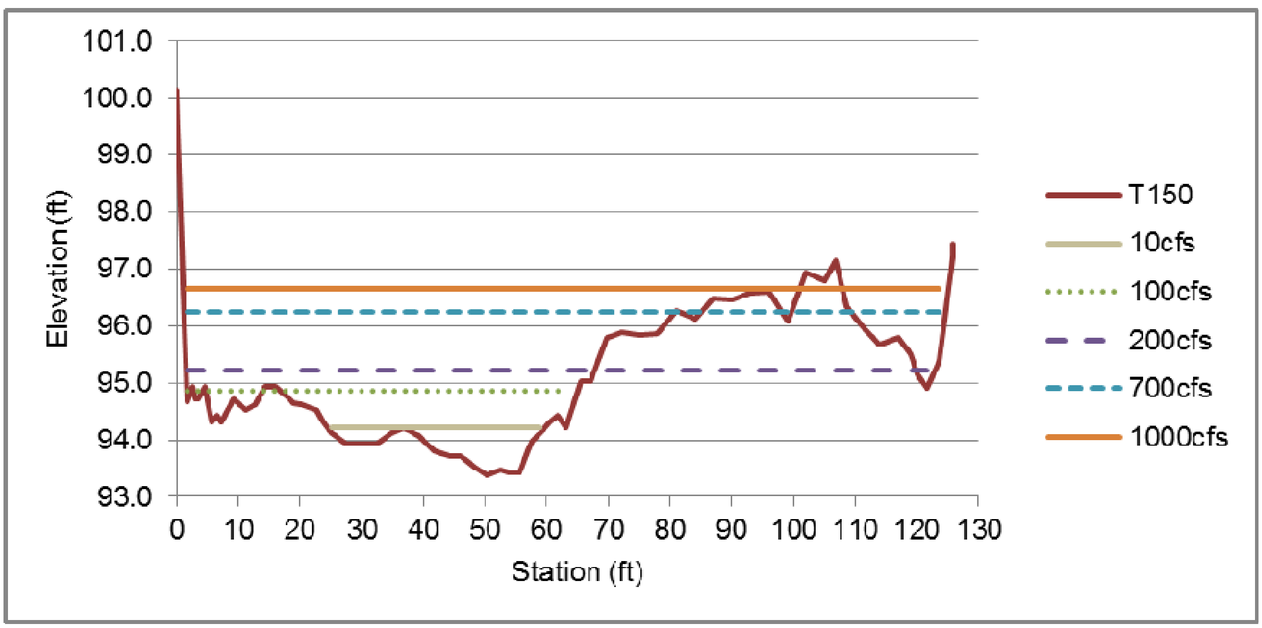

Figure A.4a-4. Transect T150 bed profile and WSE, 10-1,000 cfs.

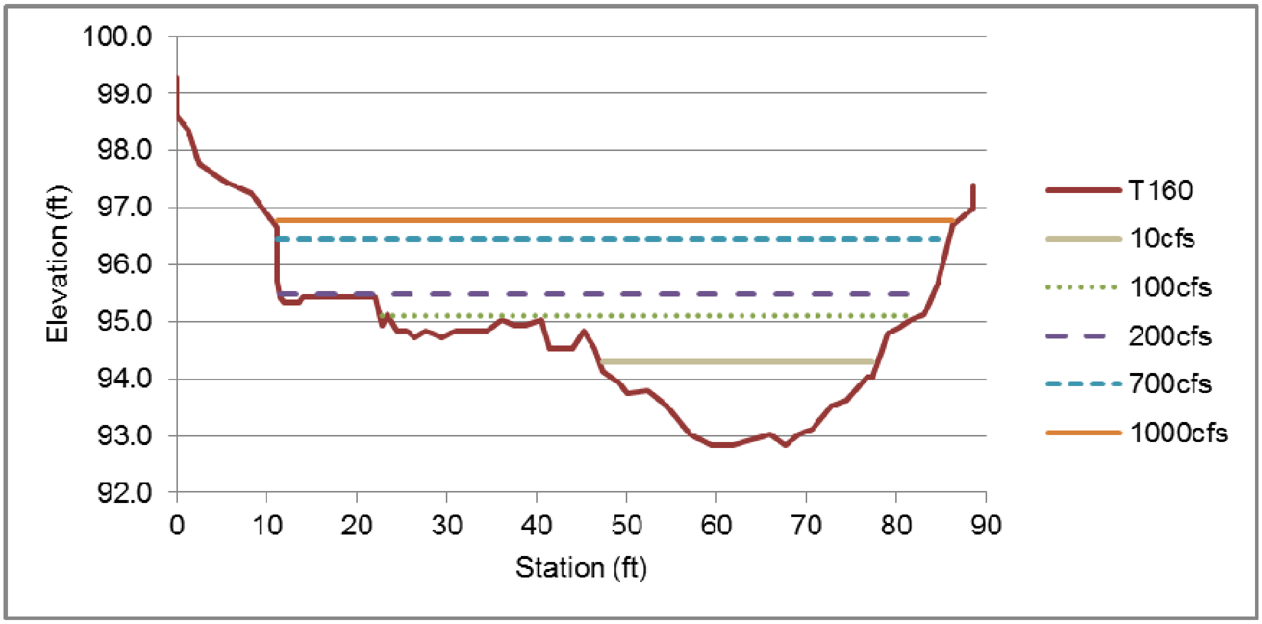

Figure A.4a-5. Transect T160 bed profile and WSE, 10-1,000 cfs.

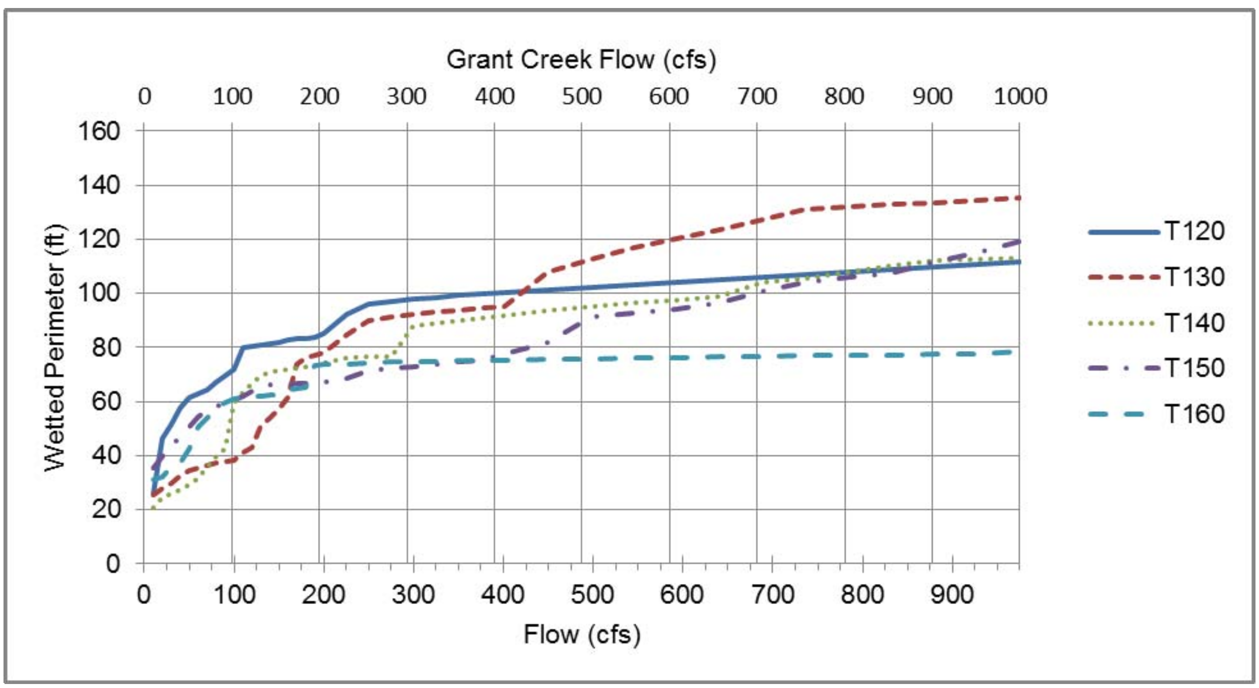

Figure A.4a-6. Reach 1 main channel wetted perimeter vs flow.

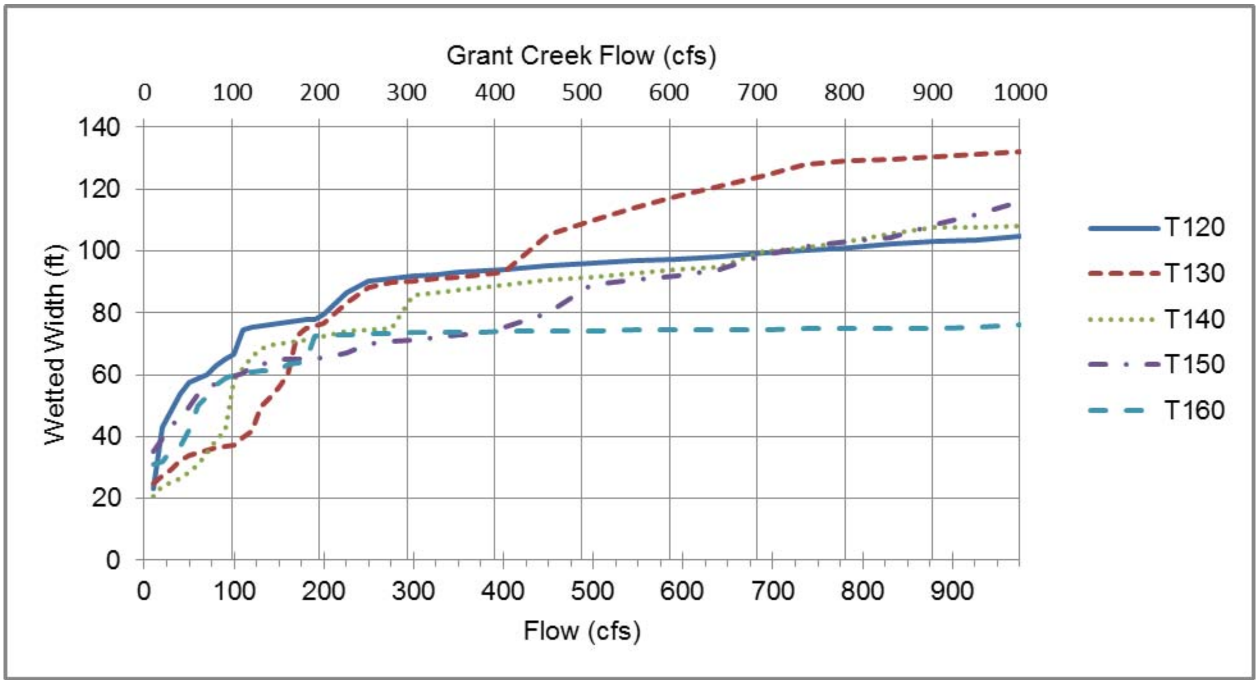

Figure A.4a-7. Reach 1 main channel wetted width vs flow.

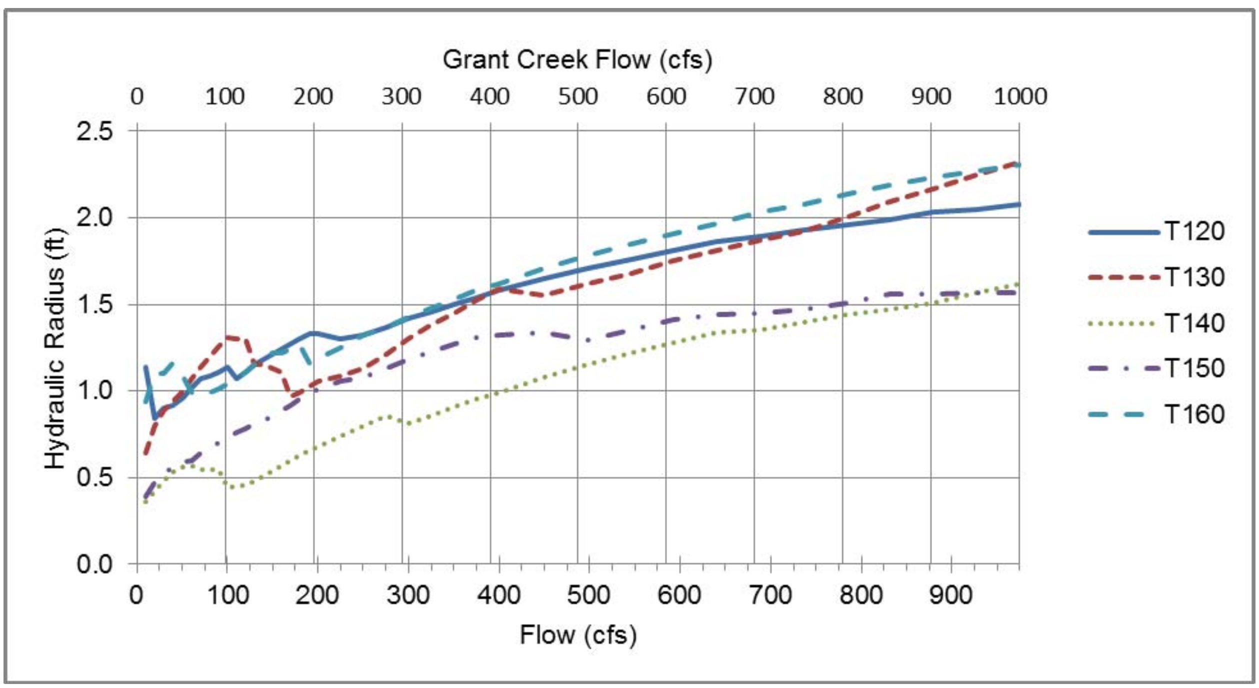

Figure A.4a-8. Reach 1 main channel hydraulic radius vs flow.

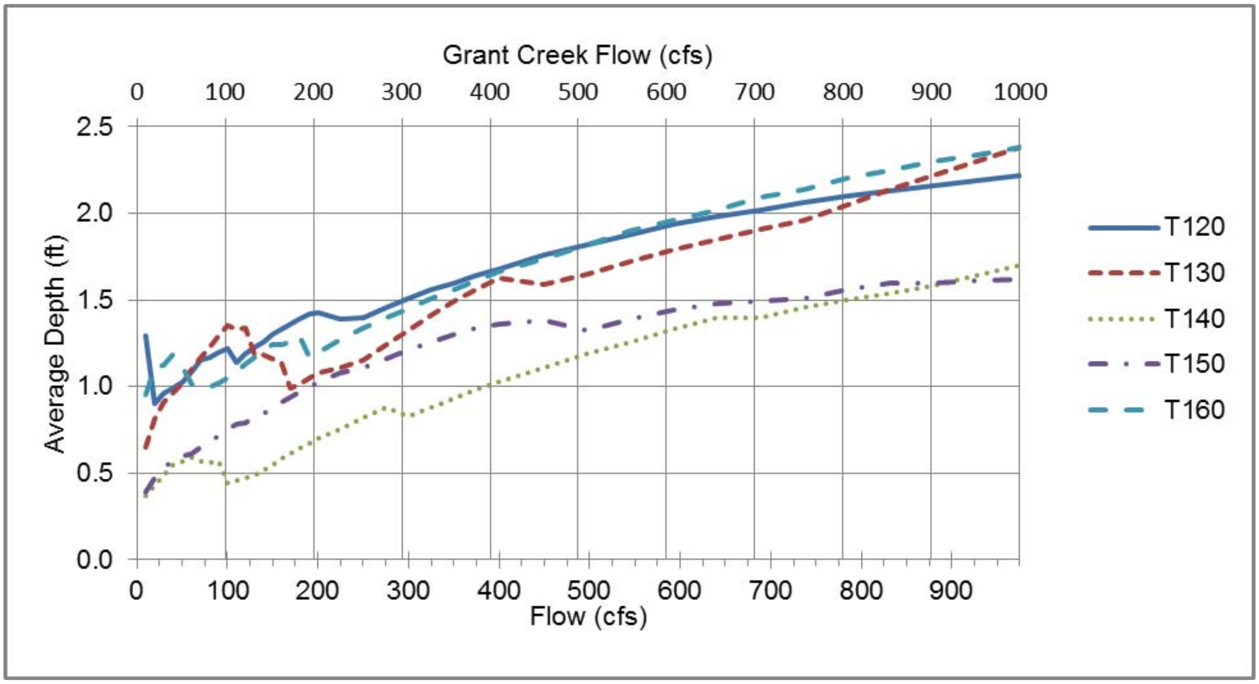

Figure A.4a-9. Reach 1 main channel average depth vs flow.

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Appendix 4b Reach 1 Side Channel

This sub-appendix contains the following figures:

Figure A.4b-1. Transect T100 bed profile and WSE, 0.1-20 cfs.
Figure A.4b-2. Transect T110 bed profile and WSE, 0.1-20 cfs.
Figure A.4b-3. Reach 1 side channel wetted perimeter vs flow.
Figure A.4b-4. Reach 1 side channel wetted width vs flow.
Figure A.4b-5. Reach 1 side channel hydraulic radius vs flow.
Figure A.4b-6. Reach 1 side channel average depth vs flow.

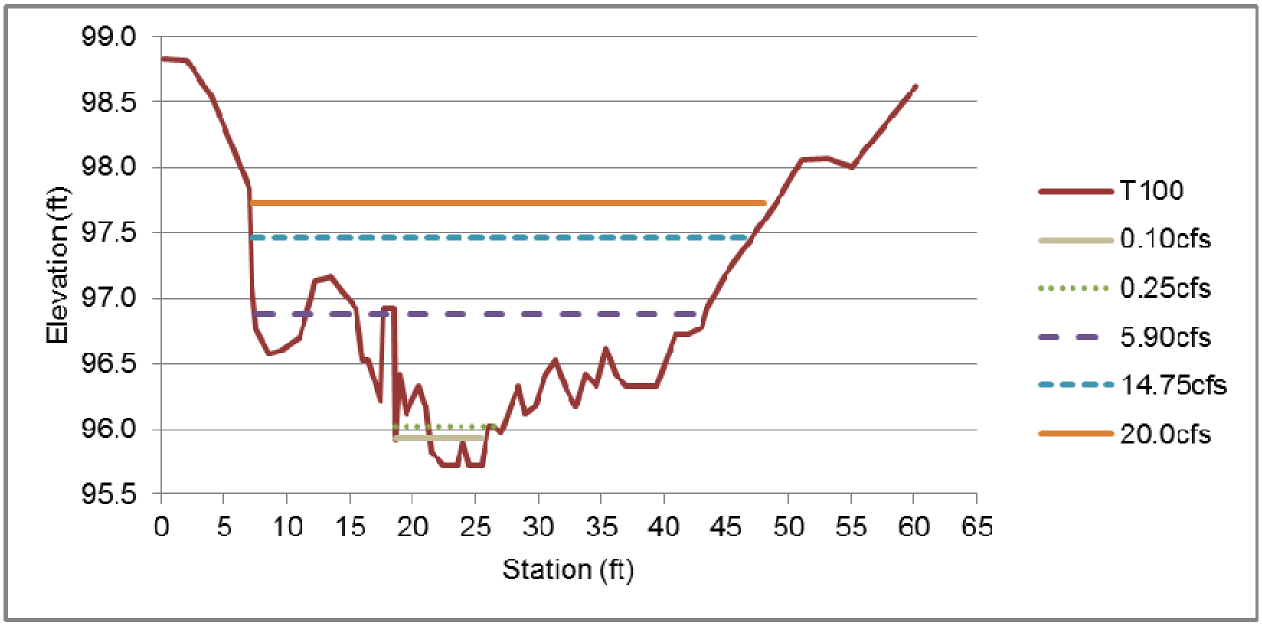

Figure A.4b-1. Transect T100 bed profile and WSE, 0.1-20 cfs.

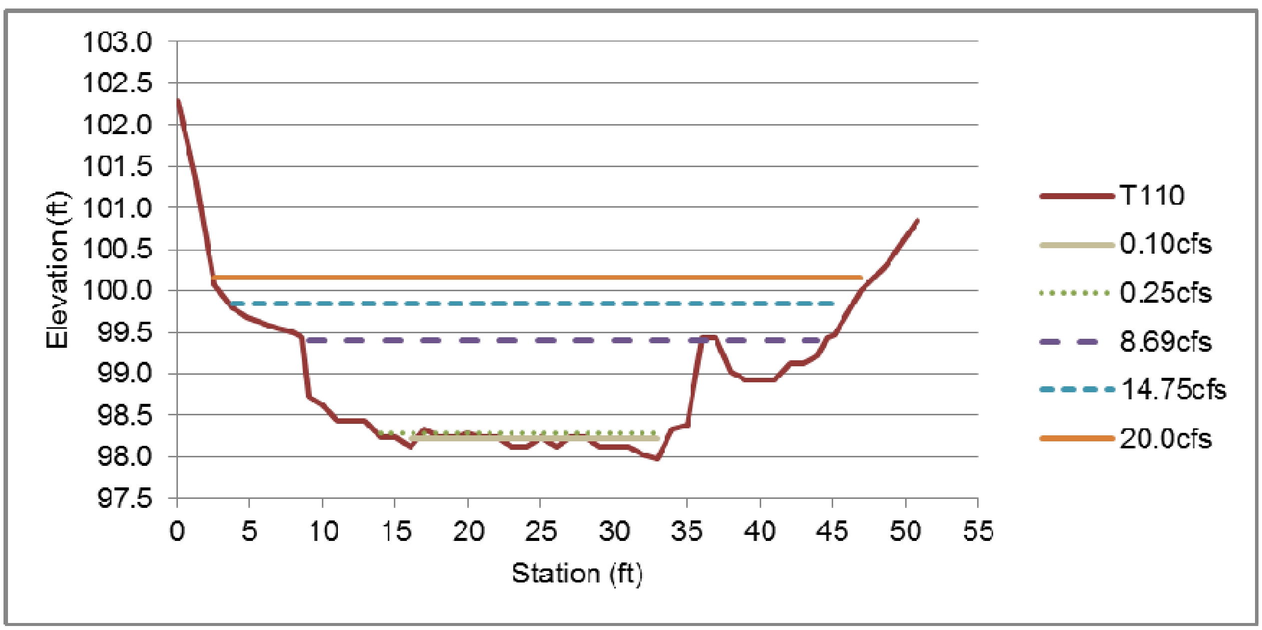

Figure A.4b-2. Transect T110 bed profile and WSE, 0.1-20 cfs.

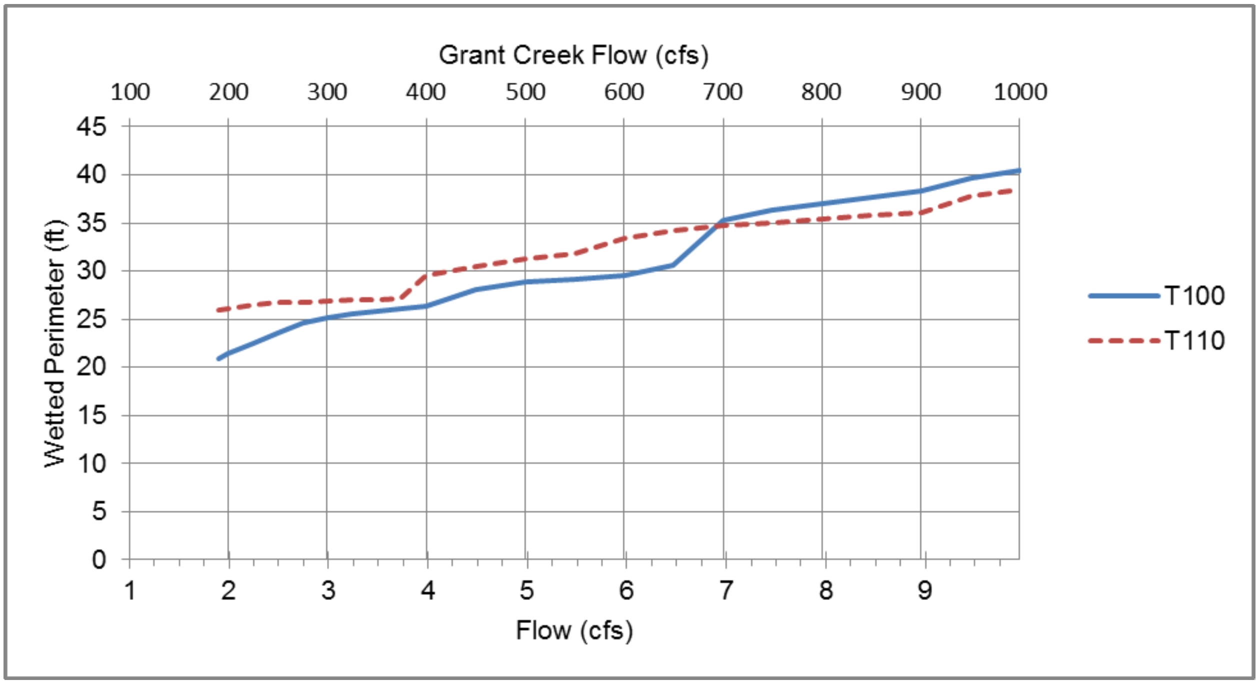

Figure A.4b-3. Reach 1 side channel wetted perimeter vs flow.

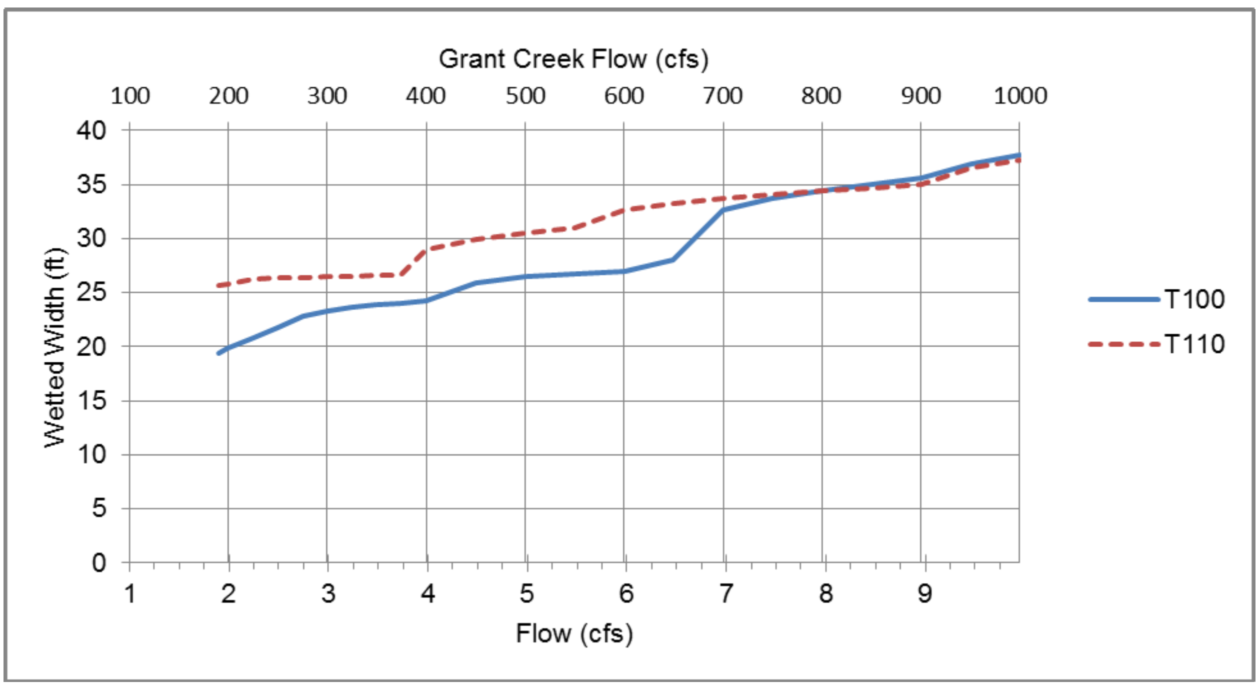

Figure A.4b-4. Reach 1 side channel wetted width vs flow.

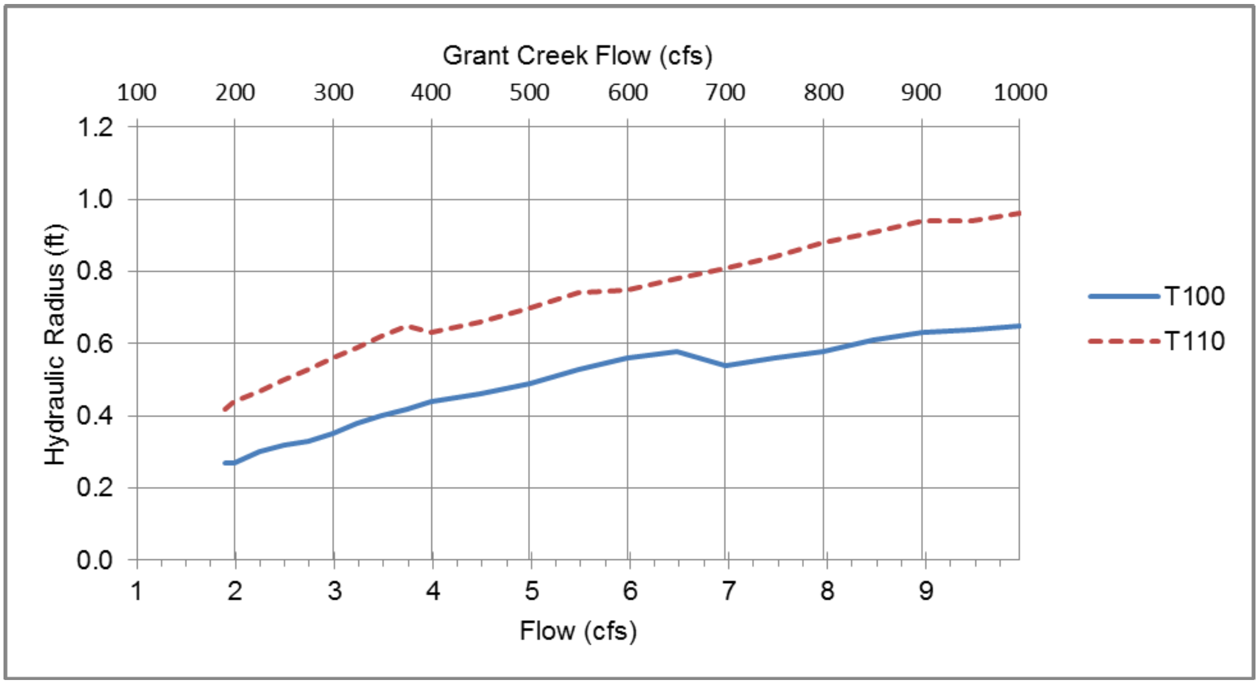

Figure A.4b-5. Reach 1 side channel hydraulic radius vs flow.

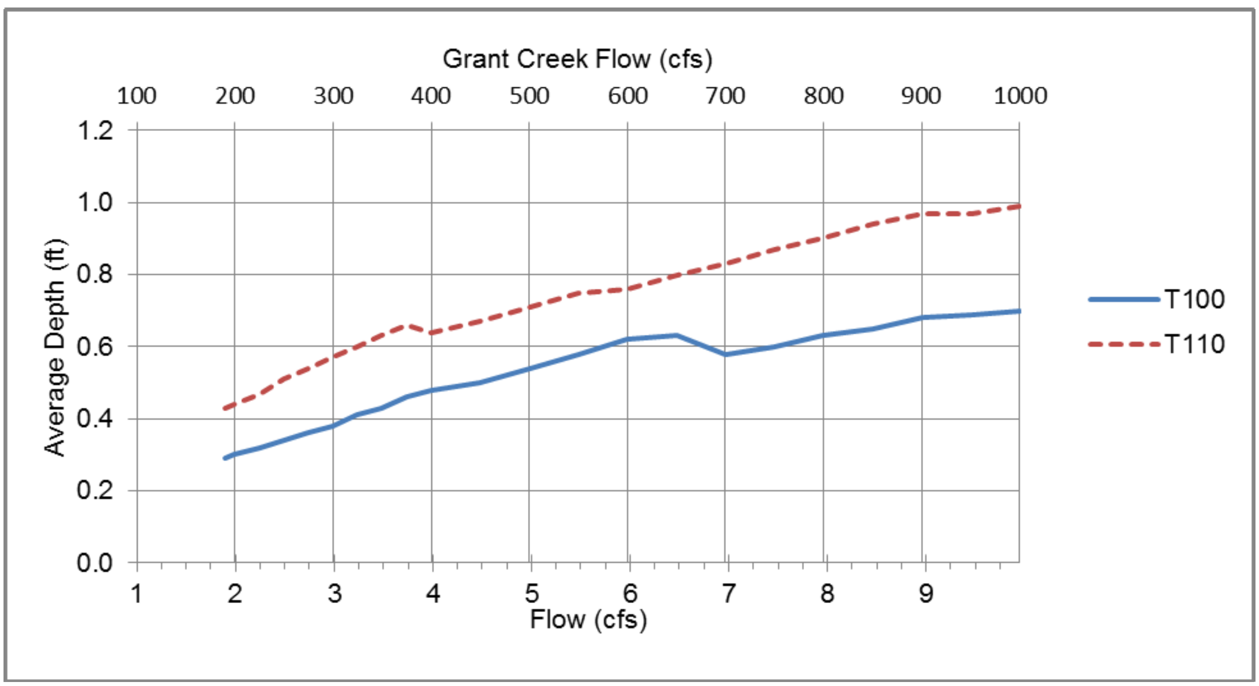

Figure A.4b-6. Reach 1 side channel average depth vs flow.

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Appendix 4c Reach 2

This sub-appendix contains the following figures:

Figure A.4c-1. Transect T200 bed profile and WSE, 0.89–89 cfs.
Figure A.4c-2. Transect T210 bed profile and WSE, 10-1,000 cfs.
Figure A.4c-3. T200 side lobe wetted perimeter vs flow.
Figure A.4c-4. T200 side lobe wetted width vs flow.
Figure A.4c-5. T200 side lobe hydraulic radius vs flow.
Figure A.4c-6. T200 side lobe average depth vs flow.
Figure A.4c-7. Reach 2 wetted perimeter vs flow.
Figure A.4c-8. Reach 2 wetted width vs flow.
Figure A.4c-9. Reach 2 hydraulic radius vs flow.
Figure A.4c-10. Reach 2 average depth vs flow.

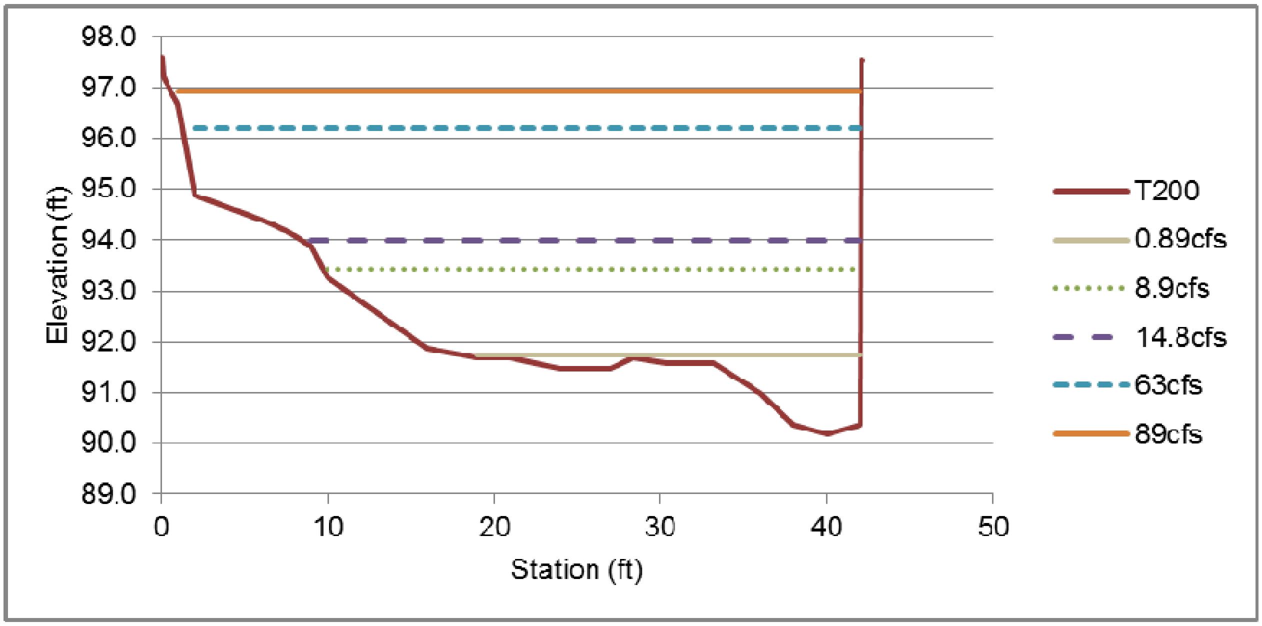

Figure A.4c-1. Transect T200 bed profile and WSE, 0.89–89 cfs.

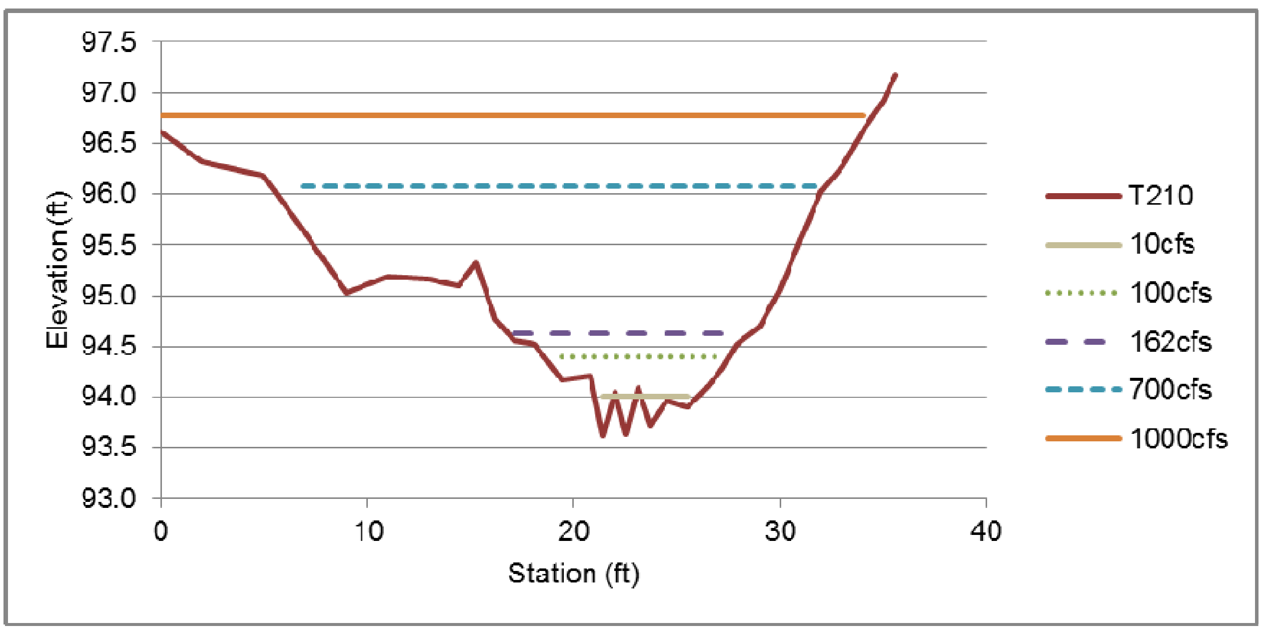

Figure A.4c-2. Transect T210 bed profile and WSE, 10-1,000 cfs.

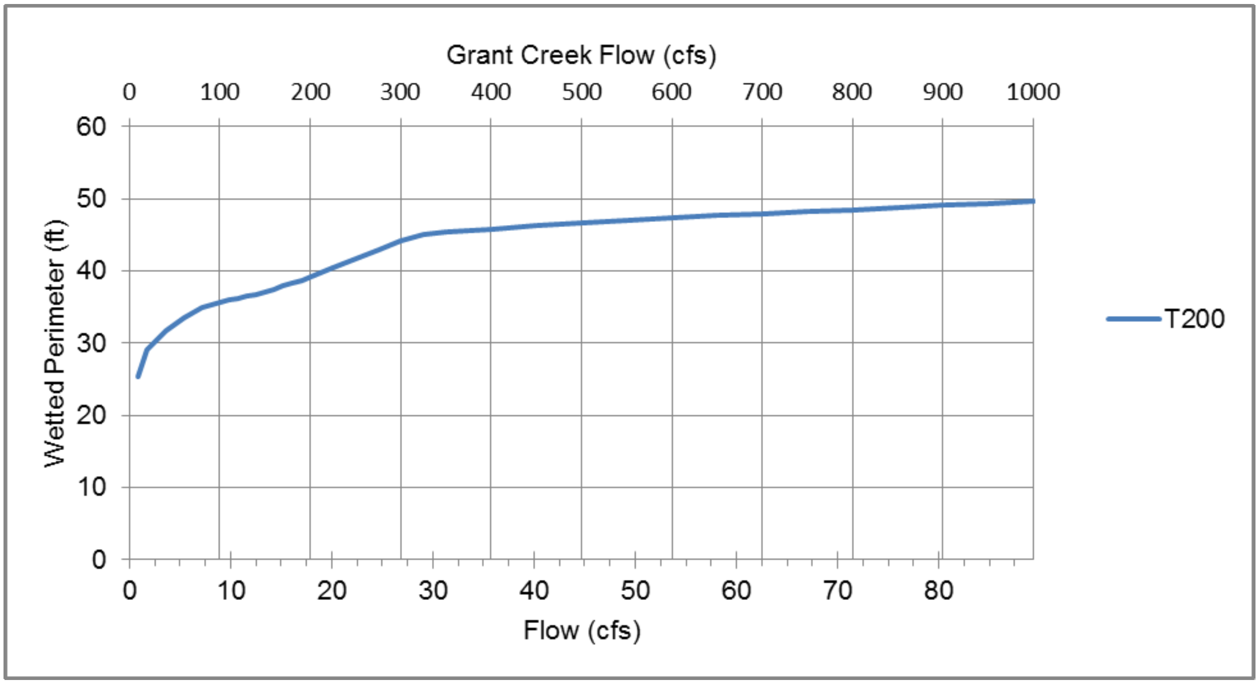

Figure A.4c-3. T200 side lobe wetted perimeter vs flow.

