Hangman (Latah) Creek
Fish Passage Barrier Inventory

Conducted by:
Spokane County Conservation District
Water Resources Program

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Sponsored by:
The Hangman (Latah) Creek WRIA 56
Watershed Implementation Team

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The impetus for this effort originated from the Hangman Creek Watershed Implementation Team. This group has been meeting and discussing watershed issues in Hangman Creek for over a decade. The SCCD would like to thank their efforts and contributions to benefit Spokane County and its local watersheds.

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ACRONYMS

ac.	Acre
BNSF	Burlington Northern Santa Fe Railroad
CDA	Coeur d'Alene Tribe
cfs	Cubic feet per second
CPC	Cast-in-place concrete
Cr.	Creek
CST	Corrugated steel culvert
DOE	Washington State Department of Ecology
DNR	Washington State Department of Natural Resources
D/S	Downstream
FFFPP	Family Forest Fish Passage Program
FUH	Fish Usable Habitat
GIS	Geographical information systems
GPS	Global positioning system
ID	Idaho
mi.	Mile
NAD	North American Datum
PCC	Pre-Cast Concrete
RM	River Mile
SCCD	Spokane County Conservation District
U/S	Upstream
USGS	United States Geological Survey
WA	Washington
WDFW	Washington State Department of Fish and Wildlife
WRIA	Water Resource Inventory Area
WSDOT	Washington State Department of Transportation

EXECUTIVE SUMMARY

Fish passage within the Hangman (Latah) Creek Watershed (herein referred to as Hangman Creek) is a subject that has not received enough attention over the years. Hangman Creek is not known for recreational sport fishing due to low summer flows and water quality issues. However, there are salmonids and many other native species within the basin. The first known fish survey was completed in 1893 and the establishment of hydroelectric dams on the Columbia and Spokane River systems extirpated all anadromous fish from the watershed near the turn of the 20th century. Land use within the watershed is predominantly dryland agriculture, with a rise in rural residential development. As more changes occur, it is important for resource managers to know the location and what fish species are present in the watershed. But it is just as important to understand the quality and quantity of habitat available to these fish. This fish barrier inventory is intended to answer some of these questions.

The Spokane County Conservation District (SCCD) initiated this inventory through the Hangman Creek Detailed Management Plan, a product of the Watershed Planning Program administered by the Washington State Department of Ecology (DOE) in 1998. The inventory is based upon current Washington State Department of Natural Resources (DNR) stream typing and fish bearing maps. All crossings of fish bearing stream reaches were inventoried and evaluated according to Washington State Department of Fish and Wildlife's (WDFW) Rapid Basic Assessment Protocols for Fish Passage. The inventory also utilized all known current and historical fishery information within the Hangman Creek Watershed boundaries. These sub-basins include: Mainstem of Hangman Creek (Lower, Middle, and Upper), Marshall/Minnie Creek, Stevens Creek, California Creek, Spangle Creek, Rock Creek, Rattler Run Creek, Cove Creek. The inventory did not include portions of subwatersheds within Idaho (headwaters of Hangman mainstem, Rock Creek, and Little Hangman Creek). The data for Idaho streams is either incomplete or nonexistent.

An interdisciplinary team conducted the inventory and classified all crossings into four basic categories: *Barrier, Non-barrier, Possible Barrier* and *Unknown.* Each barrier is rated for replacement/removal and prioritized according to amount/quality of upstream habitat and fisheries information for that subwatershed.

The inventory surveys approximately 359 miles of fish usable habitat within the Hangman Creek Watershed (WA). 488 stream crossings were classified; 65 barriers, 94 possible barriers, 238 non-barriers, and 91 unknown**.** The majority of the barriers are different types of culverts (78%). Most of these are County owned (55%) and are barriers primarily due to due to slope, velocity and outfall drops (72%). These barriers block nearly 118 mi of fish usable habitat (37%). There are 94 possible barriers. The unknown crossings and possible barriers require further evaluation as they may block an even greater amount of habitat.

Marshall/Minnie Creek and Rock Creek are the most impacted subwatersheds in the basin. Marshall/Minnie Creek has 100% blockage of its 43 miles of fish usable habitat. Rock Creek has the most fish usable habitat in the watershed (95 miles). Approximately 24% of that habitat is blocked by numerous barriers (16). Steven's Creek has a salmonid population, but 99% of its nine miles of fish usable habitat are blocked. California Creek has 39% of its habitat blocked. It has a known self-sustaining population of interior redband trout and is considered to be the highest priority subwatershed in the basin.

1.0 INTRODUCTION

Washington State native fish require unobstructed waterways in order to thrive and reproduce. Most freshwater fish travel between small tributaries and larger bodies of water to avoid predation and access sources of food, shelter, and spawning areas. Hangman Creek is no different; it contains numerous human caused obstructions that block natural fish passage to tributary habitats. The first major fish passage barriers that influenced Hangman Creek were not constructed within the watershed itself. The Nine-Mile and the Little Falls Dam were completed in 1908, and 1910 (respectively). Although the Nine-Mile Dam had been built in 1908, it did not completely block the fish runs (Chinook, coho, and steelhead), the Little Falls Dam did. Over the course of the next 100 years, humans have continued to construct new roads, driveways and stream diversions with little to no thought of fish movement or life stage requirements (such as access to spawning areas). These existing barriers present long-term fishery management implications and include various types of culverts, weirs, pipes, and small dams. Until now, these barriers have never been formally inventoried or evaluated for management purposes.

In 2008, the Hangman Creek Watershed Management (WRIA 56) Team developed and adopted a Detailed Implementation Plan. This planning effort includes addressing the issue of fisheries habitat within the basin. Recommendation R12.a of the plan states that fish barriers should be identified and mapped within the mainstem and tributaries of Hangman Creek. A feasibility plan to identify the benefits of removal of these barriers and an action plan should be developed. This document is a result of this task and provides data for developing future action for the watershed.

1.1 WATERSHED, FISHERY, & BARRIERS

The Hangman Creek Watershed drains approximately 430,000 acres with approximately one third of the upper watershed located in Idaho (Figure 1). The mainstem is approximately fifty-six miles in length as it winds out the forested headwaters across deep loess soils and a steep basalt canyon. It then meanders through glacially derived deposits of sands and gravels/boulders from the Missoula Flood Events before connecting with the Spokane River just west of the City of Spokane incorporated limits.

Hydrologically, the watershed is characterized by an annual average flow of approximately 229 cubic feet per second (cfs). Typical summer period flow ranges from five to ten cfs and the winter/spring flow averages approximately 300-400 cfs with periodic storm events that can create a rapid response of thousands of cfs within a few short hours. Sedimentation from actively eroding stream banks, degraded riparian habitat, and agricultural cropland runoff routinely impacts the stream channel, aquatic instream habitat and the fishery.

Once a highly productive salmon, native cutthroat and rainbow trout rearing stream, Hangman Creek now maintains poor instream and riparian habitats and a depressed fishery that supports warm water species such as bridgelip sucker (*Catostomus columianus*), red-sided shiner (*Richardsonius balteatus*), and speckled dace (*Rhinichthys osculus*). However, the watershed has a relatively small population of non-native fish species, yet contains several populations of

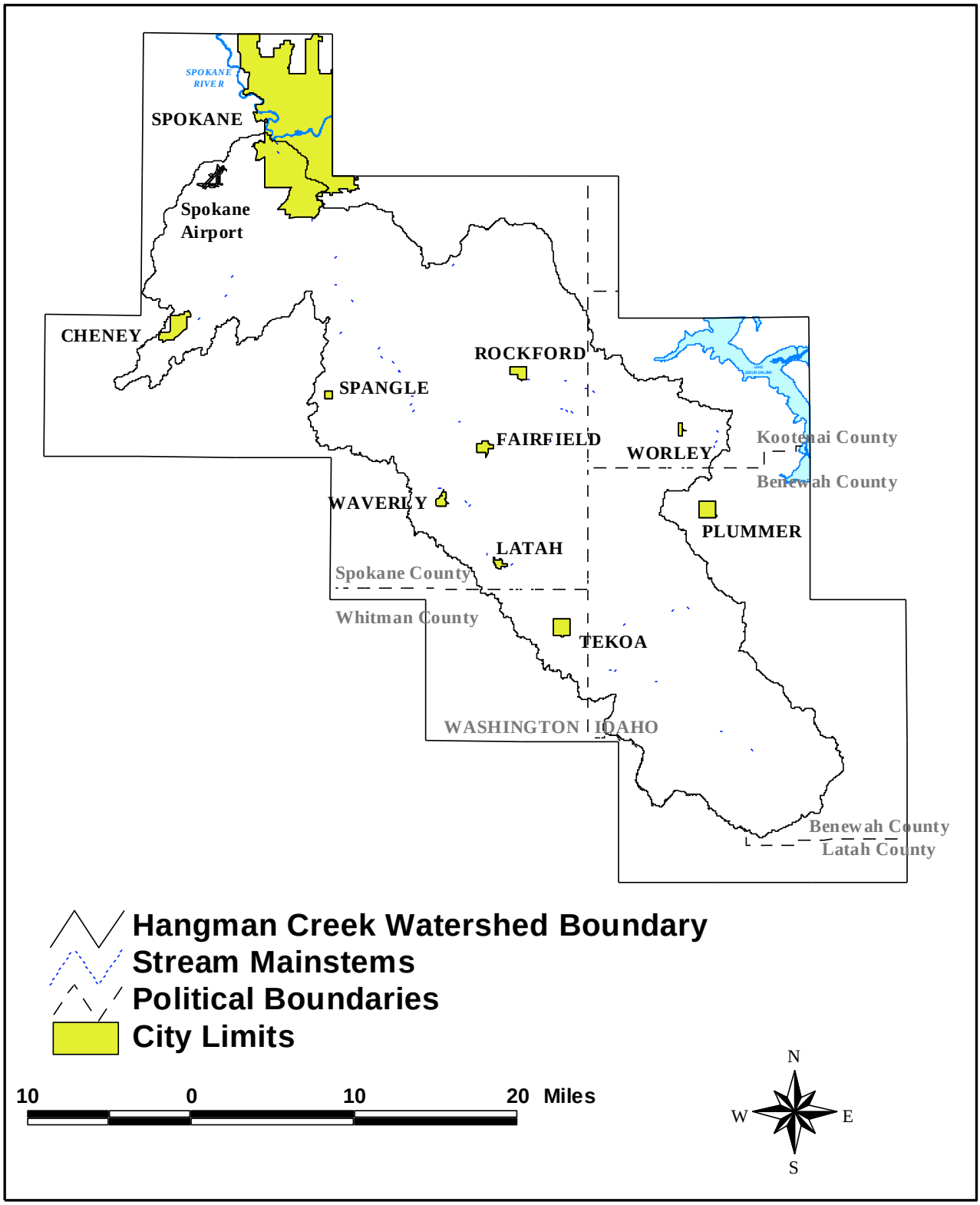


Figure 1. Hangman Creek Location Map

Columbia River Native inland redband trout (*Oncorhynchus mykiss garideini*). An important isolated genetically pure population of redband trout was discovered in California Creek. The protection and management of these species have led to the questions regarding long-term actions for habitat improvement and the need for barrier removal. A complete list of fisheries of the Hangman Creek Watershed is located in Appendix C.

Fish passage barriers can be found throughout the Hangman Creek Watershed. They can take many forms, but their cumulative effect can have a significant impact to native fish reproduction. These barriers can be defined as any artificial (human-caused) structure in a stream that impedes free passage of fish – any species, any life stage – to habitat upstream or downstream (FFFPP, 2006). There are three main types of barriers including; physical, hydraulic, and natural.

Physical Structures
- Dams
- Spillways
- Roads
- Culverts
- Puncheons
- Fords
- Standpipes
- Weirs

Hydraulic
- Areas of high velocity flow or turbulence

Natural
- Waterfalls
- Debris

*Habitats where food and shelter are degraded (sediment and siltation) may also impact upon the migration of native fish species.

*Natural barriers such as waterfalls do exist and are considered within the scope of this work.

1.2 PROJECT GOALS & OBJECTIVES

The overall goal of this project is to better understand how much aquatic habitat is currently accessible to resident fisheries. This information, combined with known fisheries population data, will allow more informed discussion and analysis of potential replacement/removal management options for passage barriers within the basin.