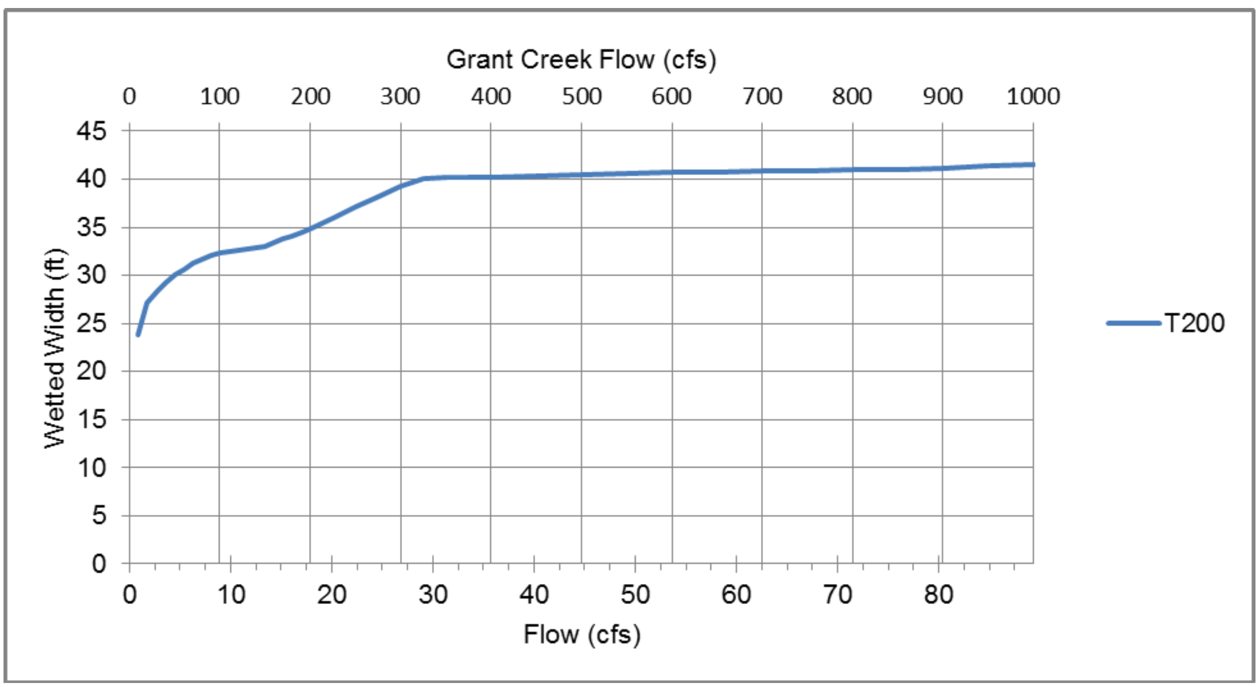

Figure A.4c-4. T200 side lobe wetted width vs flow.

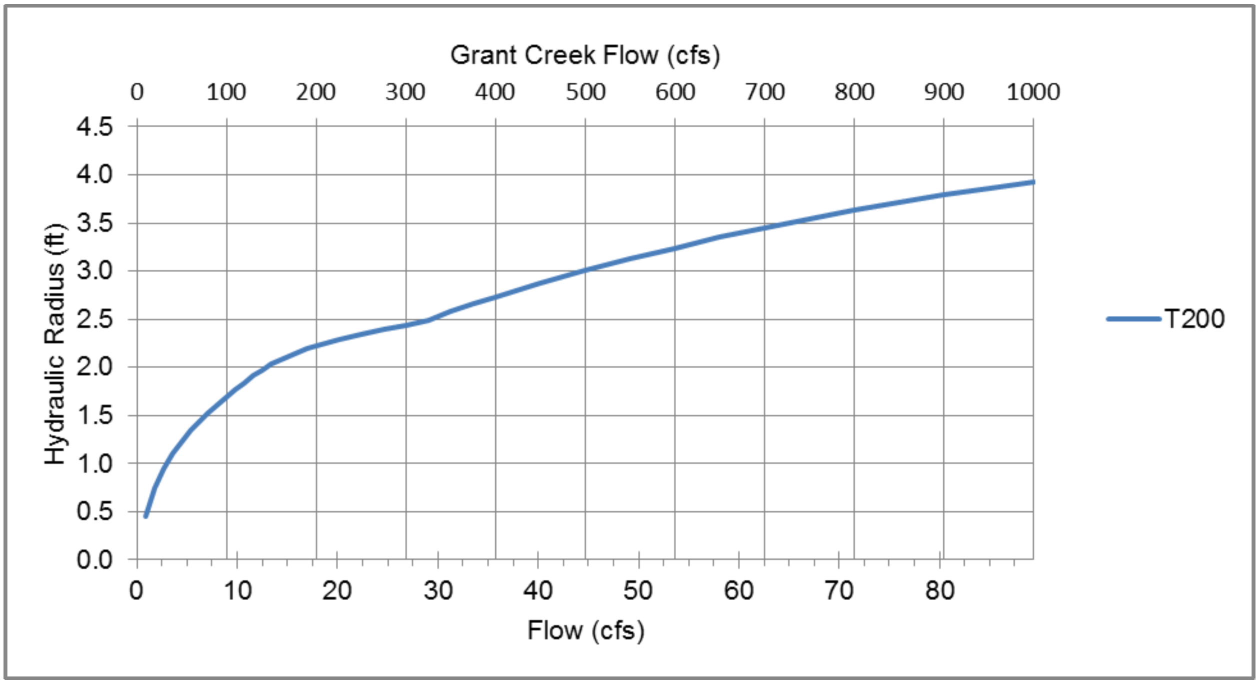

Figure A.4c-5. T200 side lobe hydraulic radius vs flow.

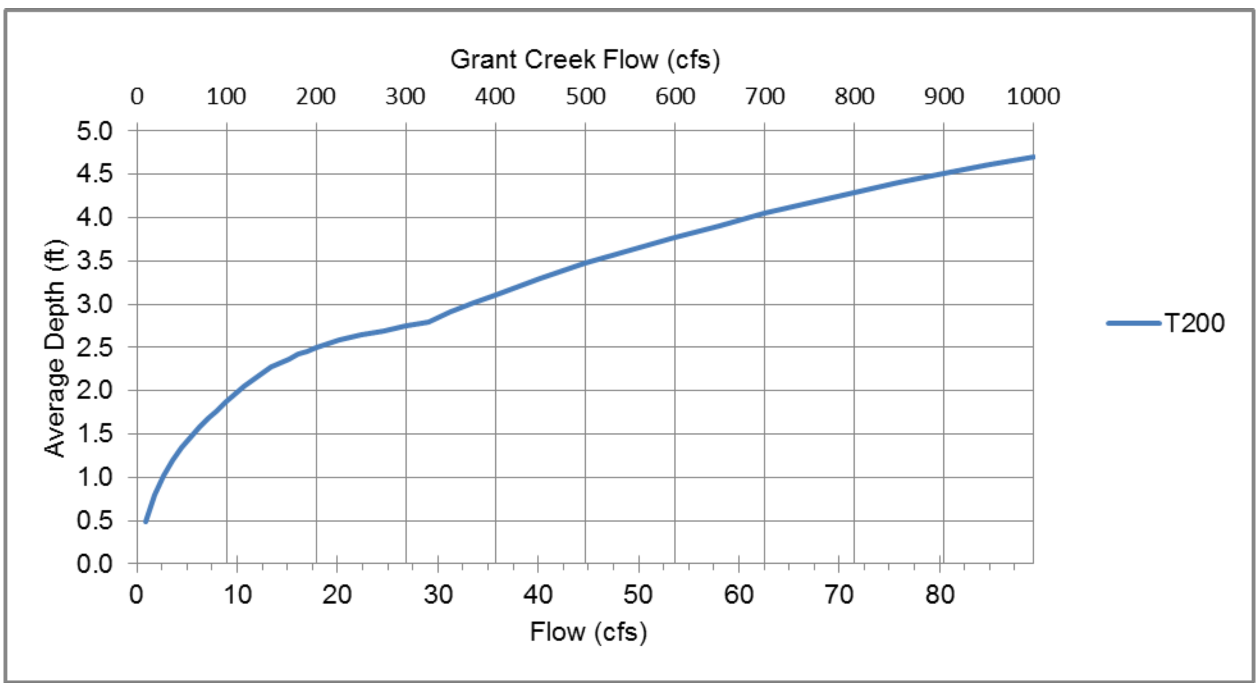

Figure A.4c-6. T200 side lobe average depth vs flow.

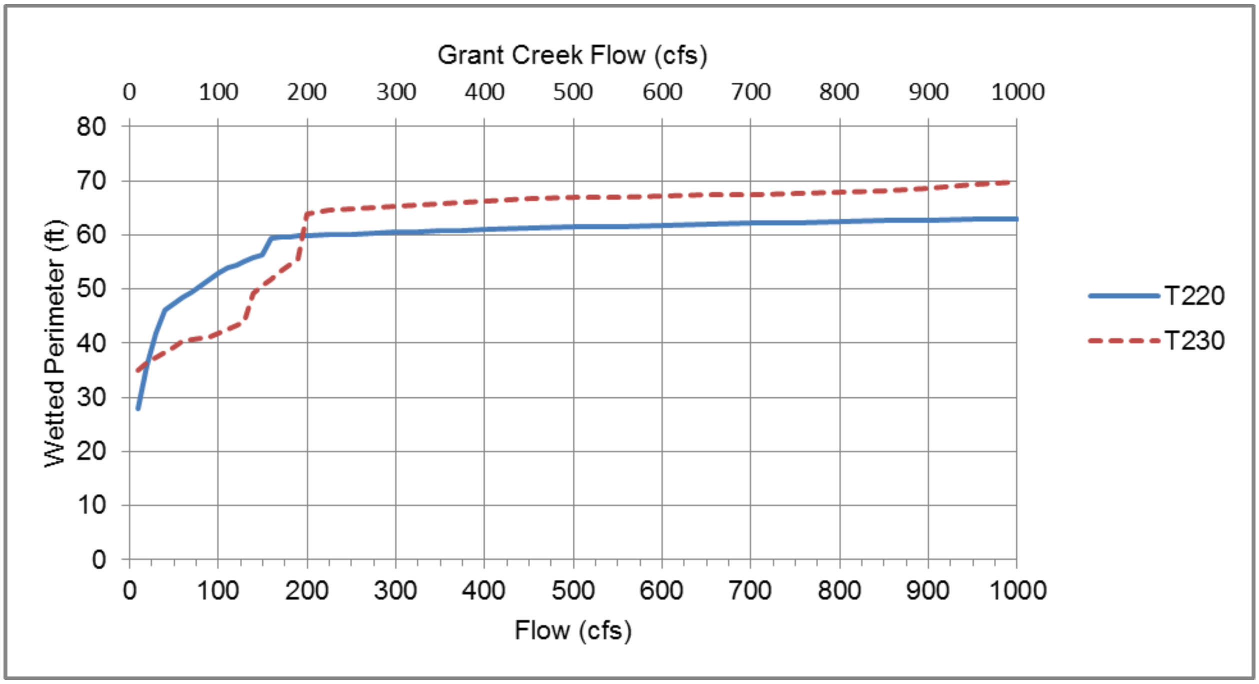

Figure A.4c-7. Reach 2 wetted perimeter vs flow.

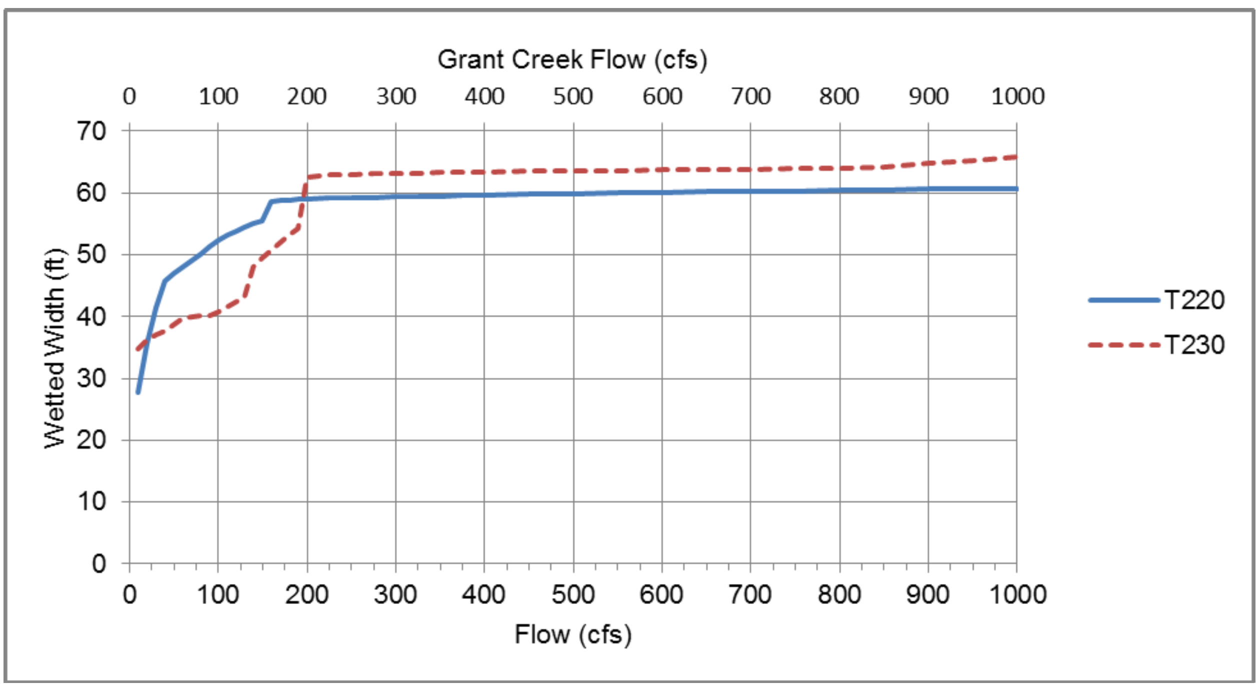

Figure A.4c-8. Reach 2 wetted width vs flow.

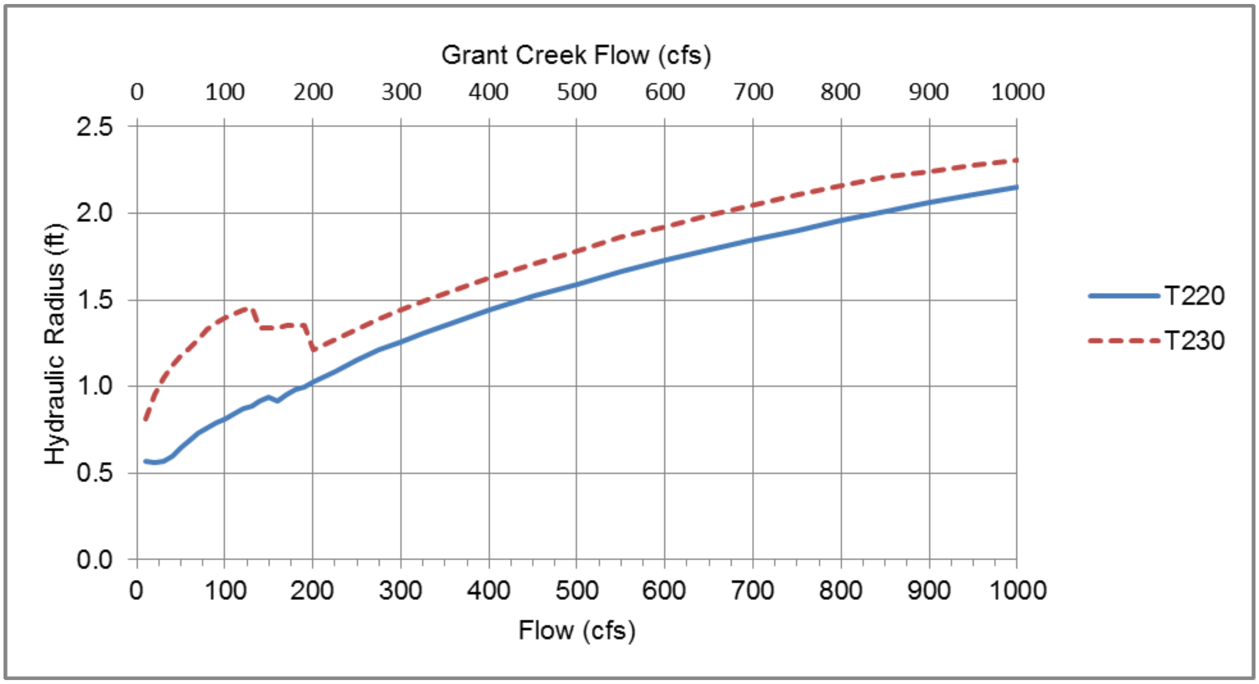

Figure A.4c-9. Reach 2 hydraulic radius vs flow.

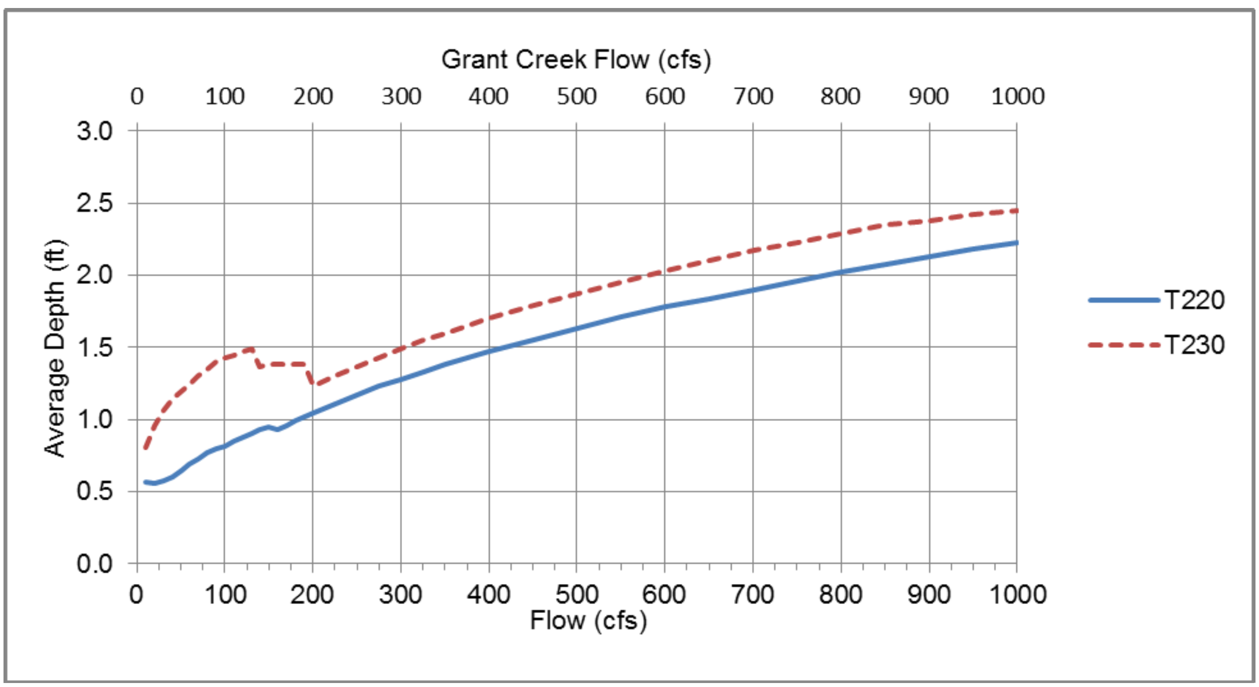

Figure A.4c-10. Reach 2 average depth vs flow.

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Appendix 4d Reach 3 Main Channel

This sub-appendix contains the following figures:

Figure A.4d-1. Transect T300 bed profile and WSE, 0.17–17 cfs.
Figure A.4d-2. Transect T310 bed profile and WSE, 10–1,000 cfs.
Figure A.4d-3. T300 side lobe wetted perimeter vs flow.
Figure A.4d-4. T300 side lobe wetted width vs flow.
Figure A.4d-5. T300 side lobe hydraulic radius vs flow.
Figure A.4d-6. T300 side lobe average depth vs flow.
Figure A.4d-7. Reach 3 main channel wetted perimeter vs flow.
Figure A.4d-8. Reach 3 main channel wetted width vs flow.
Figure A.4d-9. Reach 3 main channel hydraulic radius vs flow.
Figure A.4d-10. Reach 3 main channel average depth vs flow.

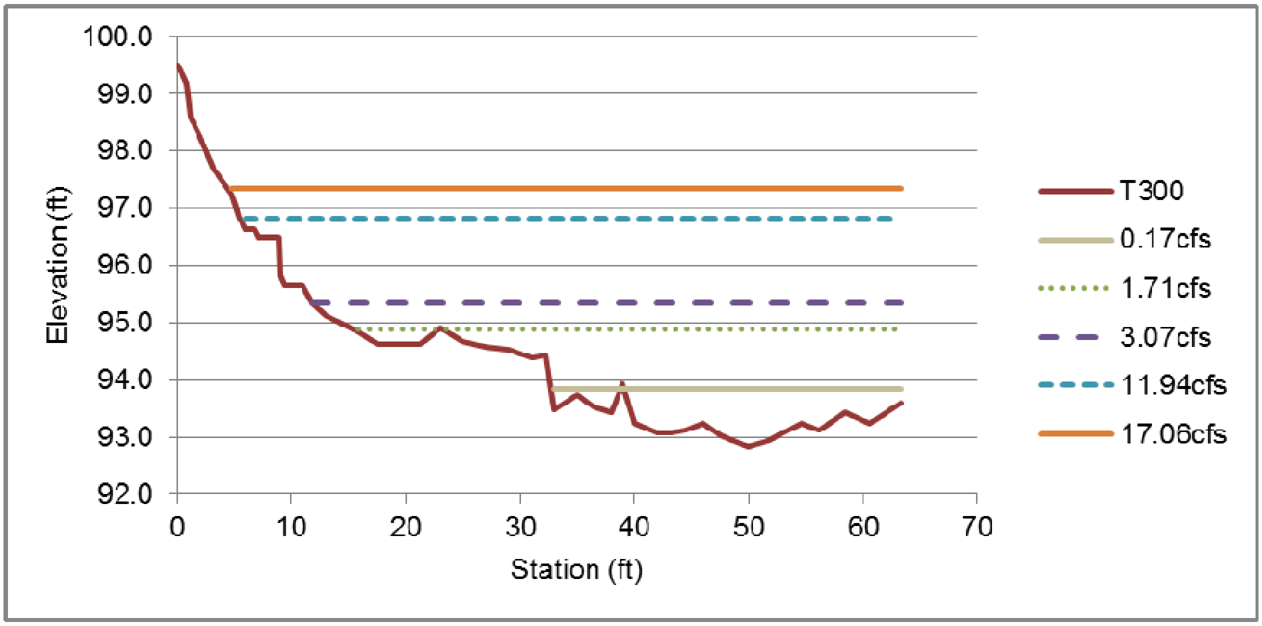

Figure A.4d-1. Transect T300 bed profile and WSE, 0.17–17 cfs.

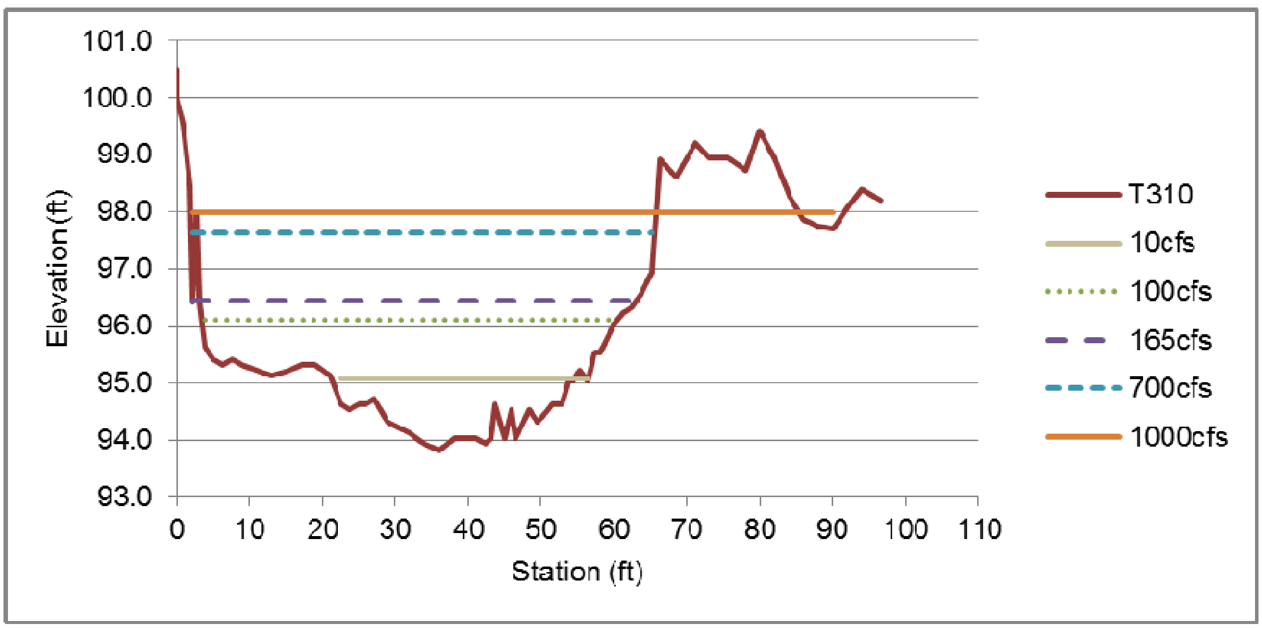

Figure A.4d-2. Transect T310 bed profile and WSE, 10–1,000 cfs.

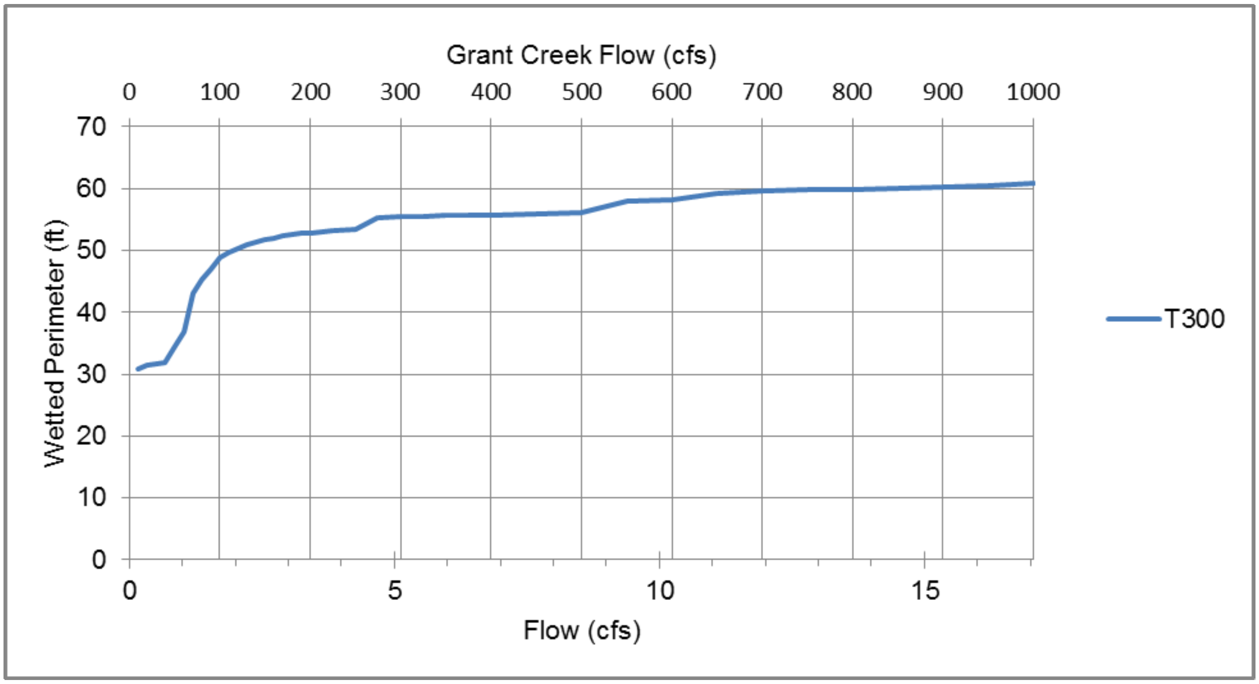

Figure A.4d-3. T300 side lobe wetted perimeter vs flow.

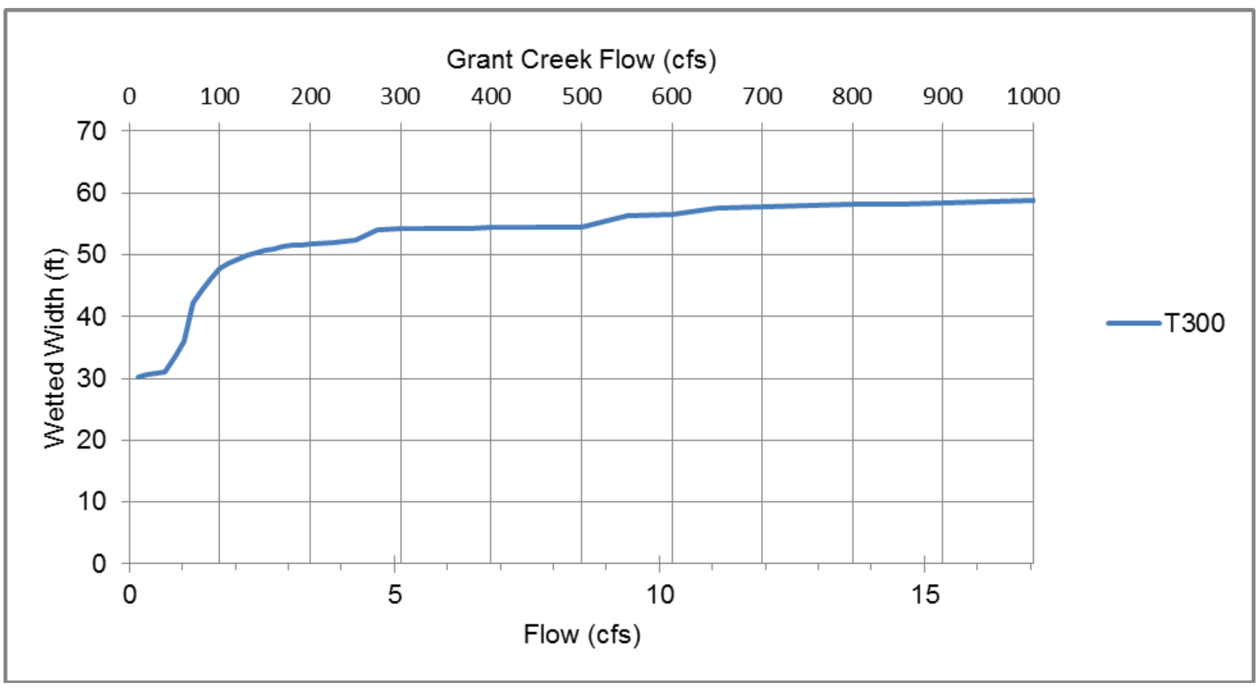

Figure A.4d-4. T300 side lobe wetted width vs flow.

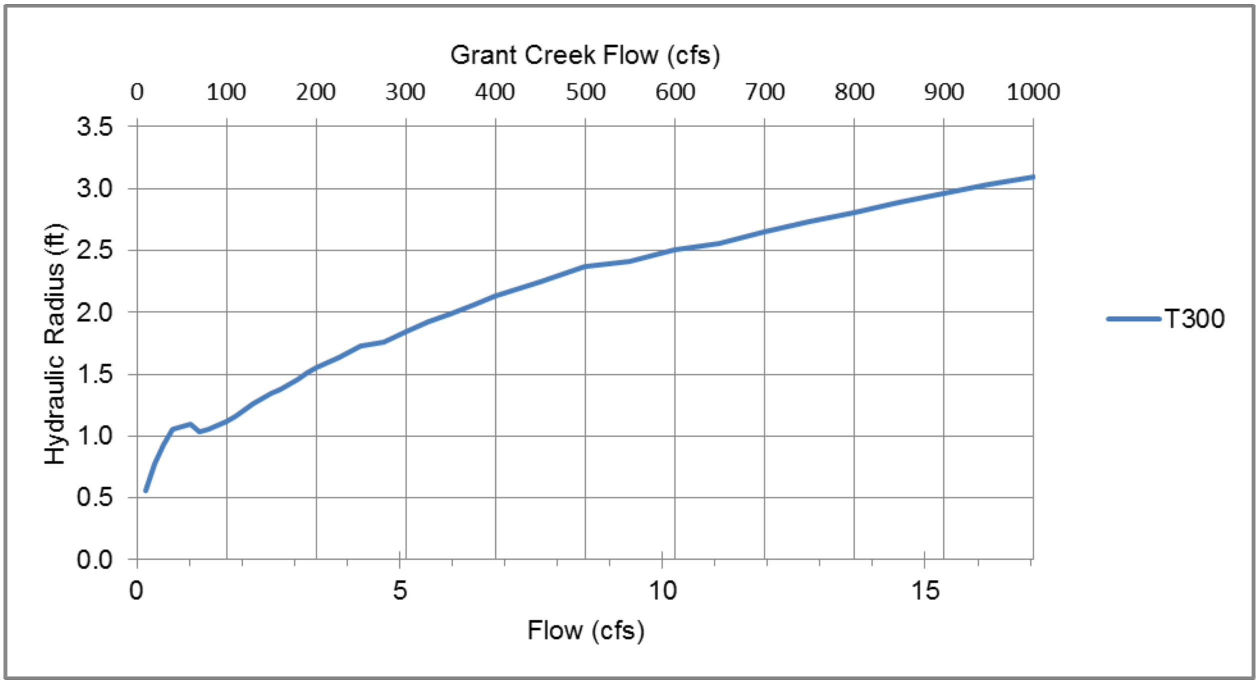

Figure A.4d-5. T300 side lobe hydraulic radius vs flow.

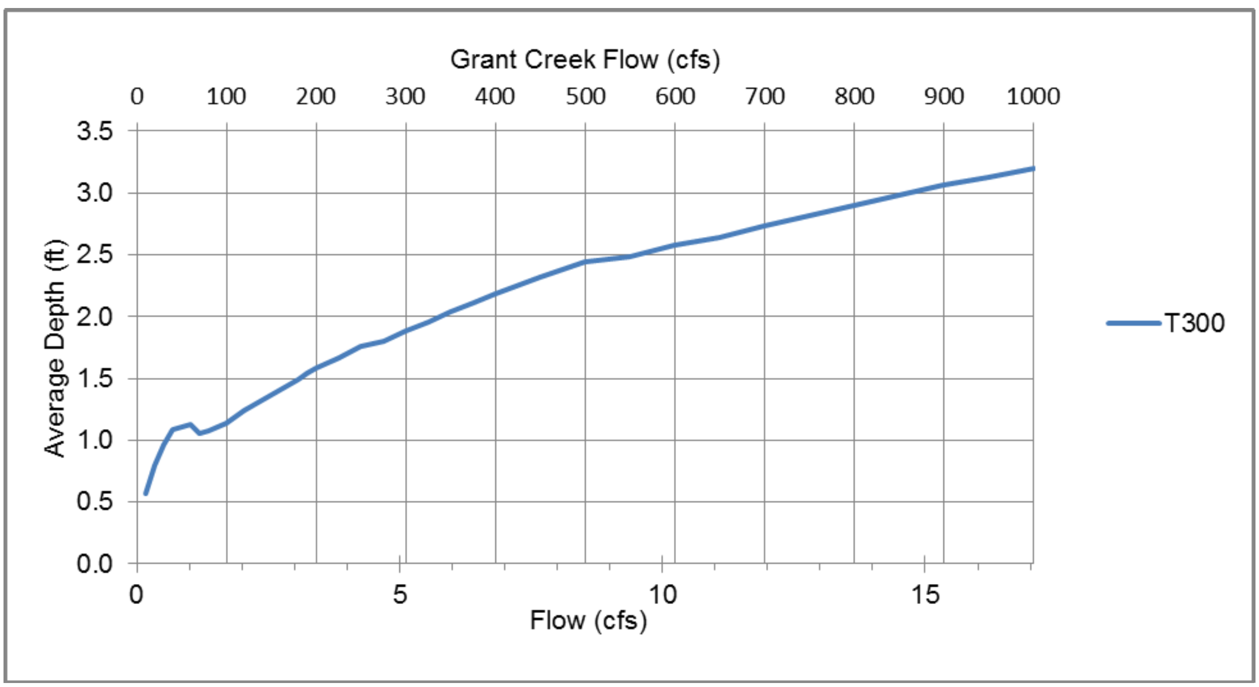

Figure A.4d-6. T300 side lobe average depth vs flow.

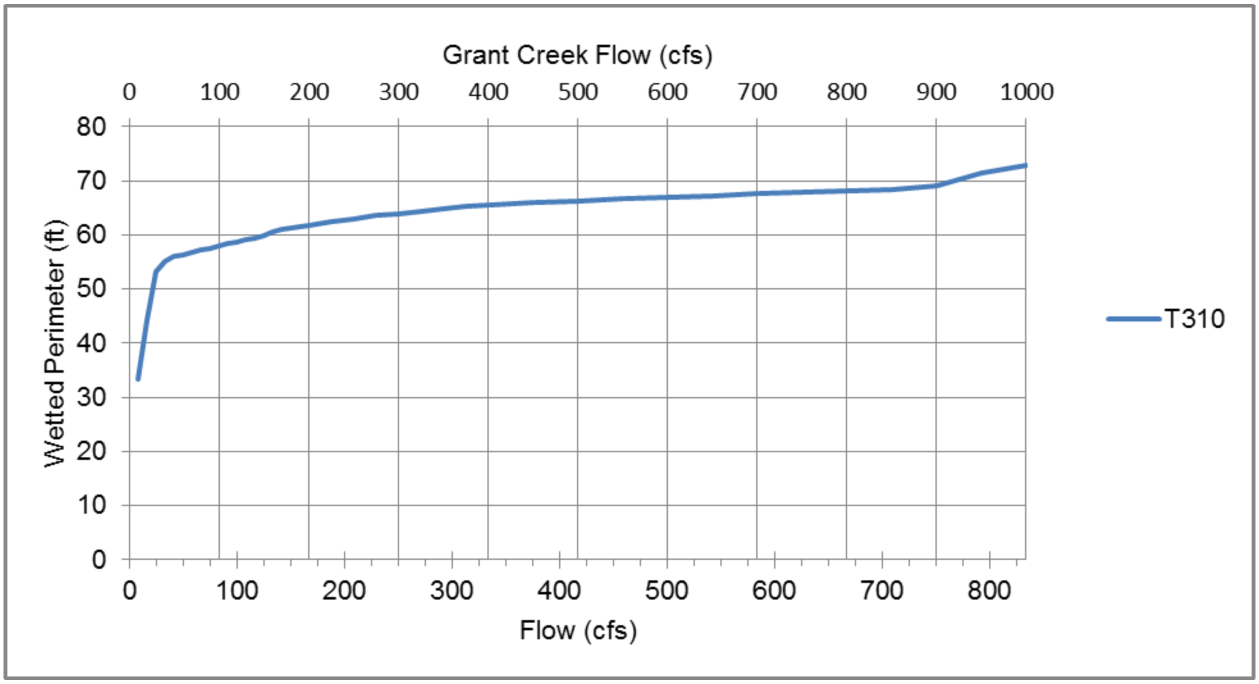

Figure A.4d-7. Reach 3 main channel wetted perimeter vs flow.

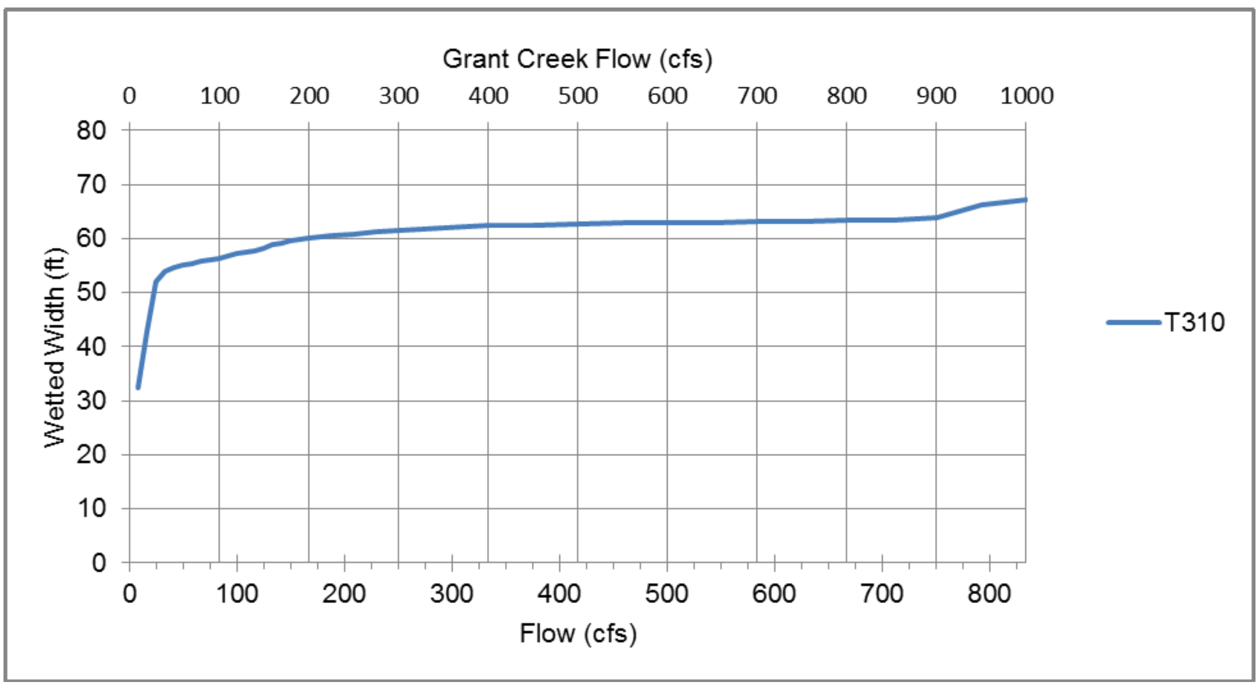

Figure A.4d-8. Reach 3 main channel wetted width vs flow.