Objectives:

- Complete watershed-based inventory and prioritization of fish passage problems.
- Map, identify and characterize baseline conditions of fish passage and the extent of fish accessible water in the Hangman Watershed.

- Map, identify and rank stream crossings on basis of replacement/removal potential.
- Provide a means of identifying "possible barriers" or stream crossings that are "at risk" and that require more detailed evaluation work.
- Use data to assess the benefits and impacts of barrier removal.
- Develop an action plan for removal of selected barriers.

1.3 STUDY AREA

The study area for this project included the Washington State portion of Hangman Creek watershed and its tributaries (approximately 277,000 acres). Specifically, the inventory encompassed the main stem of Hangman Creek and the following subwatersheds (Figure 2): Marshall/Minnie Creek, Stevens Creek, California Creek, Spangle Creek, Rock Creek, Rattler Run Creek, Cove Creek, and Little Hangman Creek.

The Idaho portion of the watershed (154,000 ac.) did not have corresponding fish bearing stream GIS layers. Developing fish-bearing stream layers for Idaho was not within the scope of this inventory process. Therefore, Idaho streams were not included in the work. Additional information was provided by the Coeur d'Alene Tribe on selected barriers and fish bearing streams in the headwaters of Hangman Creek.

2.0 METHODS

The Spokane County Conservation District conducted the following tasks to complete the inventory and assessment fieldwork and associated analysis in the office.

A. Identify and obtain existing (known) information and sources about the watersheds from local, municipal, regional, and federal planning and resource agencies.

B. Identify local knowledge through discussion and documentation from local and regional resource professionals and local community members.

C. Delineate watersheds and prepare preliminary maps of each priority watershed, its boundaries, and stream network.

D. Identify all known State, County and private road crossings and prepare preliminary reference maps for inventory purposes.

E. Apply Barrier Evaluation Methodology and basic assessment protocols, as set forth in the Washington Department of Fish and Wildlife (WDFW) Publication, titled "Fish Passage Barrier Evaluation Guide" (Family Forest Fish Passage Program, June 2005) to conduct Fish Passage inventory.

F. Categorize and rank crossings according to acceptable minimum stream crossing standards that allow for fish passage, as listed in the above referenced publication.

G. Identify removal/replacement potential for crossings that are identified in the "*Barrier* "and *"Possible Barrier"* categories and the restoration capacity of fish accessible waters, based on DNR Stream Typing map layers. Quantify, rank and map those crossings and fish accessible areas.

H. Utilize existing fisheries/wildlife surveys and local knowledge to develop a community profile of fisheries communities and the terrestrial wildlife that depend on them.

I. Identify land uses and possible future development that may conflict with fish passage and natural stream function.

2.1 Rapid Basic Assessment Protocols for Fish Passage Inventory

The SCCD utilized the Standard Barrier Evaluation Methodology, as set forth in the Washington Department of Fish and Wildlife (WDFW) Publication, entitled "Fish Passage Barrier Evaluation Guide" (Family Forest Fish Passage Program, June 2005). This method was adapted into a rapid visual assessment protocol that considers stream crossing standards for outfall drop (>0.8 foot), slope (>1.0%), velocity (lack of bed material inside structure or culvert span to bankfull width ratio is <0.75), or depth (water depth inside structure is <0.6 foot).

This inventory provided a consistent approach for reaching four basic crossing classifications of *Barrier*, *Non-barrier*, *Possible Barrier* and *Unknown*, as described in this report. The "on-the-ground" crossing classifications refer to the evaluator's visual observations of the physical functioning condition of the crossing at the time of the evaluation.

For assessment purposes, an interdisciplinary team with experience in fish passage, hydrology, geomorphology, and fluvial systems conducted the inventory work and review process. Most stream crossings were accessible by vehicle and/or by foot. The team first collected information for each crossing using field notes, and a checklist of the minimum standards for stream crossings that allow fish passage. Inventory work was only completed on streams designated by the DNR as fish-bearing. Streams are generally considered *fish-bearing* if they are 2 feet or greater in width in Western Washington, or 3 feet or greater in Eastern Washington, and have a gradient of 20 percent or less. Intermittent streams (those which go dry during a portion of the year) may have fish present during those times when the streams are flowing. A determination was made during the evaluation process if it is unknown whether a stream is fish-bearing.

The information collected in the field notes helped build an understanding of the physical condition of each crossing. A review was performed later in the office and the crossings were placed into one of the four barrier classification categories. An accurate portrayal of the present condition of each crossing is essential in designing plans that will correctly prioritize the replacement/removal potential. Digital photographs were also an important part of the fish passage inventory process. Numerous photographs were recorded for the project to help characterize a select number of the crossings and document important features and attributes.

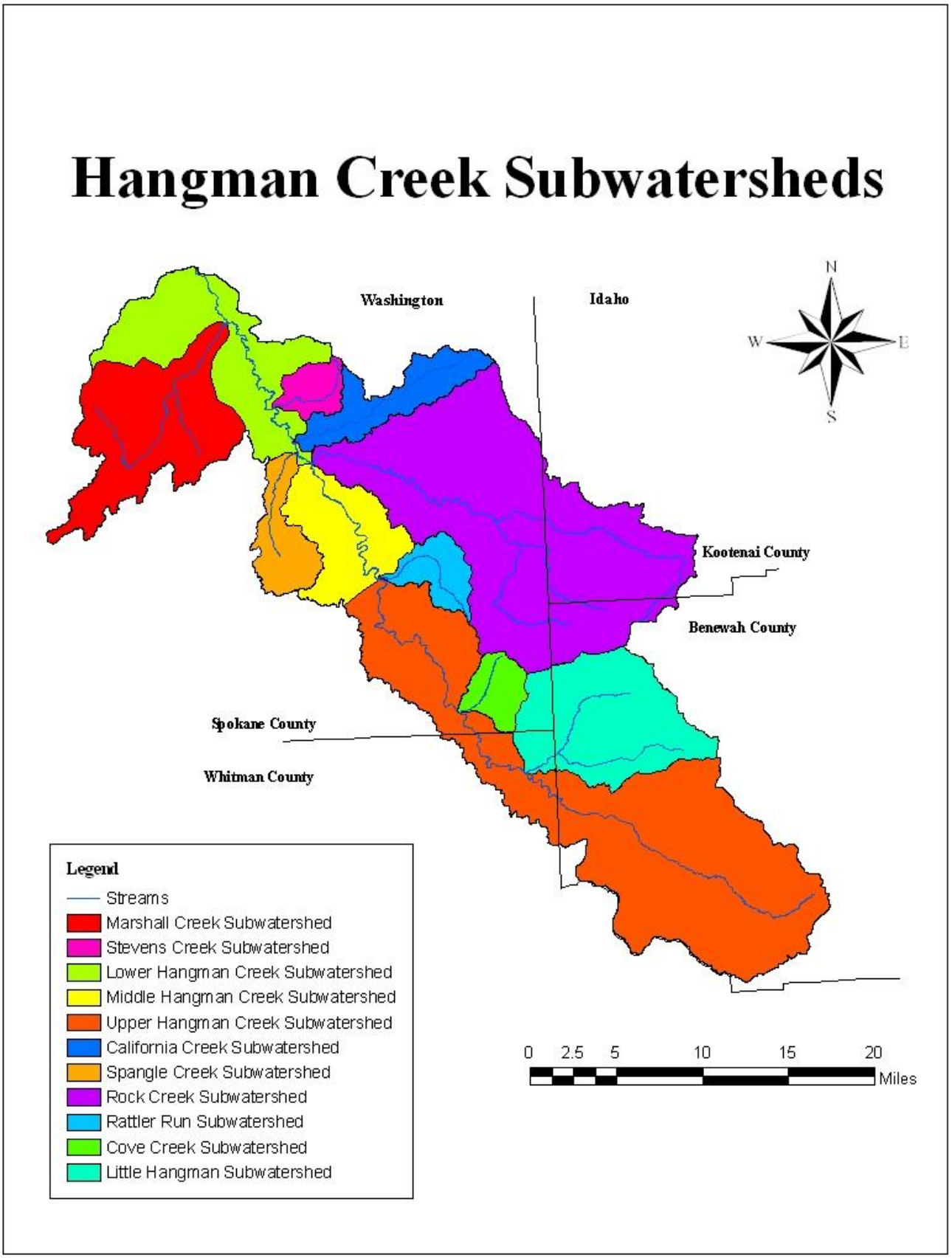


Figure 2. Hangman Creek Subwatersheds

2.1.1 Stream Crossing Classifications:

1. ***Barrier***:
A stream crossing is considered to be a ***barrier*** when the crossing structure obviously exceeds one or more of the minimum stream crossing standards that allow for fish passage:

- The outfall drop of the structure is greater than 0.8 foot;
- The slope of the structure is greater than 1.0%;
- It is apparent that the velocity inside the structure is excessive, as indicated by a lack of bed material inside structure or that the span to bankfull width ratio is less than 0.75;
- The water depth inside structure is less than 0.6 foot.

2. ***Non-barrier***:
A stream crossing is considered to be a ***non-barrier*** when the crossing structure is obviously with-in ***all*** acceptable minimum stream crossing standards that allow for fish passage:

- The outfall drop of the structure is less than 0.8 foot;
- The slope of the structure is less than 1.0%;
- It is ***not*** apparent that the velocity inside the structure is excessive, as indicated by an abundance of bed material through the entire length of the structure or that the span to bankfull width ratio is 0.75 or greater;
- The water depth inside structure is 0.6 foot or greater.

3. ***Possible Barrier*** (at-risk):
A classification of "*Possible Barrier*" indicates that it was ***not*** obvious, either way that the crossing structure would be with-in acceptable minimum stream crossing standards that allow for fish passage. This indicates that the crossing requires a more in depth and time consuming physical evaluation to determine the actual barrier status. Consideration should be given to crossings in the "*Possible Barrier*" classification category and these crossings should be considered "at-risk" and prioritized for further evaluation.

4. ***Unknown***
Information was not collected for that crossing or there is insufficient information to make any form of determination.

It should be noted that stream dynamics and seasonal run-off events can rapidly affect the status of any stream crossing. A Garmin™ global position system (GPS) was utilized to document exact locations (waypoints) where possible. All waypoints were identified, catalogued, and incorporated into a digital mapping layer.

2.1.2 Fish Passage Barrier Replacement/Removal Potential Ratings

Crossings were given conditional ratings that reflect the functional level, based on the minimum standards, as set forth in the Washington Department of Fish and Wildlife (WDFW) Publication, titled "Fish Passage Barrier Evaluation Guide" (Family Forest Fish Passage Program, June 2005). The replacement/removal potential of the crossings evaluated is a determination of physical condition and fish use benefit. Anthropogenic influences and land use management have disturbed many

riparian and wetland areas, as well as the natural stream functions of reaches that include road crossings. If these limiting factors were removed, would the site exhibit natural resiliency through time and return to a condition that allows for natural stream function and fish passage or would the site require restoration assistance to do so? (e.g. replacement/removal). These characteristics contributed to priority ratings for replacement/removal potential of High, Medium, Low and Unknown, based on the following criteria:

High: Crossing qualifies as 0 - 32% passable (exceeds at least 3 or 4 of the minimum standards for fish passage); crossing opens at least one 1.0 miles of additional stream habitat; crossing is located on a stream that is documented to have extensive portions of high quality fisheries areas/habitat that support priority fish species (salmonids/natives).

Medium: Crossing qualifies as 33 - 67% passable (exceeds 1 or 2 of the minimum standards for fish passage); crossing opens at least .50 miles of additional stream habitat; crossing is located on a stream that is documented to have discontinuous and isolated portions of high quality fisheries areas/habitat that support priority fish species (salmonids/natives).

Low: Crossing qualifies as 68 - 100% passable (does not exceed more than 1 of the minimum standards for fish passage); crossing opens a minimal or limited amount of stream habitat; crossing is located on a stream that is ***not*** documented to have high priority fish species (salmonids/natives).

Unknown: Not enough is known about the crossing condition and/or fish use or the rating does not apply for other reasons.

*Special circumstances are taken into consideration for some of the barriers. For e.g. A few barriers may have close proximity to other barriers that have significant habitat benefits. In these cases, a high priority rating may be given to both.

2.1.3 High Quality/Priority Fisheries Areas:

1. Supports known native fish populations (native inland redband trout, rainbow trout, cutthroat trout, or mountain whitefish)

2. Contains known salmonid spawning beds

3. Contains quality riparian and/or instream habitat (continuous vegetative communities) that would benefit salmonid populations

3.0 RESULTS & DISCUSSION

The native fishery within the Hangman Creek Watershed has been depressed for many decades. Anthropogenic influences, such as stream channel modifications, deforestation, agricultural production, water quality issues, and riparian habitat losses all have had impacts to the local fish habitat. In this study, an inventory of stream crossings within the watershed was conducted to identify various barriers to fish passage (Appendix A). We identified 488 stream crossings and evaluated 397 of these crossing structures for barrier status (Appendix B). 65 crossings (Table 1. page 11) are reported as barriers and 94 are possible barriers. These barriers severely compromise fish life cycles and reproduction capabilities. To date, these structures have been largely ignored in the watershed.

The Washington State Department of Natural Resources (DNR) developed a set of maps delineating the total fish usable habitat within the Hangman Creek watershed (Approximately 359 miles not including ID). This is the total number of miles of stream habitat available to fish if there were no barriers present in the watershed. The installation of crossings/barriers throughout the watershed has reduced this available habitat to approximately 241 miles (A 33% reduction). The barriers found across the watershed included small dams/water diversions, perched culverts, undersized culverts, over-sloped culverts, utility crossings, and box culverts. Each of these structures presented different types of issues preventing normal fish passage.

The Marshall/Minnie Creek subwatershed was the most impacted basin in the Hangman Creek Watershed (Table 1. below). There is no fish passage available from Hangman Creek. It is 100% blocked due to a significant barrier located right at its confluence with Hangman Creek (43 miles of fish usable habitat). Stevens Creek is highly impacted with approximately 99% of fish usable habitat blocked. California Creek is approximately 39% blocked, but has a redband interior trout population. Rattler Run Creek is the least blocked at 2%, but has a possible barrier near the mouth. Hangman Creek Upper has the most available fish usable habitat at approximately 65 miles. Rock Creek, the largest sub-watershed, had the highest number of stream crossings (112), the most fish barriers (16), and significant barriers within its tributaries (45% of fish usable habitat).

3.1 Types of Barriers

Barrier types within the watershed consist of culverts, dams, natural obstructions and others. In all, 65 barriers (Figure 3) are indentified in the inventory (51 culverts, 5 dams, 3 falls, 5 others).

3.1.2 Culverts

Approximately 267 of the stream crossings in the watershed are culverts. They are also the primary fish passage barriers in the watershed (78%). Fifty-one culverts were identified (41 round, 7 box, 3 squash) as actual barriers. For the purposes of this project a "culvert" is defined as either a hollow metal pipe or concrete structure placed within a streambed to convey water under the road or crossing. In some cases, it may also include multiple pipes where the clear distance between openings is less than half of the smaller contiguous opening. Culverts are commonly used in many engineering projects throughout the watershed. They come in a variety of sizes and shapes (box, round, smooth, corrugated, etc) and usually involve sizing calculations by a design engineer to

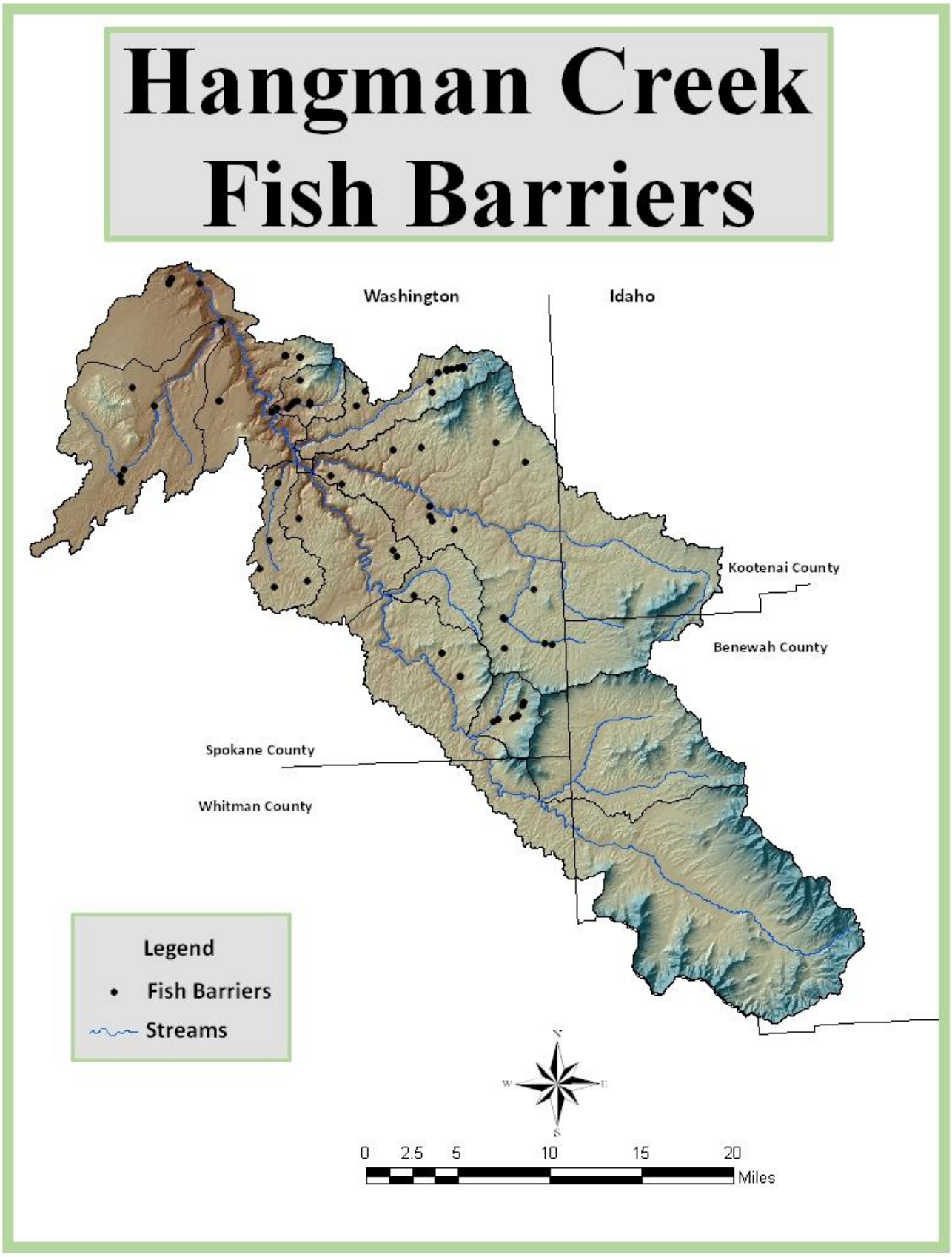


Figure 3. Hangman Creek Watershed Fish Barriers

Table 1: Summary of Hangman Creek Watershed Fish Usable Habitat and Barrier Classification

Subwatershed	Total Available FUH (mi)	FUH Blocked (mi)	FUH Blocked (%)	# Known Stream Crossings	Classification: Barriers	Classification: Possible Barriers	Classification: Non-barrier	Classification: Unknown
California Creek	22	8.6	39	39	11	8	18	2
Cove Creek	9	2	22	18	3	1	12	2
Hangman Creek (lower)	31	5.7	18	43	8	11	16	8
Hangman Creek (middle)	53	2.7	5	26	3	4	15	4
Hangman Creek (upper)	67	2.7	4	79	2	13	42	22
Marshall/Minnie Cr.	43	43	100	62	7	11	25	19
Rattler Run Cr.	13	0.3	2	41	1	7	28	5
Rock Cr.	95	23	24	112	16	27	49	20
Spangle Cr.	17	1.9	11	38	5	7	25	1
Stevens Cr.	9	8.9	99	30	9	5	8	8
Total	359	118	33	488	65	94	238	91

Notes
1. Total available fish usable habitat is the number of stream miles without any barriers.
2. Unknown barriers are those crossings not evaluated.
3. FUH is Fish Usable Habitat.

Table 2: Hangman Creek Barrier Types

Subwatershed	Barrier Type: Culvert Box	Culvert Round	Culvert Squash	Dam	Falls	Other	Total
California Creek	1	7	0	2	0	1	**11**
Cove Creek	0	3	0	0	0	0	**3**
Hangman Creek (lower)	0	4	0	1	2	1	**8**
Hangman Creek (middle)	0	3	0	0	0	0	**3**
Hangman Creek (upper)	0	2	0	0	0	0	**2**
Marshall/Minnie Creek	1	5	0	0	0	1	**7**
Rattler Run Creek	0	1	0	0	0	0	**1**
Rock Creek	3	10	3	0	0	0	**16**
Spangle Creek	0	2	0	0	1	2	**5**
Stevens Creek	2	4	0	3	0	0	**9**
Total	**7**	**41**	**3**	**6**	**3**	**5**	**65**

convey water without impacting the crossing. There are several issues regarding culverts and their ability to allow passage of fish. Round culverts placed by private landowners are commonplace but are often not sized correctly (Figure 5 below). The under-sizing funnels the water and increases the velocity of the water. This, in combination with improper sloping, creates a situation allowing varying degrees of fish passage. Another associated problem with culverts is that they do not have a natural streambed substrate. This increases the water velocity within the culvert and creates a velocity barrier to fish. A natural streambed with various gravels, rocks and other materials creates roughness and slows water velocity. It also usually provides natural pockets that form ideal resting places for fish as they move upstream.

Perched culverts present, by far, the greatest basin-wide challenge (90%). A perched culvert is one with an outlet elevated above the downstream water surface, allowing a freefall condition (Figure 4 below). Perched culverts often result from the erosion that occurs at the outlet of an undersized culvert. Water exiting the culvert at high velocities has a high erosive potential that results in downstream scour of the channel bed and banks. These culverts were found on both public and private roads. This condition requires migrating fish to leap into the culvert from the downstream pool. The outfall usually becomes a barrier to trout at a height of 0.8 foot. The perched culverts had outfalls that ranged from approximately one to eight feet and are often combined with slope and velocity issues.

Box culverts are concrete, rectangular in shape, and usually create sheet flow problems for fish passage (Figure 6 below). Sheet flow is produced by uniform conditions across the bottom of the culvert. Typical box culverts do not provide resting places for the fish to move against high velocities of water and therefore prevents fish movement. The inventory found seven box culverts as actual barriers. Three of these are on Rock Creek. Stevens Creek has 2 of more box culverts with one located near its confluence with Hangman Creek. This prevents any fish movement upstream due to the placement of boulders and being semi-perched. Marshall Creek has one box culvert at its mouth with Hangman Creek (a significant barrier). Box culverts tend to present a similar type of issue as over-sloped culverts. The uniform flow (sheet flow) in a box culvert can partially or fully block fish passage.

Figure 4. Perched County road culvert

Figure 5. Multiple perched culverts

Figure 6. Perched box culvert and sheet flow

Figure 7. 5' Headgate dam

3.1.3 Dams

Dams usually present situations where there is a 100% blockage of fish movement. Six small to medium sized concrete dams are identified in the Hangman Creek Watershed (10% of barriers). Three of these are found in the Stevens Creek subwatershed and two others are located on California Creek. One dam is located on Hangman Creek (lower). Some of these dams have an adjoining culvert. Most appeared to be built for either livestock watering or had a head gate to divert water for private fishponds. Some are antiquated and did not have a current valid use, while others were still apparently active (Figure 7).

3.1.4 Other Barriers

Fish passage barriers can take many forms. In the Hangman Creek watershed, several unusual barriers are present. These included stream head-cuts (or nick-points), utility line crossings, ditching, road-fill, and a few natural waterfalls.

Head-cutting is a serious problem in many local watersheds in Spokane County. The process involves the initiation of channel incision at a nick-point as the stream channel bed elevation adjusts to a natural or human-induced disturbance. The nick point can be as subtle as an over-steepened riffle zone or as obvious as a "waterfall" or cascade. As the streambed erodes and lowers at the nick point, the active head-cut migrates upstream (Wilcox et al., 2001). Head-cutting may eventually cause channel incision, but it can also act as a fish barrier if it is large enough.