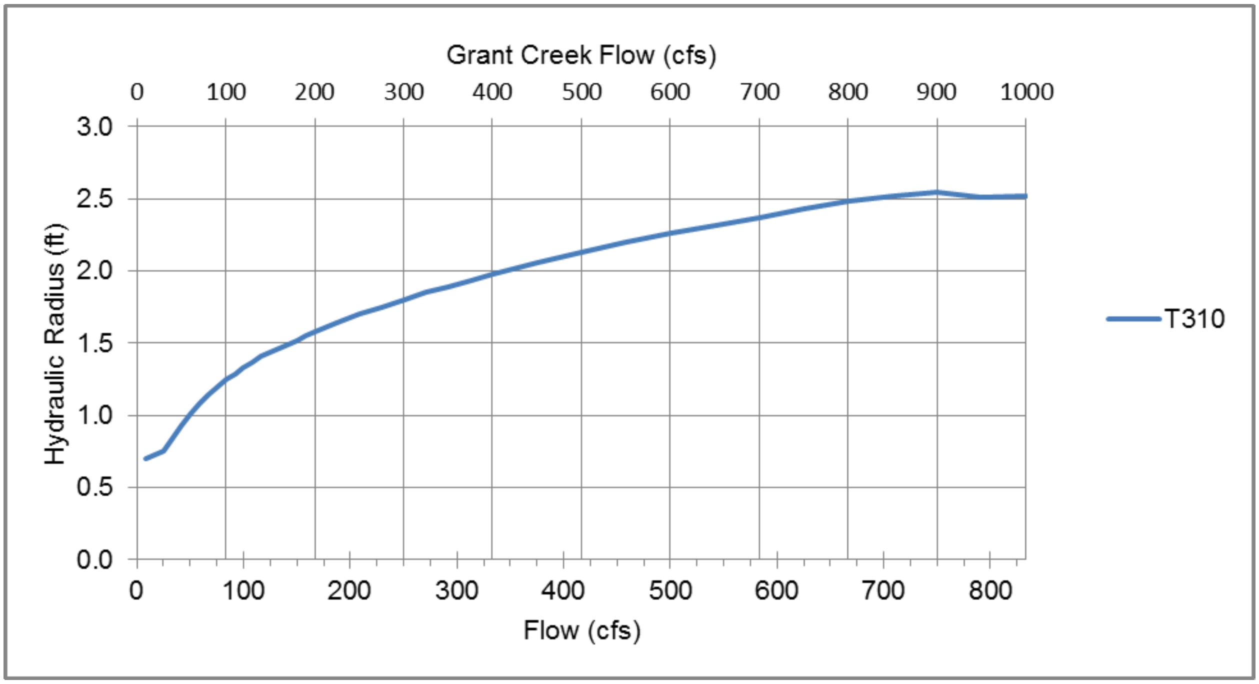

Figure A.4d-9. Reach 3 main channel hydraulic radius vs flow.

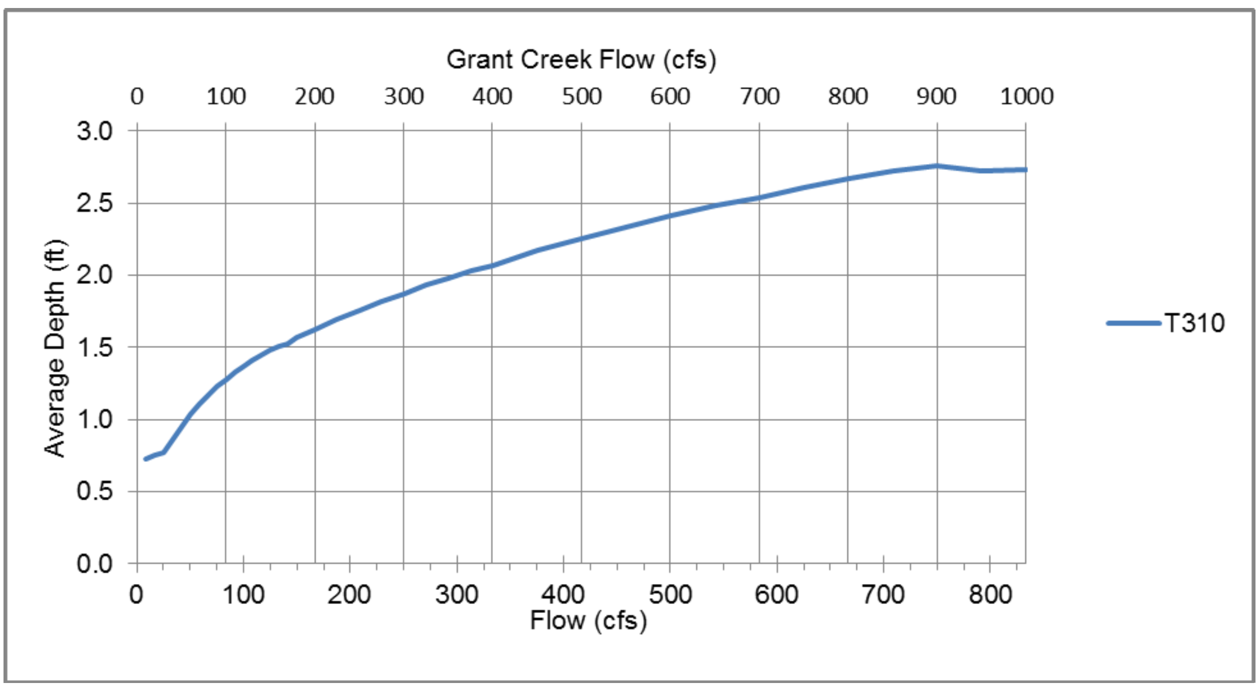

Figure A.4d-10. Reach 3 main channel average depth vs flow.

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Appendix 4e Reach 3 Side Channel

This sub-appendix contains the following figures:

Figure A.4e-1. Transect T320 bed profile and WSE, 1.6–158 cfs.
Figure A.4e-2. Transect T330 primary bed profile and WSE, 1.5–151 cfs.
Figure A.4e-3. Transect T330 secondary bed profile and WSE, 0.13–12.7 cfs.
Figure A.4e-4. Transect T330 tertiary bed profile and WSE, 0.13–97 cfs.
Figure A.4e-5. Transect T320 wetted perimeter vs flow.
Figure A.4e-6. Transect T320 wetted width vs flow.
Figure A.4e-7. Transect T320 hydraulic radius vs flow.
Figure A.4e-8. Transect T320 average depth vs flow.
Figure A.4e-9. Transect T330 primary wetted perimeter vs flow.
Figure A.4e-10. Transect T330 primary wetted width vs flow.
Figure A.4e-11. Transect T330 primary hydraulic radius vs flow.
Figure A.4e-12. Transect T330 primary average depth vs flow.
Figure A.4e-13. Transect T330 secondary wetted perimeter vs flow.
Figure A.4e-14. Transect T330 secondary wetted width vs flow.
Figure A.4e-15. Transect T330 secondary hydraulic radius vs flow.
Figure A.4e-16. Transect T330 secondary average depth vs flow.
Figure A.4e-17. Transect T330 Tertiary wetted perimeter vs flow.
Figure A.4e-18. Transect T330 tertiary wetted width vs flow.
Figure A.4e-19. Transect T330 tertiary hydraulic radius vs flow.
Figure A.4e-20. Transect T330 tertiary average depth vs flow.

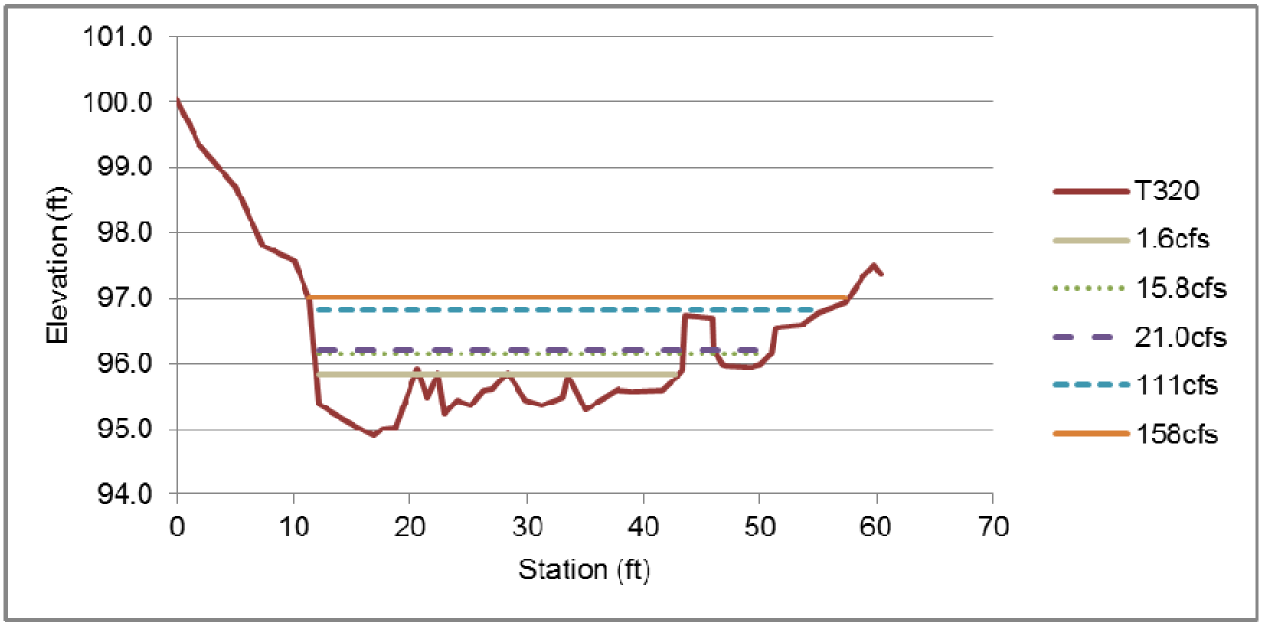

Figure A.4e-1. Transect T320 bed profile and WSE, 1.6–158 cfs.

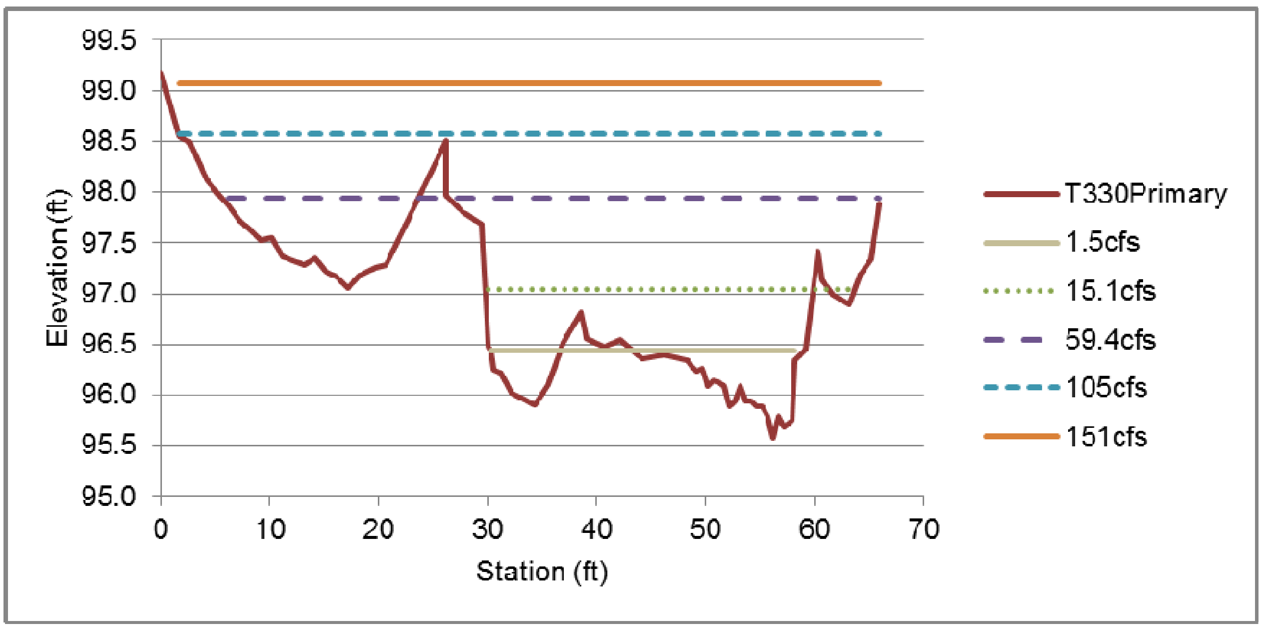

Figure A.4e-2. Transect T330 primary bed profile and WSE, 1.5–151 cfs.

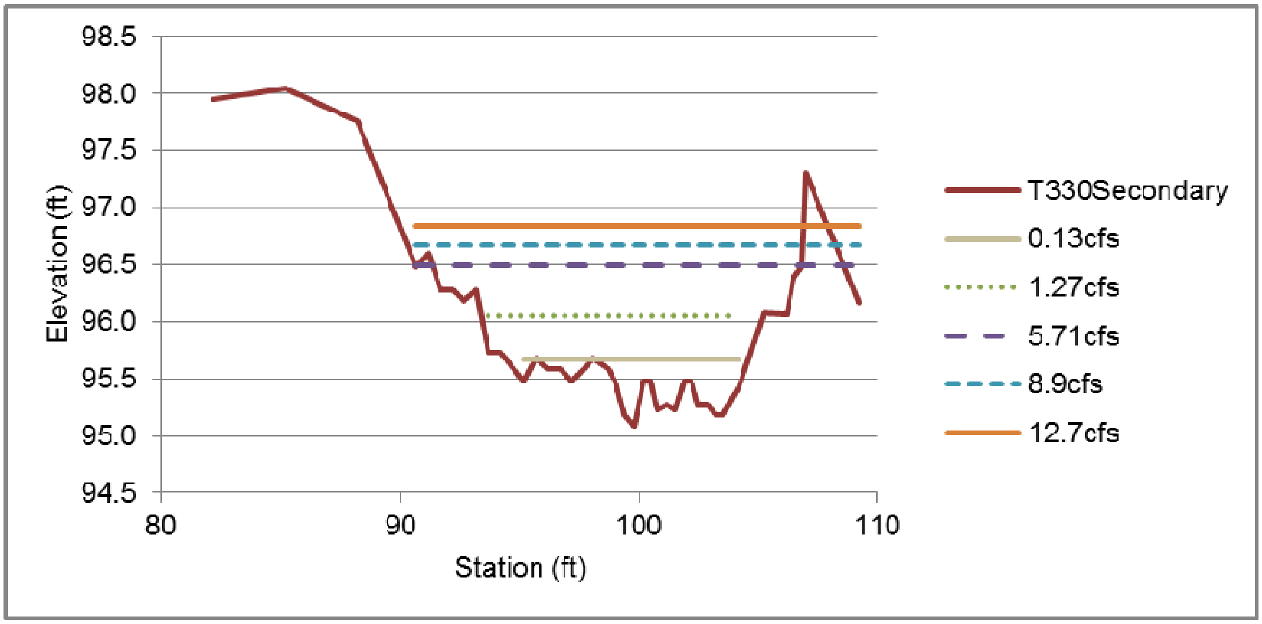

Figure A.4e-3. Transect T330 secondary bed profile and WSE, 0.13–12.7 cfs.

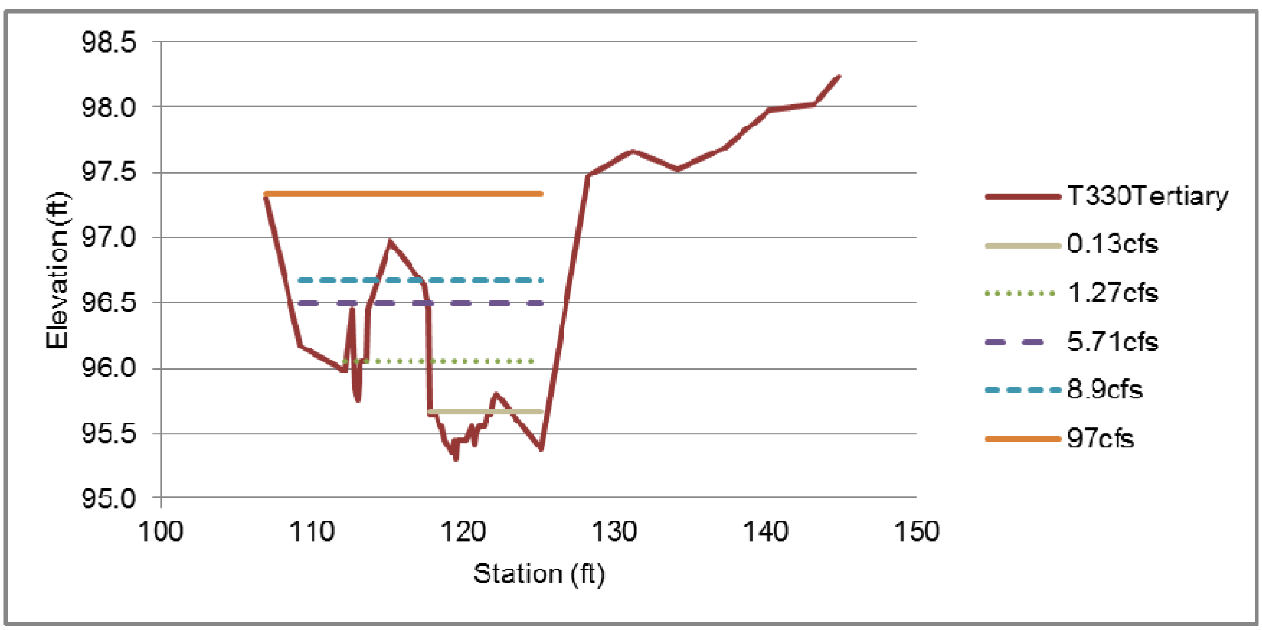

Figure A.4e-4. Transect T330 tertiary bed profile and WSE, 0.13–97 cfs.

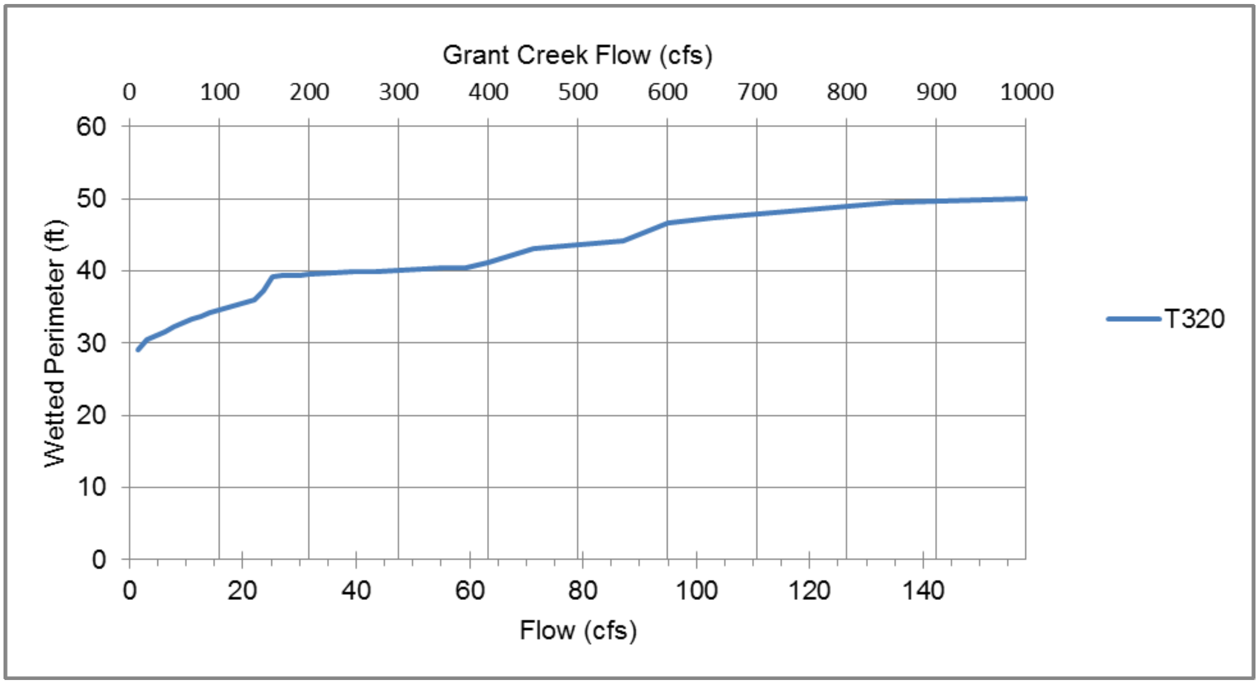

Figure A.4e-5. Transect T320 wetted perimeter vs flow.

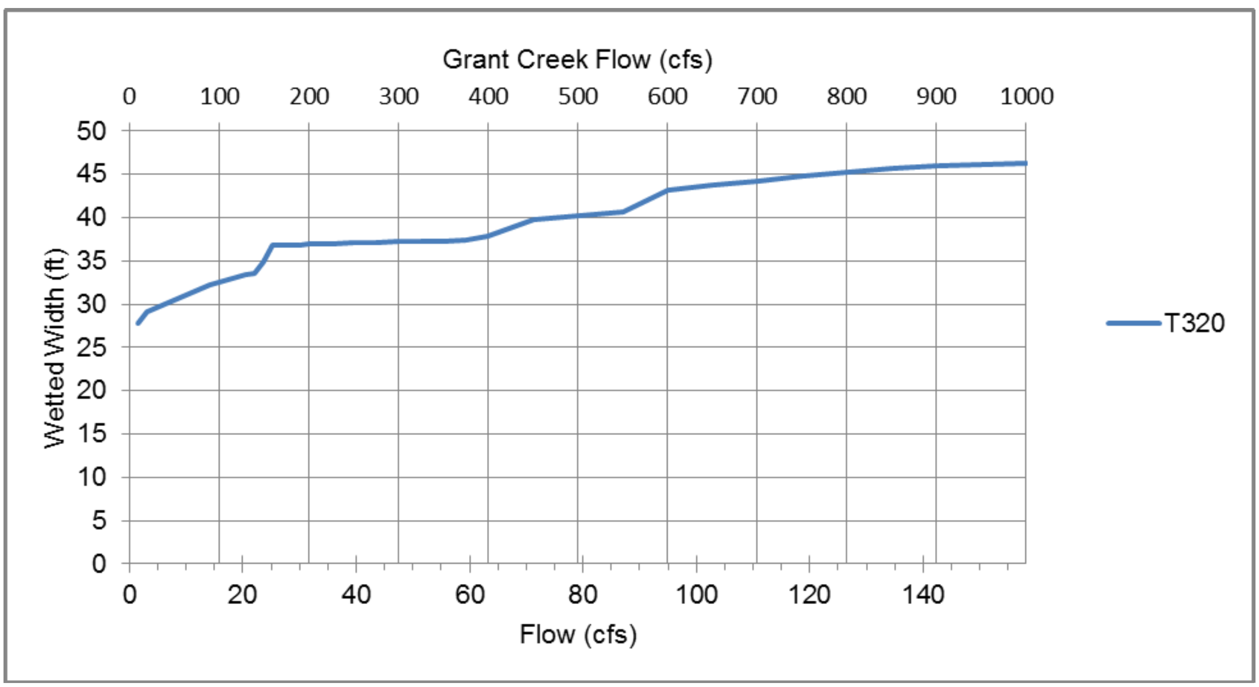

Figure A.4e-6. Transect T320 wetted width vs flow.

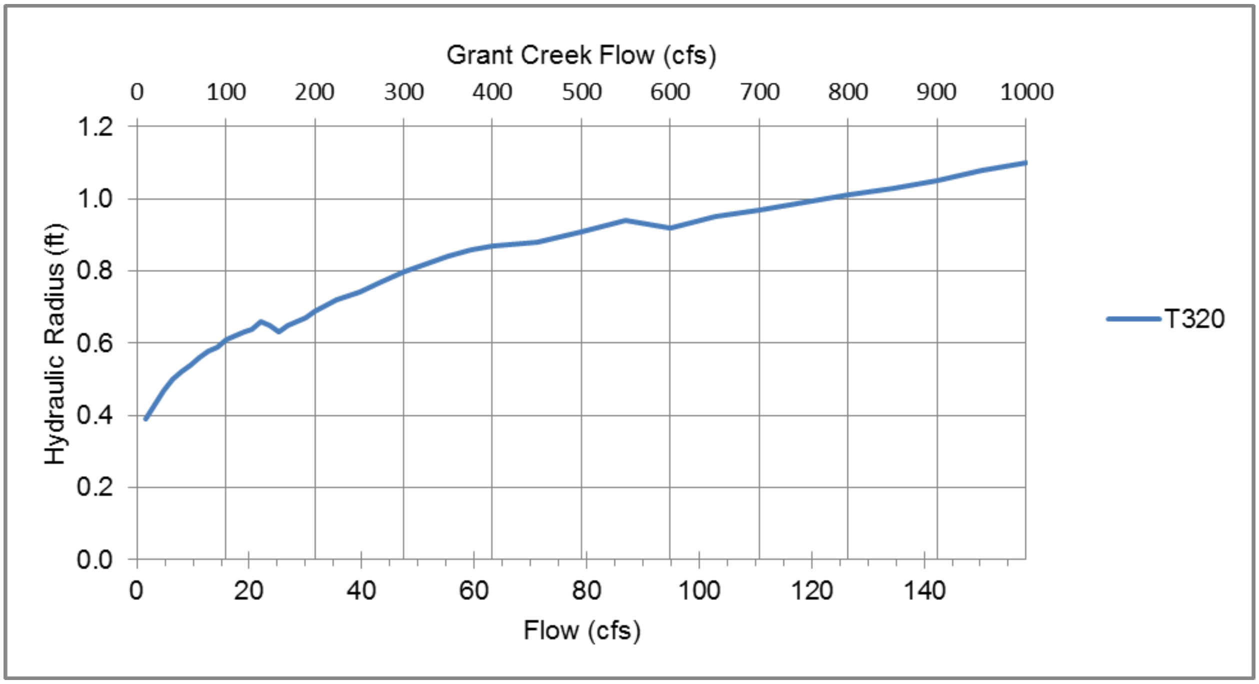

Figure A.4e-7. Transect T320 hydraulic radius vs flow.

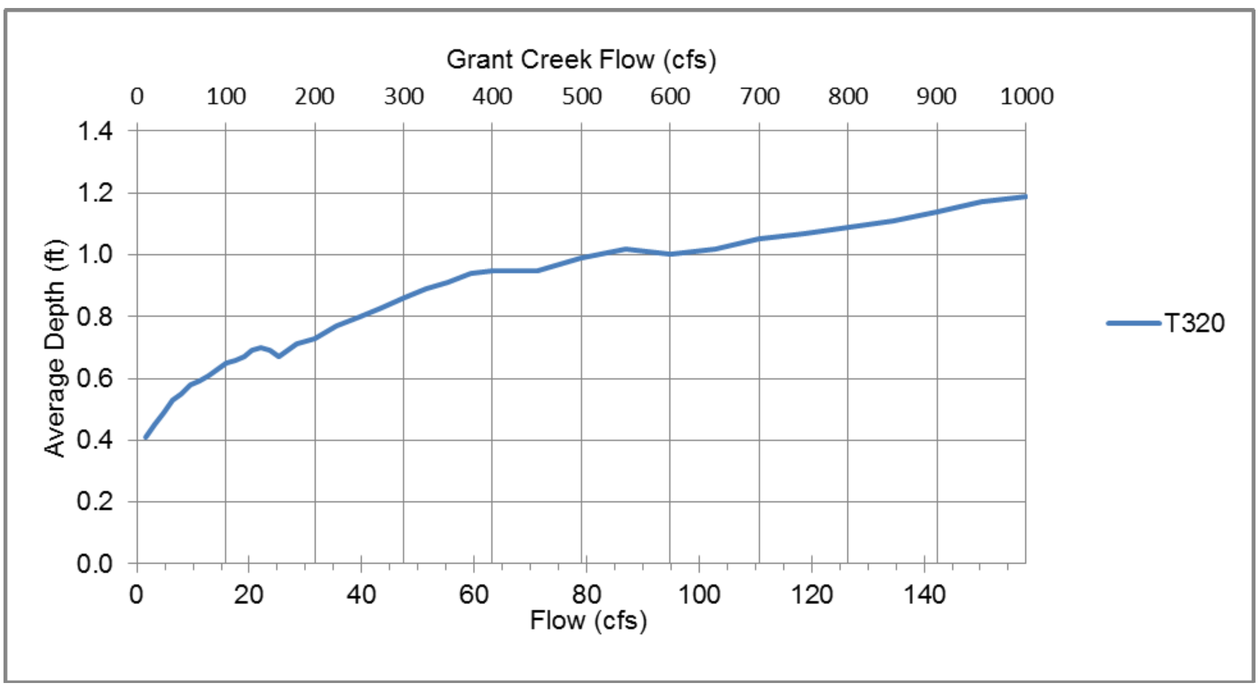

Figure A.4e-8. Transect T320 average depth vs flow.

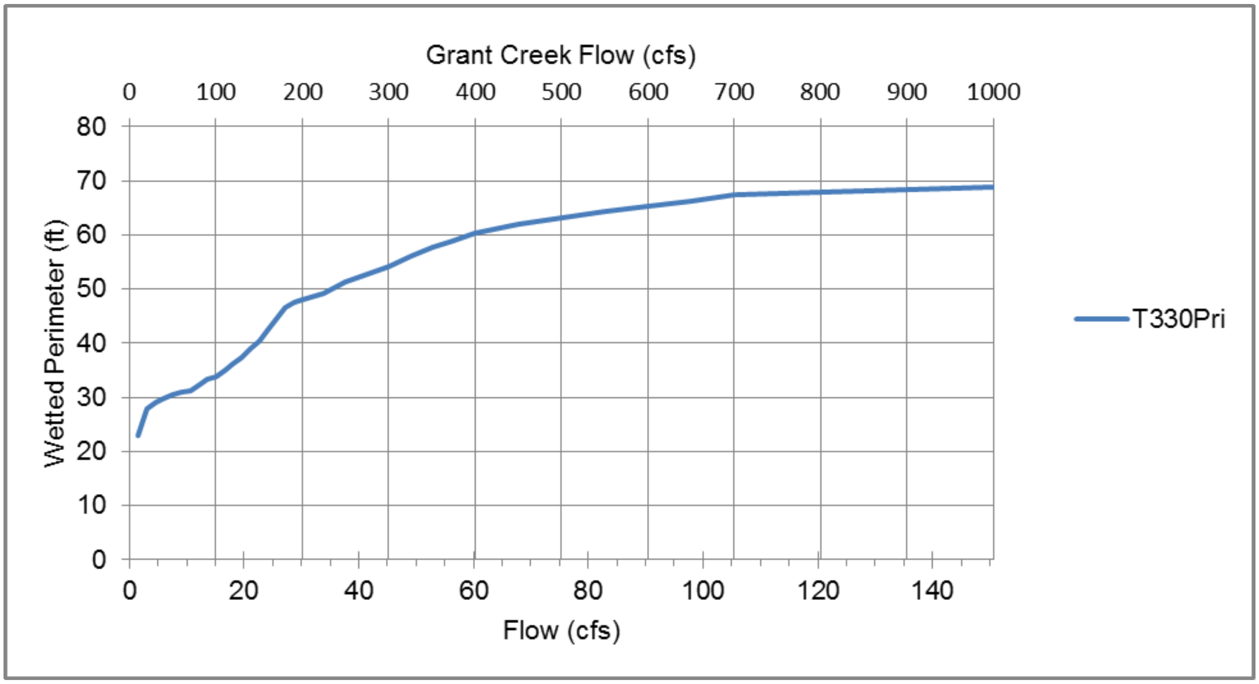

Figure A.4e-9. Transect T330 primary wetted perimeter vs flow.

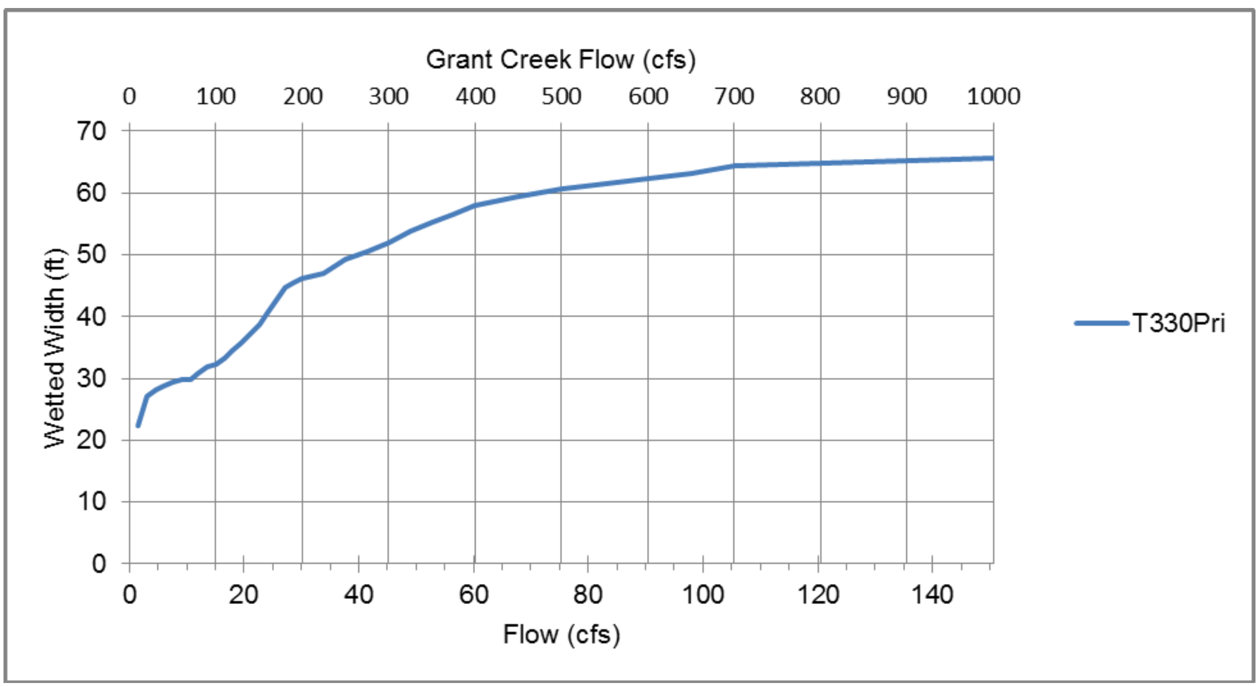

Figure A.4e-10. Transect T330 primary wetted width vs flow.

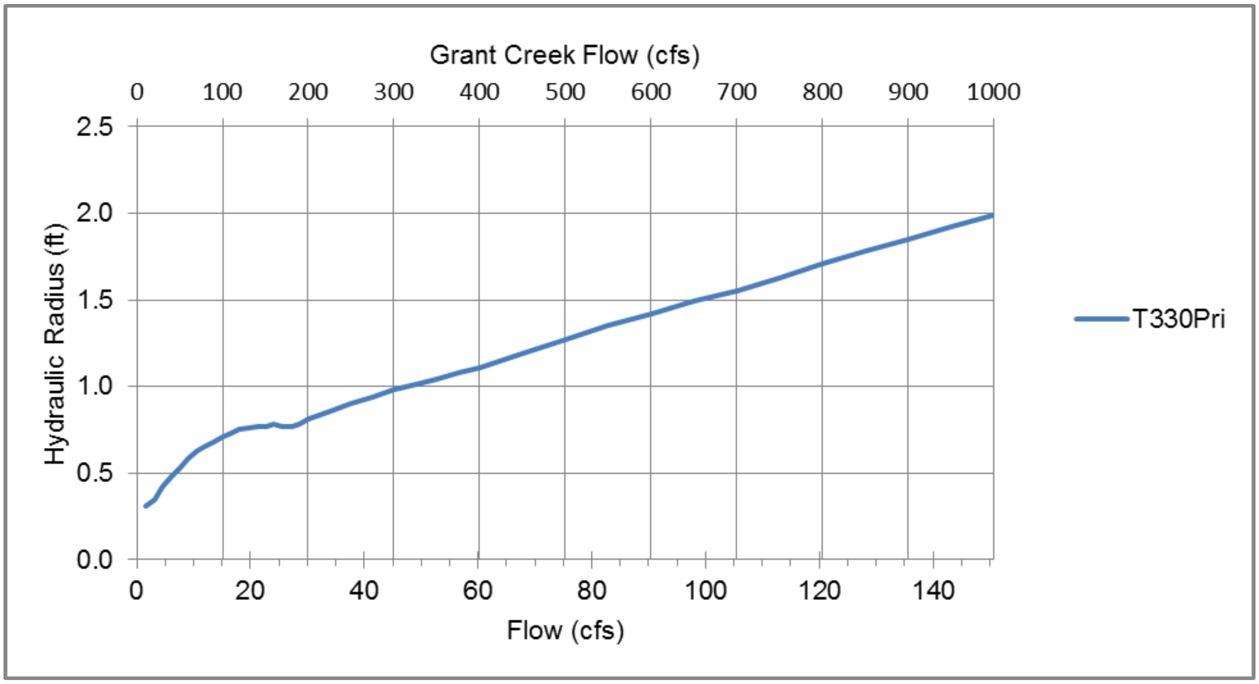

Figure A.4e-11. Transect T330 primary hydraulic radius vs flow.

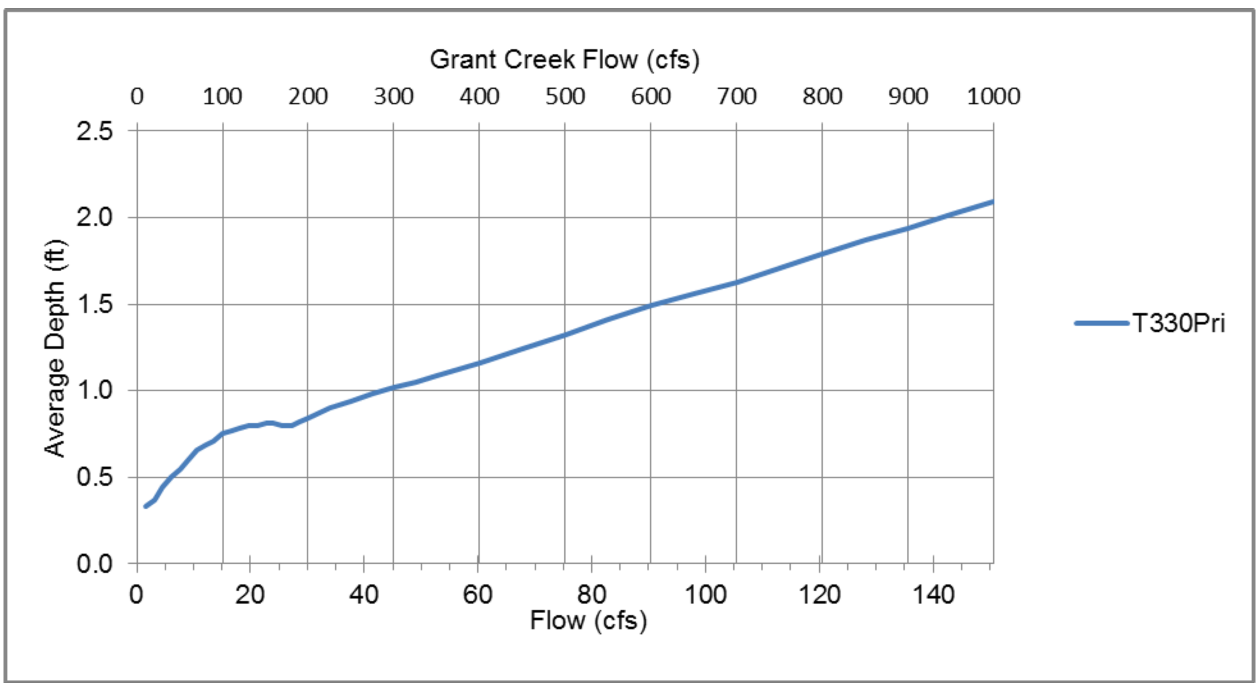

Figure A.4e-12. Transect T330 primary average depth vs flow.

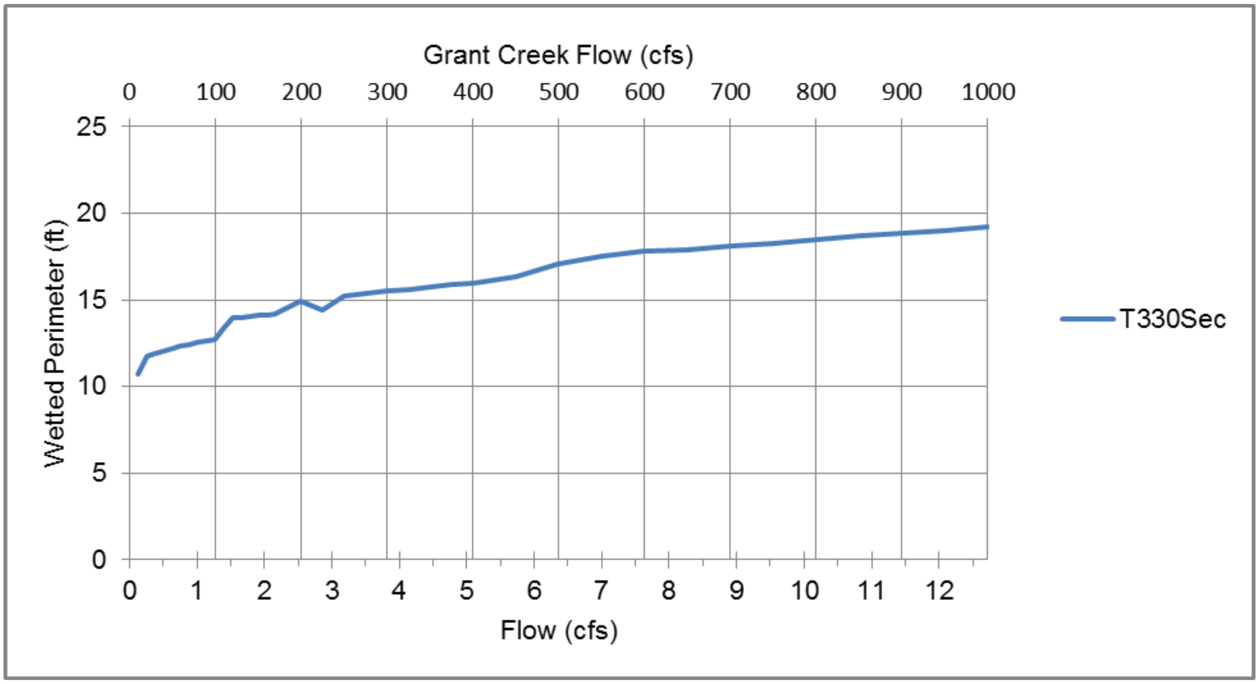

Figure A.4e-13. Transect T330 secondary wetted perimeter vs flow.