Utility line crossings are present in only one area on the mainstem of Hangman Creek. Within the City of Tekoa incorporated limits, two utility line crossings were installed decades ago and reinforced with concrete and asphalt. This artificially raises the streambed and introduces a partial fish barrier during lower flow conditions.

Filling and realigning stream channels can also produce fish barriers. In some predominantly agricultural watersheds, producers often cultivate directly through small tributary streams, thus blocking fish passage (e.g. Spangle Cr.). In California Creek, a tributary was realigned away from its natural course (agricultural purpose) and rerouted into a completely different basin. The ditch creates a barrier to fish passage and presents an additional concern for instream flow. In another creek, a road was built directly through the stream course with no conveyance for water.

Natural fish passage barriers do exist in the watershed. Indian Creek, a small tributary located near the mouth of the Spokane River, Garden Springs Creek, near the I-90 Bridge, and Spangle Creek all contain natural basalt waterfalls ranging from six to fifty feet that preclude any fish passage upstream. California Creek has a few small bedrock features in the basalt canyon area that may prevent some seasonal fish passage. No management actions are advised for any naturally occurring barriers.

4.0 HANGMAN CREEK SUBWATERSHEDS

4.1 California Creek Basin Priority # 1

California Creek is a watershed of approximately 15,943 acres. Approximately 40% of the basin's land uses are agricultural (crop and pasture). The remainder of the basin is primarily rural residential development. The headwaters of the basin originate from the west slope of Mica Peak which is still largely forested. Ownership consists largely of private residents and a few large timber companies. California Creek gently winds through pastoral land uses all the way through to the community of Valleyford. The creek then flows into a deep basalt canyon before it empties into Hangman Creek (Figure 8). The canyon is basically undisturbed and contains significant beaver activity with many dams.

Overall, there are 39 crossings in the California Creek basin. Eleven of these crossings are considered to be barriers and 8 are possible barriers (Figure 10.). There are eighteen non-barriers that include full spanning bridges, private driveways and county road crossings. There are two crossings that are classified as unknown (private residences, railroad grade) and require further evaluation. The barriers identified in the basin mainly consist of round and box culverts used in private and Spokane County road crossings. Many of the culverts are perched or include velocity and/or slope barriers. Two of the culverts are associated with instream structures (dams/weirs) and completely block fish passage. Neither one of these structures is currently being utilized for its original purpose. The possible barriers in the watershed are located primarily on the larger tributaries to California Creek (75%). The headwaters of unnamed tributary # 3 has a water diversion in the upper portion that prevents fish passage and presents a reduction of instream flow due to rerouting the creek out of the watershed (CAC-8e).

California Creek once contained approximately 22 stream miles of fish usable habitat. Approximately 8.6 miles of habitat are currently blocked (39% of FUH). The majority of these barriers (11) occur within the upper portion of the watershed. However, there is a possible barrier (CAC-5, Figure 9 below) that could, if found to be a real barrier, result in a loss of approximately 84% of fish usable habitat in the watershed.

Figure 8. California Creek Basalt Canyon

Figure 9. CAC-5, double culvert crossing

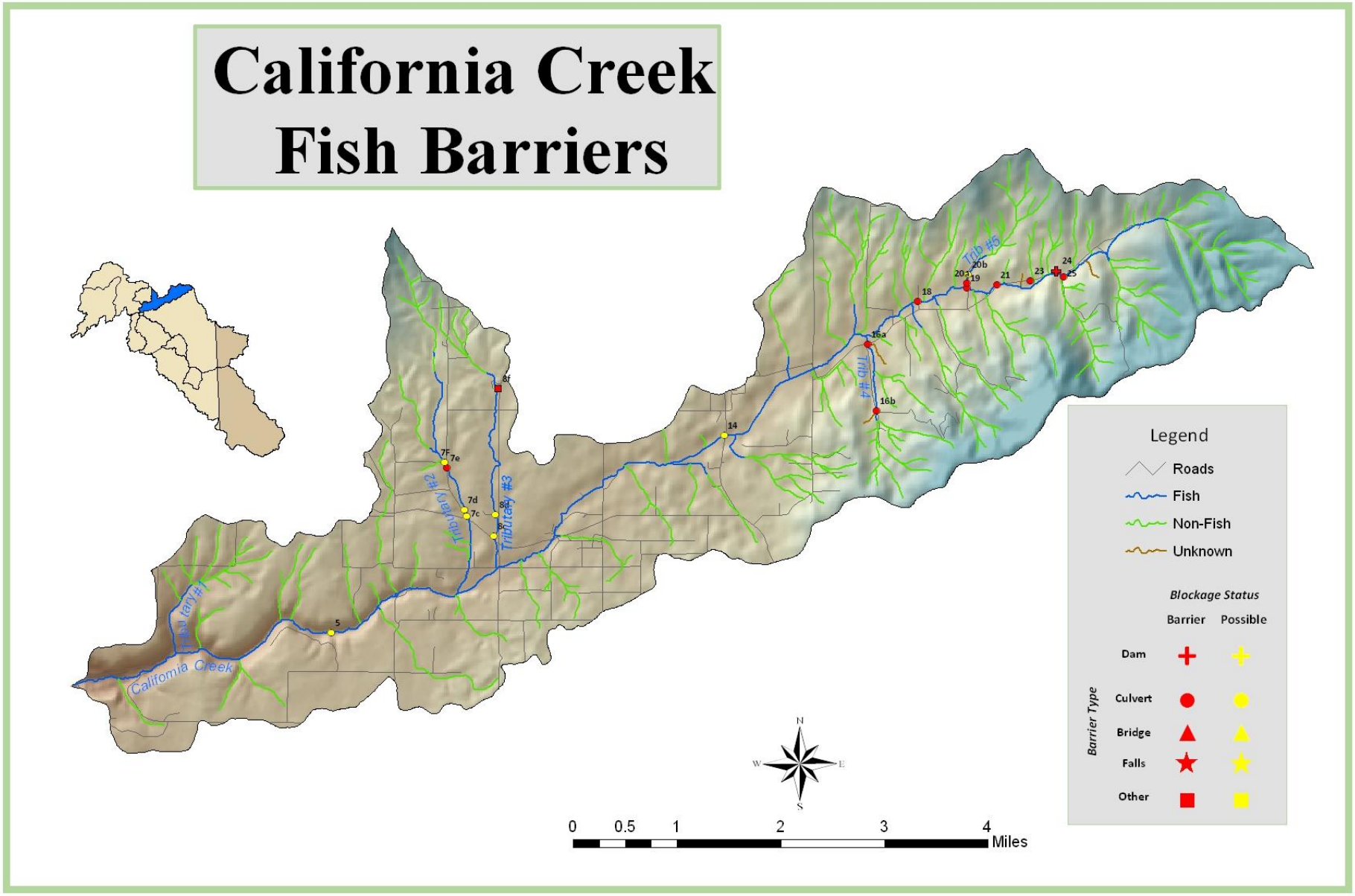


Figure 10. California Creek Fish Barriers

Fish Passage Barrier Replacement/Removal Potential

Several fish barriers within the California Creek watershed are rated as high for removal/replacement based on the amount of fish usable habitat and the salmonid populations present (Table 6). However, the removal or replacement of the lower fish barriers within the California Creek subwatershed should be further discussed with WDFW regional biologists and/or other local fisheries experts. The isolated populations of inland redband trout may benefit more from preserving specific barriers to protect them from non-native fish and potential genetic introgression. The barriers located in the upper watershed may be removed or replaced without this threat.

Table 3. California Creek Barrier Removal Ratings

Crossing ID#	Fish Usable Habitat Benefit (mi)	Removal Potential Rating	Removal Priority
CAC-7(e)	1.1	High	5
CAC-8(f)	0.4	High	6
CAC-16(a)	0.8	High-Medium	2
CAC-16(b)	0.1	Low	11
CAC-18	0.6	High	1
CAC-19	0.4	High	3
CAC-20(a)	0.3	Medium	4
CAC-21	0.4	Medium	9
CAC-23	0.3	Medium	10
CAC-24	0.1	Medium	7
CAC-25	1.2	High	8
Total	**21.0**		

CAC-7e, 8e

CAC-7e is a Spokane County road culvert blocking approximately 1.1 miles of stream habitat on unnamed tributary # 2 to California Creek. There is a resident trout population in this tributary. Removal potential is high and it should be removed to open up additional access.

CAC-8e is located on unnamed tributary # 3 and presents a minor amount of fish passage blockage (0.4 mi.), but a larger instream flow issue. Apparently, the unnamed stream was diverted years ago to dewater an area to allow for cultivation. The stream is currently ditched away from its natural course and rerouted to the Chester Creek watershed. This presents an instream flow and habitat concern for that fish bearing tributary.

CAC-16(a), 16(b), 18, 19, 20a, 21

These barriers are all Spokane County Road culverts. CAC-16(a) is a barrier for velocity and outfall. CAC-16(b) is an undersized or "shotgun" culvert. The water backs up behind it and shoots out the downstream end. CAC-18 (Figure 11) is a barrier due to velocity and outfall drop. This crossing currently serves only one rural resident. CAC-19 has an associated concrete dam structure just upstream from it. The drop structure is a dam that was constructed in the middle of the creek to pond water for livestock use years ago. This use is not current as the landowner no longer has livestock. Sediment has built up behind the dam and water flows freely over the 5' drop to the culvert. Barrier CAC-20(a) is located on a small tributary that enters the mainstem of California Creek at the same

location of barrier CAC-19. This perched culvert completely blocks unnamed tributary # 5. CAC-21 is another perched culvert that prevents fish movement. These sites all have a medium to high potential for removal. Altogether, they would open up approximately 2.4 miles of habitat to the upper watershed.

CAC-23, 24, 25

These barriers are all contained within private property. CAC-23 and 25 are both culverts under private driveways. These culverts (2-3'in diameter) are undersized and considered to be velocity and slope barriers. CAC-24 is a concrete weir/dam structure utilized decades ago to divert water into an off-channel fish or livestock pond by a private landowner (Figure 12). This structure is not currently in use and has a significant build-up of sediment behind it. Removal of these barriers would open up approximately 1.6 miles of additional habitat.

Figure 11. CAC-18, Perched culvert

Figure 12. CAC-24, Weir/Dam Structure

High Quality/Priority Fisheries Areas: YES

In 1936 and 1944, WDFW planted 10,000 rainbow and 5,000 eastern brook trout (respectively) from the Spokane hatchery in California Creek (Small, et. al, 2007). The basin has a long history of fishing with local stories of trout (averaging 12-14") being caught decades ago. There are no known fish surveys conducted on California Creek prior to 2003. Recent fish survey work completed by Scholz 2004, and WDFW 2004, reported the following species to be currently residing in the subwatershed; chiselmouth (*Acrocheilus alutaceus),* northern pikeminnow (*Ptchocheilus oregonensis*), longnose dace (*Rhinichthys cataractae*), speckled dace (*Rhinichthys osculus*), redside shiner (*Richardsonius balteatus*), brideglip sucker (*Catostomus colmbianus*), rainbow trout (*Oncorhynchus mykiss*), and sculpin (*Cotus* spp.). One eastern brook trout (*Salvelinus fontinalis)* was found during the fish survey work but not reported. It is believed that it emigrated from Hangman Creek and that there is no viable resident population present.

Scholz's 2004 surveys reported that redside shiners, speckled dace, rainbow trout, sculpins, and bridgelip suckers all had higher relative abundance in the lower third of the basin (Table 4). In the canyon and Valleyford areas, rainbow trout is dominant. The upper portions of the watershed had a minor number of salmonids and a higher prevalence of speckled dace and bridgelip suckers. A small unnamed tributary of California Creek contains only rainbow trout.

Isolated populations of native inland redband trout (*Oncorhynchus mykiss gairdneri*) were discovered during Scholz's survey work. A year later, WDFW and North Central High School conducted genetic studies (microsatellite DNA techniques) and confirmed the species presence in 2005 (WDFW, 2005; NC High School, 2005). Unfortunately, the basin's overall fish usable habitat has been significantly diminished over the years. Significant spawning areas are suspected but unknown at this time.

California Creek does support native inland redband trout (*Oncorhynchus mykiss gairdneri*). It is therefore designated as a priority fisheries basin with areas of high quality instream and riparian habitat. This population should be protected from additional habitat losses.

Table 4. California Creek Fish Species

Common Name	Scientific Name	Native	Introduced	Common	Uncommon	Rare
Redband trout	*Oncorhynchus mykiss gairdneri*	X		M,L	U	
Eastern brook trout	*Salvelinus fontinalis*		X			X
Speckled dace	*Rhinichthys osculus*	X		U,M,L		
Longnose dace	*Rhinichthys cataractae*	X		L	U,M	
Redside shiner	*Richardsonius balteatus*	X		L	U,M	
Bridgelip sucker	*Catostomus columbianus*	X		U,M,L		
Chiselmouth	*Acrocheilus alutaceus*	X		L	U,M	
Northern pikeminnow	*Ptchocheilus oregonensis*	X		L	U,M	
Mottled sculpin	*Cottus bairdi*	X		M,L		U

Notes:
1. U,M,L refers to Upper, Middle and Lower portions of the watershed.
2. Common, Uncommon, and Rare refer to occurrence in the watershed according to survey work of Scholz 2004; WDFW 2004; Laumeyer and Maughan 1973; Maughan 1974; Gilbert and Evermann 1893.

4.2 Cove Creek Basin Priority # 8

Cove Creek is a small subwatershed located near the Spokane/Whitman County border. It is approximately 7,768 acres in size and has over 65% of the land use in agricultural cropland. The creek winds through the small rural Town of Latah near its confluence with Hangman Creek. Cove Creek has approximately nine miles of total fish usable habitat with only two miles that are inaccessible to fish passage (22% impacted). The barriers occur higher in the watershed allowing for approximately 78% of the stream to be accessible to fish from Hangman Creek. It is the least impacted basin containing identified barriers, but not much is known about its fishery.

Of the eighteen crossings inventoried in the subwatershed, three barriers are known (Figure 15). These barriers are private and Spokane County road culverts. All three have outfall drops ranging from 0.5' to 2' plus slope and velocity issues. There is one possible barrier that requires further evaluation (Bibbie Rd.). The other crossings consisted of 12 non-barriers, and 2 unknowns.

Figure 13. CVC-11. Wheeler Rd. culvert

Figure 14. CVC-13. Ham Rd. culvert

Fish Passage Barrier Replacement/Removal Potential Ratings

The barriers associated within this watershed have a medium-low potential rating for removal due to the lack of salmonid presence and quality of habitat (Table 5). There are not significant amounts of quality habitat to be gained throughout this system. The initial barriers found within the subwatershed are located in the upper portions of the basin on the mainstem. Most of subwatershed is accessible to fish from Hangman Creek (Approximately 70%).

Table 5. Cove Creek Barrier Removal Ratings

Crossing ID#	Fish Usable Habitat Benefit (mi)	Removal Potential Rating	Removal Priority
CVC-11	0.5	Medium-Low	2
CVC-13	1.1	Medium	1
CVC-16	0.4	Medium-Low	3
Total	**2.0**		

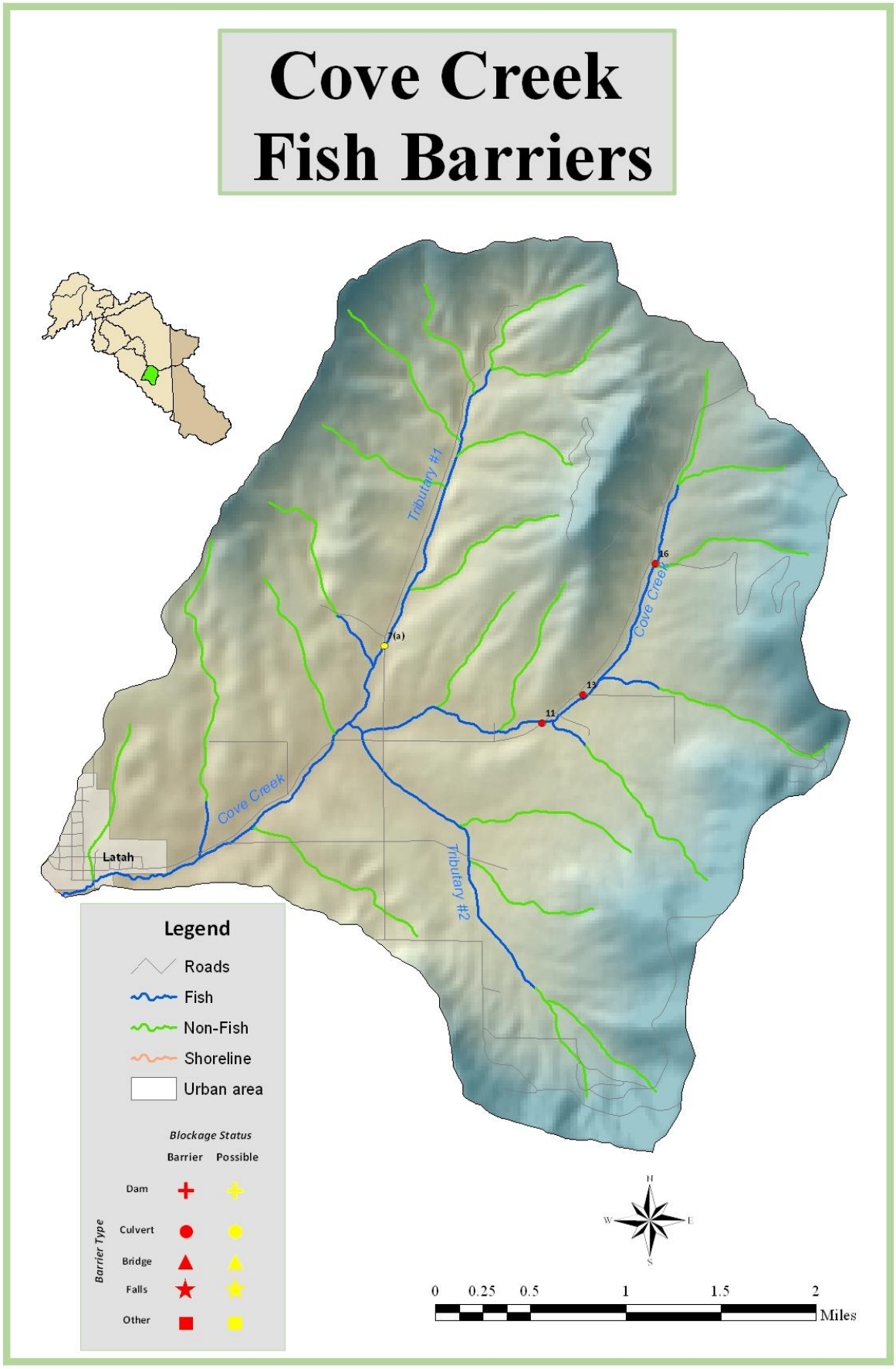


Figure 15. Cove Creek Fish Barriers

CVC-11
This barrier is located on Wheeler Rd (Figure 13). It is a Spokane County culvert with too much slope and an outfall drop of approximately 0.5'. It is rated as medium to low for replacement due to a limited amount of habitat gain on the mainstem and there are no salmonids present in this area.

CVC-13
This is a Spokane County culvert that is a barrier for slope and outfall drop (2'). Removal/Replacement of this barrier would open access to over one mile of upstream habitat, but the quality of the habitat is questionable (Figure 14).

CVC-16
This barrier is a private driveway access over the mainstem of Cove Creek. The culvert is a barrier for slope, velocity and outfall. The amount of habitat gained by replacement/removal is minimal and the quality of habitat is poor.

High Quality/Priority Fisheries Areas: NO

Very little is known about the fishery in this sub-watershed. The only fish survey work to be completed in this basin was conducted by Scholz, 2004 (Table 6). He found the following species in Cove Creek; Tui chub (*Gila bicolor*), speckled dace (*Rhinichthys osculus*), redside shiner (*Richardsonius balteatus*), and brideglip sucker (*Catostomus columbianus*). Scholz sampled two different sites (upper and lower watershed). In the lower portion of the watershed he collected 56 fish of which the dominant species found is the bridgelip sucker. Speckled dace and redside shiners are prominent and two Tui chubs were identified. This is the only basin to date where Tui chubs have been identified or even noted. None of these species are considered to be of major significance in the watershed.

Cove Creek does not support any known resident population of salmonids and is not designated as a priority fishery basin. Instream and riparian habitat are not well maintained due to agricultural land uses, but the lower portions of the creek have better stream habitat. Spawning habitat areas are unknown.

Table 6. Cove Creek Fish Species

Common Name	Scientific Name	Native	Introduced	Common	Uncommon	Rare
Tui Chub	*Gila bicolor*		X		L	U,M
Speckled dace	*Rhinichthys osculus*	X		L	U,M	
Redside shiner	*Richardsonius balteatus*	X		L		U,M
Bridgelip sucker	*Catostomus columbianus*	X		L	U.M	

Notes:
1. U,M,L refers to Upper, Middle and Lower portions of the watershed.
2. Common, Uncommon, and Rare refer to occurrence in the watershed according to survey work of Scholz 2003; WDFW 2004; Laumeyer and Maughan 1973; Maughan 1974; Gilbert and Evermann 1893.

4.3 Hangman Creek Mainstem (Lower, Middle, Upper)

The mainstem of Hangman Creek is divided into three subwatersheds based on geology and consists of the Lower (42,496 ac.), the Middle (23,296 ac.), and the Upper (121,344 ac.) for a total of 187,136 acres. This is approximately half of the watershed. There are no barriers located directly on the mainstem. All barriers (13) within these subwatersheds are within the associated tributaries. Total fish usable habitat is high within the entire mainstem (151 mi.). Of the 148 crossings inventoried, the thirteen barriers block approximately 11 miles of fish usable habitat (11%). The remaining crossings consist of; 73 non-barriers, 34 unknowns, and 28 possible barriers. Fish species present is varied among the subwatersheds.

4.3.1 Hangman Creek (Lower) **Basin Priority # 6**

This portion of the mainstem has approximately 31 miles of available fish usable habitat. There are eight barriers identified in this section. All fish usable habitat is accessible. This portion of the mainstem contains small sections of contiguous riparian communities and associated aquatic habitats (Figure 16). But the combined anthropogenic influences and the natural geology of the area have resulted in channel degradation that has likely impacted the quality of instream habitats. The lower portion of Hangman Creek (from the confluence of Rock Creek to the mouth) is characterized by high sandy bluffs leftover from Glacial Lake Missoula flood events. Road construction has confined the stream in some areas while bridges have further constricted the stream. Residential development occurs throughout the lower sub-watershed and the riparian communities have been highly disturbed in some reaches. Overall, the unconsolidated streambank material is easily eroded under flashy stream conditions which tend to choke the stream with bedload sediments. Suspended sediment clouds the water column during high flow events (sources primarily located in upper watershed). All of these conditions impact the quality of the aquatic habitat available to fish species which inhabit the mainstem.

Forty-three crossings are identified in the lower mainstem. The majority of these (16) are non-barriers. These are mostly Spokane County road and golf course crossings (bridges). There are eight barriers (Figure 18), eleven possible barriers, and eight unknown crossings. Half of the barriers within this subwatershed are found on small streams designated as non-fish bearing. However, according to Scholz, 2004, these small streams not only contain fish, they support salmonids. These streams (Indian Creek and Garden Springs Creek) should be reclassified by the DNR as fish bearing. Both of these streams also have natural waterfalls blocking portions of fish usable habitat (Figure 17).