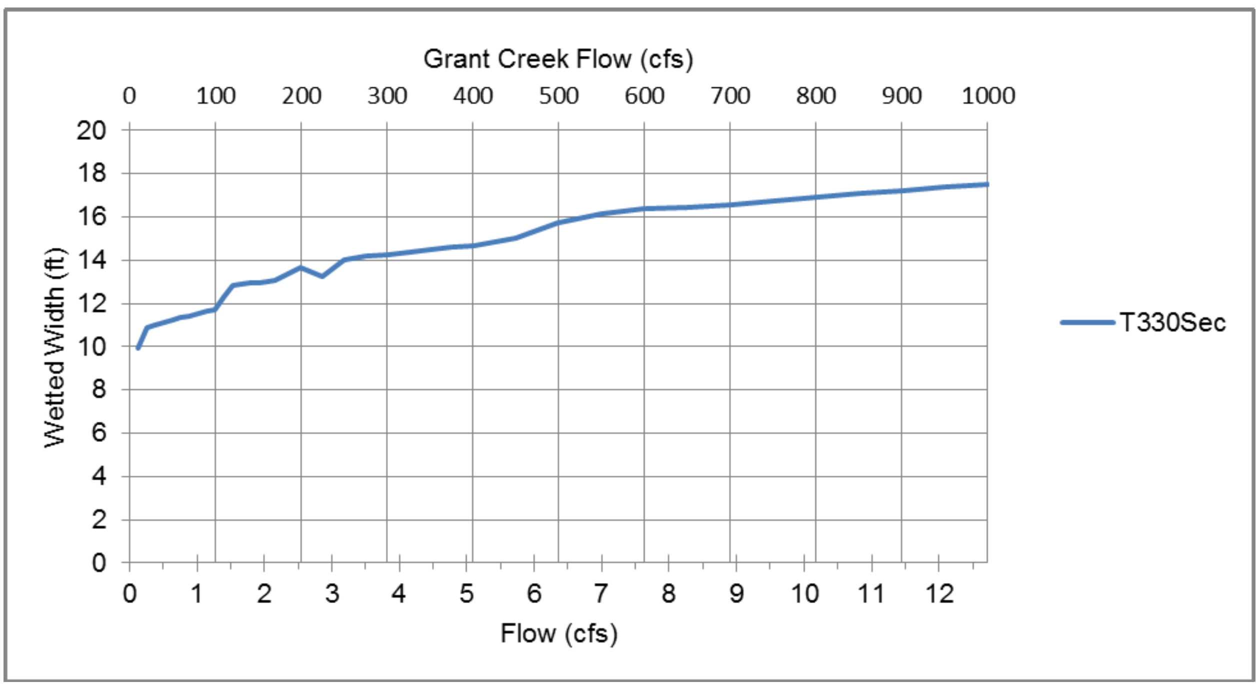

Figure A.4e-14. Transect T330 secondary wetted width vs flow.

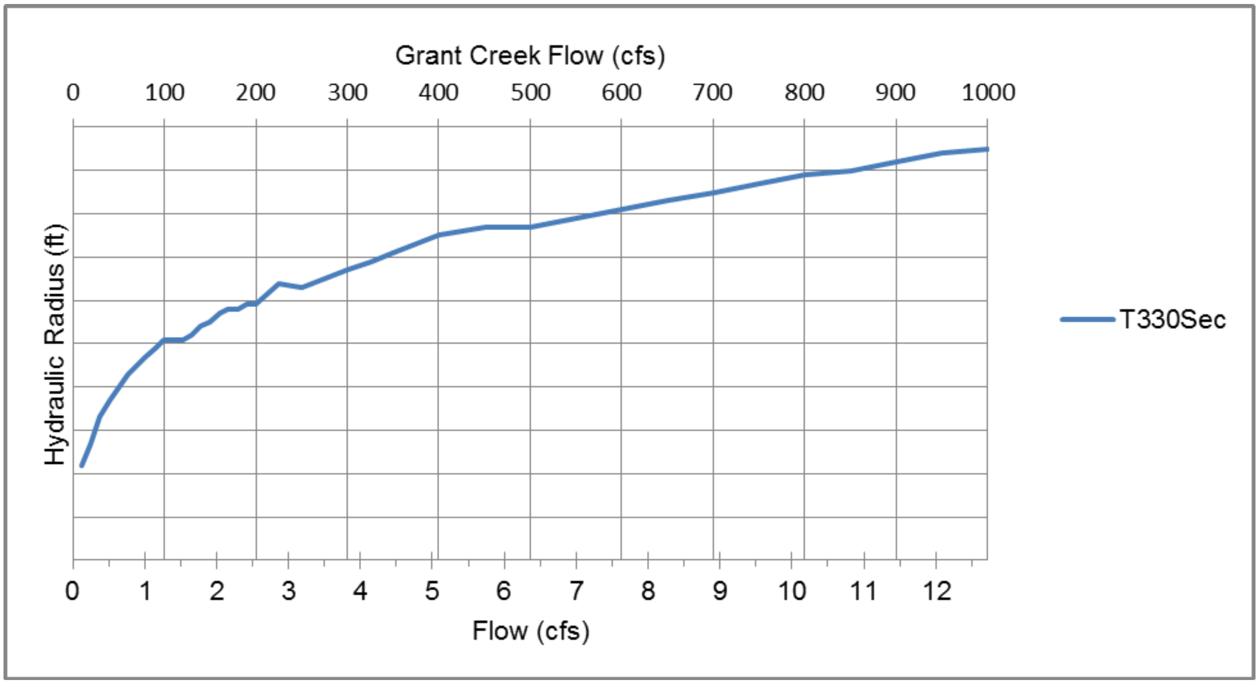

Figure A.4e-15. Transect T330 secondary hydraulic radius vs flow.

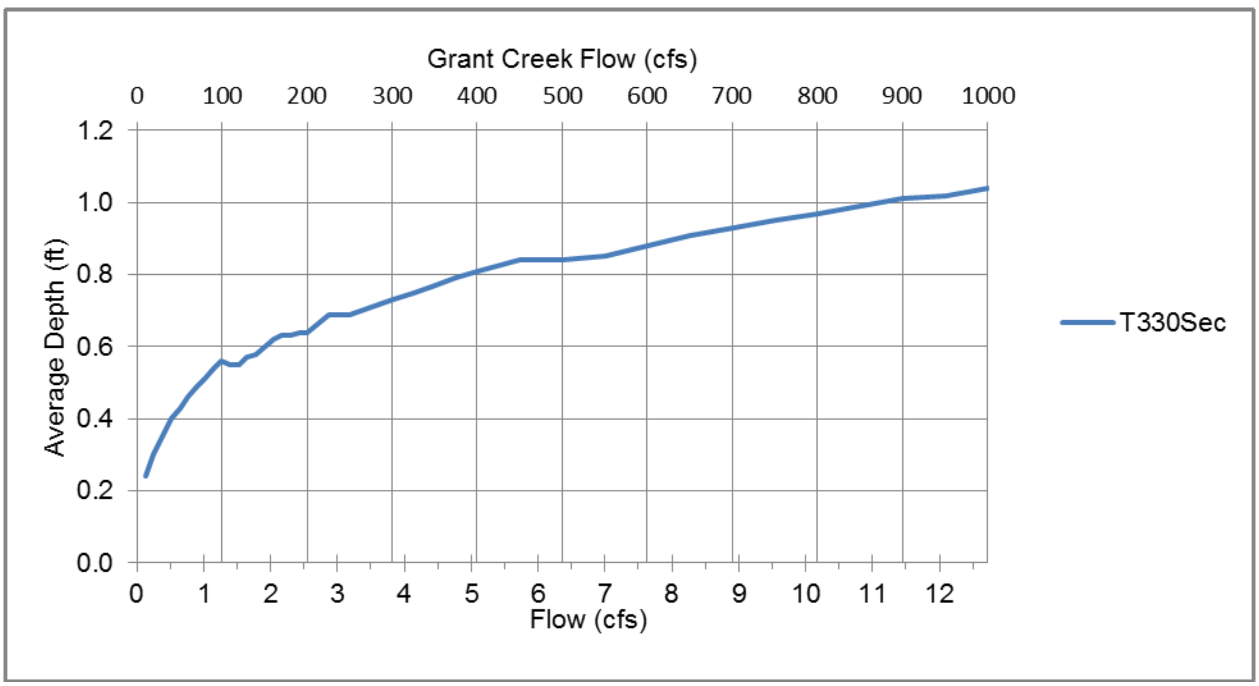

Figure A.4e-16. Transect T330 secondary average depth vs flow.

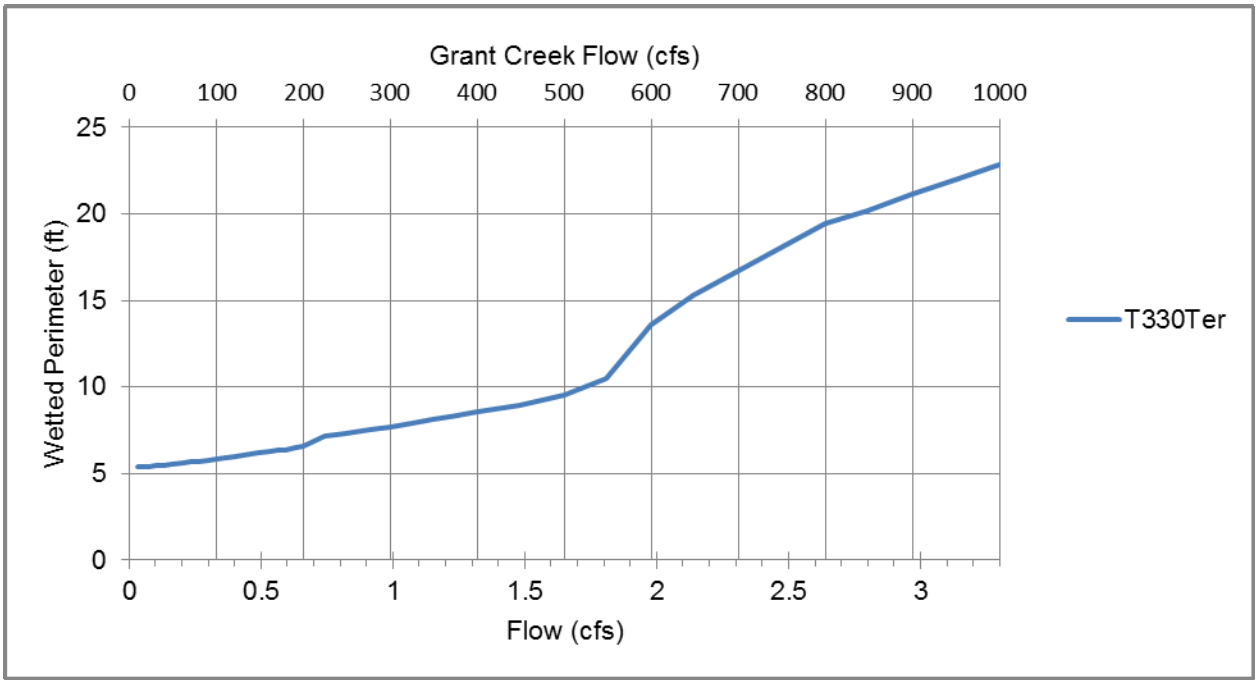

Figure A.4e-17. Transect T330 Tertiary wetted perimeter vs flow.

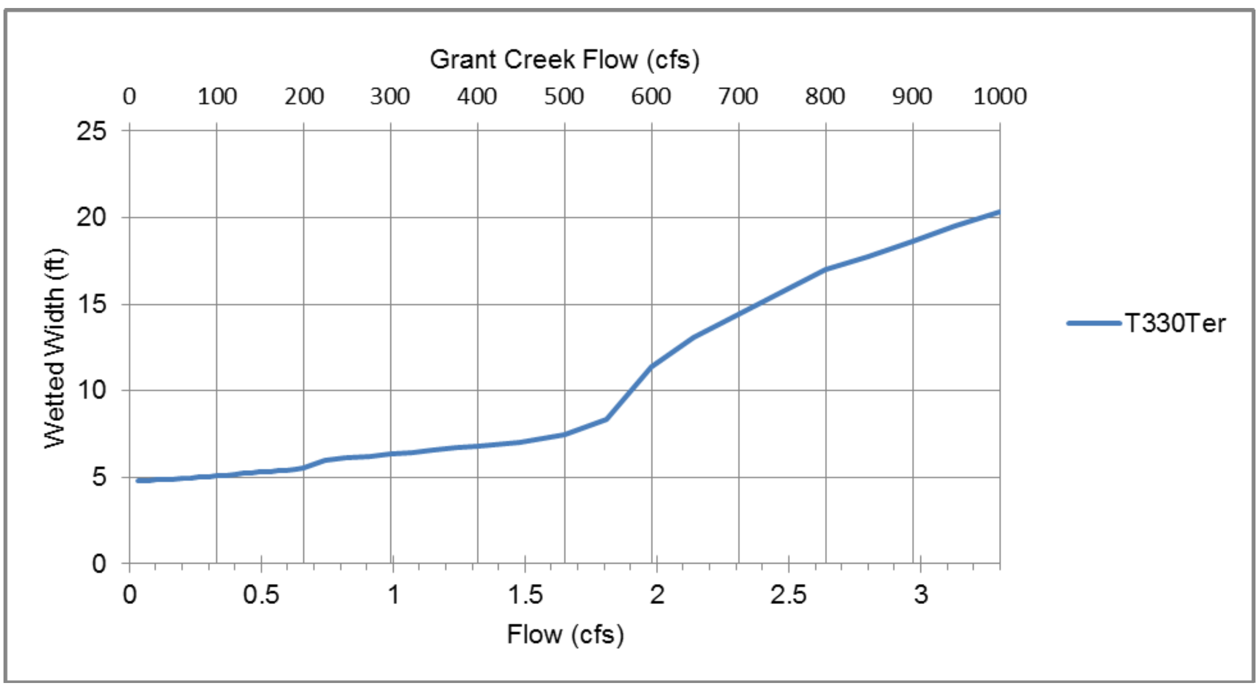

Figure A.4e-18. Transect T330 tertiary wetted width vs flow.

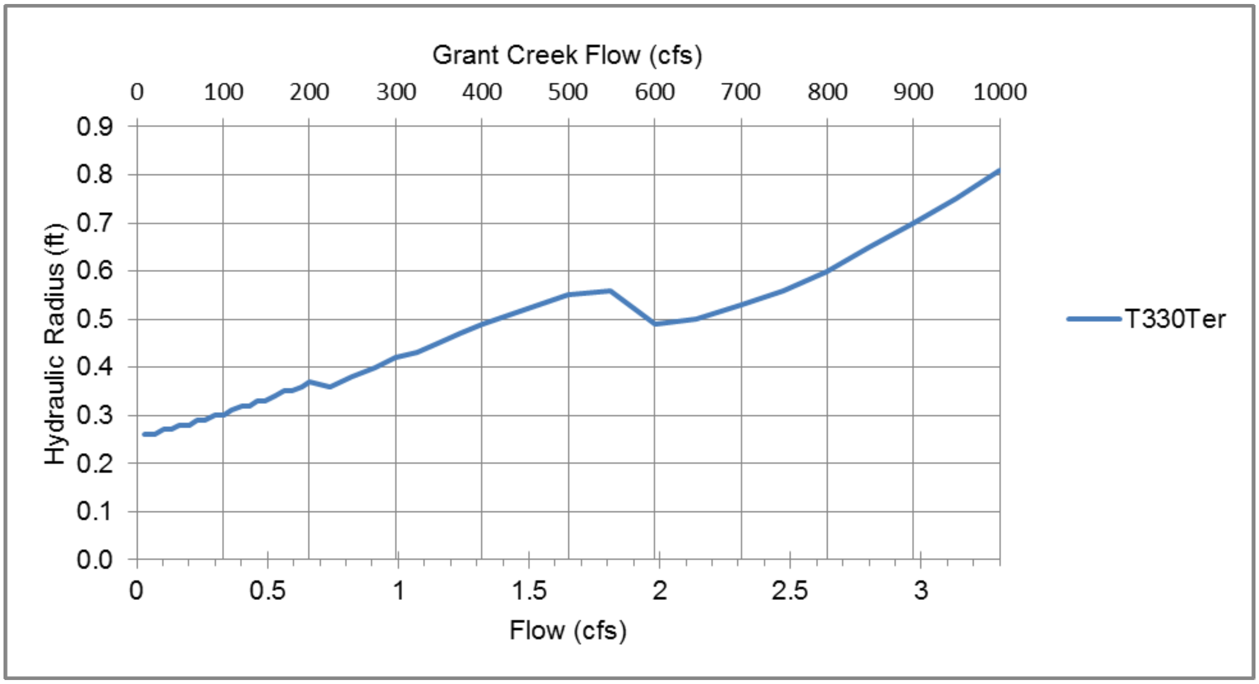

Figure A.4e-19. Transect T330 tertiary hydraulic radius vs flow.

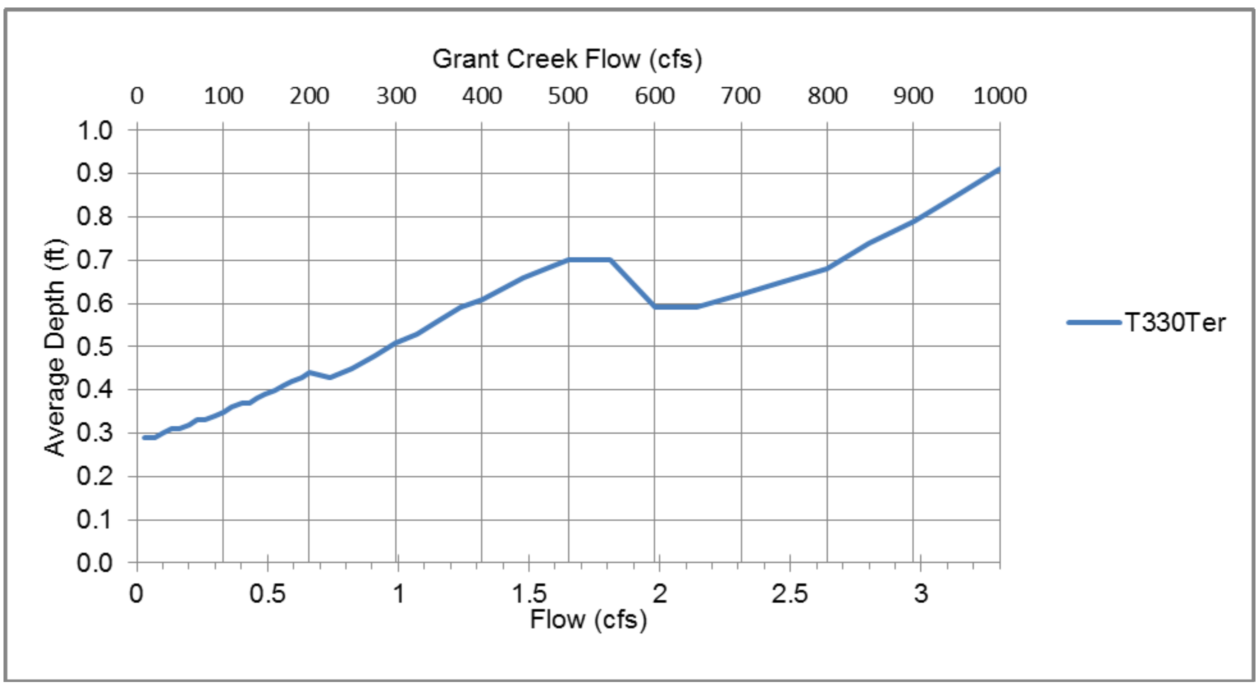

Figure A.4e-20. Transect T330 tertiary average depth vs flow.

Appendix 4f Reach 4

This sub-appendix contains the following figures:

Figure A.4f-1. Transect 400 bed profile and WSE, 10–1,000 cfs.
Figure A.4f-2. Transect T410 bed profile and WSE, 10–1,000 cfs.
Figure A.4f-3. Transect T430 bed profile and WSE, 10–1,000 cfs.
Figure A.4f-4. Reach 4 wetted perimeter vs flow.
Figure A.4f-5. Reach 4 wetted width vs flow.
Figure A.4f-6. Reach 4 hydraulic radius vs flow.
Figure A.4f-7. Reach 4 average depth vs flow.

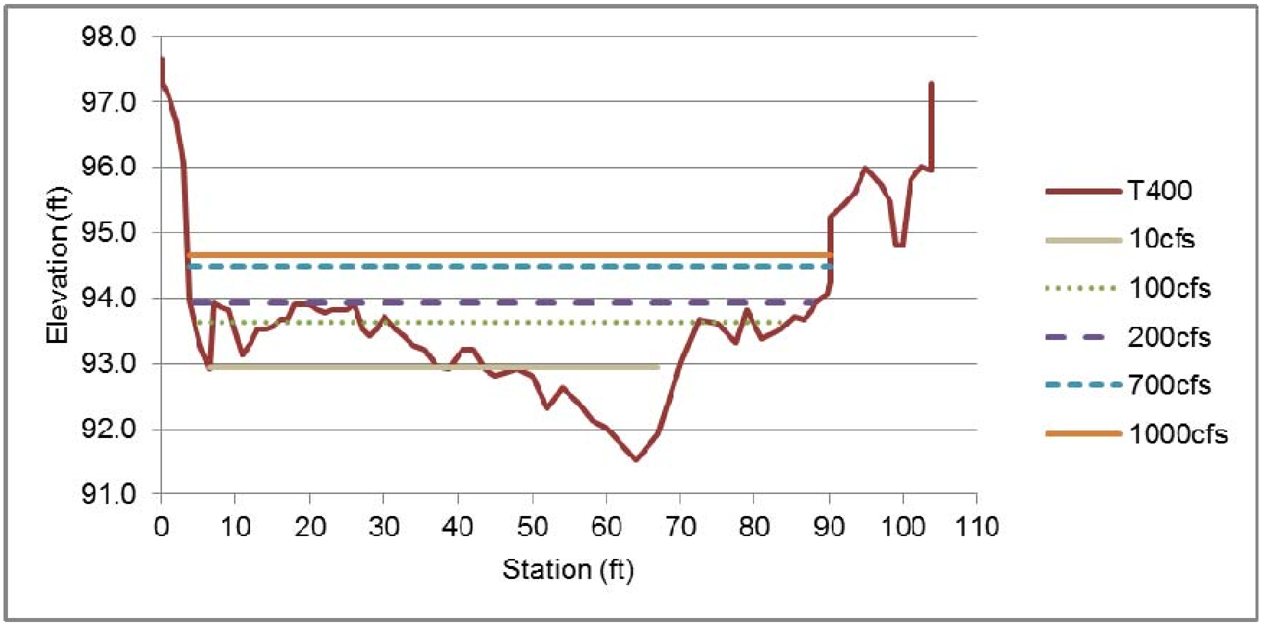

Figure A.4f-1. Transect 400 bed profile and WSE, 10–1,000 cfs.

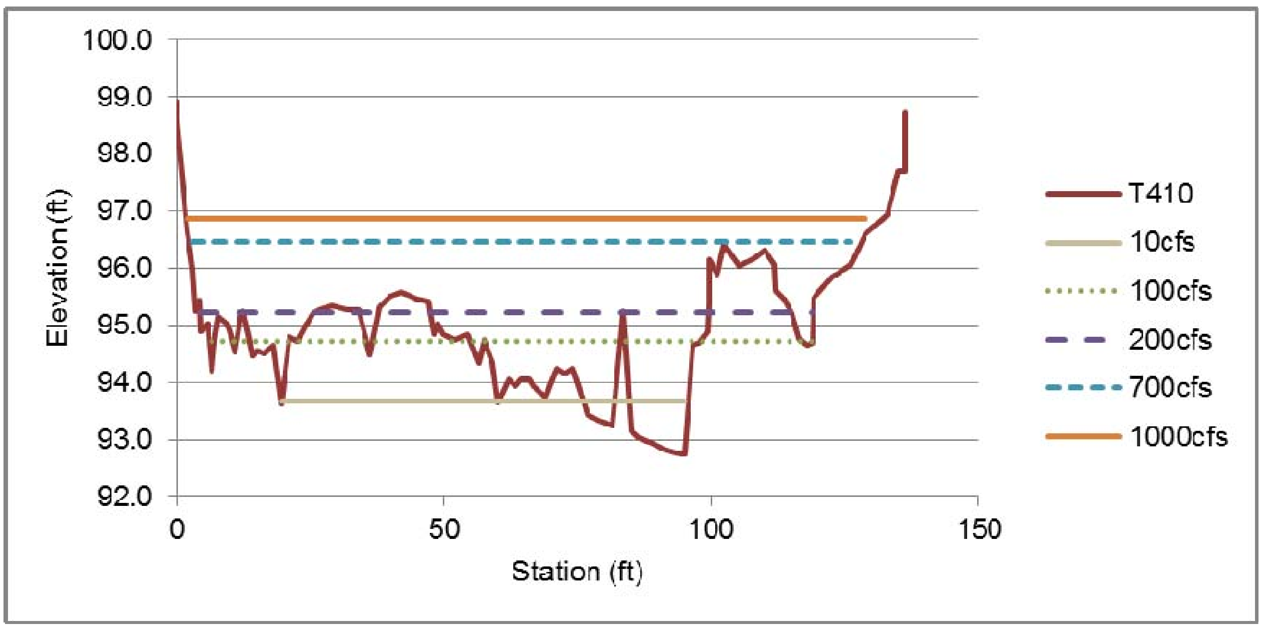

Figure A.4f-2. Transect T410 bed profile and WSE, 10–1,000 cfs.

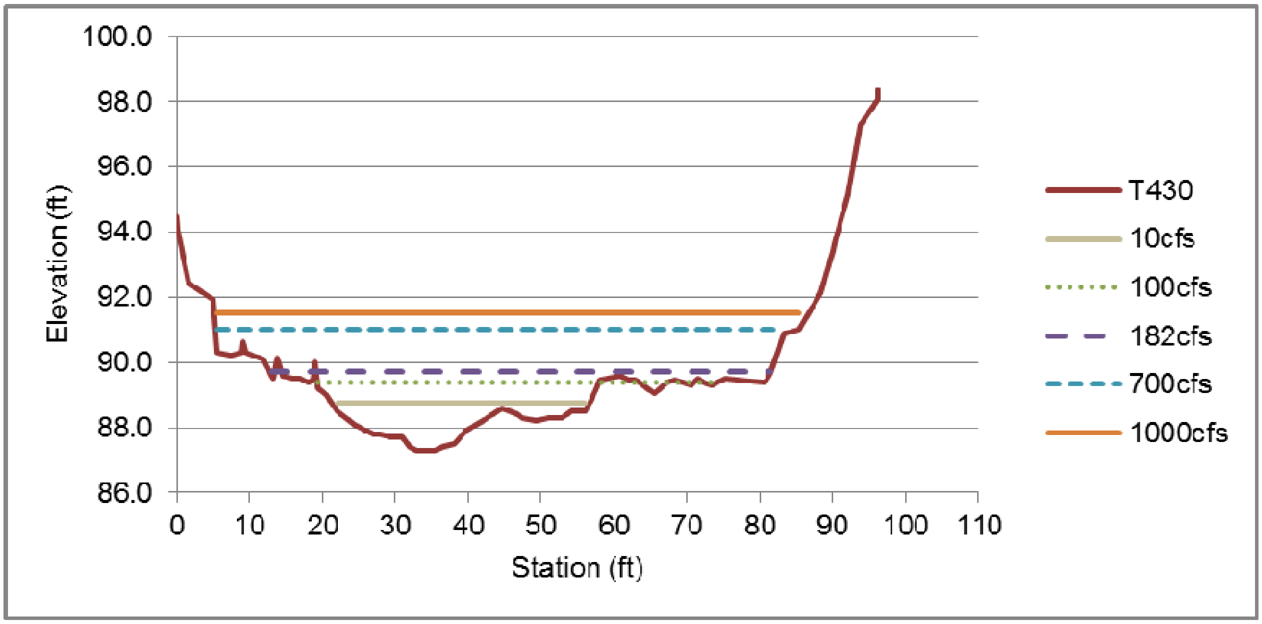

Figure A.4f-3. Transect T430 bed profile and WSE, 10–1,000 cfs.

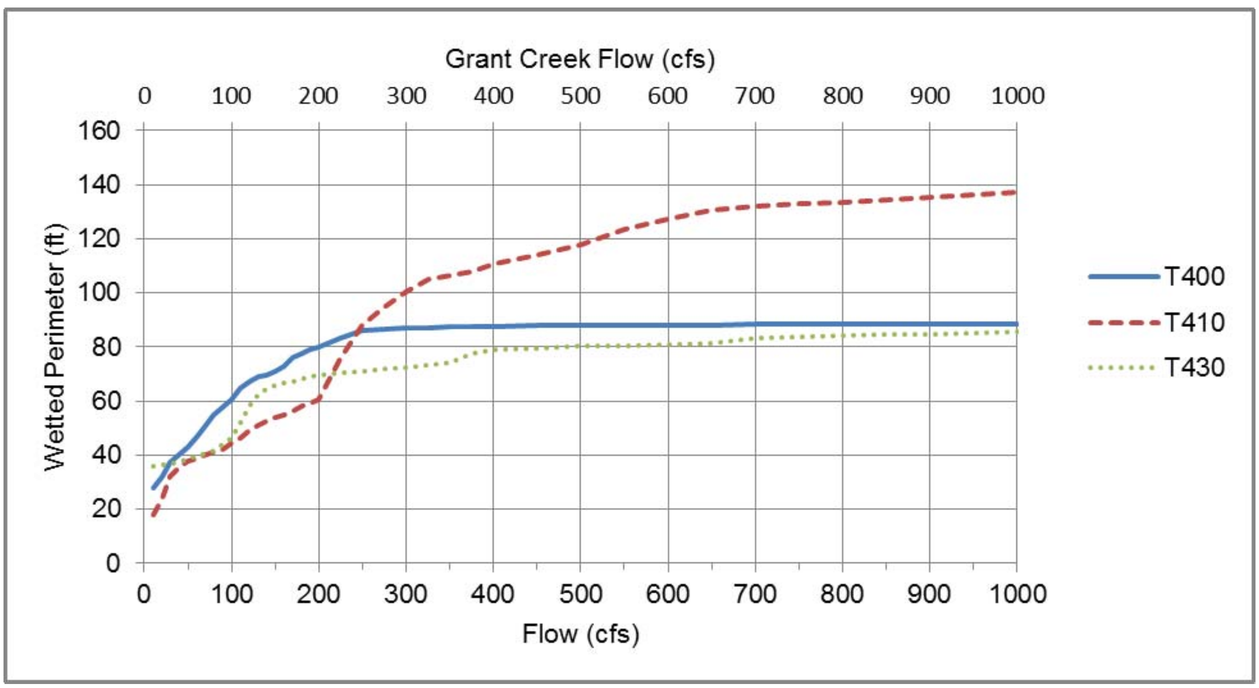

Figure A.4f-4. Reach 4 wetted perimeter vs flow.

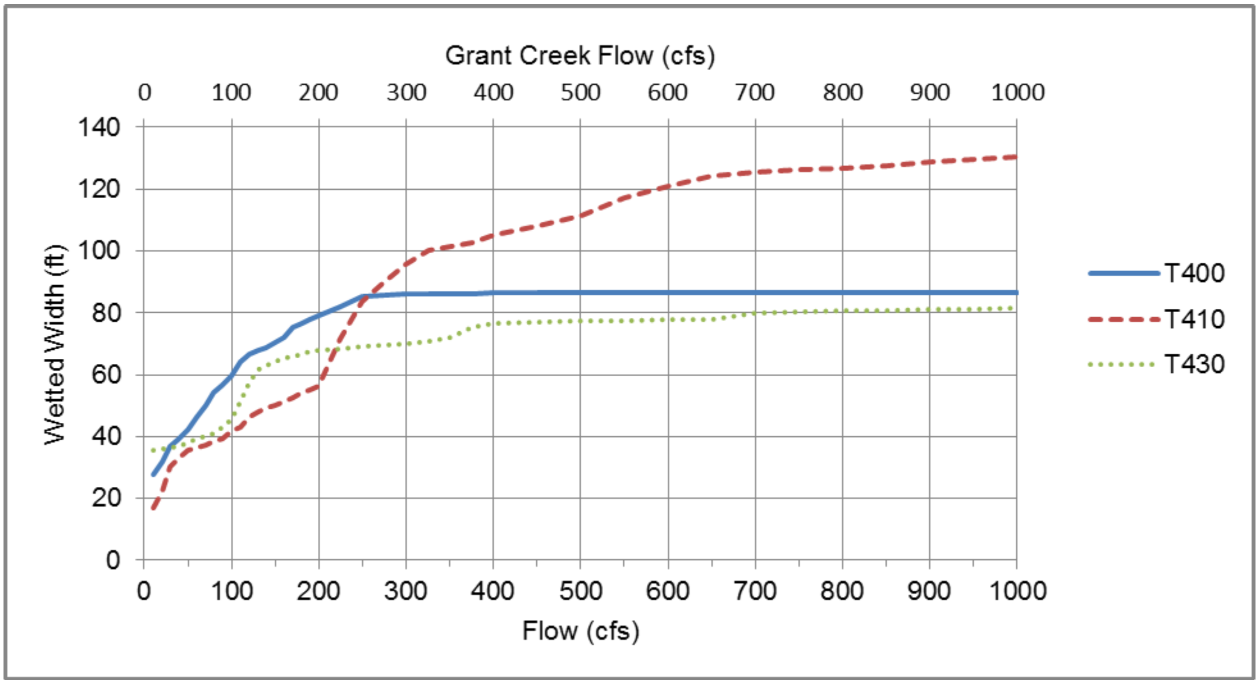

Figure A.4f-5. Reach 4 wetted width vs flow.

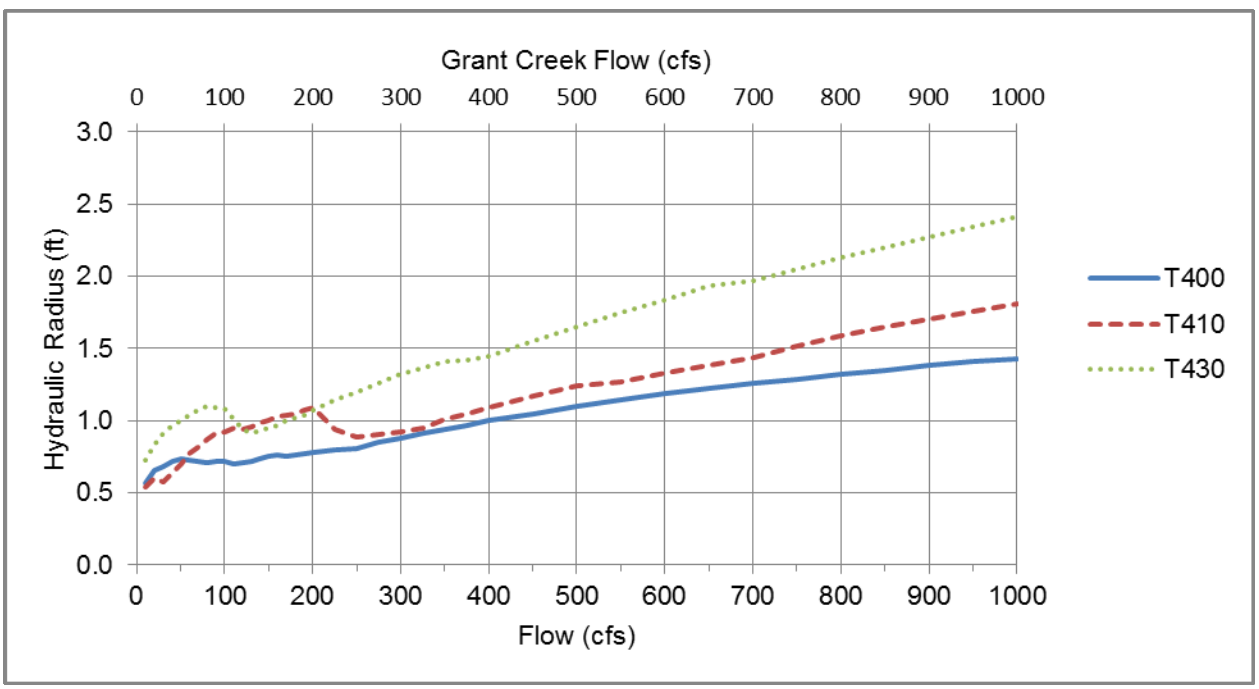

Figure A.4f-6. Reach 4 hydraulic radius vs flow.

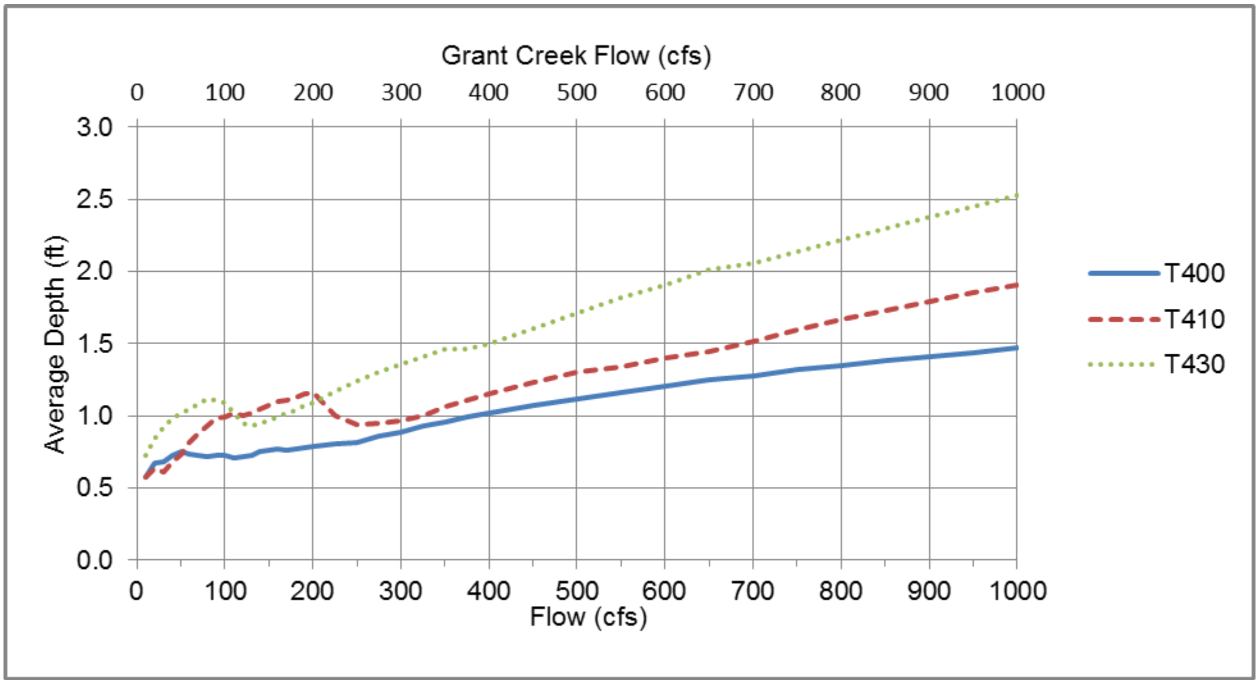

Figure A.4f-7. Reach 4 average depth vs flow.

Appendix 5: Weighted Usable Area Graphs

Appendix 5a. Reach 1 Main Channel WUA
Appendix 5b. Reach 1 Side Channel WUA
Appendix 5c. Reach 2 WUA
Appendix 5d. Reach 3 Main Channel WUA
Appendix 5e. Reach 3 Side Channel WUA
Appendix 5f. Reach 4 WUA

Appendix 5a. Reach 1 Main Channel WUA

This sub-appendix contains the following figures:

Figure A.5a-1. Transect T120 WUA, spawning.
Figure A.5a-2. Transect T120 WUA, fry rearing.
Figure A.5a-3. Transect T120 WUA, adult and juvenile rearing.
Figure A.5a-4. Transect T130 WUA, spawning.
Figure A.5a-5. Transect T130 WUA, fry rearing.
Figure A.5a-6. Transect T130 WUA, adult and juvenile rearing.
Figure A.5a-7. Transect T140 WUA, spawning.
Figure A.5a-8. Transect T140 WUA, fry rearing.
Figure A.5a-9. Transect T140 WUA, adult and juvenile rearing.
Figure A.5a-10. Transect T150 WUA, spawning.
Figure A.5a-11. Transect T150 WUA, fry rearing.
Figure A.5a-12. Transect T150 WUA, adult and juvenile rearing.
Figure A.5a-13. Transect T160 WUA, spawning.
Figure A.5a-14. Transect T160 WUA, fry rearing.
Figure A.5a-15. Transect T160 WUA, adult and juvenile rearing.

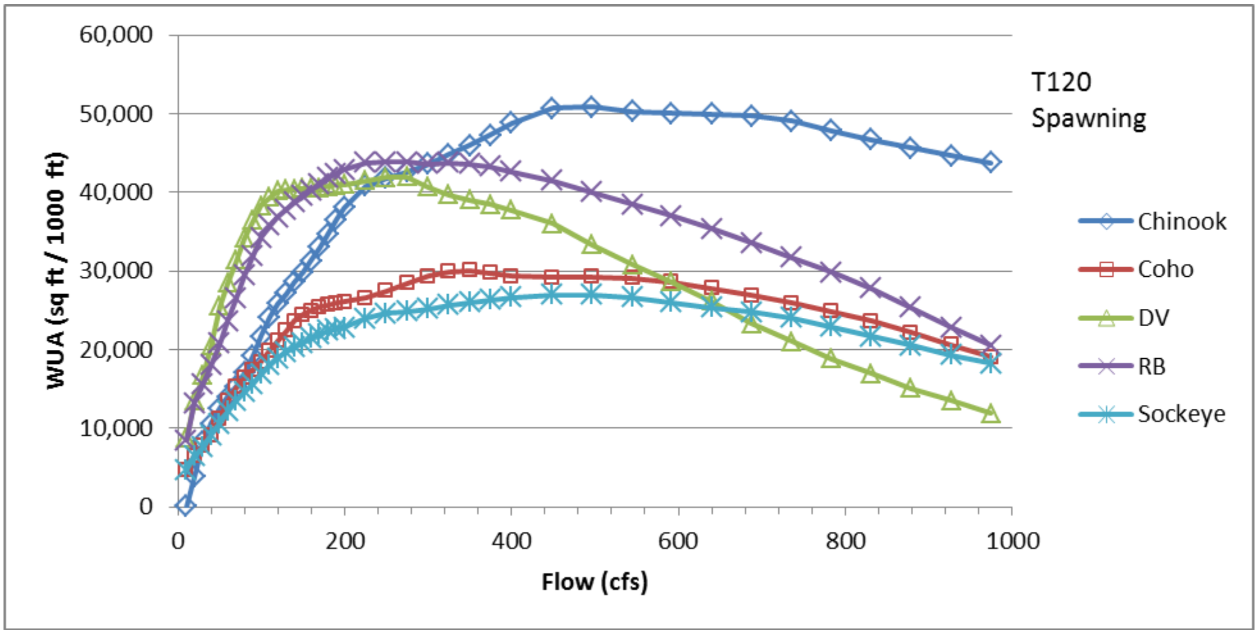

Figure A.5a-1. Transect T120 WUA, spawning.