Figure 16. Hangman Creek (Lower)

Figure 17. HCL-2(b). Garden Springs Cr. Falls

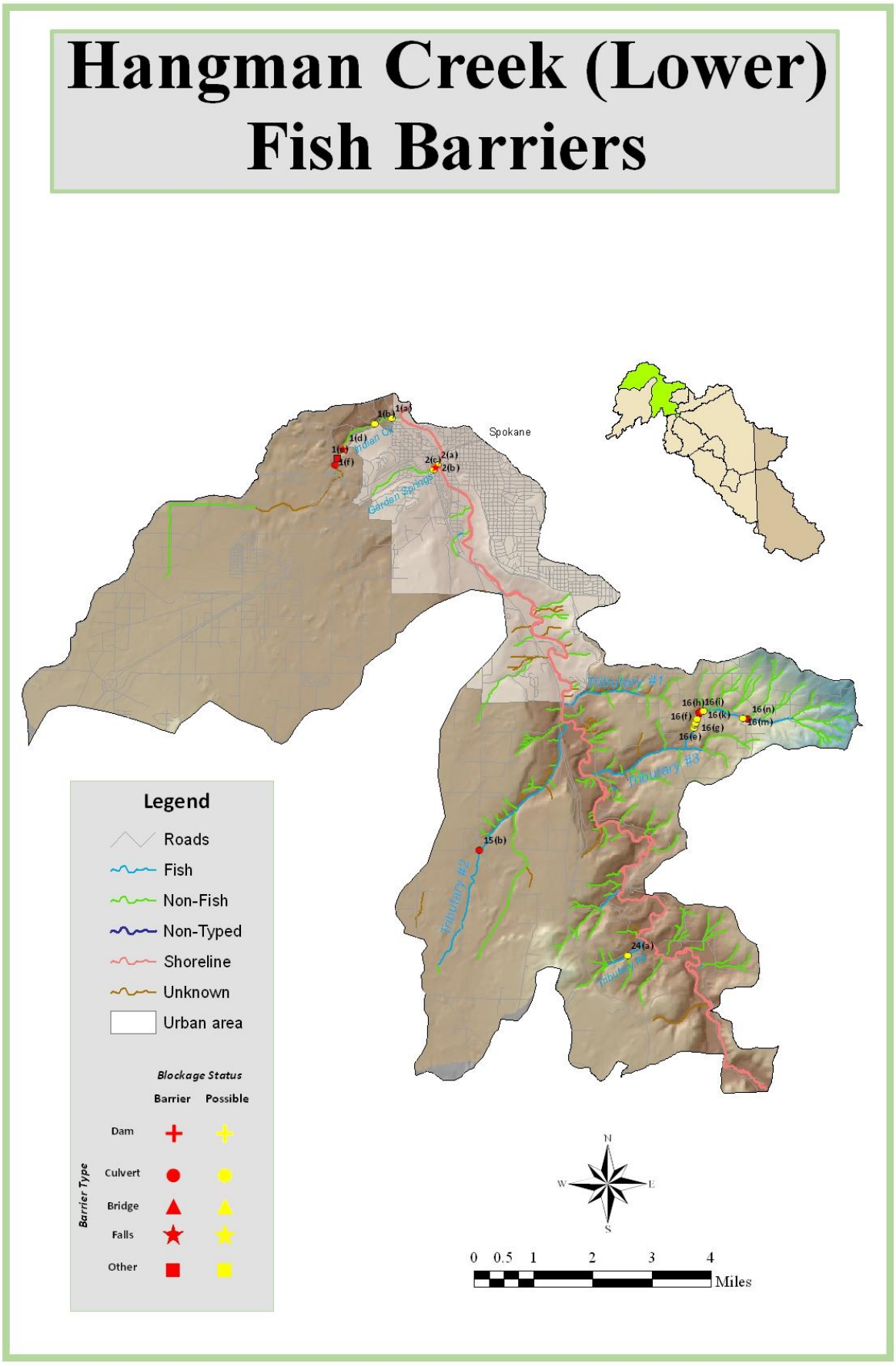


Figure 18. Hangman Creek (Lower) Fish Barriers

Fish Passage Barrier Removal/Replacement Potential

There is one barrier within the subwatershed rated as high for removal (HCL-22(b). The rest are rated medium-low potential rating for removal due to the lack of salmonid presence and quality of habitat (Table 5). There are not significant amounts of quality habitat to be gained throughout this system. Most of subwatershed is accessible to fish from Hangman Creek (Approximately 80%).

Table 7. Hangman Creek (Lower) Barrier Removal Ratings

Crossing ID#	Fish Usable Habitat Benefit (mi)	Removal Potential Rating	Removal Priority
HCL-1(d)	0.2	NA	NA
HCL-1(e)	0.1	Low	5
HCL-1(f)	0.01	Low	6
HCL-2(b)	1.3	NA	NA
HCL-15(b)	2.3	High	1
HCL-16(h)	0.01	Medium	3
HCL-16(i)	0.9	Medium	2
HCL-16(n)	0.9	Medium	4
Total	**5.7**		

HCL-1(d), (e), (f)
HCL-1(d) is not a crossing. It is located on Indian Canyon Creek within Palisades Park. It is a natural basalt waterfall of approximately 50-60'. No upstream fish passage is possible past this point. HCL-1(e) is primitive road built within Palisades Park. It crosses the stream but has no culvert to allow fish passage. The water seeps through the basalt rocks and forms a channel on the downstream end. It is rated low due to the lack of upstream habitat. HCL-1(f) is a City of Spokane culvert under Bonnie Rd. with an outfall drop and rock fill below it. It is rated low due to insignificant habitat above it.

HCL-2(b)
This barrier is a natural series of waterfalls located on Garden Springs Creek. There are three separate falls ranging from 3' to 10' in size (Figure 17 above). No fish passage is possible past this point.

HCL-15(b)
This barrier is an undersized Spokane County culvert with a 2' foot outfall drop on unnamed tributary # 2. It is ranked high for removal/replacement due to the amount of upstream habitat above it.

HCL-16(h), 16(i)
This barrier is a private crossing across unnamed tributary # 3. It has a 1' outfall drop. It is ranked medium due to its proximity to the next upstream barrier (HCL-16(i). Correction of both barriers would result in approximately one mile in habitat. HCL-16(i) is a private dam with a control gate on unnamed tributary #3. It is ranked medium due to the amount of habitat upstream.

HCL-16(n)
This barrier is a Spokane County culvert with a 2' outfall drop on unnamed tributary # 3.

High Quality/Priority Fisheries Areas: NO

Approximately 100 years ago, the Hangman Creek Watershed was regularly visited by anadromous fish such as steelhead and salmon. These fish were reported to have moved upstream as far as Tekoa, WA. The construction of the hydro-electric dams on the Spokane River silenced these fish runs in the early 1900s.

Several different fish surveys have been completed on the mainstem of Hangman Creek (Gilbert and Evermann 1893; Laumeyer and Maughan 1973; Coeur d'Alene Tribe 1993, and Scholz 2004). The most comprehensive was Scholz's in 2004. He conducted inventory work on over 65 sites within the watershed. Eight of those sites were located within the Lower Hangman Watershed (below Rock Creek). Gilbert and Evermann inventoried one site near the mouth of Hangman Creek and the other was located near Tekoa, WA. Laumeyer and Maughan only inventoried one site below Rock Creek on the mainstem.

Gilbert and Evermann found the following species near the confluence of the Spokane River; Largescale sucker (*Catostomus macrocheilus)* and Redside shiner (*Richardsonius balteatus).* Laumeyer and Maughan inventoried these species and four others at their site near the Hatch Road Bridge; chiselmouth (*Acrocheilus alutaceus),* Bridgelip sucker (*Catostomus columbianus),* Northern pikeminnow (*Ptchocheilus oregonensis),*and Speckled dace (*Rhinichthys osculus).* Scholz's inventory, in 2004, found the six previously mentioned species and added five more; longnose dace (*Rhinichthys cataractae),* tench *(Tinca tinca),* rainbow trout *(Oncorhynchus mykiss),* eastern brook trout *(Salvelinus fontinalis),* and sculpin *(Cottus spp.).*

In comparison to over 100 years ago, the fishery in Lower Hangman has changed significantly. It has lost the anadromous fishery and has seen an increase in chiselmouth population and range. Both Laumeyer and Maughan, and Scholz's work confirm this. Since chiselmouth prefer water that is warm and slow, their increased presence may indicate poor water quality conditions. But, Scholz also found salmonids that were not present in former surveys. Surprisingly, more native species have been found in each new survey. It is difficult to explain why there are additional fish species noted in each new survey. The eastern brook trout was likely an anomaly that migrated from the Spokane River. The presence of tench is more difficult to explain, especially since more of this species was found upstream.

Differences in the inventories could possibly be attributed to methodology, better equipment/technology, the seasonal timing of the inventory, and even the number of sites inventoried. Scholz's work was far more comprehensive than any other inventory.

The Hangman Creek (Lower) subwatershed had eleven different species that were recently inventoried by Scholz in 2004 (Table 8). Despite the number of native species and the lack of fish passage barriers the watershed was not designated as a high quality area or a priority fisheries area. It had a relatively small number of salmonids (5) in comparison to the number of available fish usable habitat miles (31.7). Another point of concern was the number of chiselmouth which may indicate a less desirable state of water quality.

Table 8. Hangman Creek (Lower) Fish Species

Common Name	Scientific Name	Native	Introduced	Common	Uncommon	Rare
Chiselmouth	*Acrocheilus alutaceus*	X		X		
Rainbow trout	*Oncorhynchus mykiss*	X			X	
Eastern brook trout	*Salvelinus fontinalis*		X			X
Bridgelip sucker	*Catostomus columbianus*	X		X		
Largescale sucker	*Catostomus macrocheilus*	X		X		
Mottled sculpin	*Cottus bairdi*	X		X		
Northern pikeminnow	*Ptchocheilus oregonensis*	X		X		
Longnose dace	*Rhinichthys cataractae*	X			X	
Speckled dace	*Rhinichthys osculus*	X		X		
Redside shiner	*Richardsonius balteatus*	X		X		
Tench	*Tinca tinca*		X		X	

Notes:
1. Fish species within the Hangman Creek (Upper) subwatershed according to survey work of Scholz 2004; WDFW 2004; Laumeyer and Maughan 1973; Maughan 1974; Gilbert and Evermann 1893.

4.3.2 Hangman Creek (Middle) Basin Priority # 5

The Middle Hangman Creek Watershed is approximately 23,296 acres in size and is defined by a deep basalt canyon that confines the vertical and lateral movement of the stream (Figure 20 & 21). The basalt is highly resistant to erosion and has resulted in a channel that is vertically and laterally stable. Talus material weathered from basalt contributes bedload material to the channel. There are no intensive types of land use within this portion of the watershed. Riparian areas within these reaches are relatively intact and natural. Deep pool and riffle habitats are found throughout these reaches. The lack of direct access and land uses has allowed the riparian vegetation to remain undisturbed in most areas.

The subwatershed has a total of 26 crossings with three known barriers (culverts) located on one small tributary and Courtney Canyon Creek (Figure 19). Fifteen of the crossings are non-barriers, four are unknown, and four are possible barriers. The possible barriers (culverts) are evenly split between private residential driveway accesses and Spokane County Roads. The barriers block a small percentage of the habitat found in this subwatershed.

This portion of the mainstem has approximately 52.6 miles of fish usable habitat. A small portion (2.5 miles or 5%) is blocked from fish passage. The barrier in Courtney Canyon Creek blocks approximately 25% of the habitat in that basin. The other barriers are found on unnamed tributary # 1. These barriers prevent fish passage in approximately 21% of that tributary.

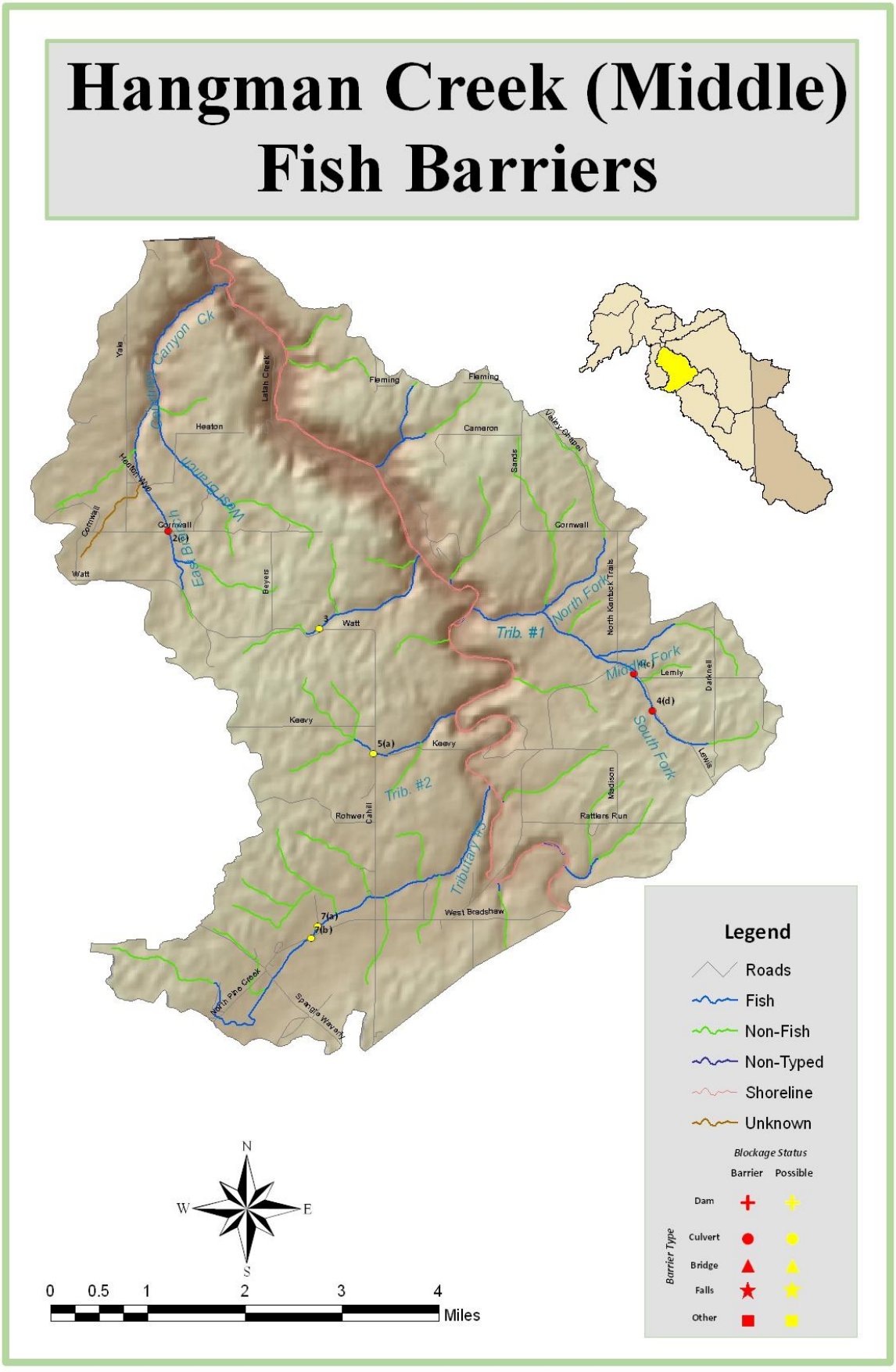


Figure 19. Hangman Creek (Middle) Fish Barriers


Figure 20. Hangman Creek canyon


Figure 21. Basalt canyon walls

Fish Passage Barrier Removal/Replacement Potential

There are only three barriers within this portion of the Hangman Creek Watershed (Table 9). The amount of habitat gained by removing these barriers is not substantial. However, Courtney Canyon may be important. Very little fishery information is available for this tributary. It has some good habitat even though Scholz's work in 2004 did not find any fish.

Table 9. Hangman Creek (Middle) Barrier Removal Ratings

Crossing ID#	Fish Usable Habitat Benefit (mi)	Removal Potential Rating	Removal Priority
HCM-2(c)	1.3	Medium-High	1
HCM-4(c)	0.4	Low	2
HCM-4(d)	0.7	Low	3
Total	**2.5**		

High Quality/Priority Fisheries Areas: **High Potential**

To date, no fisheries inventory work has been conducted within the canyon of Hangman Creek due to inaccessibility. All surveys have been conducted just above and below the canyon (Table 10). This is unfortunate due to the fact that the canyon provides the most protection of fisheries habitat. In 2004, the SCCD and others conducted shoreline assessment/evaluation work which involved the use of canoes through the canyon. General observations noted that the canyon holds the most natural riparian and aquatic habitat of anywhere on Hangman Creek.

Fish survey work by Laumeyer and Maughan just below the canyon found speckled dace (*Rhinichthys osculus)*, chiselmouth (*Acrocheilus alutaceus)*, redside shiner (*Richardsonius balteatus)*, northern pikeminnow (*Ptchocheilus oregonensis*), bridgelip sucker (*Catostomus columbianus*), and largescale suckers (*Catostomus macrocheilus*). Speckled dace and chiselmouth were the most abundant species found at this site just above the confluence of Rock Creek.

Scholz's survey work included 4 sites within this watershed, two above the canyon and two sites below the canyon. Below the canyon, Scholz inventoried a few redside shiners, but mostly bridgelip suckers. Above the canyon, just downstream of Rattler Run confluence, Scholz found a few chiselmouth and

some northern pikeminnow. The majority of the species found included speckled dace, redside shiners, and bridgelip suckers. Scholz investigated the lower portion of Courtney Canyon with one sample site, but found no fish species present. According to local residents, there are fish in the canyon.

The Hangman Creek canyon is considered to be one of the most natural and undisturbed areas within the entire watershed. Yet, there is no data to substantiate it as a high quality or priority fish area. Observations indicate it may hold high potential for providing refuge for sustaining a resident salmonid population. It contains many deep pool habitats and riffle areas. However, until further data is collected, this section will be ranked as having high potential for a priority fishery area.

Table 10. Hangman Creek (Middle) Fish Species

Common Name	Scientific Name	Native	Introduced	Common	Uncommon	Rare
Rainbow trout	*Oncorhynchus mykiss*	X			X	
Chiselmouth	*Acrocheilus alutaceus*	X		X		
Bridgelip sucker	*Catostomus columbianus*	X		X		
Largescale sucker	*Catostomus macrocheilus*	X		X		
Northern pikeminnow	*Ptchocheilus oregonensis*	X		X		
Speckled dace	*Rhinichthys osculus*	X		X		
Redside shiner	*Richardsonius balteatus*	X		X		

Notes:
1. Fish species within the Hangman Creek (Upper) subwatershed according to survey work of Scholz 2004; WDFW 2004; Laumeyer and Maughan 1973; Maughan 1974; Gilbert and Evermann 1893.

4.3.3 Hangman Creek (Upper) **Basin Priority # 7**

The Upper Hangman Creek subwatershed begins near the confluence of Rattler Run Creek and extends all the way to the headwaters in Idaho. For the purposes of this inventory, the subwatershed is redefined to the Stateline of Idaho, but includes the small portion of Little Hangman Creek (Figure 23) within Washington. It is approximately 163,000 acres in size and characterized by rolling loess hills and reworked channel sediments near the creek. Bedrock outcrops can be found throughout these upper reaches. Dryland agricultural operations are dominant throughout this portion of the watershed. The riparian communities in this section have been subjected to a variety of detrimental activities such as; channel widening and clearing (Figure 24). Past agricultural production practices drained wetland areas and removed riparian vegetation.

Approximately 40.0 miles of fish usable habitat exists in the upper watershed to the state line. There are 65 crossings and only two barriers in this subwatershed (Figure 22.). The barriers are both culverts (BNSF, Spokane County) with slope, velocity and outfall concerns. These barriers are located on small tributary streams. There are 13 possible barriers, 36 non-barriers, and 14 unknowns. The total amount of blocked fish usable habitat is approximately 2.5 miles (6%).

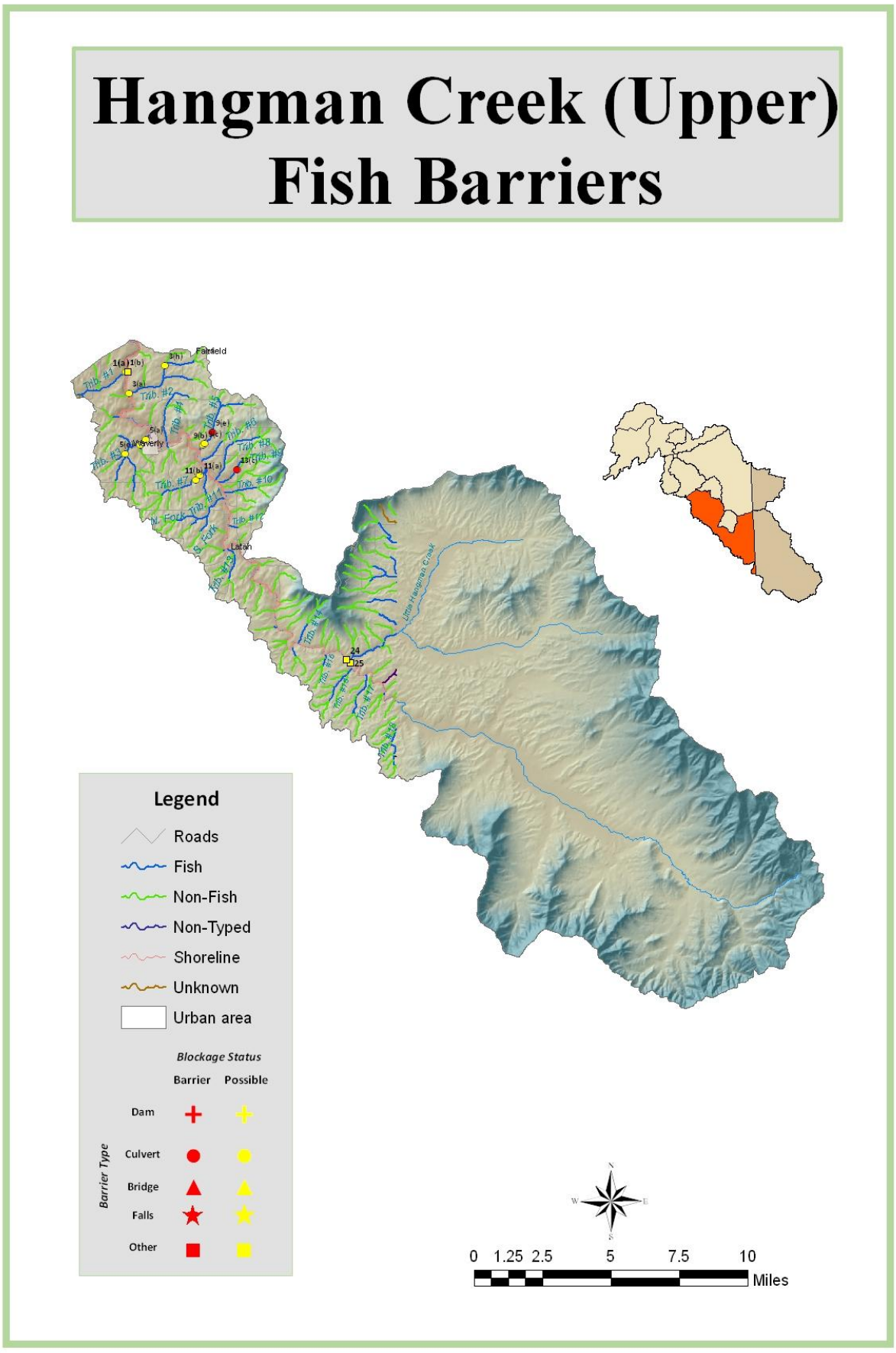


Figure 22. Hangman Creek (Upper) Fish Barriers


Figure 23. Little Hangman Creek channel


Figure 24. Hangman Cr. agricultural influence

Fish Passage Barrier Removal/Replacement Potential

The Upper Hangman Creek subwatershed does not have any barriers located on the mainstem (Figure 25). Although the channel is open to fish passage, low summer flows present channels choked with Reed canarygrass (Figure 26). There are only two barriers and both are located on small tributaries (Table 11). These barriers block a small percentage of the fish usable habitat (6%), but HCU-9(e) would open up over two miles of habitat. There are many species of fish noted in these reaches of the mainstem.

Table 11. Hangman Creek (Upper) Barrier Removal Ratings

Crossing ID#	Fish Usable Habitat Benefit (mi)	Removal Potential Rating	Removal Priority
HCU-9(e)	2.1	Medium-High	1
HCU-13(c)	0.4	Low	2
Total	**2.5**		

HCU-9(e)
This barrier exists on unnamed tributary # 5. It is a BNSF culvert barrier for slope, velocity and outfall. Removal of this barrier would provide significant habitat benefit to that tributary. It currently blocks over 70% of the stream.