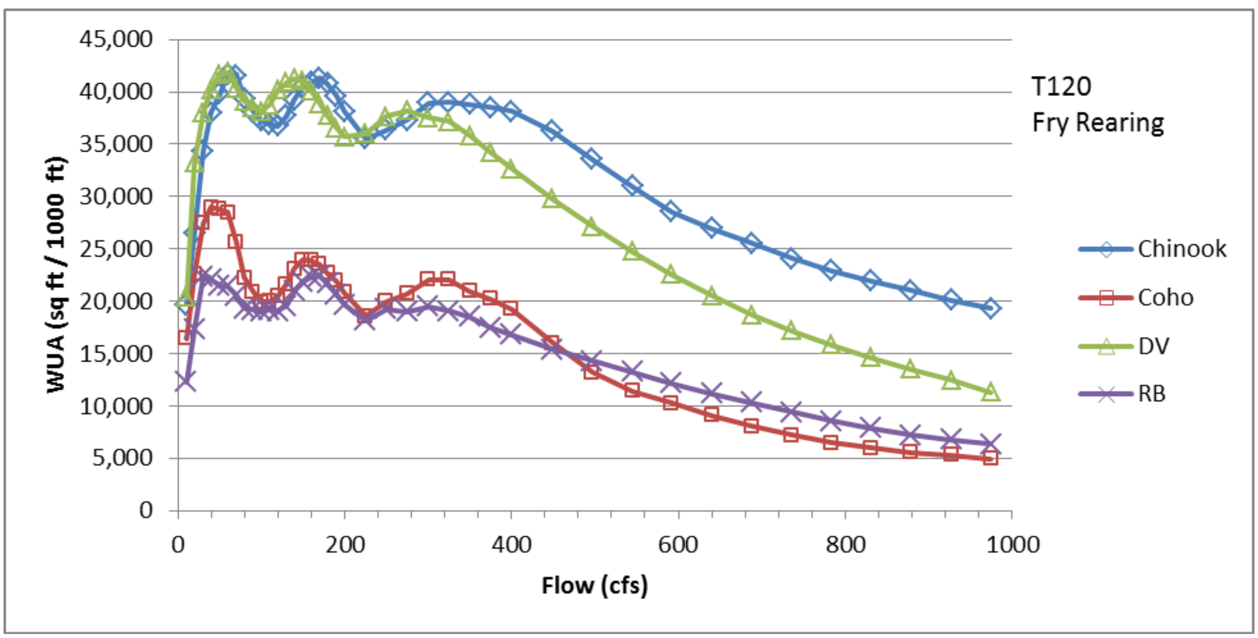

Figure A.5a-2. Transect T120 WUA, fry rearing.

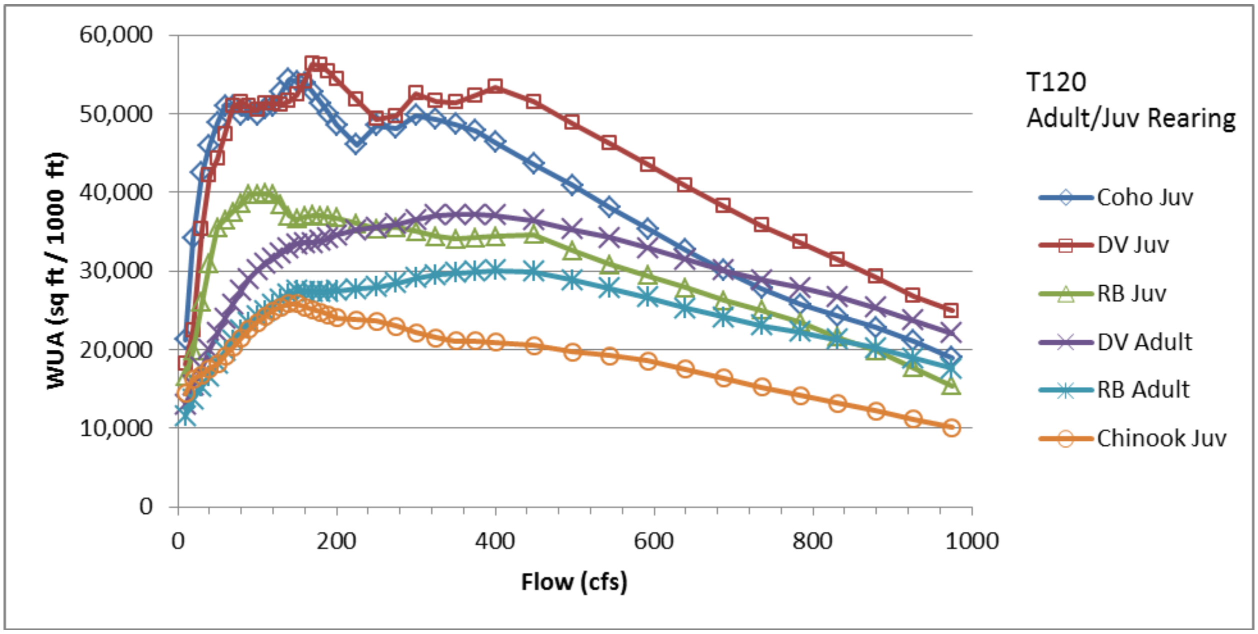

Figure A.5a-3. Transect T120 WUA, adult and juvenile rearing.

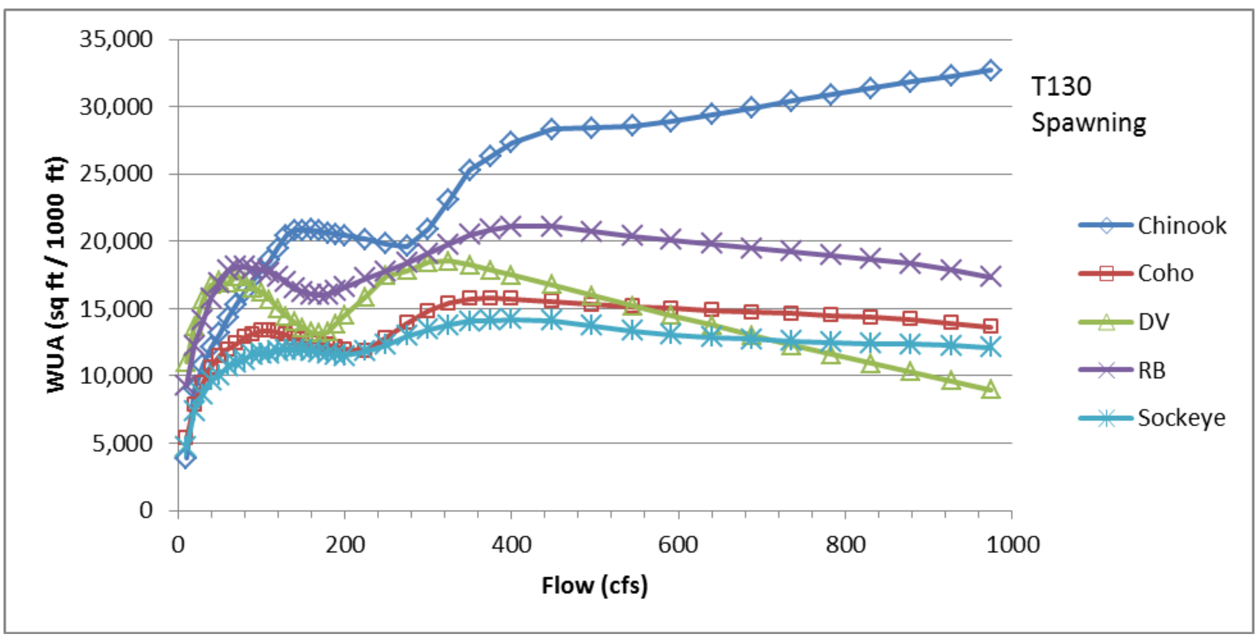

Figure A.5a-4. Transect T130 WUA, spawning.

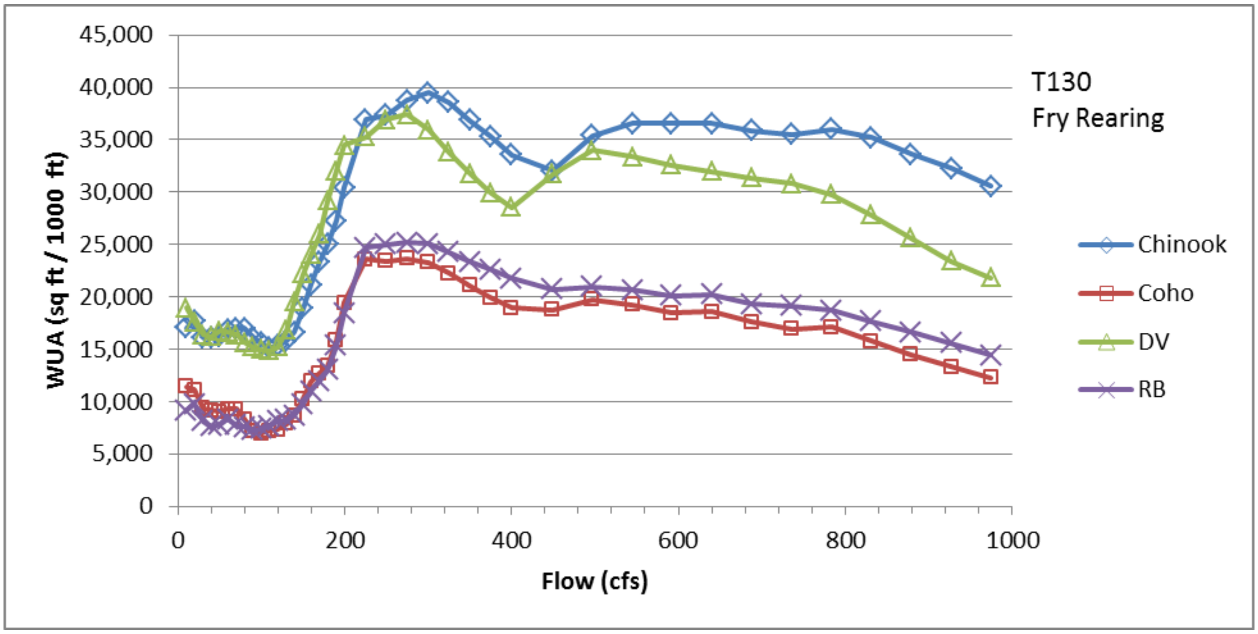

Figure A.5a-5. Transect T130 WUA, fry rearing.

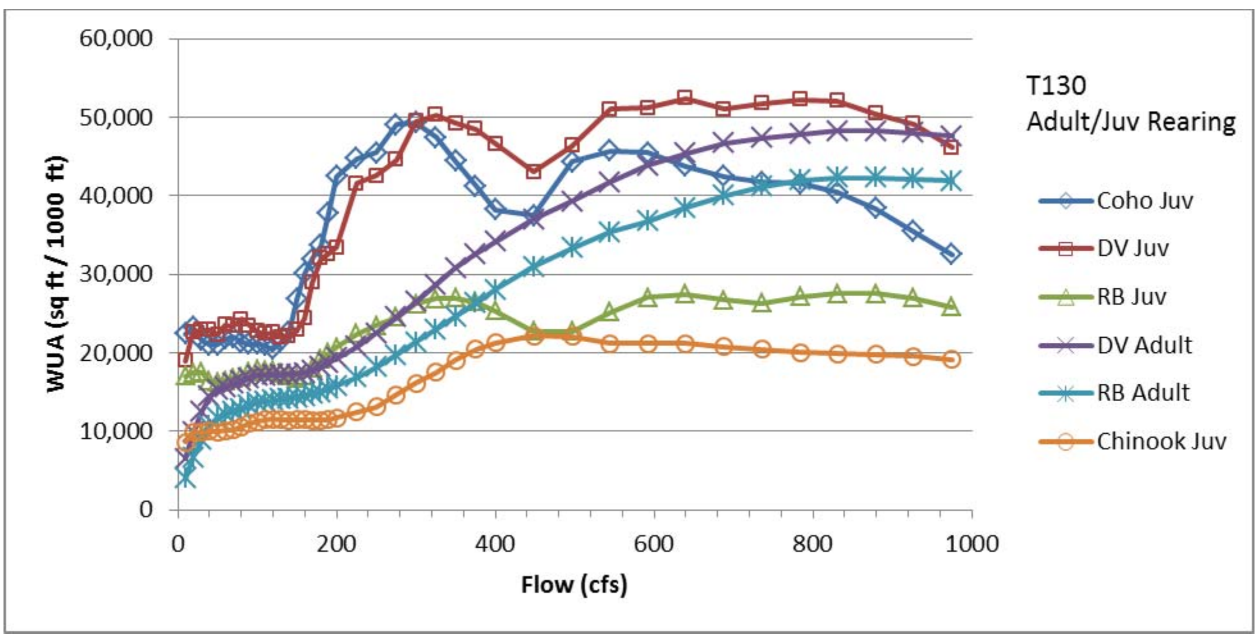

Figure A.5a-6. Transect T130 WUA, adult and juvenile rearing.

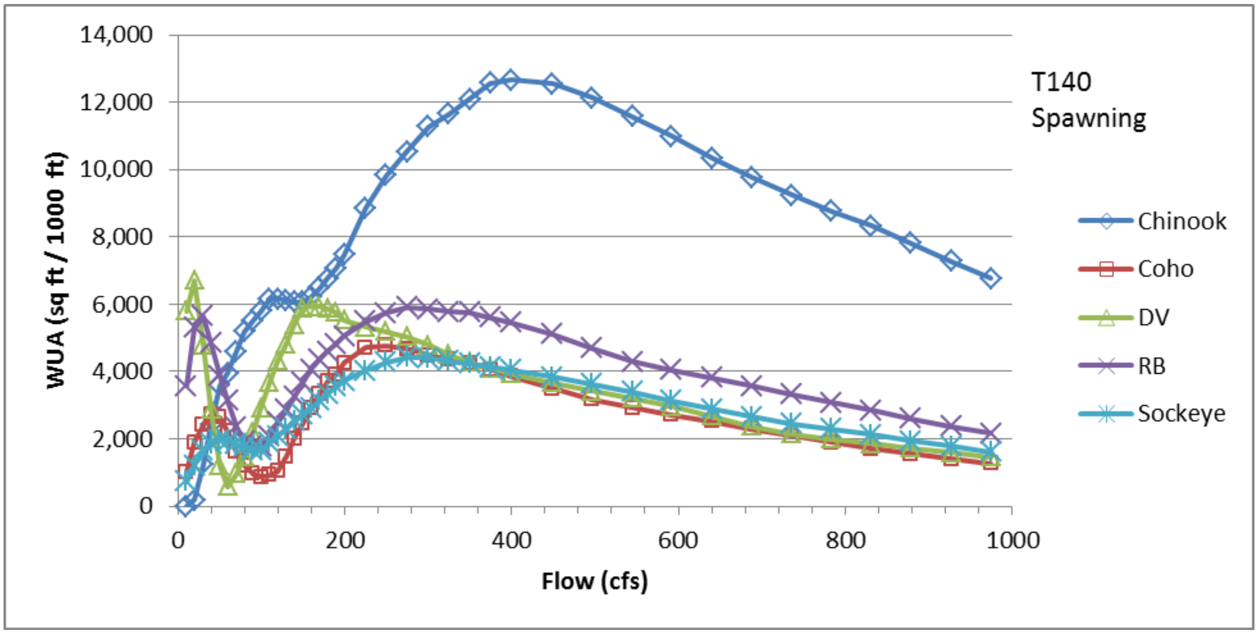

Figure A.5a-7. Transect T140 WUA, spawning.

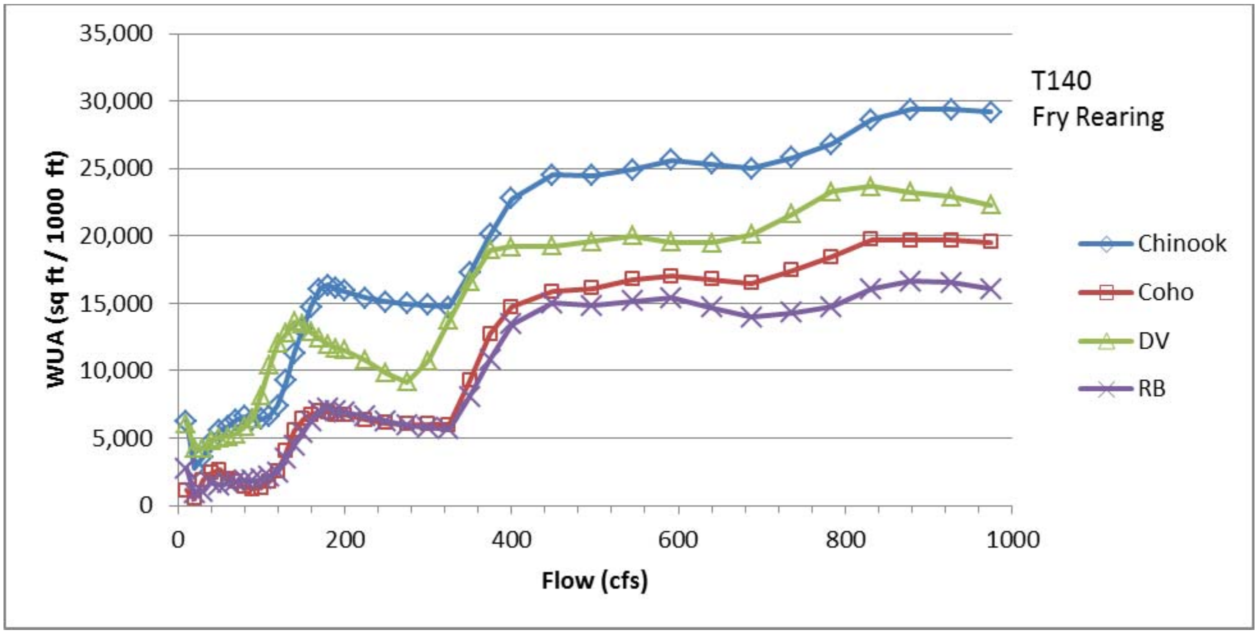

Figure A.5a-8. Transect T140 WUA, fry rearing.

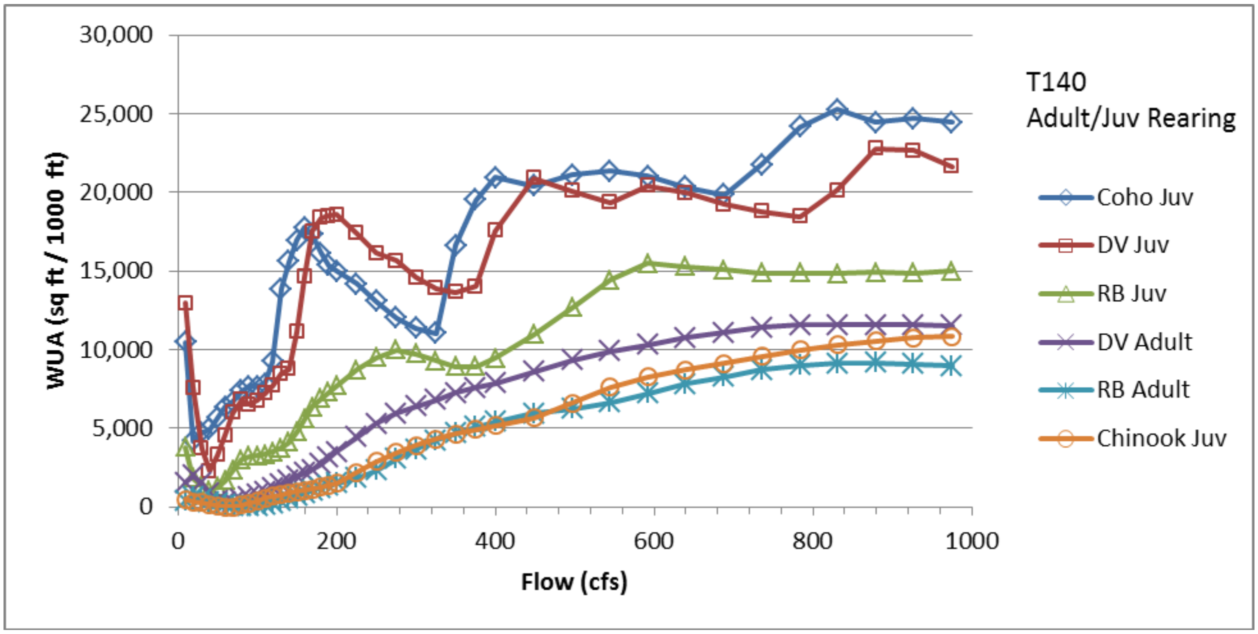

Figure A.5a-9. Transect T140 WUA, adult and juvenile rearing.

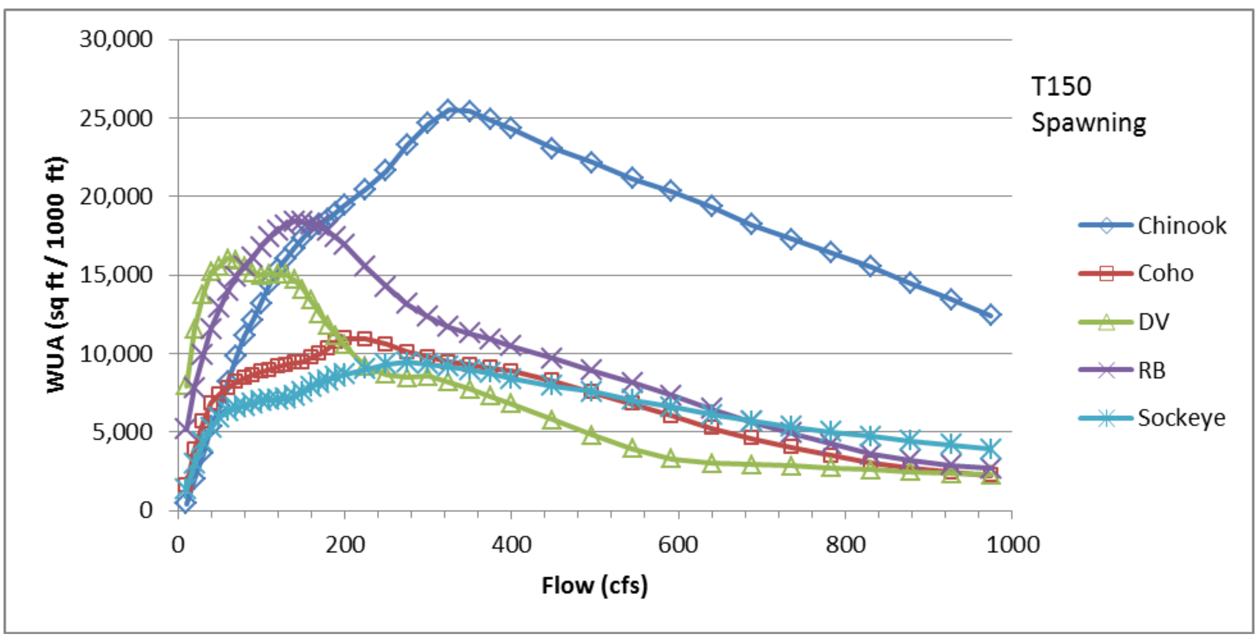

Figure A.5a-10. Transect T150 WUA, spawning.

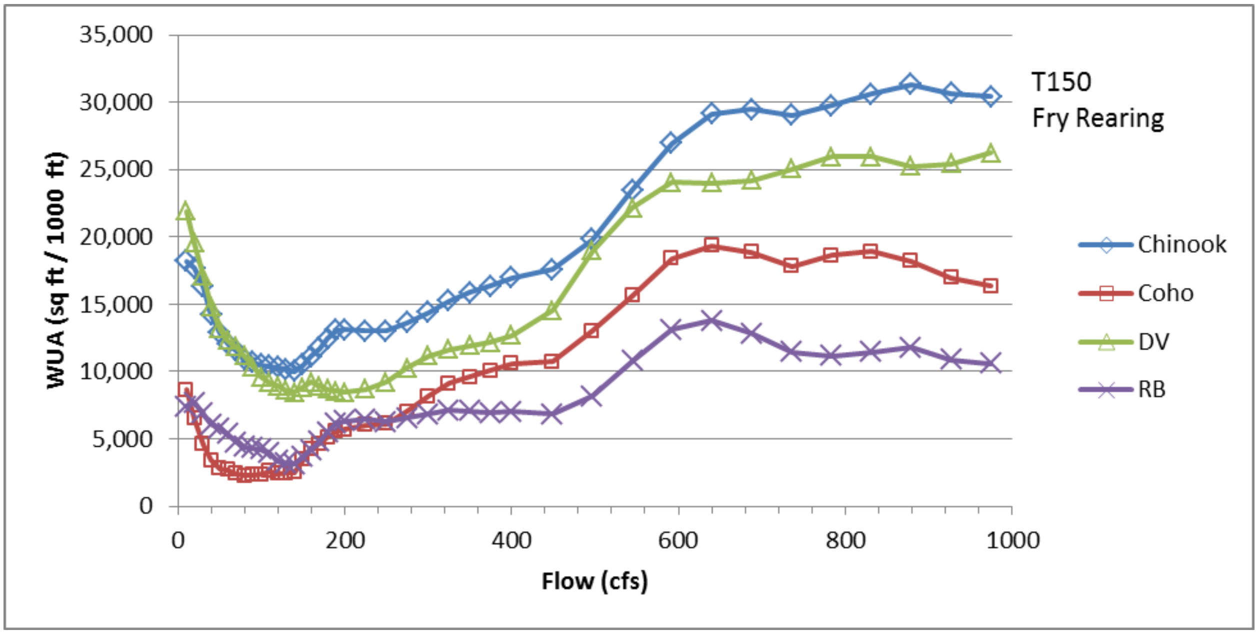

Figure A.5a-11. Transect T150 WUA, fry rearing.

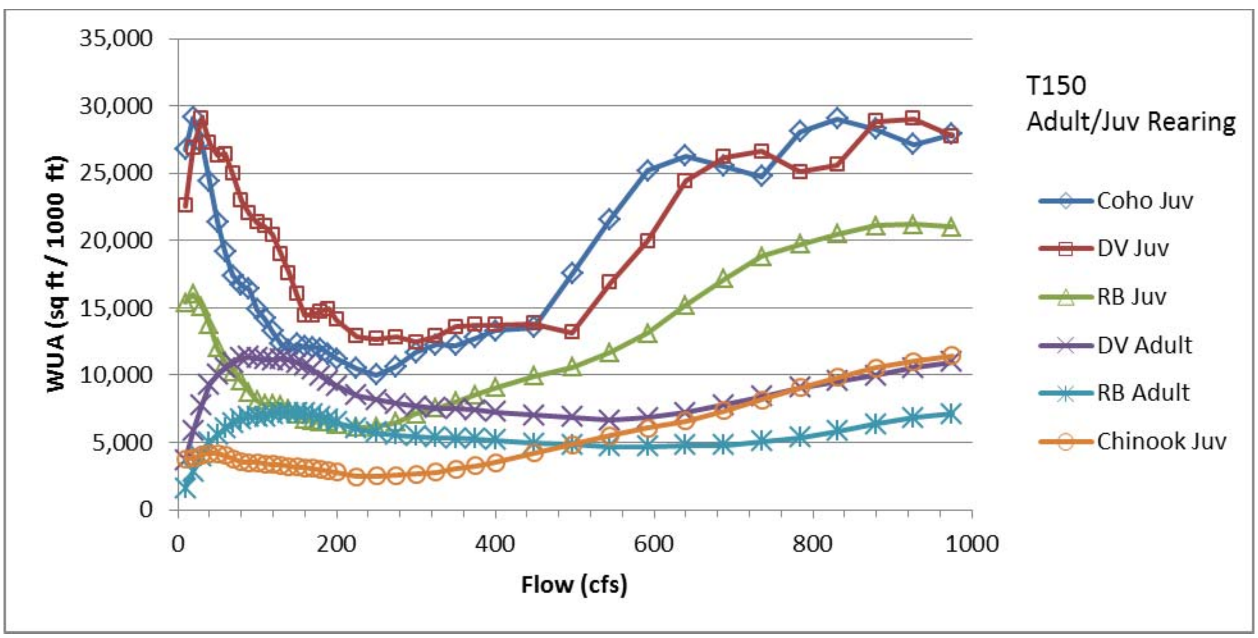

Figure A.5a-12. Transect T150 WUA, adult and juvenile rearing.

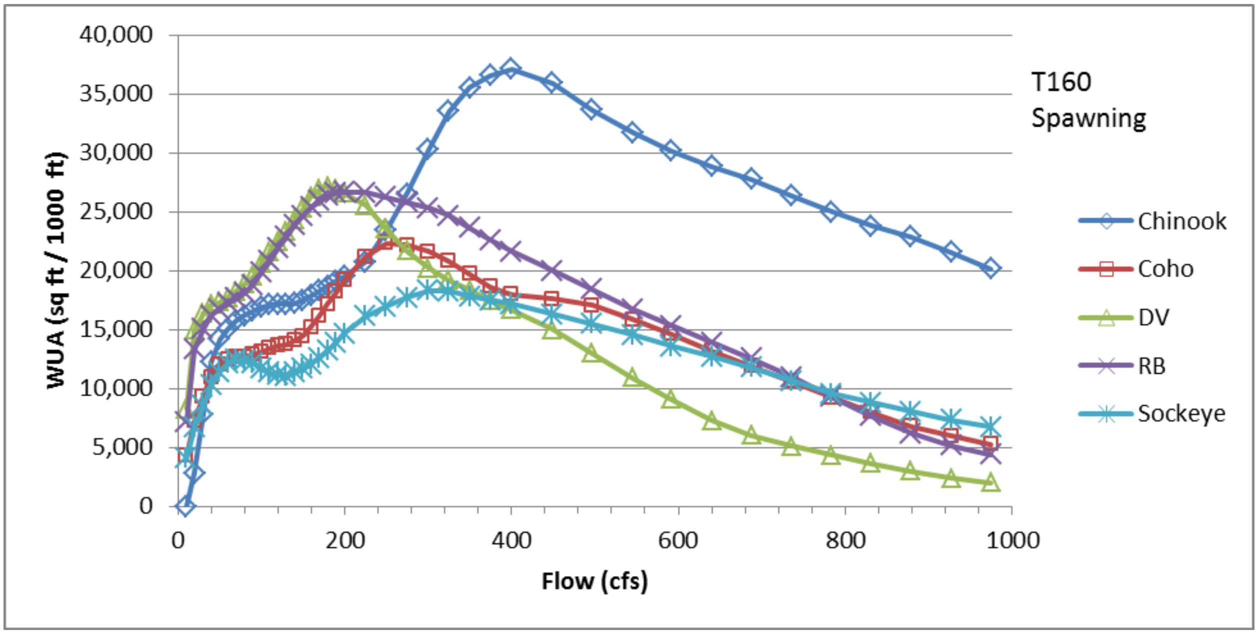

Figure A.5a-13. Transect T160 WUA, spawning.

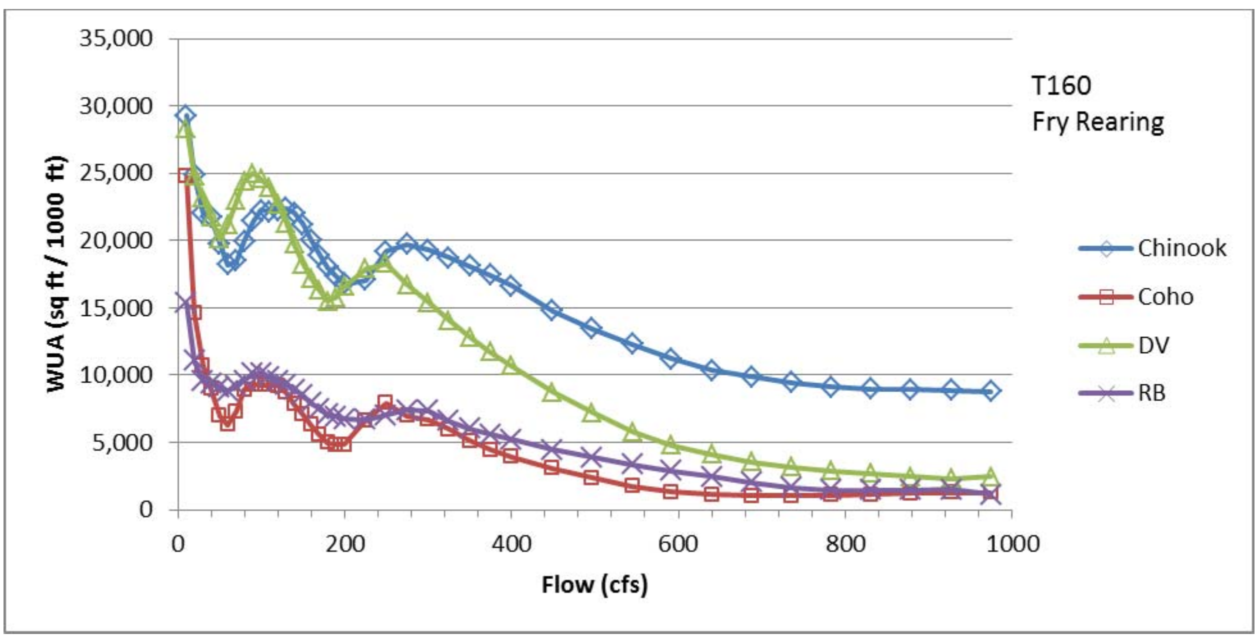

Figure A.5a-14. Transect T160 WUA, fry rearing.

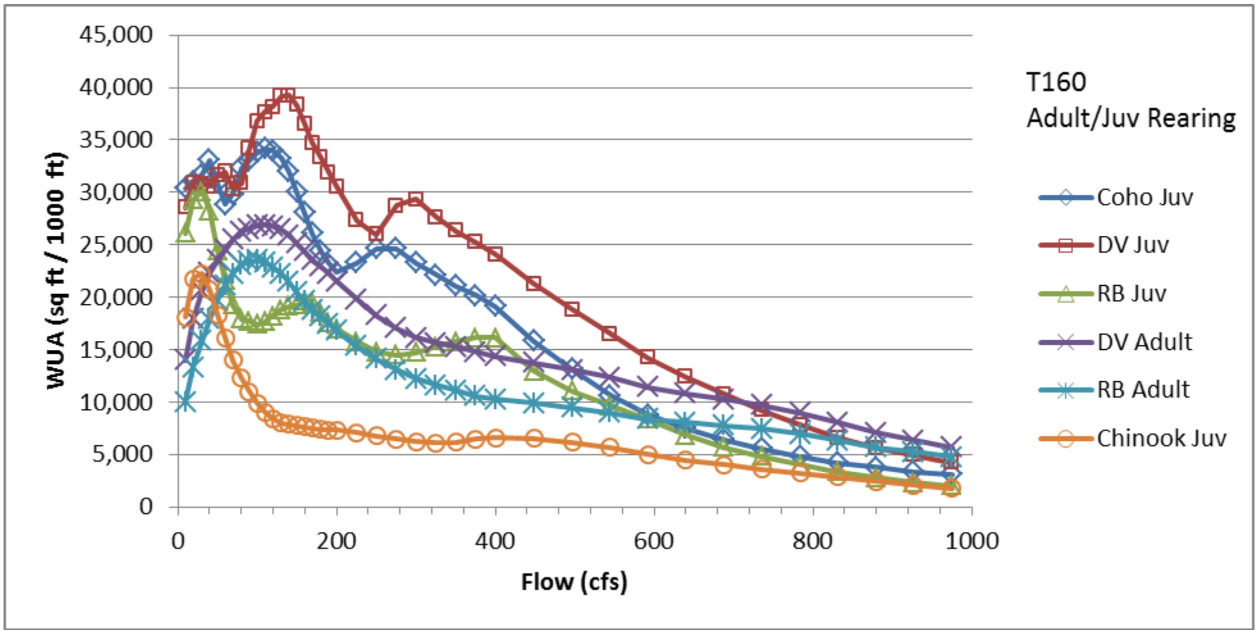

Figure A.5a-15. Transect T160 WUA, adult and juvenile rearing.

Appendix 5b. Reach 1 Side Channel WUA

This sub-appendix contains the following figures:

Figure A.5b-1. Transect T100 WUA, spawning.
Figure A.5b-2. Transect T100 WUA, fry rearing.
Figure A.5b-3. Transect T100 WUA, adult and juvenile rearing.
Figure A.5b-4. Transect T110 WUA, spawning.
Figure A.5b-5. Transect T110 WUA, fry rearing.
Figure A.5b-6. Transect T110 WUA, adult and juvenile rearing.

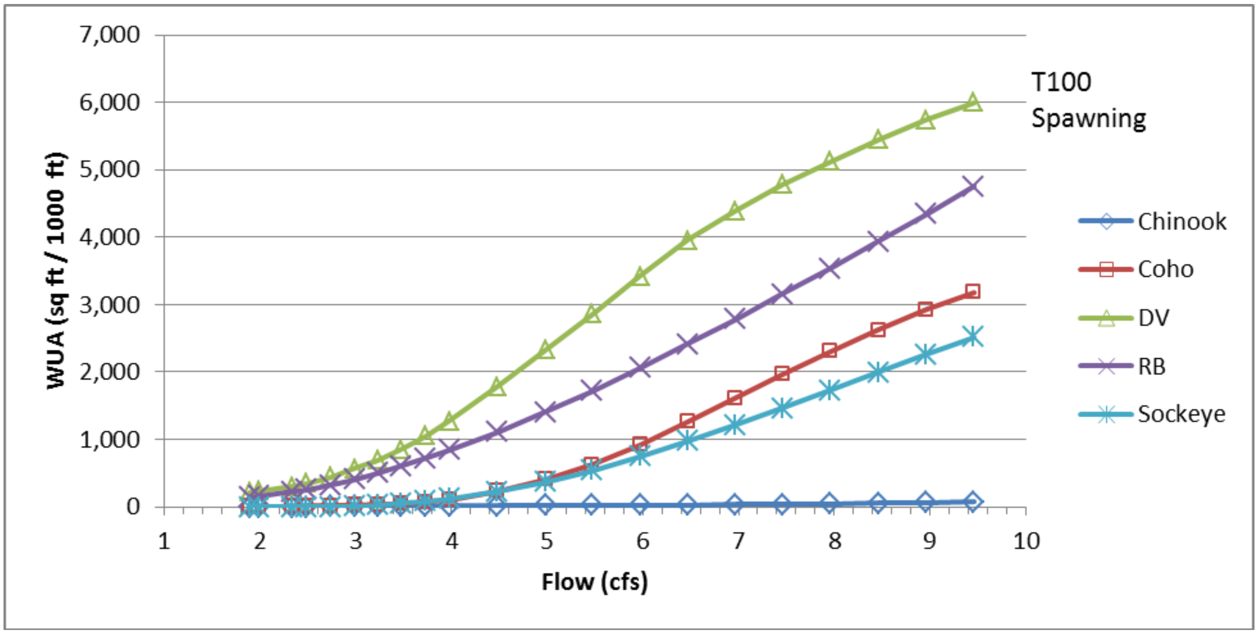

Figure A.5b-1. Transect T100 WUA, spawning.

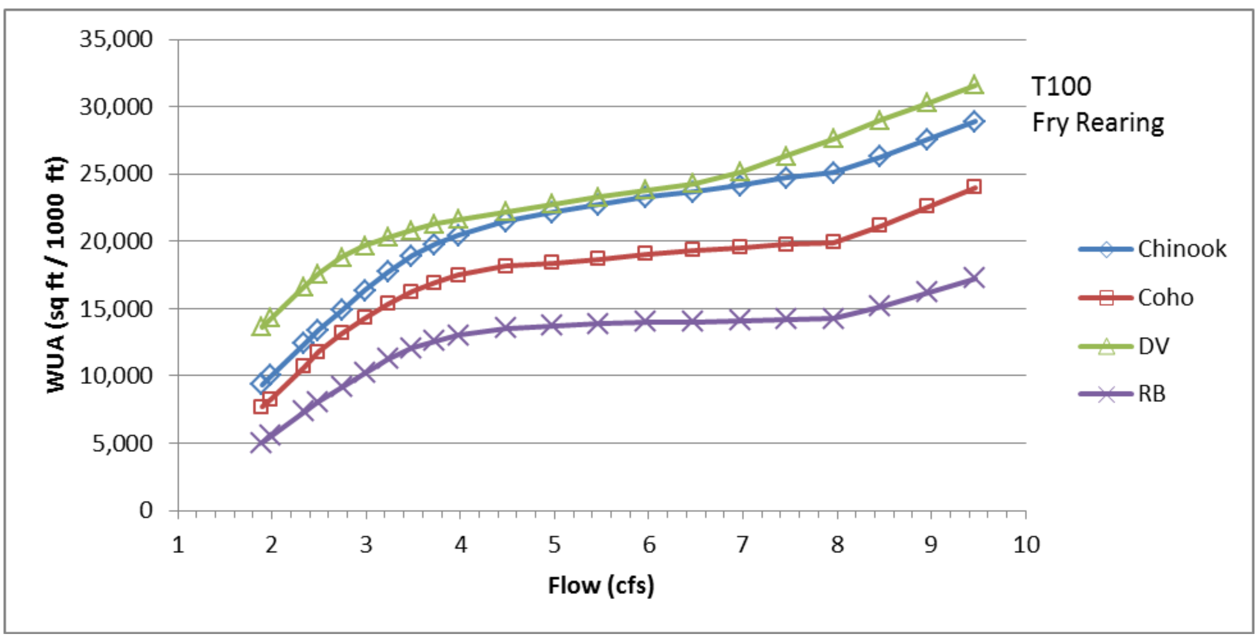

Figure A.5b-2. Transect T100 WUA, fry rearing.

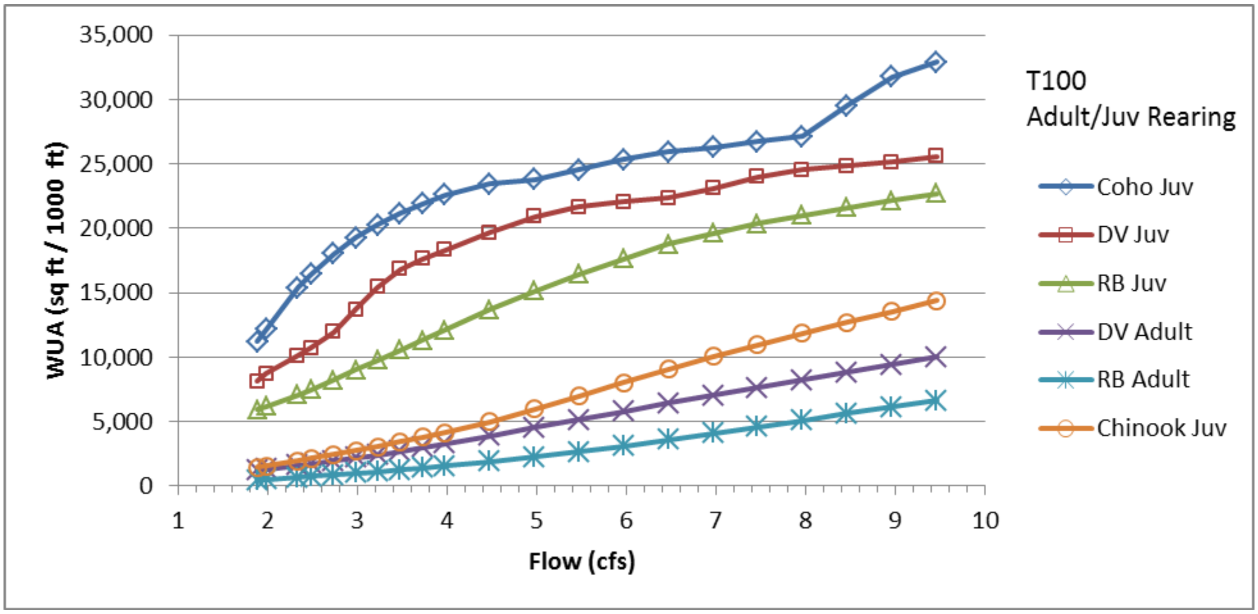

Figure A.5b-3. Transect T100 WUA, adult and juvenile rearing.

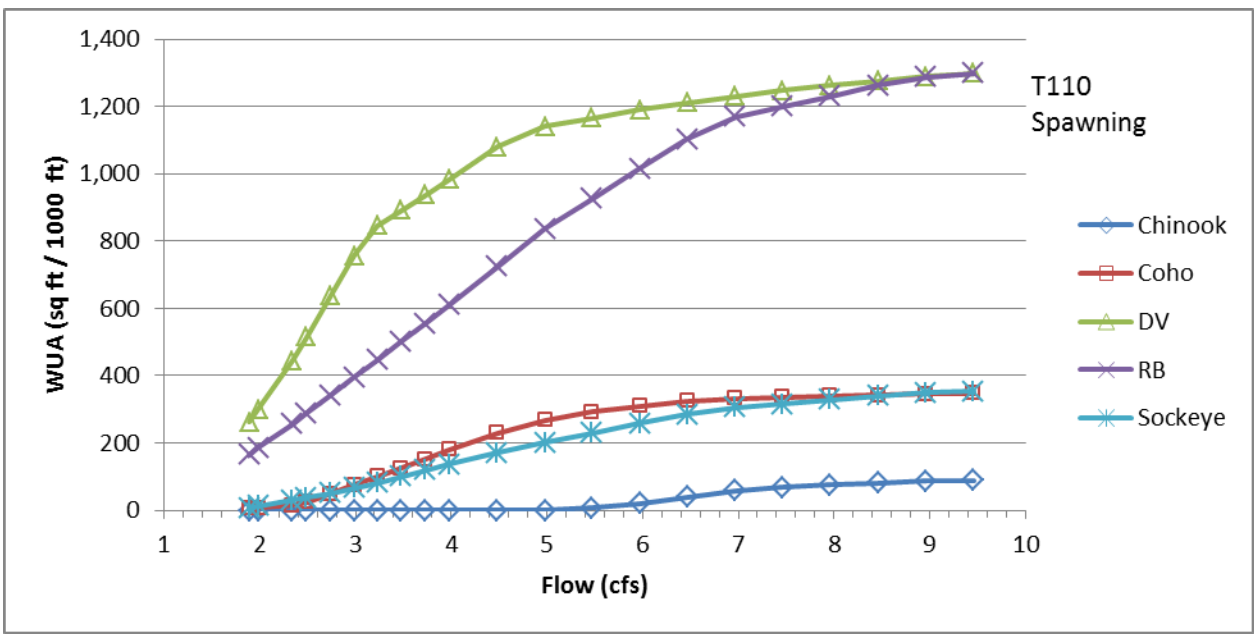

Figure A.5b-4. Transect T110 WUA, spawning.

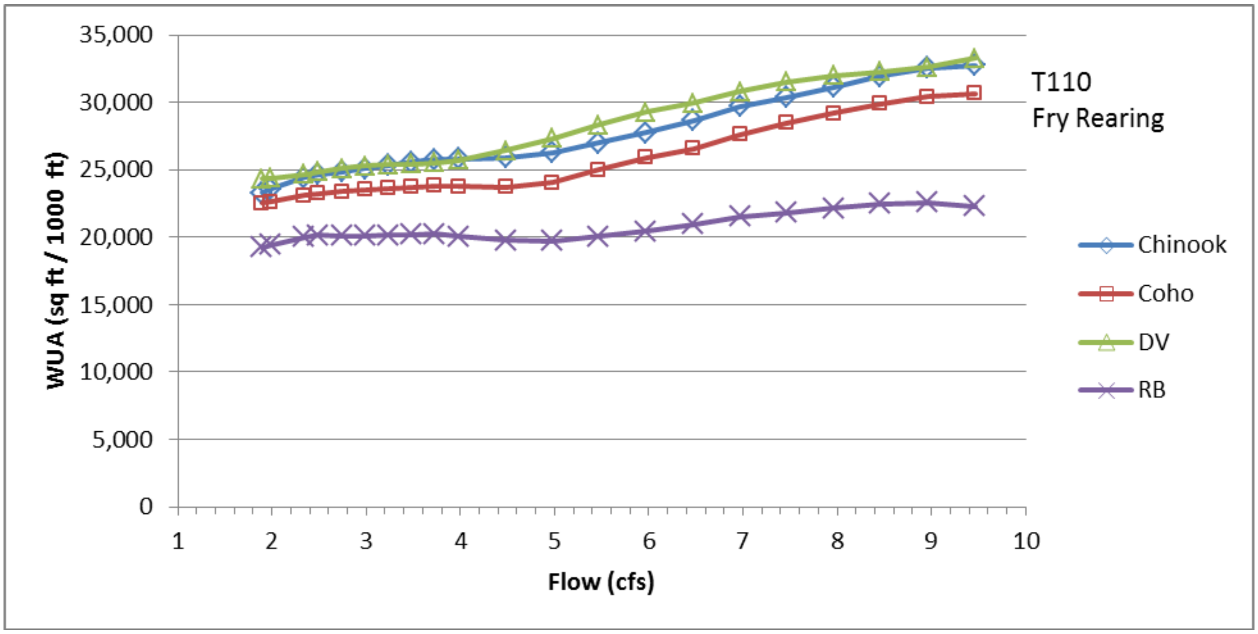

Figure A.5b-5. Transect T110 WUA, fry rearing.

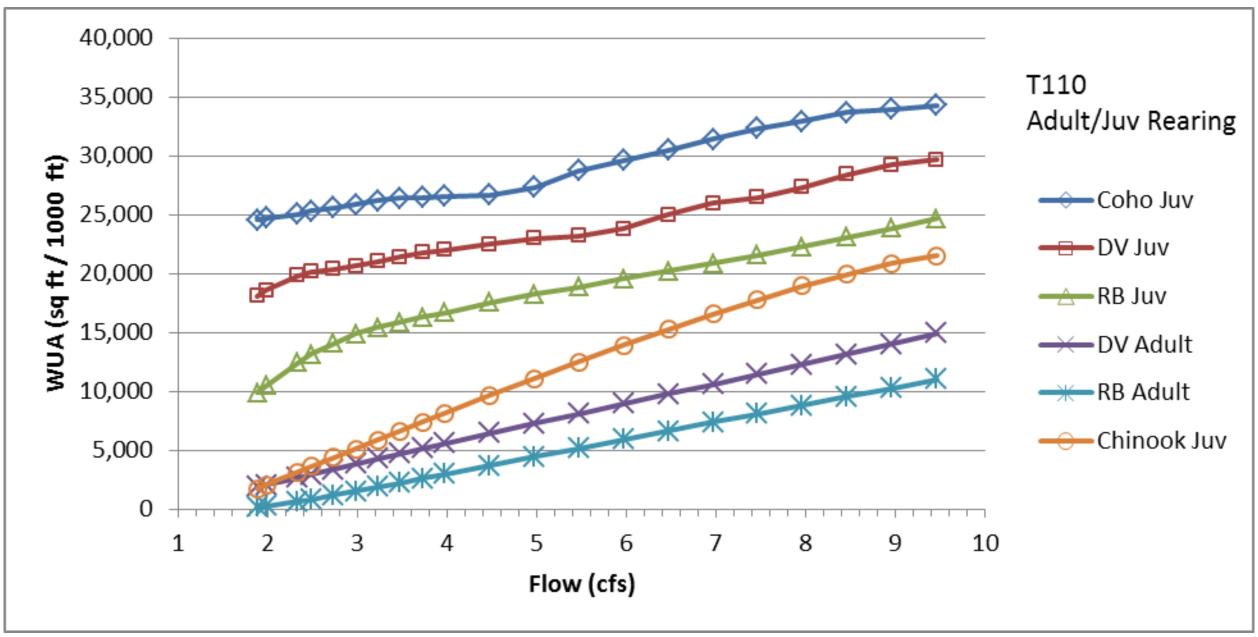

Figure A.5b-6. Transect T110 WUA, adult and juvenile rearing.

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Appendix 5c. Reach 2 WUA

This sub-appendix contains the following figures:

Figure A.5c-1. Transect T200 WUA, spawning.
Figure A.5c-2. Transect T200 WUA, fry rearing.
Figure A.5c-3. Transect T200 WUA, adult and juvenile rearing.
Figure A.5c-1. Transect T220 WUA, spawning.
Figure A.5c-2. Transect T220 WUA, fry rearing.
Figure A.5c-3. Transect T220 WUA, adult and juvenile rearing.
Figure A.5c-4. Transect T230 WUA, spawning.
Figure A.5c-5. Transect T230 WUA, fry rearing.
Figure A.5c-6. Transect T230 WUA, adult and juvenile rearing.

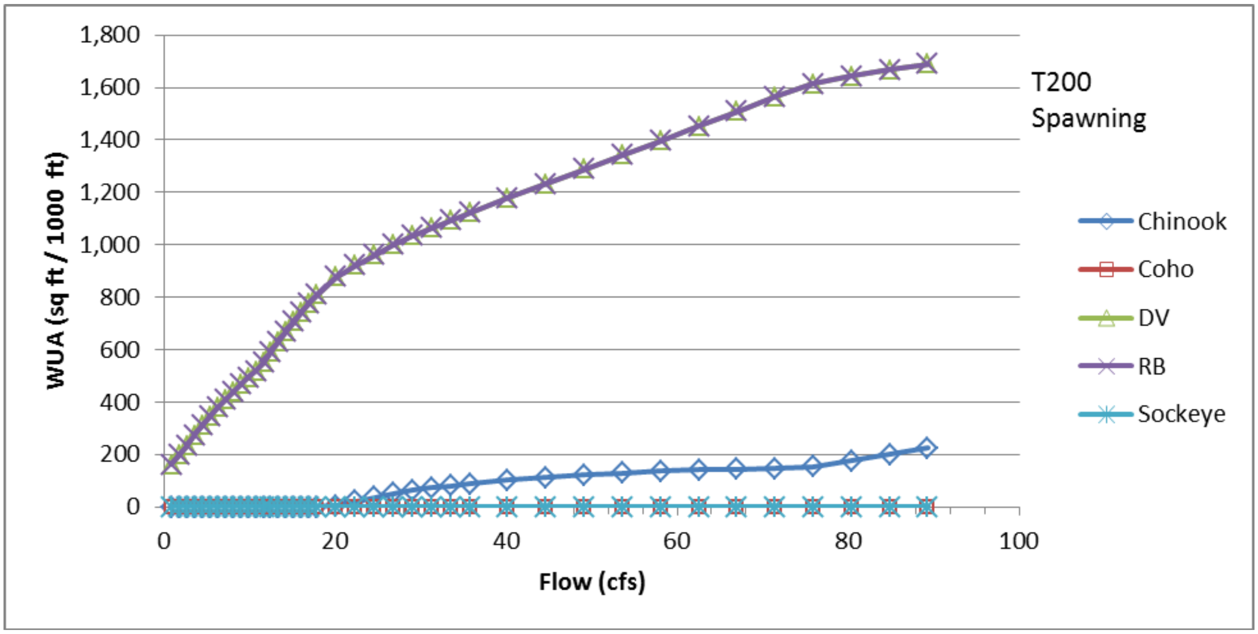

Figure A.5c-1. Transect T200 WUA, spawning.

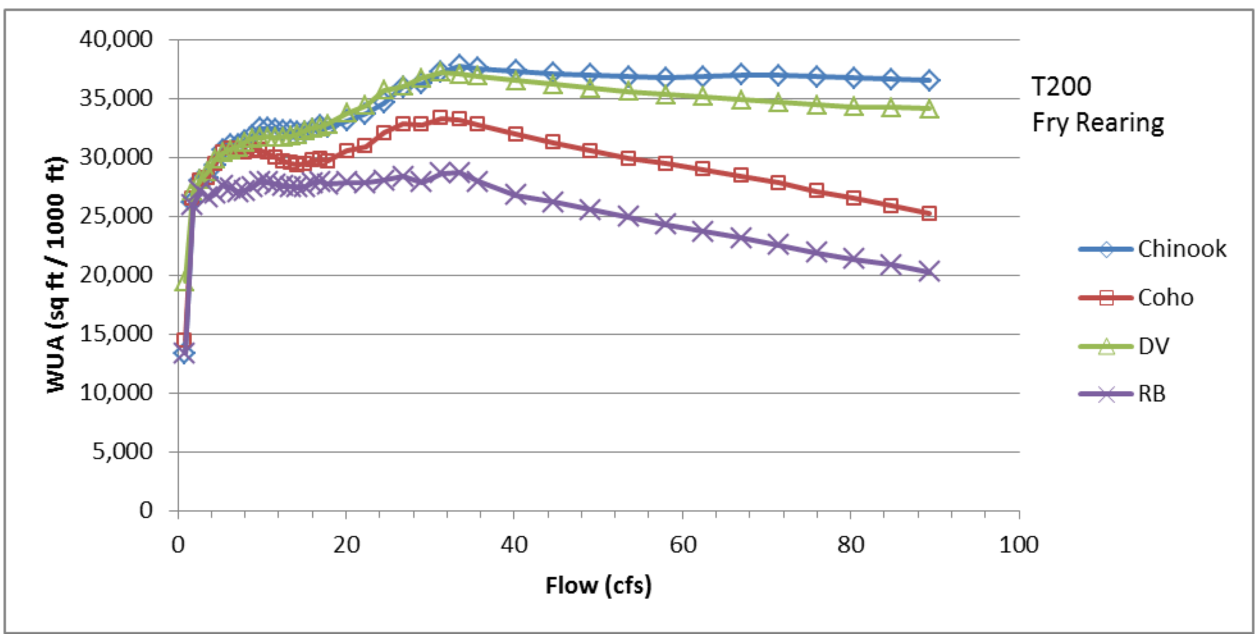

Figure A.5c-2. Transect T200 WUA, fry rearing.

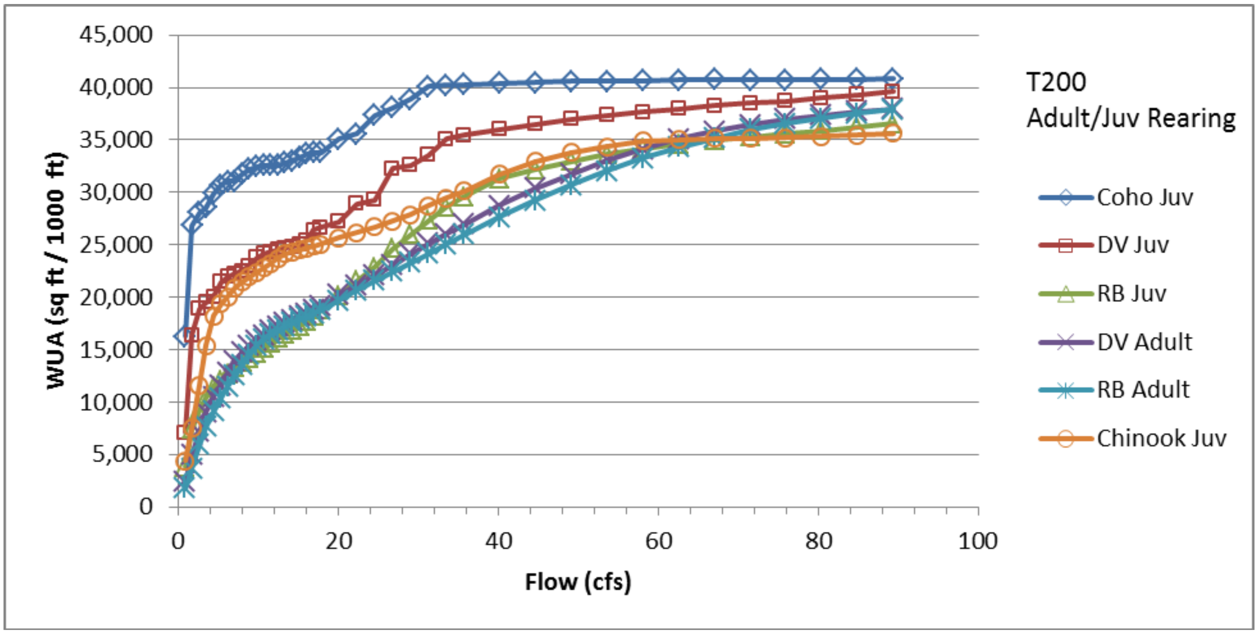

Figure A.5c-3. Transect T200 WUA, adult and juvenile rearing.

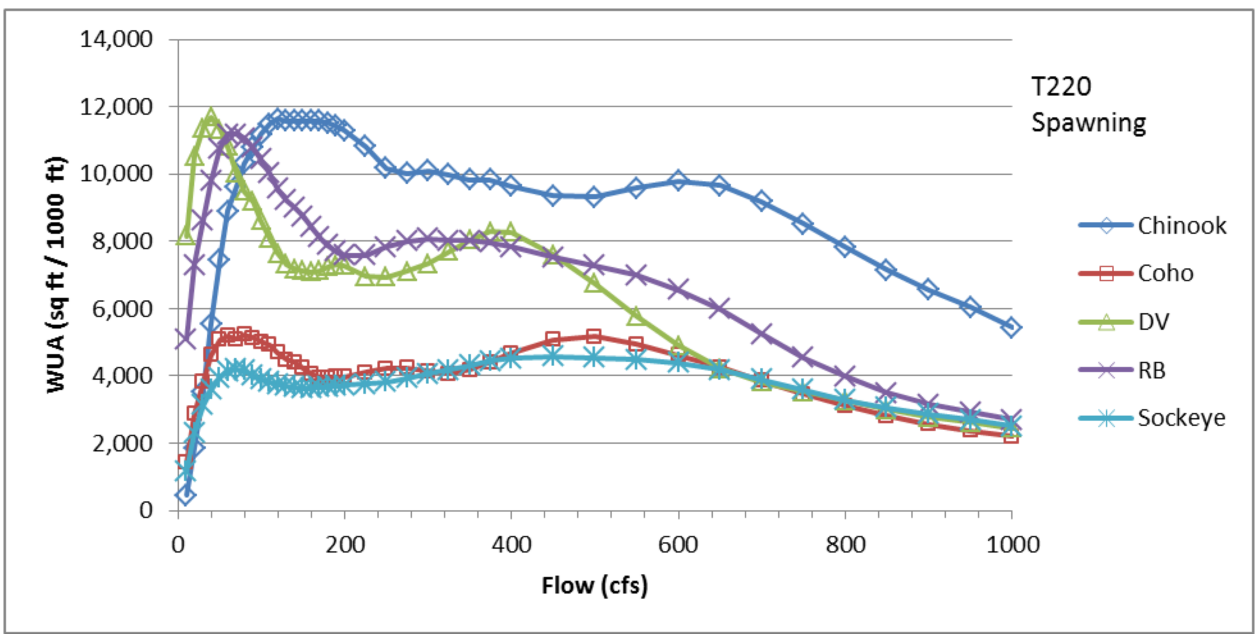

Figure A.5c-4. Transect T220 WUA, spawning.

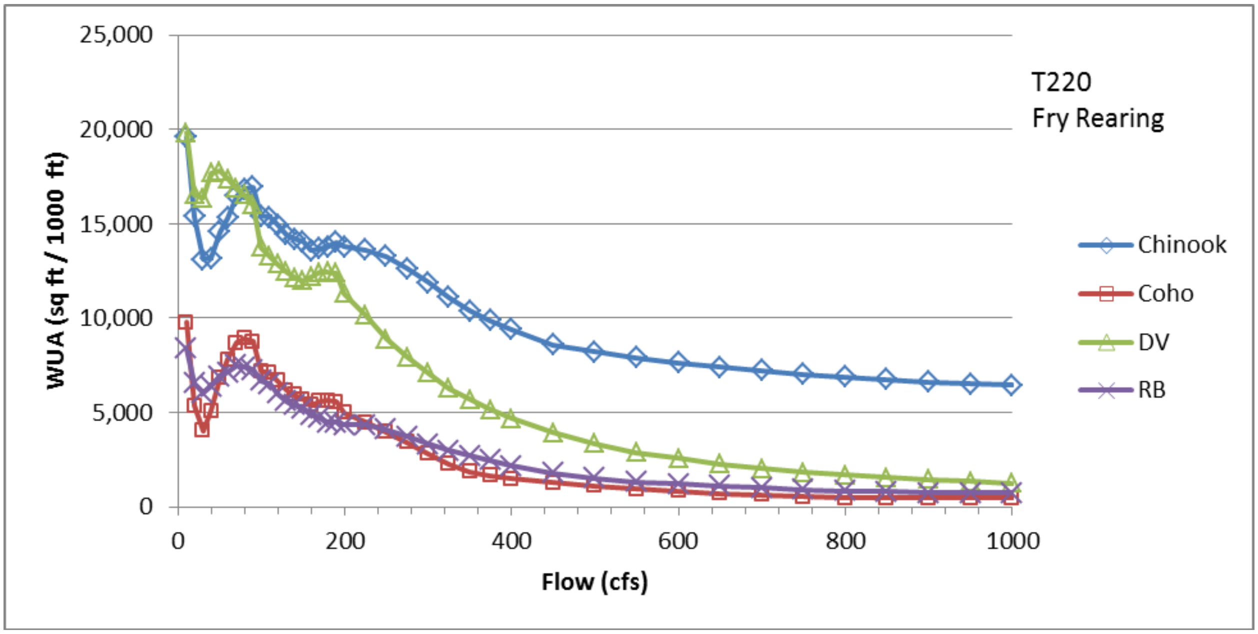

Figure A.5c-5. Transect T220 WUA, fry rearing.

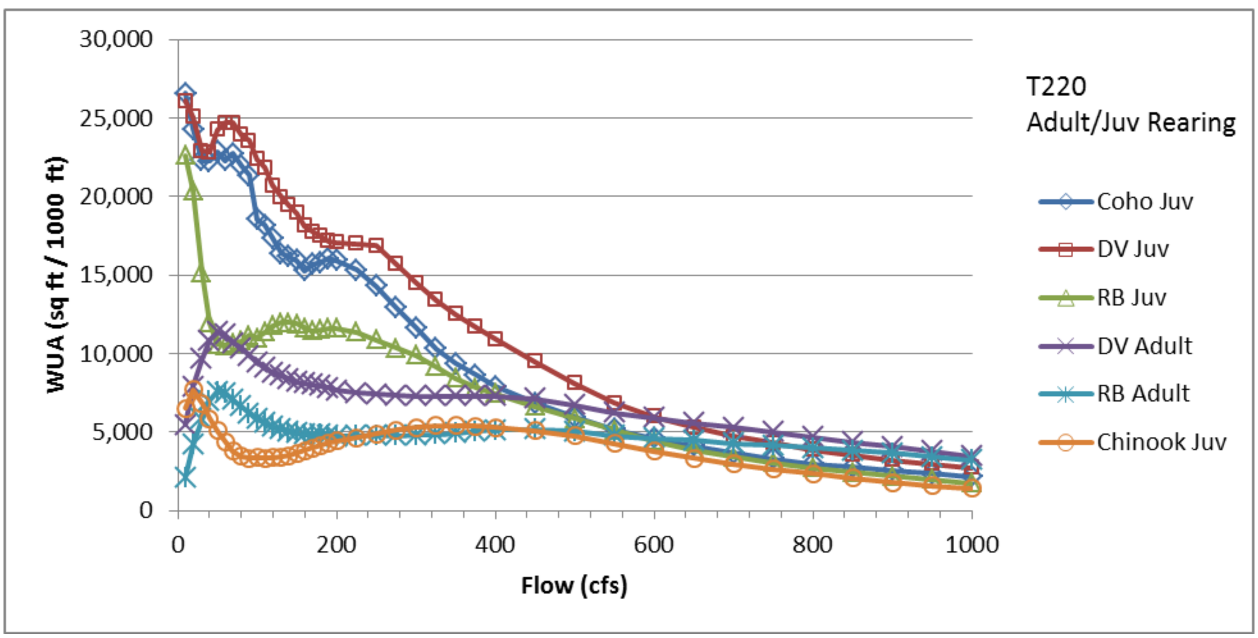

Figure A.5c-6. Transect T220 WUA, adult and juvenile rearing.

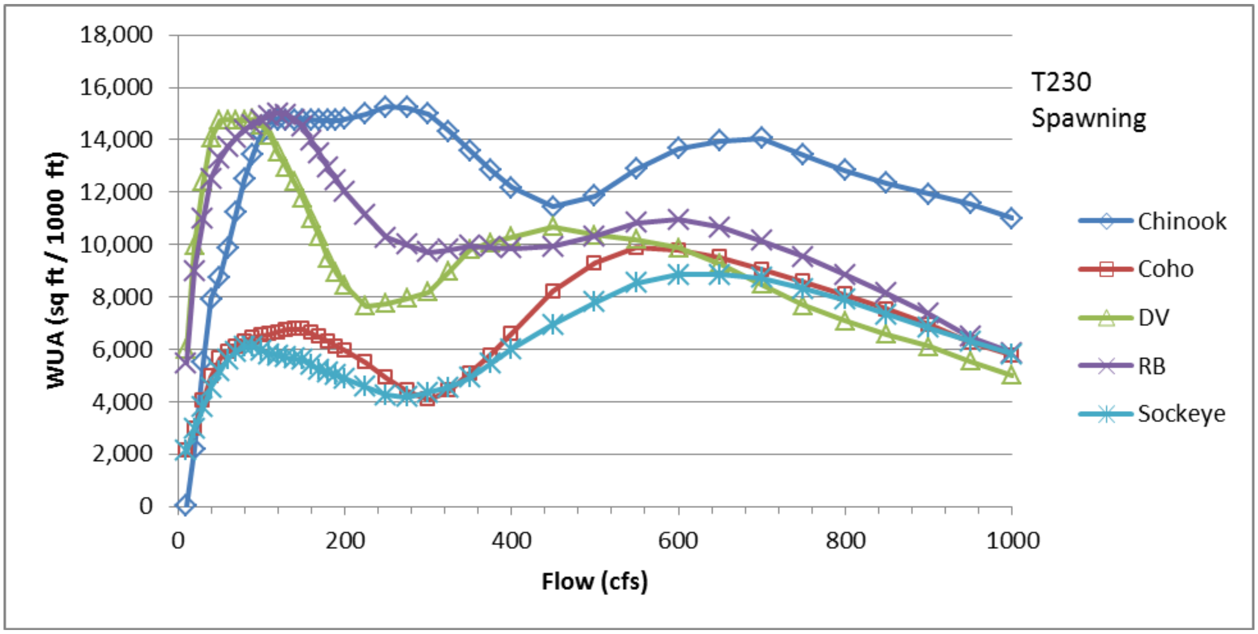

Figure A.5c-7. Transect T230 WUA, spawning.

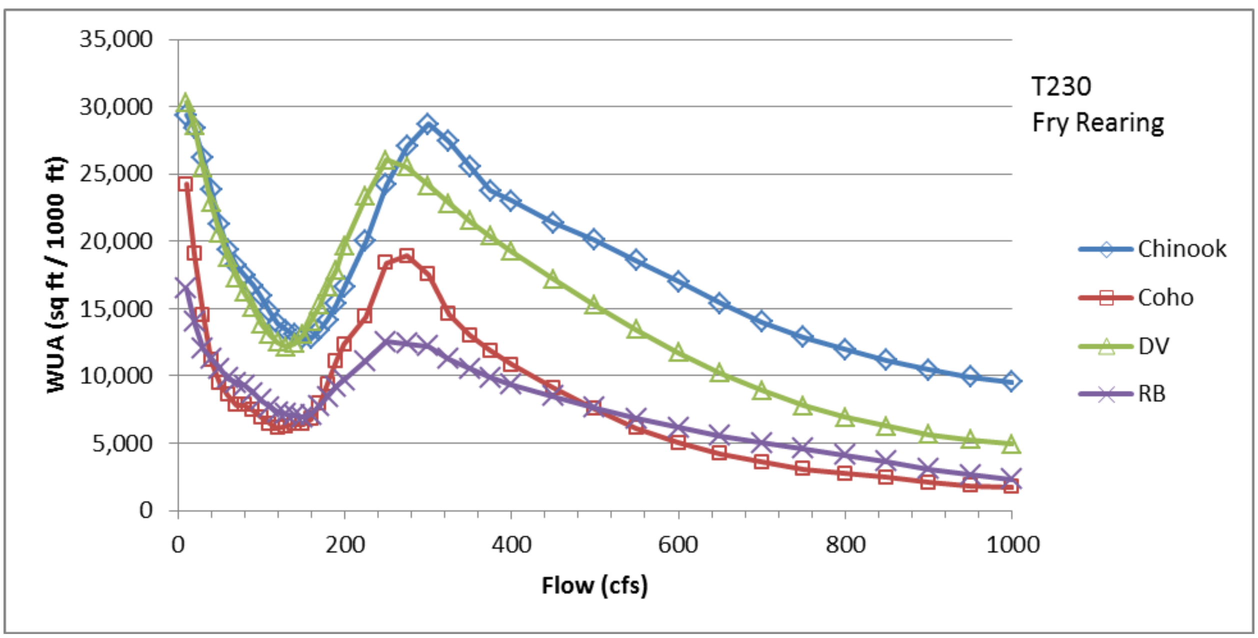

Figure A.5c-8. Transect T230 WUA, fry rearing.

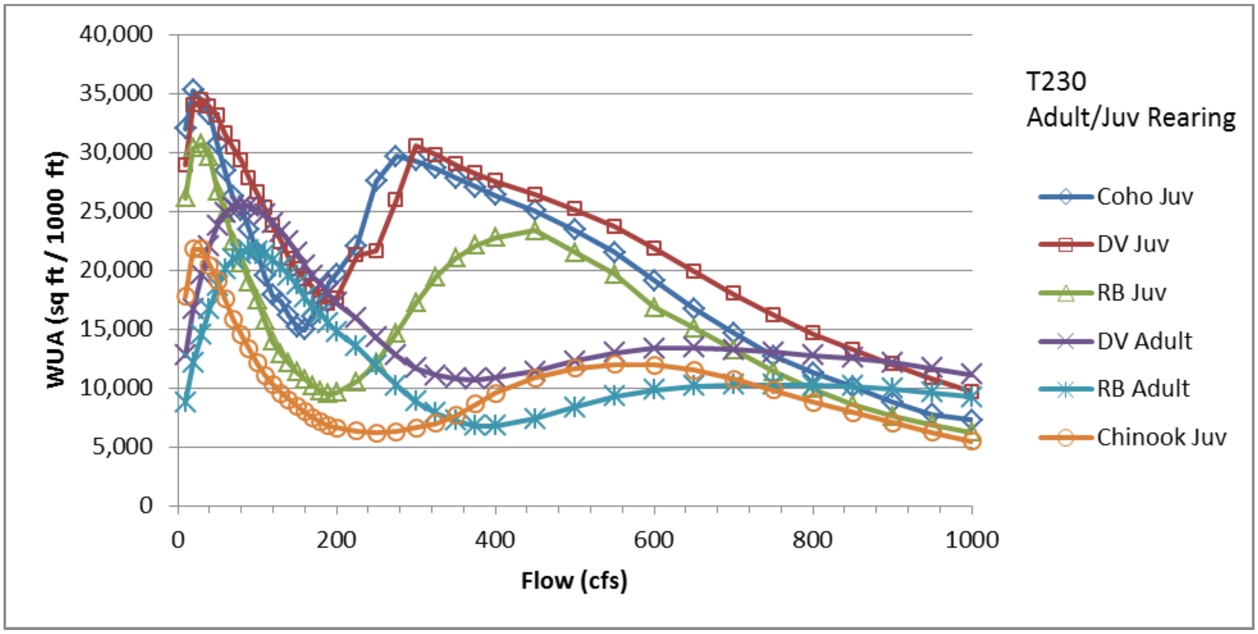

Figure A.5c-9. Transect T230 WUA, adult and juvenile rearing.

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Appendix 5d. Reach 3 Main Channel WUA

This sub-appendix contains the following figures:

Figure A.5d-1. Transect T300 WUA, spawning.
Figure A.5d-2. Transect T300 WUA, fry rearing.
Figure A.5d-3. Transect T300 WUA, adult and juvenile rearing.
Figure A.5d-4. Transect T310 WUA, spawning.
Figure A.5d-5. Transect T310 WUA, fry rearing.
Figure A.5d-6. Transect T310 WUA, adult and juvenile rearing.

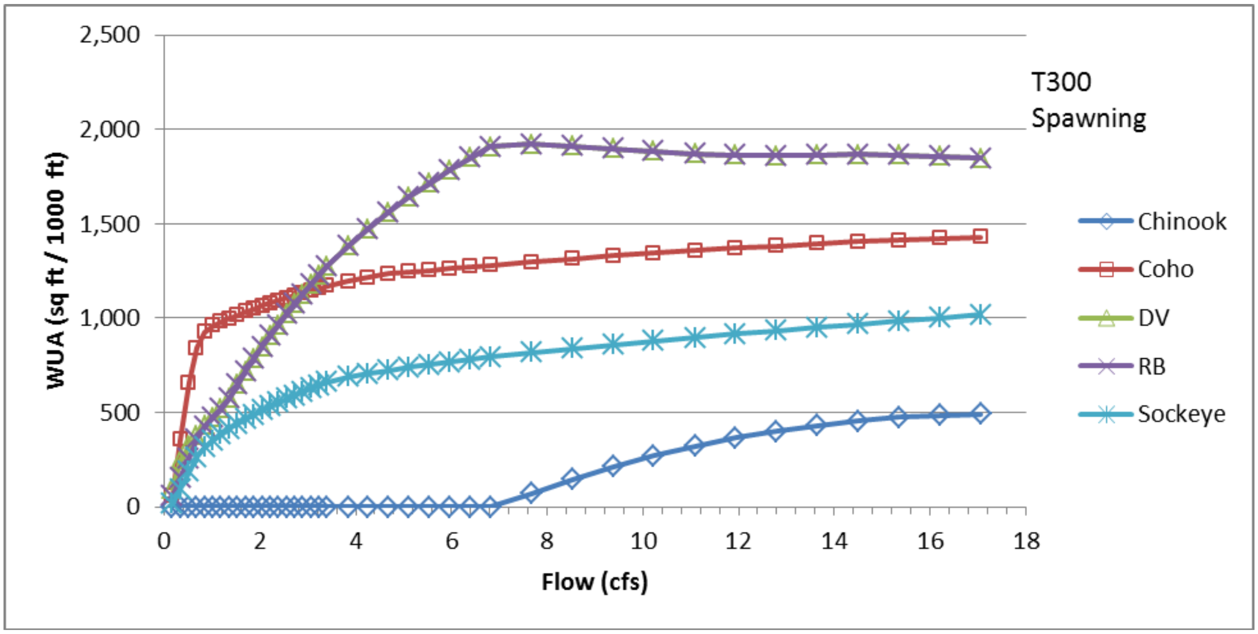

Figure A.5d-1. Transect T300 WUA, spawning.

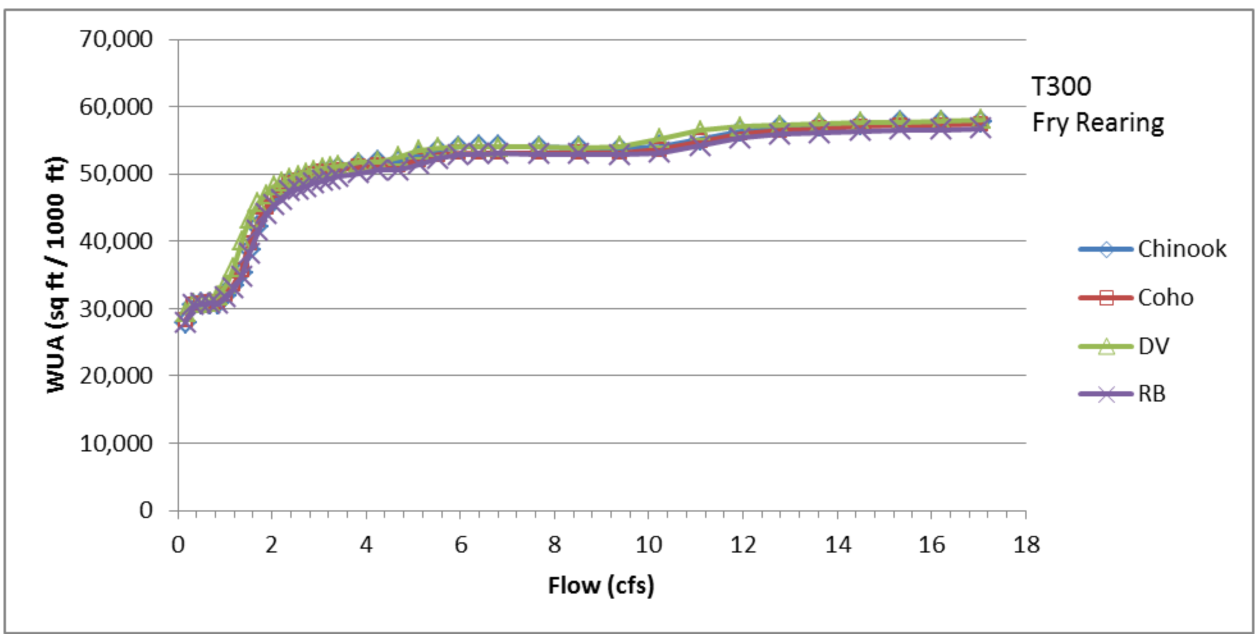

Figure A.5d-2. Transect T300 WUA, fry rearing.

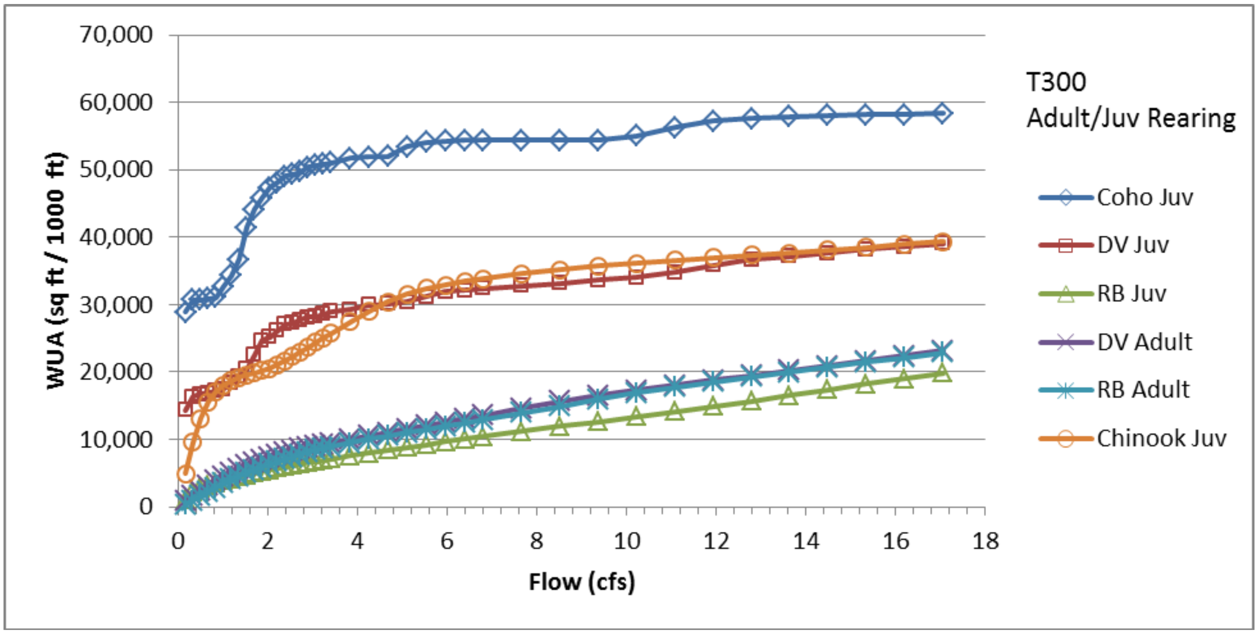

Figure A.5d-3. Transect T300 WUA, adult and juvenile rearing.

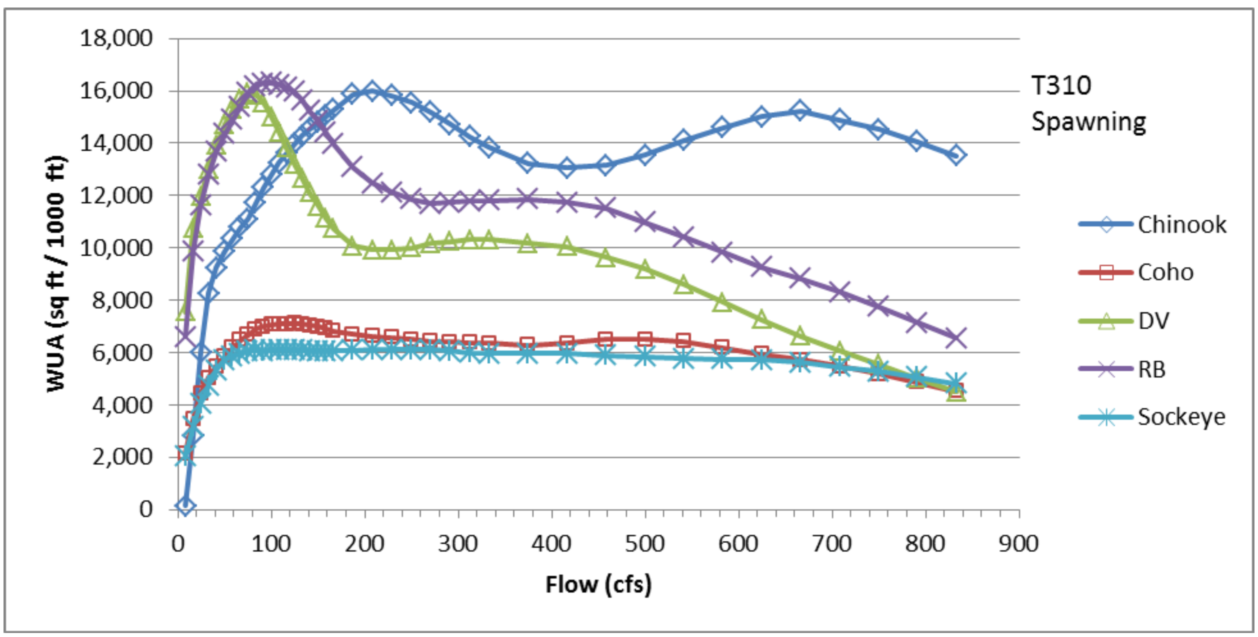

Figure A.5d-4. Transect T310 WUA, spawning.

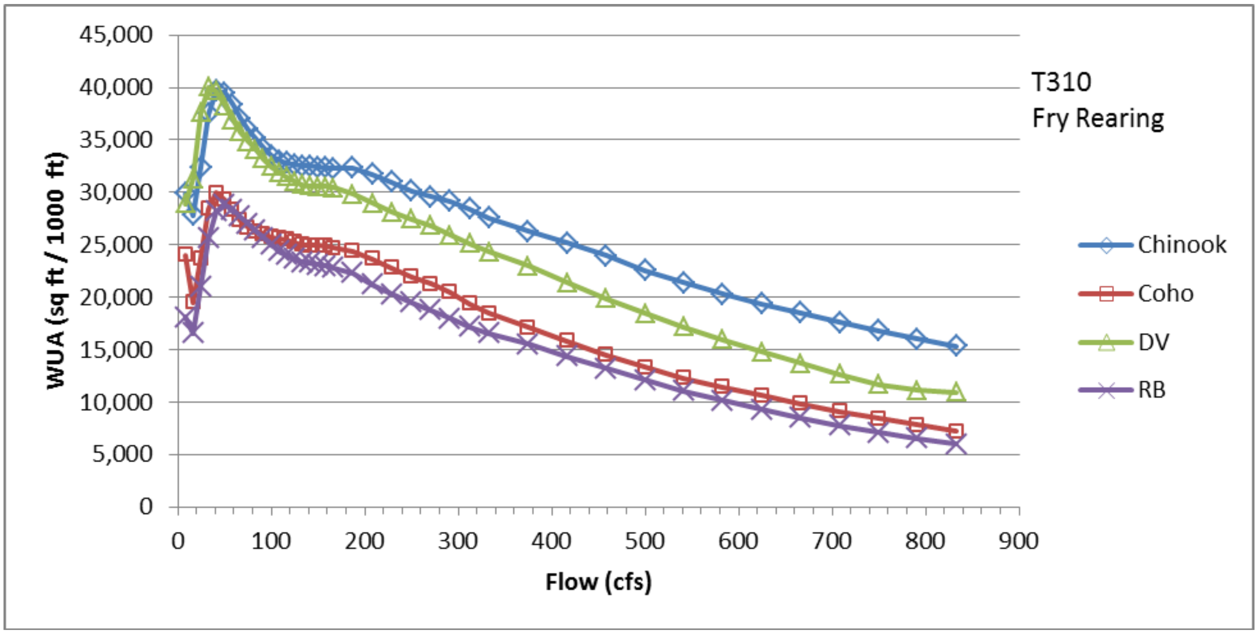

Figure A.5d-5. Transect T310 WUA, fry rearing.

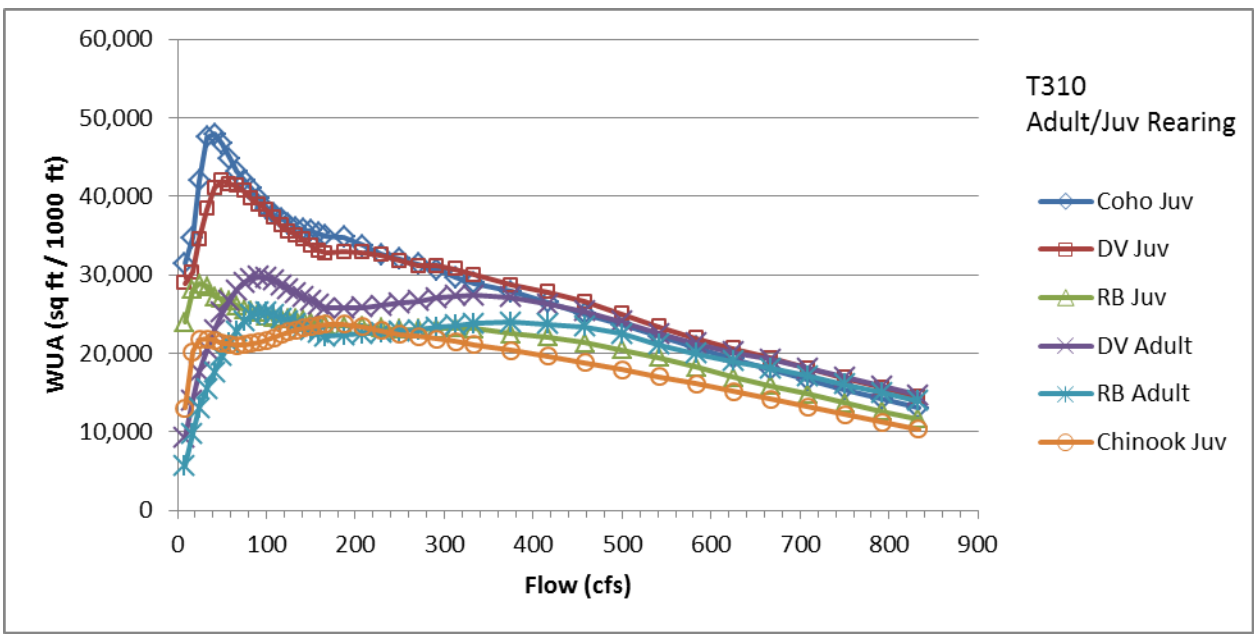

Figure A.5d-6. Transect T310 WUA, adult and juvenile rearing.

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Appendix 5e. Reach 3 Side Channel WUA

This sub-appendix contains the following figures:

Figure A.5e-1. Transect T320 WUA, spawning.
Figure A.5e-2. Transect T320 WUA, fry rearing.
Figure A.5e-3. Transect T320 WUA, adult and juvenile rearing.
Figure A.5e-4. Transect T330 primary WUA, spawning.
Figure A.5e-5. Transect T330 primary WUA, fry rearing.
Figure A.5e-6. Transect T330 primary WUA, adult and juvenile rearing.
Figure A.5e-7. Transect T330 secondary WUA, spawning.
Figure A.5e-8. Transect T330 secondary WUA, fry rearing.
Figure A.5e-9. Transect T330 secondary WUA, adult and juvenile rearing.
Figure A.5e-7. Transect T330 tertiary WUA, spawning.
Figure A.5e-8. Transect T330 tertiary WUA, fry rearing.
Figure A.5e-9. Transect T330 tertiary WUA, adult and juvenile rearing.

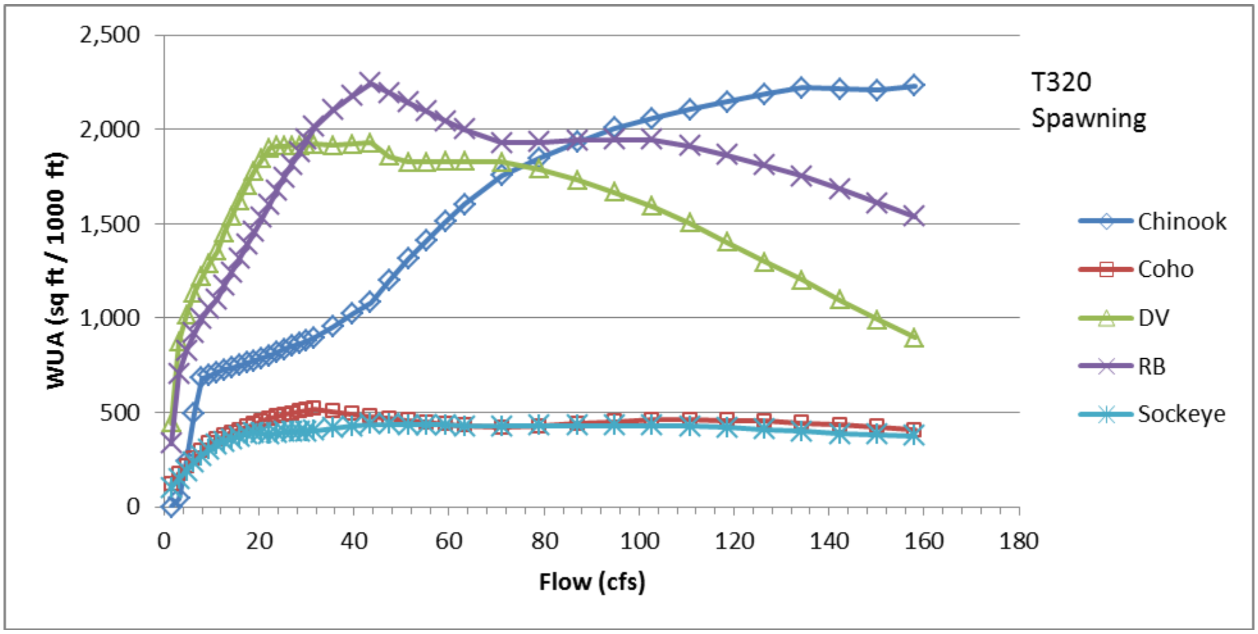

Figure A.5e-1. Transect T320 WUA, spawning.

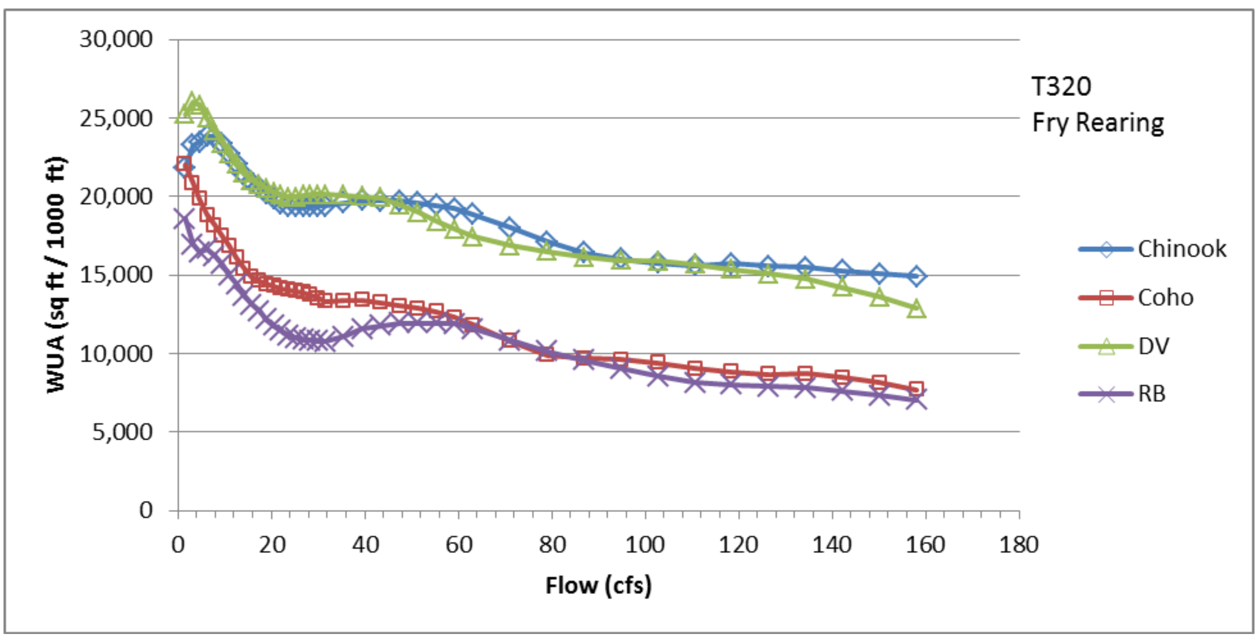

Figure A.5e-2. Transect T320 WUA, fry rearing.

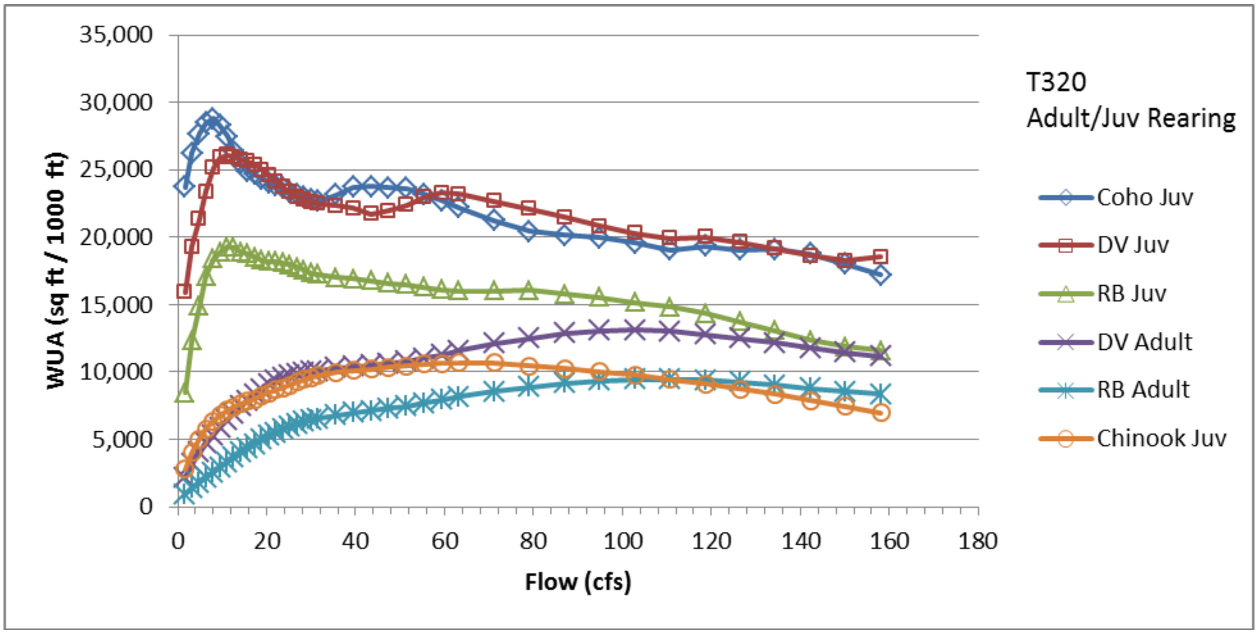

Figure A.5e-3. Transect T320 WUA, adult and juvenile rearing.

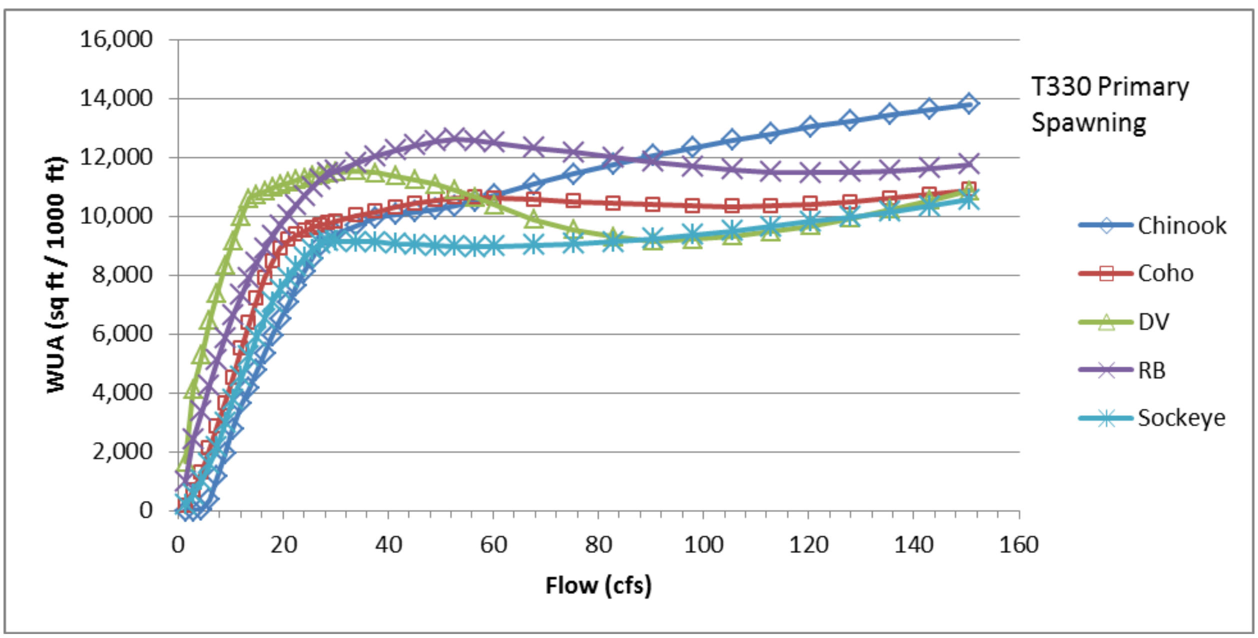

Figure A.5e-4. Transect T330 primary WUA, spawning.

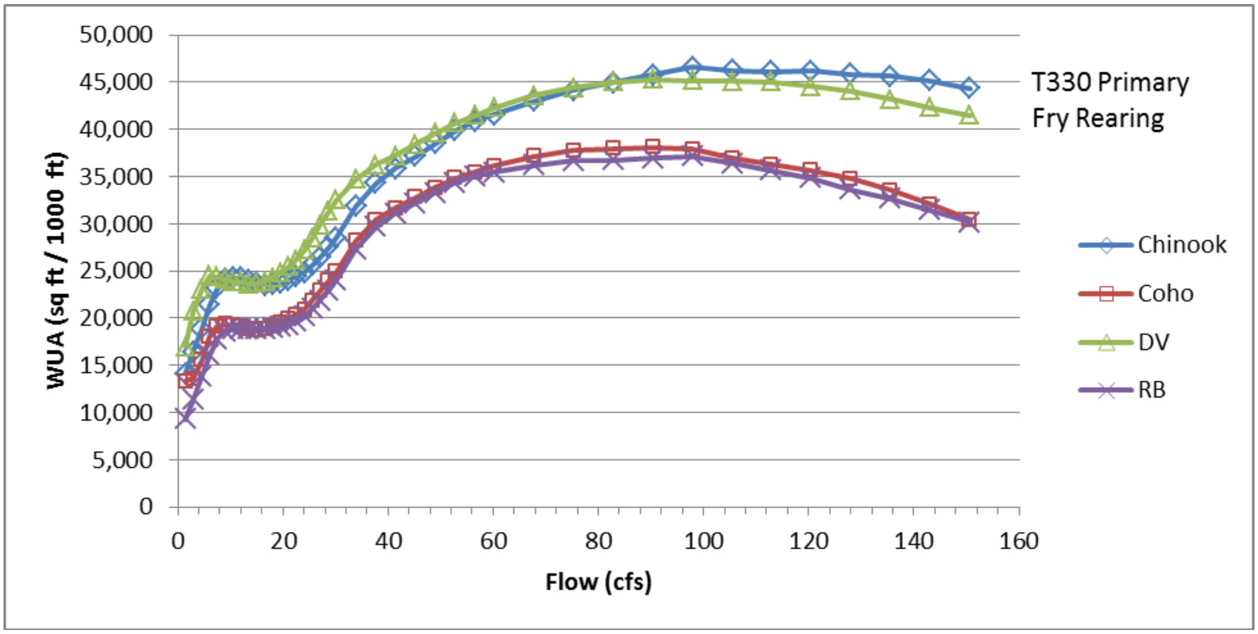

Figure A.5e-5. Transect T330 primary WUA, fry rearing.

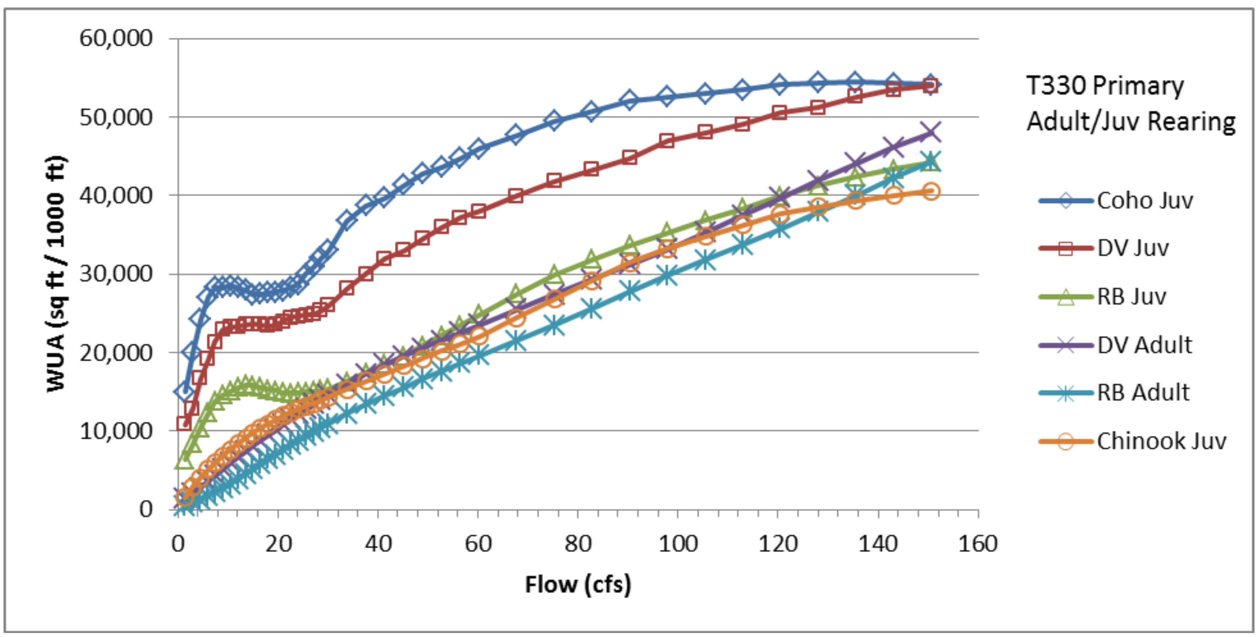

Figure A.5e-6. Transect T330 primary WUA, adult and juvenile rearing.

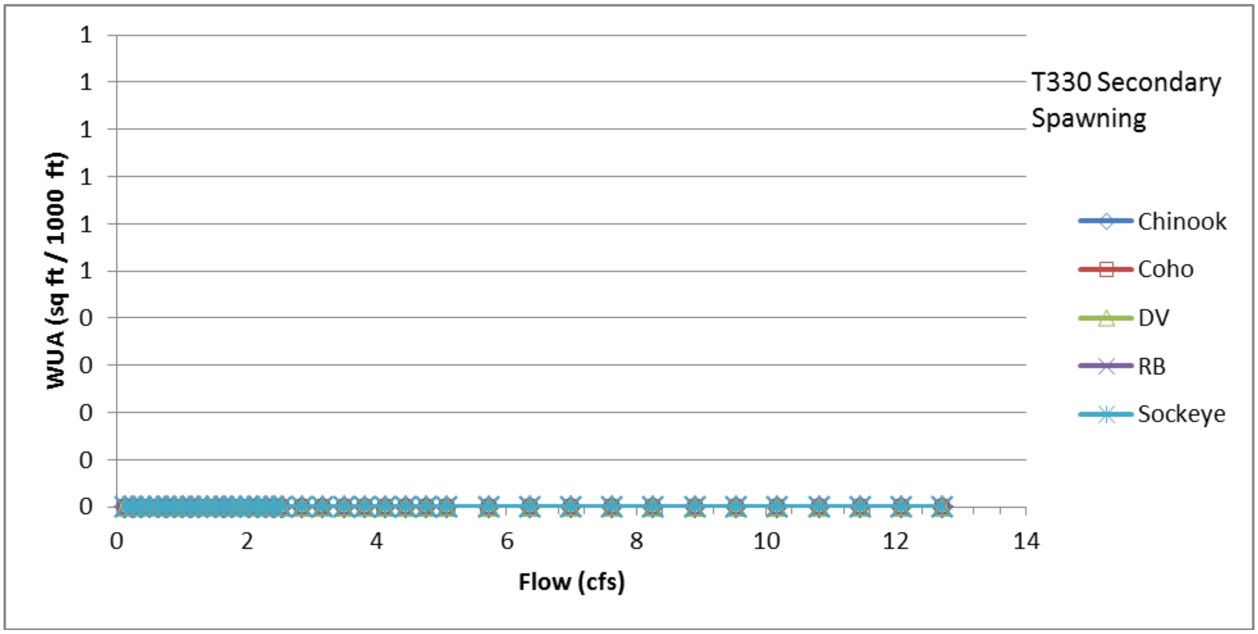

Figure A.5e-7. Transect T330 secondary WUA, spawning.

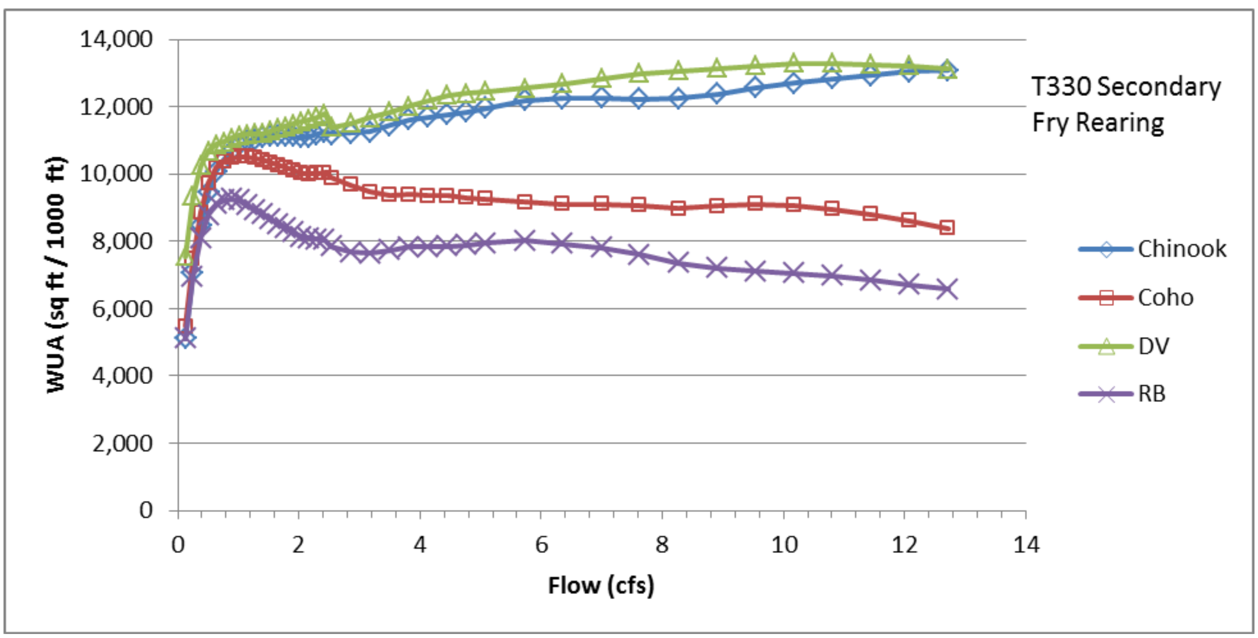

Figure A.5e-8. Transect T330 secondary WUA, fry rearing.

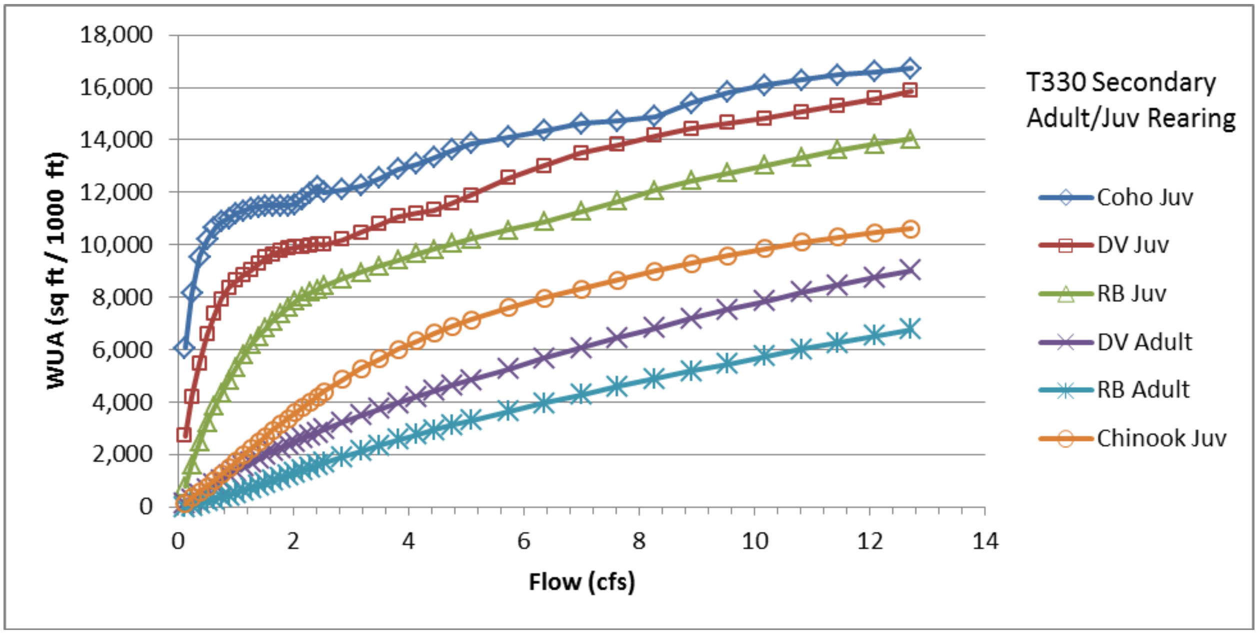

Figure A.5e-9. Transect T330 secondary WUA, adult and juvenile rearing.

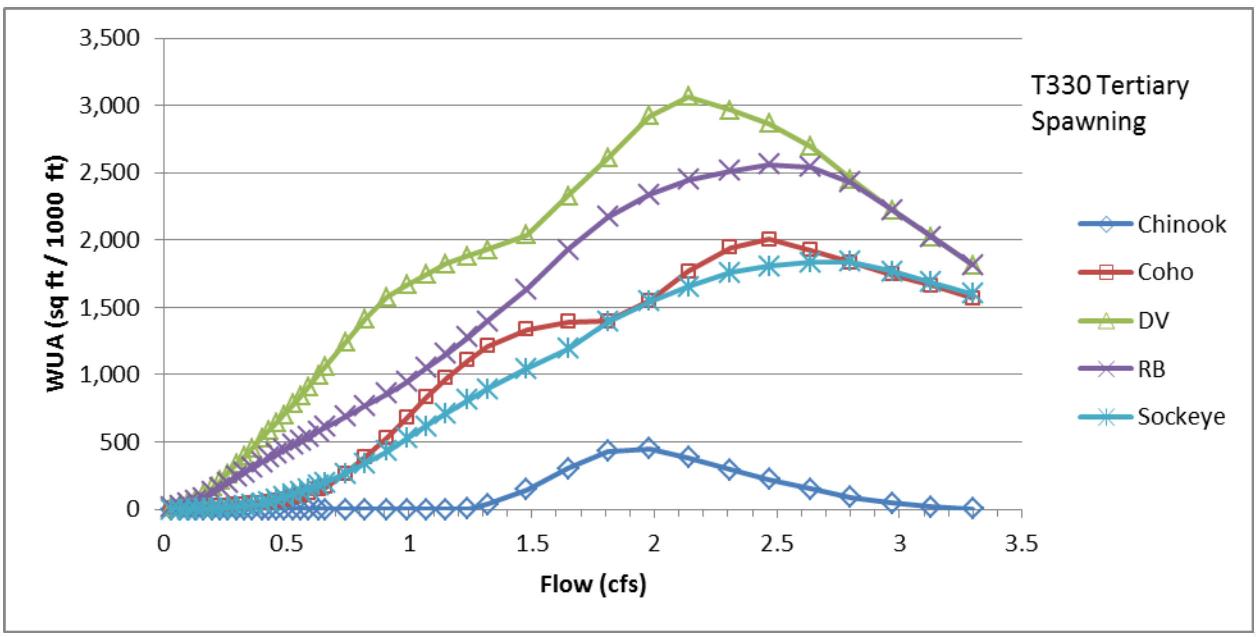

Figure A.5e-10. Transect T330 tertiary WUA, spawning.

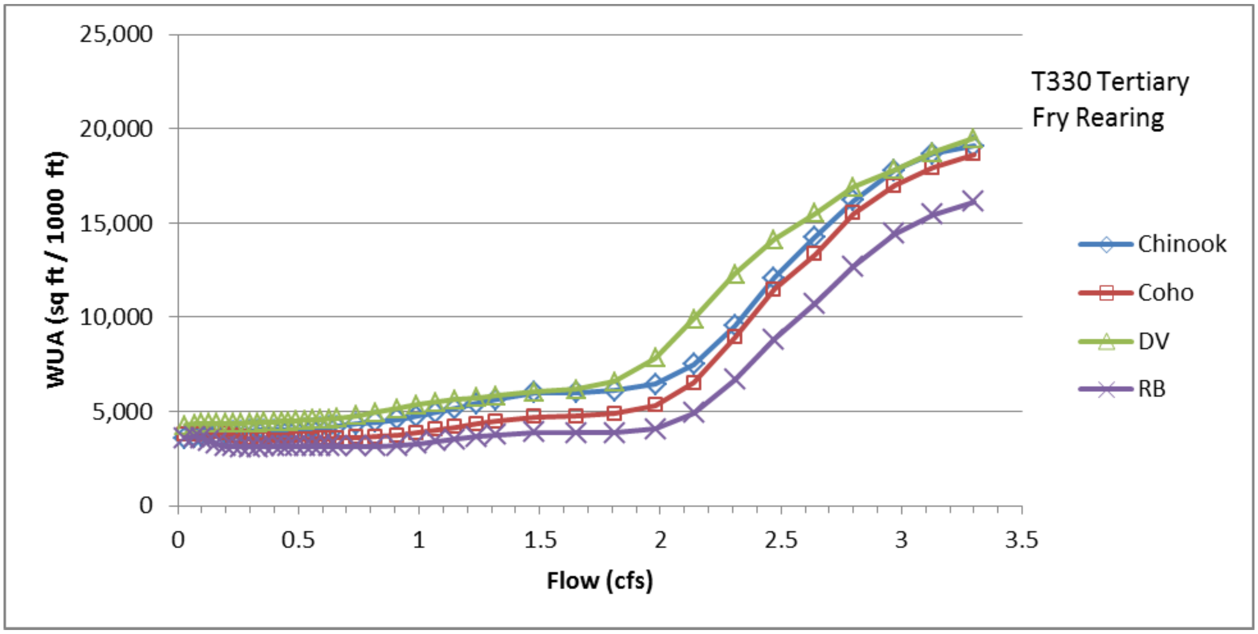

Figure A.5e-11. Transect T330 tertiary WUA, fry rearing.

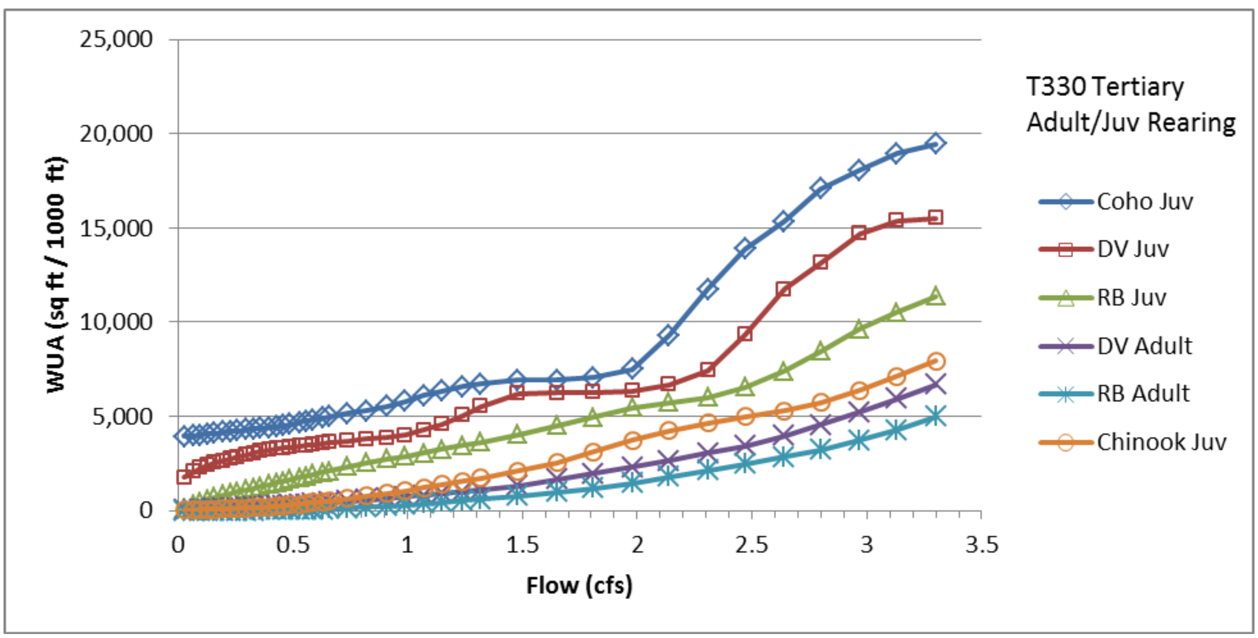

Figure A.5e-12. Transect T330 tertiary WUA, adult and juvenile rearing.

Appendix 5f. Reach 4 WUA

This sub-appendix contains the following figures:

Figure A.5f-1. Transect T400 WUA, spawning.
Figure A.5f-2. Transect T400 WUA, fry rearing.
Figure A.5f-3. Transect T400 WUA, adult and juvenile rearing.
Figure A.5f-4. Transect T410 WUA, spawning.
Figure A.5f-5. Transect T410 WUA, fry rearing.
Figure A.5f-6. Transect T410 WUA, adult and juvenile rearing.
Figure A.5f-7. Transect T430 WUA, spawning.
Figure A.5f-8. Transect T430 WUA, fry rearing.
Figure A.5f-9. Transect T430 WUA, adult and juvenile rearing.

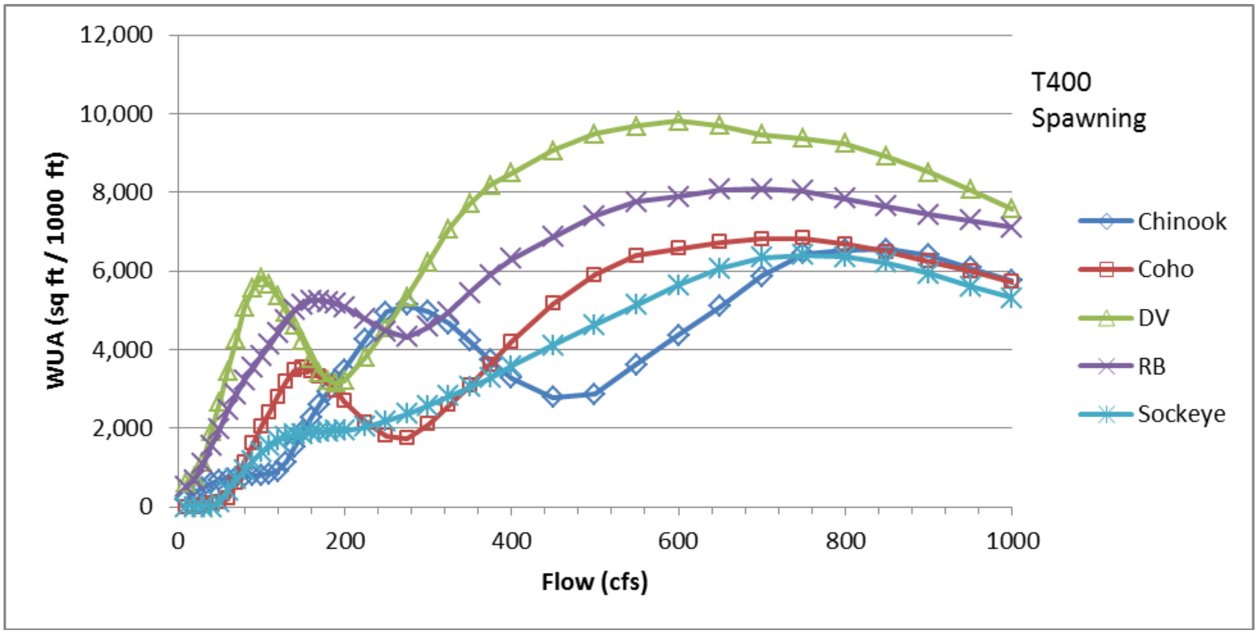

Figure A.5f-1. Transect T400 WUA, spawning.

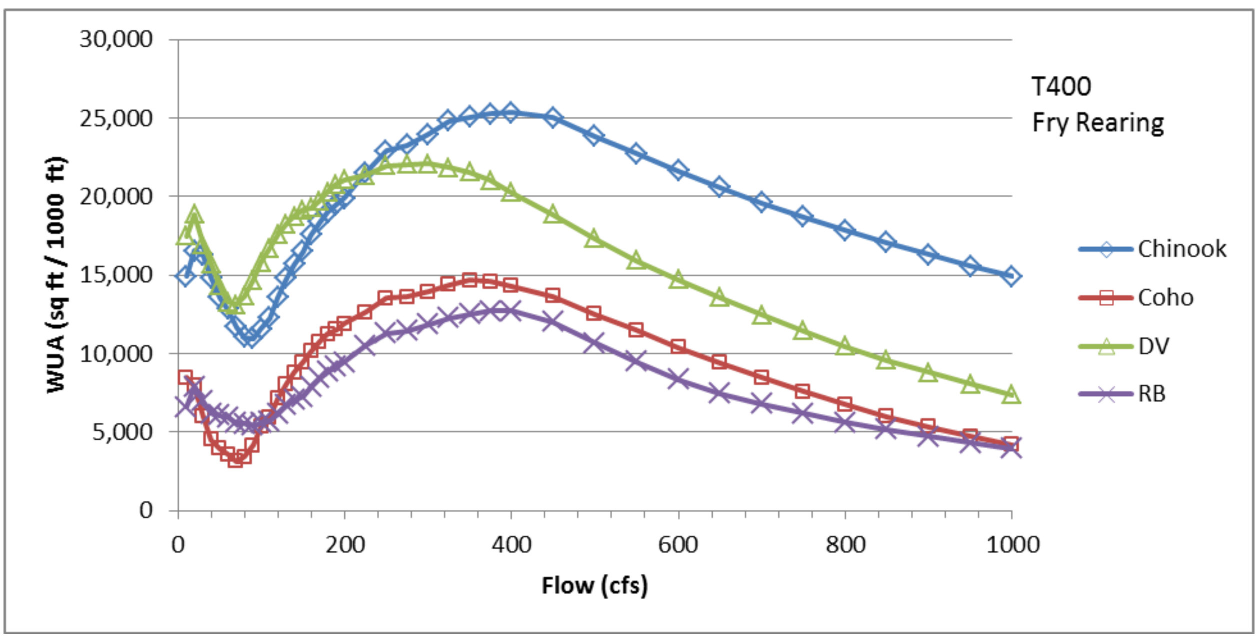

Figure A.5f-2. Transect T400 WUA, fry rearing.

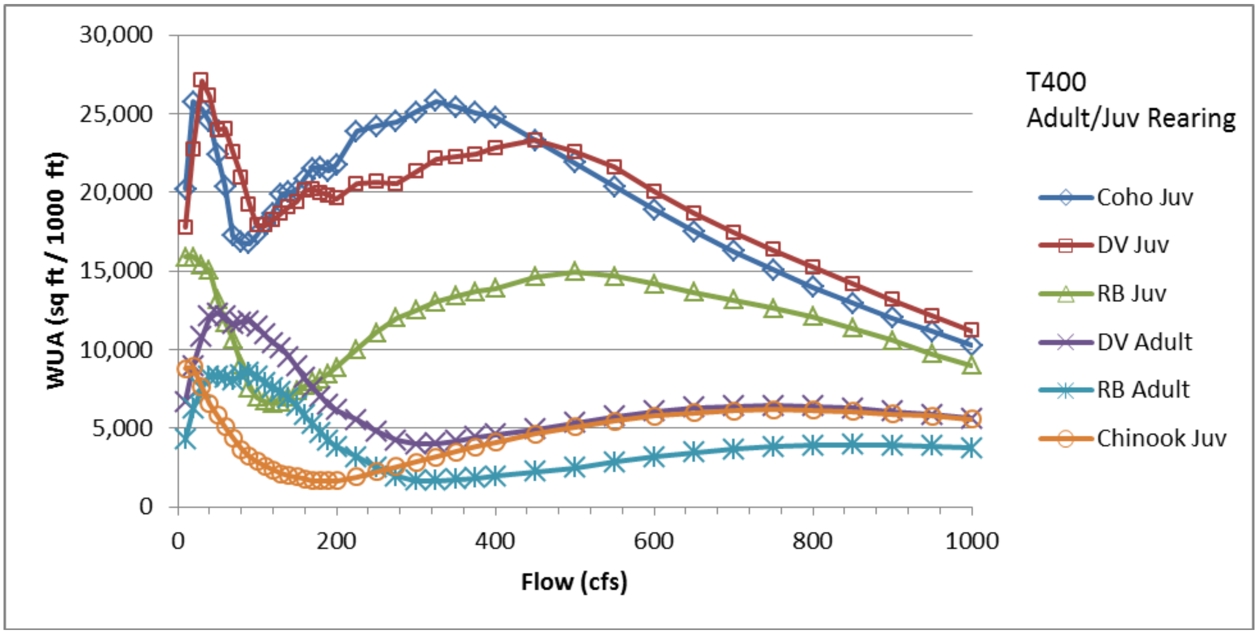

Figure A.5f-3. Transect T400 WUA, adult and juvenile rearing.

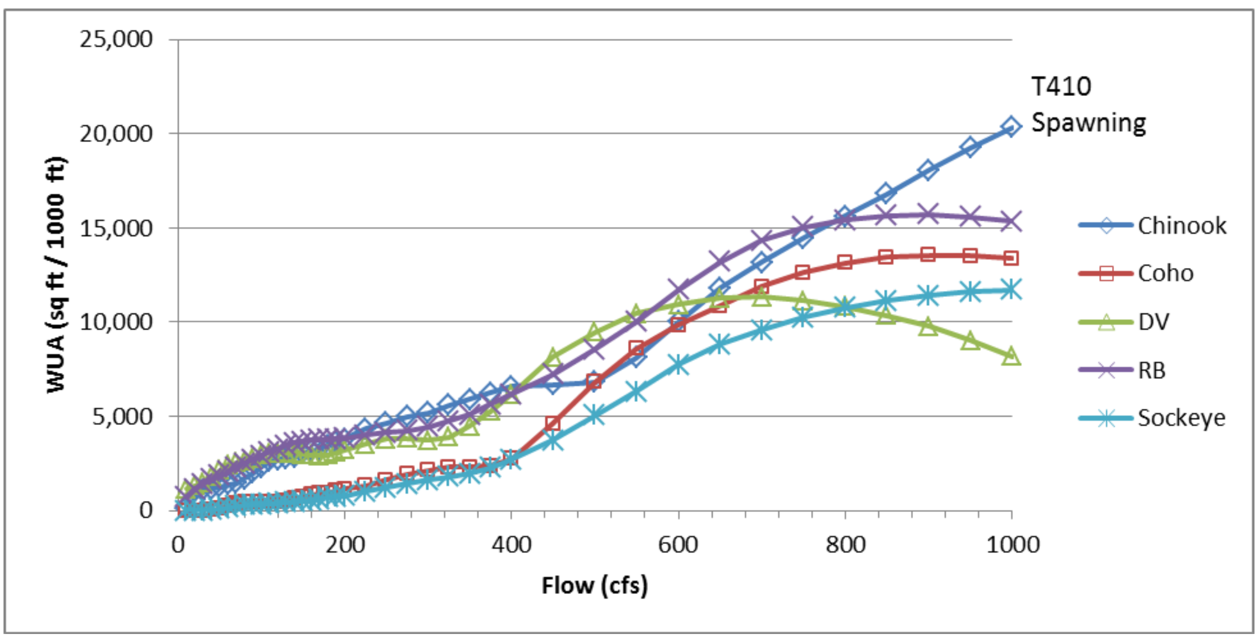

Figure A.5f-4. Transect T410 WUA, spawning.

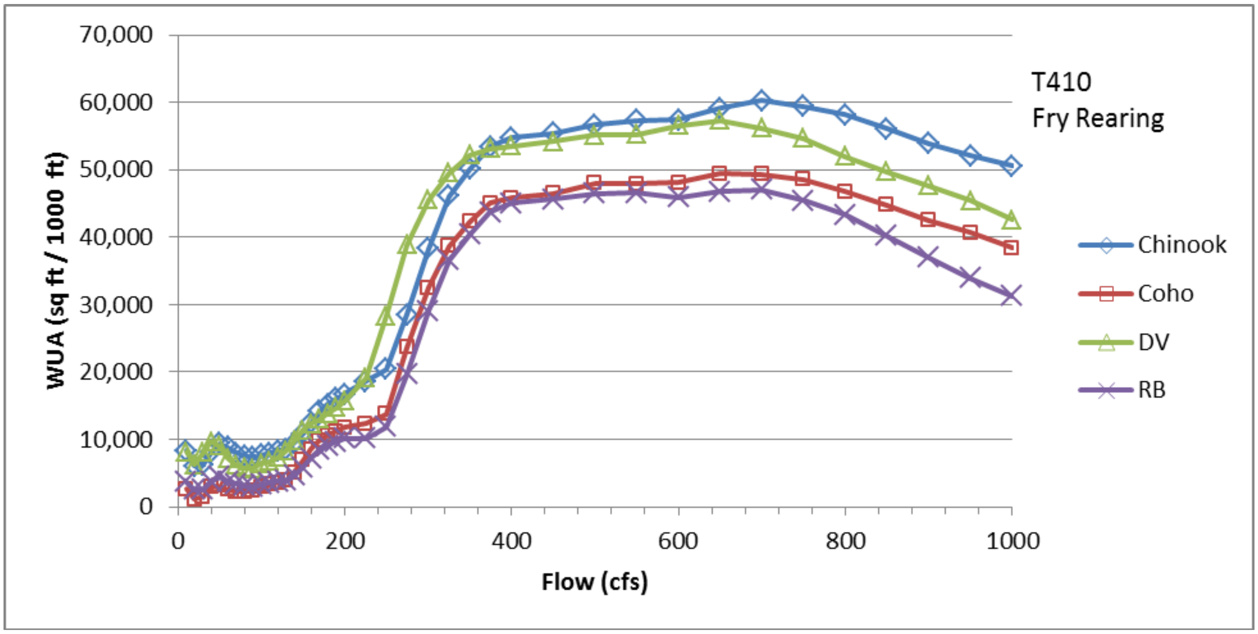

Figure A.5f-5. Transect T410 WUA, fry rearing.

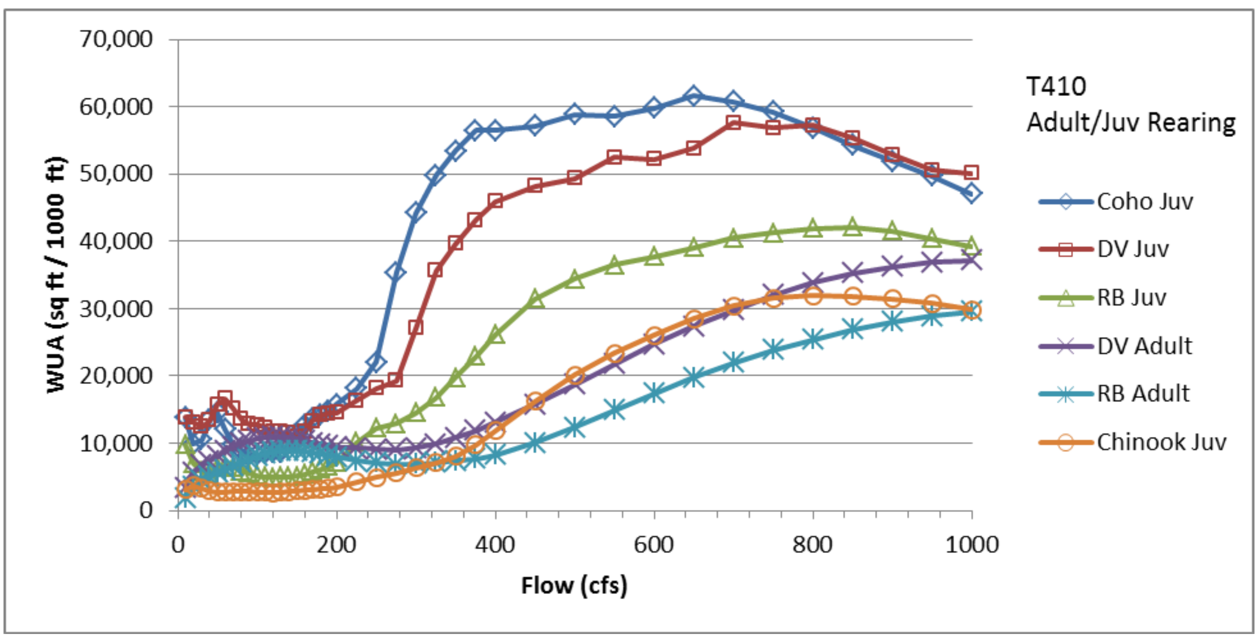

Figure A.5f-6. Transect T410 WUA, adult and juvenile rearing.

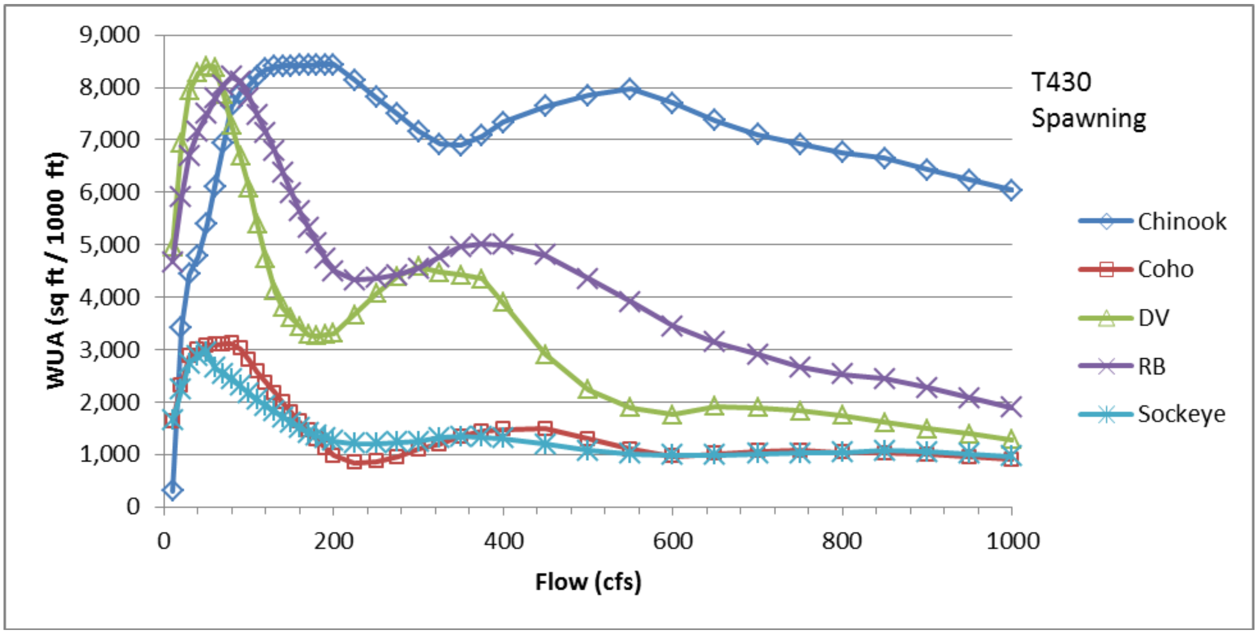

Figure A.5f-7. Transect T430 WUA, spawning.

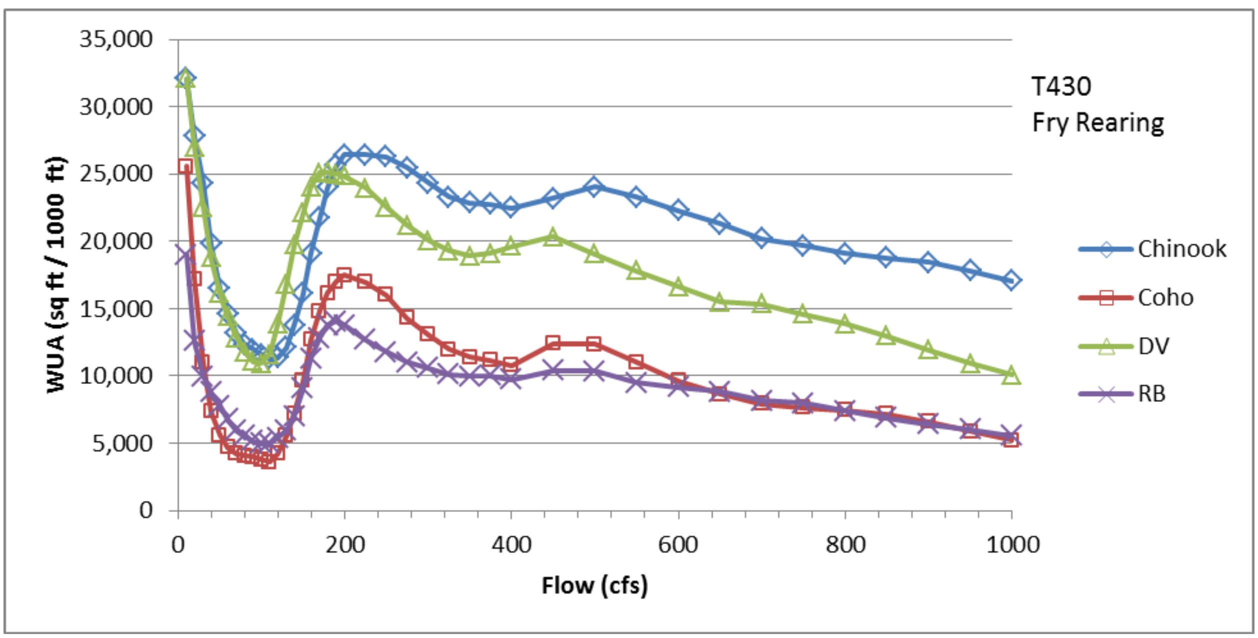

Figure A.5f-8. Transect T430 WUA, fry rearing.

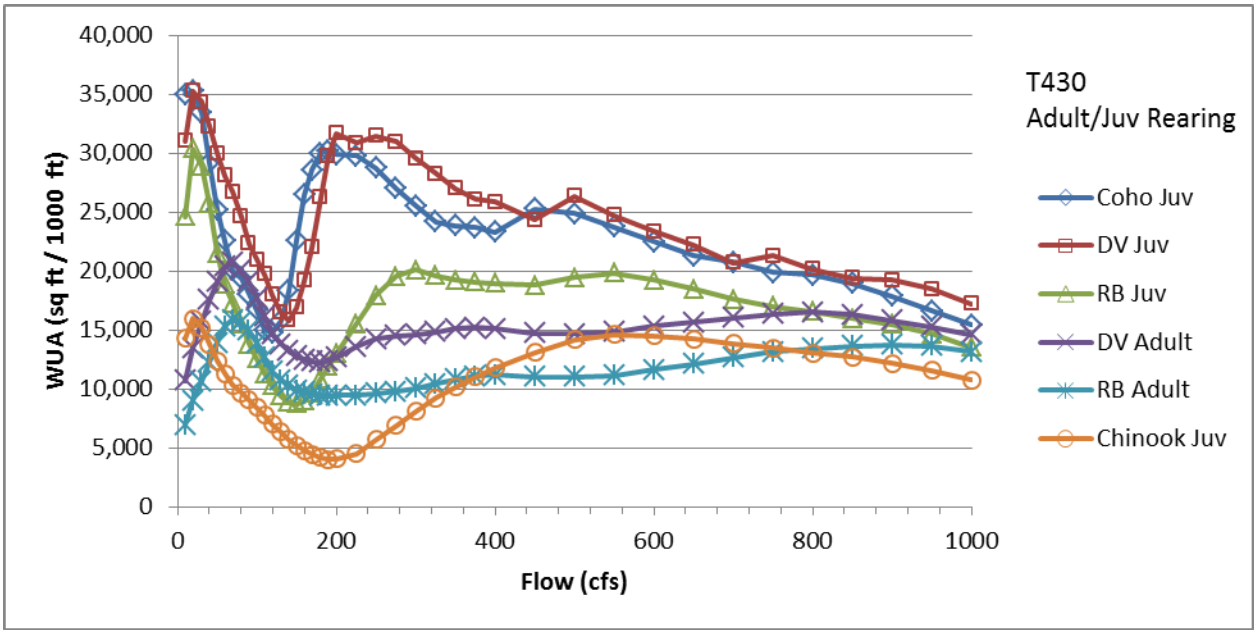

Figure A.5f-9. Transect T430 WUA, adult and juvenile rearing.

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Appendix 6: Reach 5 Connectivity

Appendix 6a. Reach 5 Bed Profiles and Water Surface Elevation (WSE)
Appendix 6b. Reach 5 Rainbow Trout and Dolly Varden Passage
Appendix 6c. Reach 5 Coho and Sockeye Salmon Passage
Appendix 6d. Reach 5 Chinook Salmon Passage

Appendix 6a. Reach 5 Bed Profiles and Water Surface Elevation (WSE)

This sub-appendix contains the following figures:

Figure A.6a-1. Transect T510 bed profile and Water Surface Elevation (WSE), 7–300 cfs.
Figure A.6a-2. Transect T520 bed profile and WSE, 7–300 cfs.

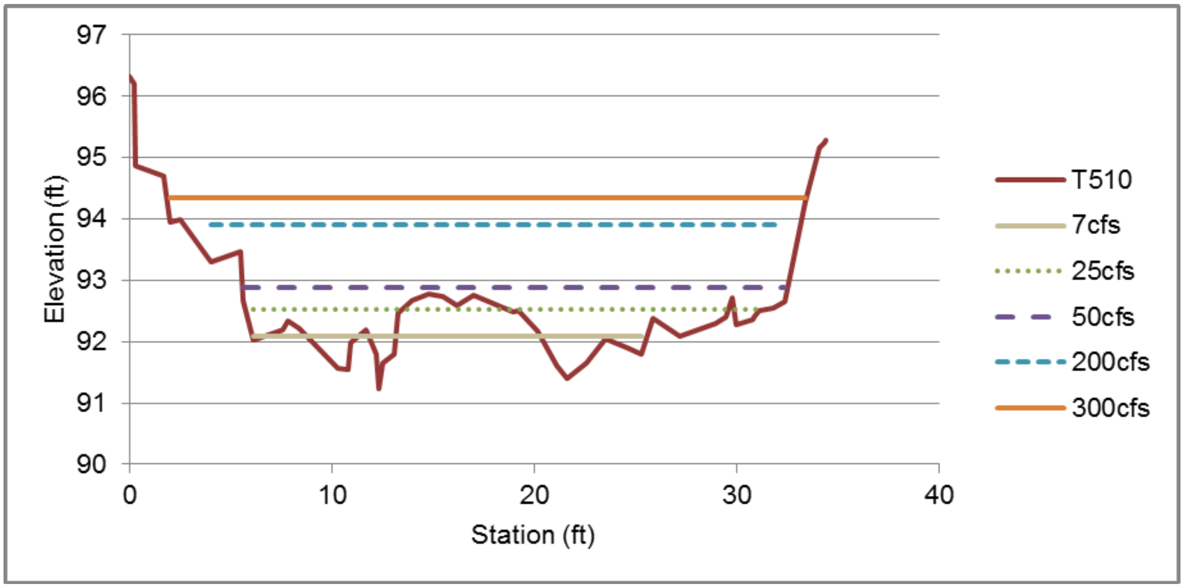

Figure A.6a-1. Transect T510 bed profile and Water Surface Elevation (WSE), 7–300 cfs.

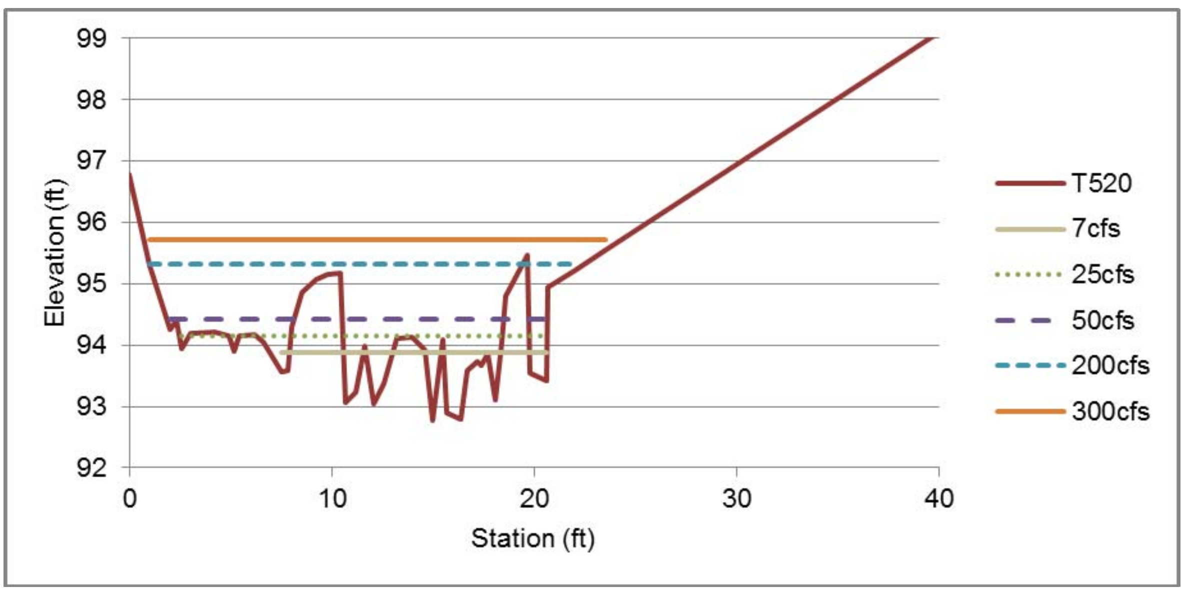

Figure A.6a-2. Transect T520 bed profile and WSE, 7–300 cfs.

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Appendix 6b. Reach 5 Rainbow Trout and Dolly Varden Passage

This sub-appendix contains the following figures:

Figure A.6b-1. Transect T510 rainbow trout and Dolly Varden passage vs flow.
Figure A.6b-2. Transect T520 rainbow trout and Dolly Varden passage vs flow.

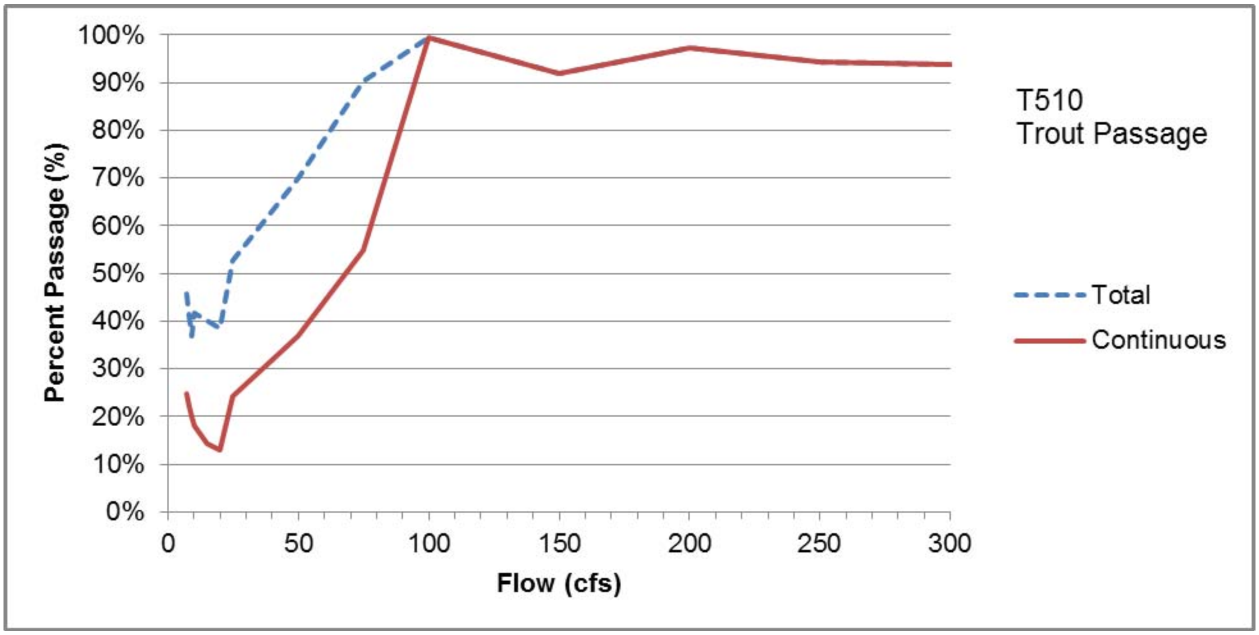

Figure A.6b-1. Transect T510 rainbow trout and Dolly Varden passage vs flow.

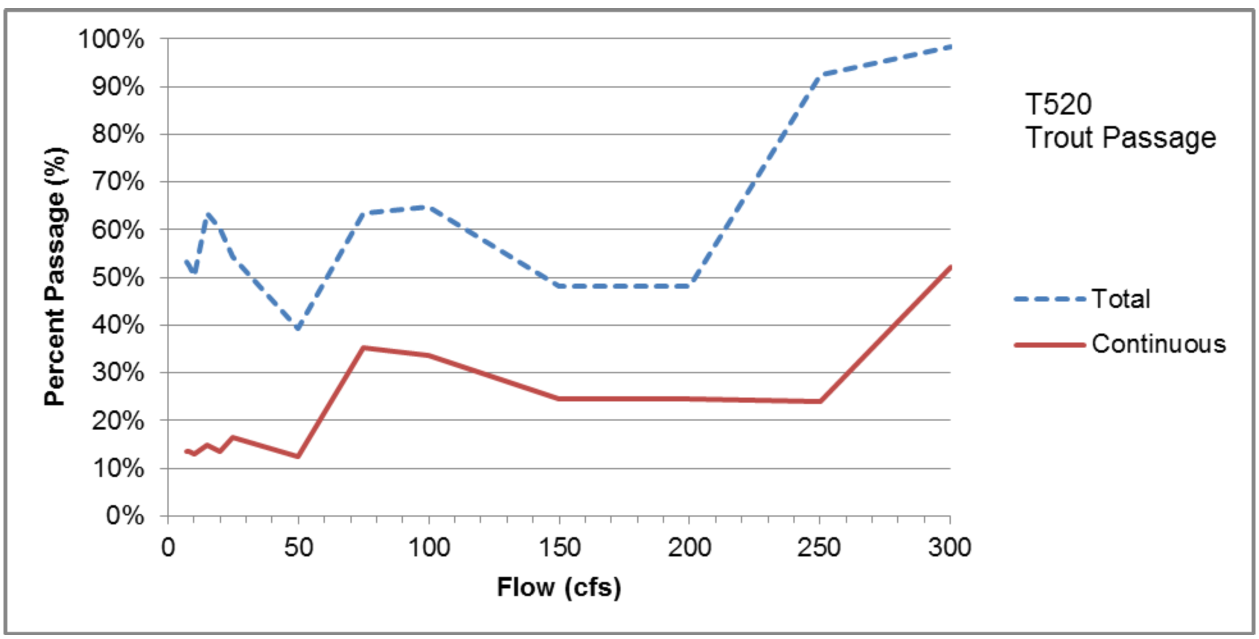

Figure A.6b-2. Transect T520 rainbow trout and Dolly Varden passage vs flow.

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Appendix 6c. Reach 5 Coho and Sockeye Salmon Passage

This sub-appendix contains the following figures:

Figure A.6c-1. Transect T510 coho and sockeye salmon passage vs flow.
Figure A.6c-2. Transect T520 coho and sockeye salmon passage vs flow.

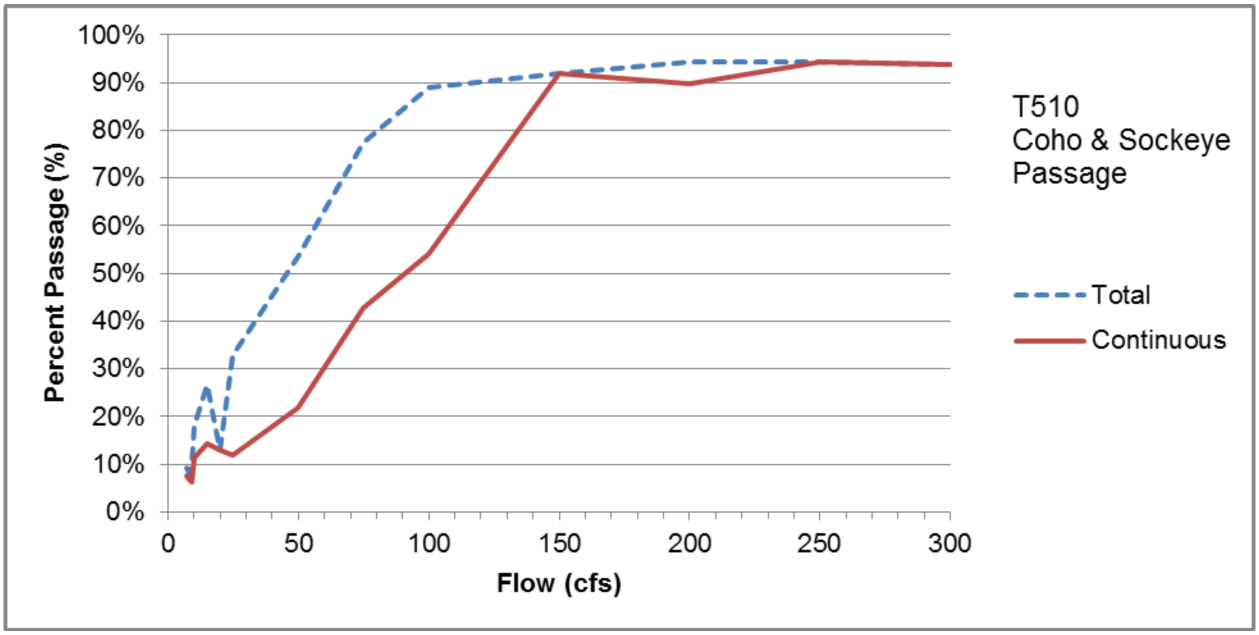

Figure A.6c-1. Transect T510 coho and sockeye salmon passage vs flow.

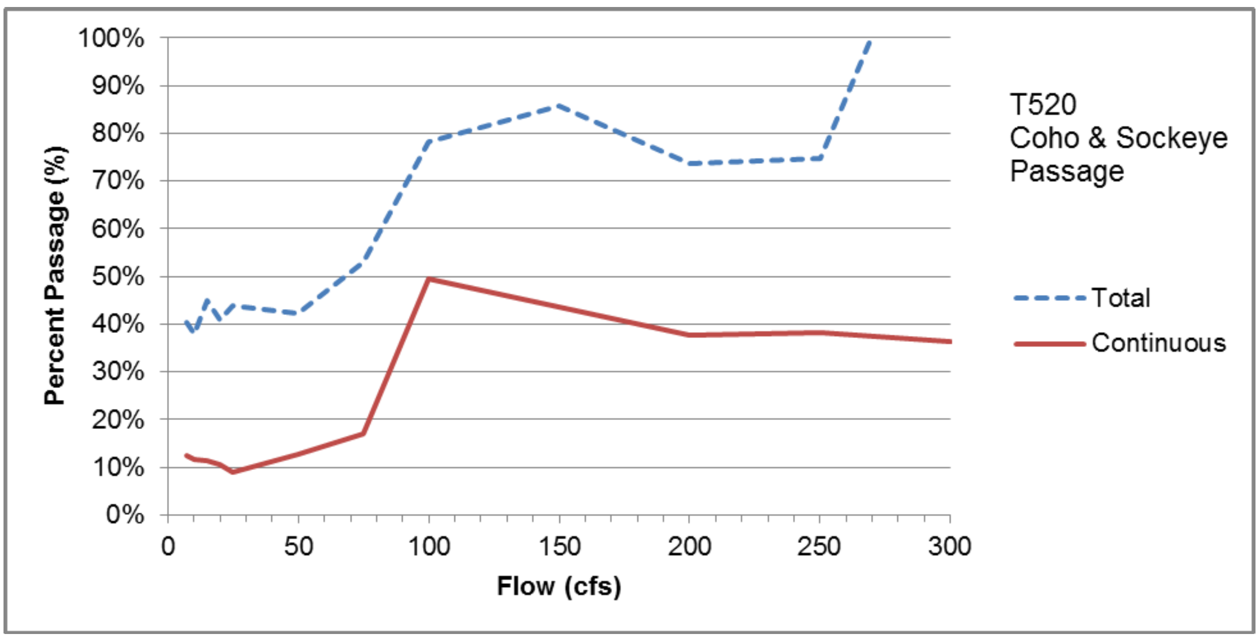

Figure A.6c-2. Transect T520 coho and sockeye salmon passage vs flow.

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Appendix 6d. Reach 5 Chinook Salmon Passage

This sub-appendix contains the following figures:

Figure A.6d-1. Transect T510 Chinook salmon passage vs flow.
Figure A.6d- 2. Transect T520 Chinook salmon passage vs flow.

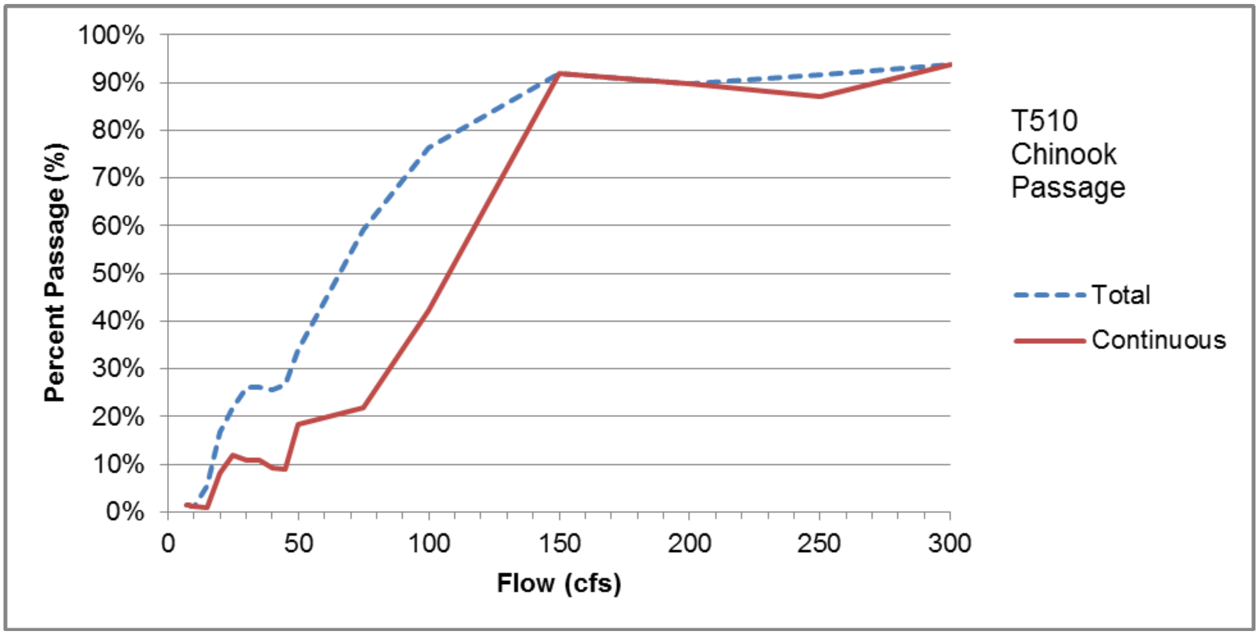

Figure A.6d-1. Transect T510 Chinook salmon passage vs flow.

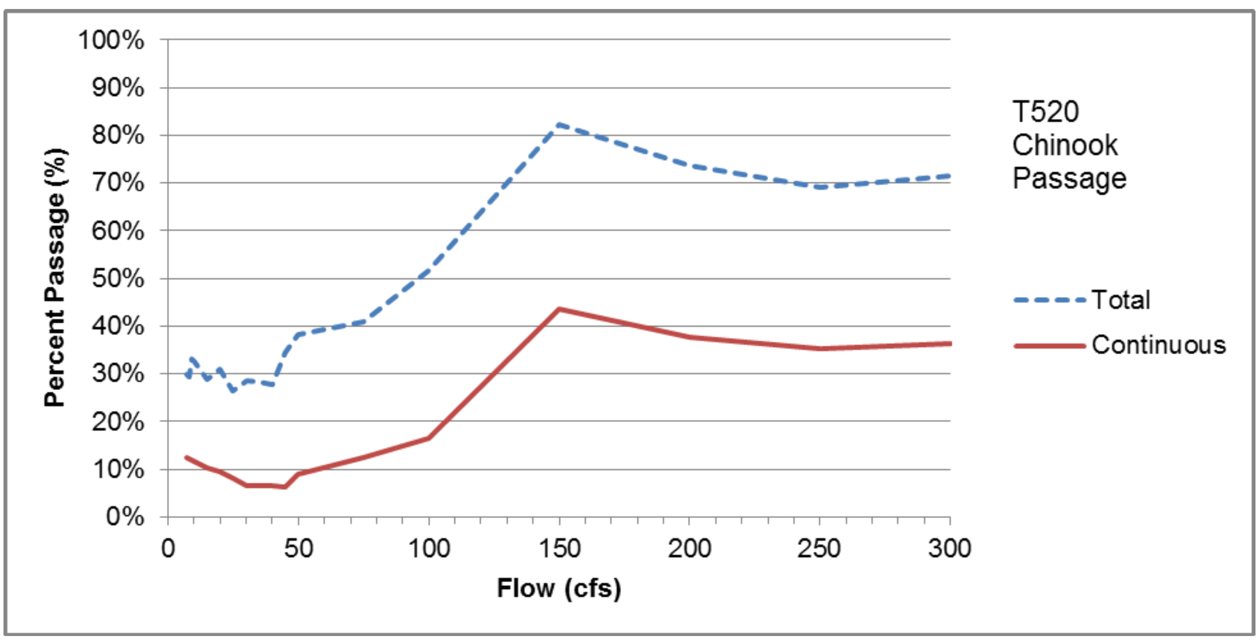

Figure A.6d- 2. Transect T520 Chinook salmon passage vs flow.

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