HCU-13(c)
This barrier is a Spokane County culvert with slope, velocity and outfall concerns. It is located on a small unnamed tributary (# 9). It does not provide substantial gains in habitat, but it does block nearly 30% of the stream.


Figure 25. Hangman Creek channel above Tekoa


Figure 26. Reed Canarygrass within channel

High Quality/Priority Fisheries Areas: **NO**

In 1893, Gilbert and Evermann conducted a fish survey near Tekoa, WA (Table 12). They found largescale sucker (*Catostomus macrocheilus*), sculpin (*Cottus spp.),* northern pikeminnow (*Ptchocheilus oregonensis*), and speckled dace (*Rhinichthys osculus*). In 1971, Laumeyer and Maughan conducted a similar inventory nearby. They found chiselmouth (*Acrocheilus alutaceus*), bridgelip sucker (*Catostomus columbianus*), largescale sucker, northern squawfish, and redside shiner (*Richardsonius balteatus*). The main difference in the collections was the chiselmouth and redside shiner increase in distribution in the system. In 2004 Scholz conducted a fish survey with more extensive sampling sites in

the area. Scholz found chiselmouth, northern squawfish, speckled dace, redside shiners, tench (*Tinca tinca*), bridgelip sucker, largescale sucker, an unidentified sucker, and a couple of pumpkinseed (*Lepomis gibbosus).* The suckers, redside shiners, and pikeminnows were the most abundant species.

There is limited information regarding the fisheries in the Little Hangman Creek sub watershed. The only known survey work was conducted by Scholz in 2004 and the Coeur d'Alene Tribe in 2002. Scholz's inventory found only a few fish at one site on Little Hangman Creek just below the tributary of Moctileme Creek in Idaho. He identified one northern pikeminnow (*Ptchocheilus oregonensis*), one bridgelip sucker (*Catostomus columbianus),* and two speckled dace (*Rhinichthys osculus).* The Tribe did some backpack electroshocking in Moctileme Creek (a tributary), but reported no fish presence. No salmonids have been reported in the Little Hangman Creek. It is therefore not listed as a high quality or priority fisheries stream.

This portion of the Hangman Creek mainstem does not currently support any known salmonid population. The area is primarily under intense agricultural influences and the riparian habitat is discontinuous and absent in some areas. The summer habitat consists of low flows with series of large warm pools with minor stream currents. It is not designated as a high quality or priority fishery.

Table 12. Hangman Creek (Upper) Fish Species

Common Name	Scientific Name	Native	Introduced	Common	Uncommon	Rare
Sculpin	*Cottus spp.*	X			X	
Chiselmouth	*Acrocheilus alutaceus*	X		X		
Bridgelip sucker	*Catostomus columbianus*	X		X		
Largescale sucker	*Catostomus macrocheilus*	X		X		
Northern pikeminnow	*Ptchocheilus oregonensis*	X		X		
Speckled dace	*Rhinichthys osculus*	X		X		
Redside shiner	*Richardsonius balteatus*	X		X		
Tench	*Tinca tinca*		X		X	
Pumpkinseed	*Lepomis gibbosus*		X			X

Notes:
1. Fish species within the Hangman Creek (Upper) subwatershed according to survey work of Scholz 2004; WDFW 2004; Laumeyer and Maughan 1973; Maughan 1974; Gilbert and Evermann 1893.

4.4 Marshall/Minnie Creek **Basin Priority # 2**

The Marshall/Minnie Creek subwatershed is a large basin with an extensive drainage pattern and fish usable habit tributaries. The basin is just over 40,000 acres with approximately 43.3 stream miles of fish usable habitat. The land uses are primarily rural residential with some passive agricultural practices. Marshall/Minnie Creek is the most impacted basin in the Hangman Creek watershed. It has significant fish passage issues, yet contains the highest populations of salmonids.

There are 62 stream crossings in the basin. Seven of these crossings are confirmed as barriers (culverts) and eleven are possible barriers (Figure 31). All of these culverts are owned by Spokane County, BNSF, The City of Cheney, and WSDOT. The barriers are primarily round and box culverts with velocity, slope and outfall issues. Minnie Creek contains the most barriers (4) and possible barriers (6). Twenty-five of the total crossings are non-barriers and there are nineteen unknown crossings. These crossings are a mix of railroad structures (20), Spokane County roads (18), private accesses (5), and a state highway. Additional evaluations are necessary in this basin to better identify additional potential barriers.

The Marshall/Minnie Creek Watershed contains a significant amount of fish usable habitat (43.3 stream miles). Unfortunately it is the most impacted due to the box culvert barrier located directly at its confluence with Hangman Creek and 100% blocked (Figure 27 & 28). This barrier prevents all upstream fish movement in the basin. The railroad is another significant influence on the creek (23 crossings). Most of the crossings are located in the upper portions of the watershed.

Figure 27. MC-1. US 195 box culvert

Figure 28. MC-1, upstream end

Figure 29. MIN-19(c). Headgate/crossing

Figure 30. MIN-17 culvert barriers

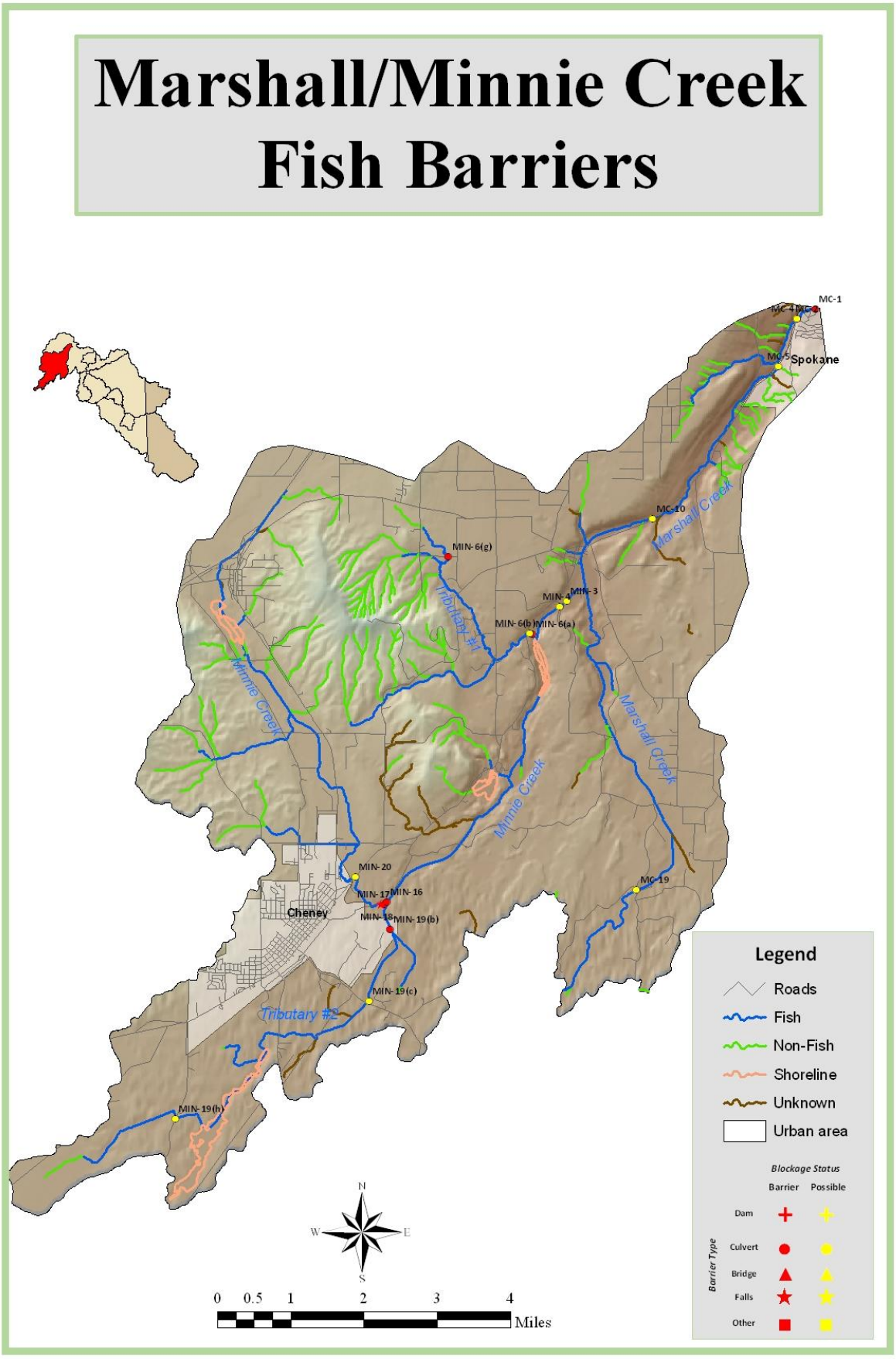


Figure 31. Marshall/Minnie Creek Fish Barriers

Fish Passage Barrier Replacement/ Removal Potential

Most of the fish passage barriers in the Marshall/Minnie Creek watershed are rated as high for removal/replacement due to the significant amount of habitat gain and salmonid populations present (Table 13). WDFW has routinely stocked salmonids in the watershed with some success in establishing self-sustaining populations. If certain barriers can be addressed, it may allow for a larger resident population of salmonids in the Hangman Creek watershed. However, it is important that the eleven possible barriers are further evaluated to better realize actual gains of habitat (e.g. Figure 29)

Table 13. Marshall/Minnie Creek Barrier Removal Ratings

Crossing ID#	Fish Usable Habitat Benefit (mi)	Removal Potential Rating	Removal Priority
MC-1	16.5	High	1
MIN-6(a)	6.4	High	5
MIN-6(g)	0.6	Medium-Low	7
MIN-16	0.01	High	2
MIN-17	0.01	High	3
MIN-18	11.7	High	4
MIN-19(b)	8.1	High	6
Total	**43.3**		

MC-1
This particular barrier may be one of the most difficult to address in the entire watershed. It is located directly at the mouth of the creek and precludes all fish movement upstream. It is a large WSDOT box culvert located directly under US 195. Removal of this barrier may be extremely difficult and expensive. Potential solutions should be addressed with WDFW (fish ladder).

MIN-6(a), (g)
This barrier is a BNSF railroad access road which crosses over an unnamed tributary (# 1) to Minnie Creek. It is comprised of three 36" round CST culverts. The culverts are perched and have an outfall drop of over 1'. This barrier could be replaced and provide a gain of over six miles of habitat. MIN-6(g) is a typical Spokane County 36" culvert with slope, velocity and outfall problems. It has a large plunge pool located on the downstream end. Removal of this barrier provides a habitat gain of approximately 0.6 mi. It is not a high priority in the watershed.

MIN-16, 17, 18
MIN-16 and 17 (Figure 30, page 34) are both BNSF culvert barriers for slope, outfall, and velocity. Although removal of these barriers provide very little additional habitat, they are associated with MIN-18. This is also a BNSF barrier. It is a road cut through the channel which has created an artificial falls of approximately 2'. All three of these barriers should be removed due to the significant gain of almost 12.0 miles of habitat. They are rated as high priority for the watershed.

MIN-19(b)
This barrier is located on unnamed tributary # 2 to Minnie Creek. It is a smooth steel culvert that is a barrier due to a 2' outfall drop into a plunge pool. Removal of this barrier would provide a significant gain in fish usable habitat (8.1 mi.). It is rated as a high priority.

High Quality/Priority Fisheries Areas: **YES**

WDFW has stocked Marshall Creek and Fish Lake with hatchery origin salmonids over the years (Table 14). These fish were not of native coastal origin strains. Fish Lake received the majority of fish stocking over the years. Over the last 70 years, WDFW has stocked just over one million fish in the watershed. According to WDFW 2005, the cutthroat trout and brown trout failed to establish self-sustaining populations, but the rainbows and eastern brook trout were successful. Survey work by both WDFW and Scholz 2004 confirm this. WDFW survey work found eastern brook trout to be the most abundant fish species in Marshall Creek. Scholz's work agrees with this as he found over 500 brook trout in four different sampling sites. Rainbow trout populations were not as dense in Marshall Creek. Scholz found nearly a 4:1 ratio of brook trout to rainbow trout at each sampling site. Nonetheless, rainbow populations do exist in the subwatershed and are abundant as compared to other streams in the system. All these sampling sites were conducted on the mainstem of Marshall Creek. Tributary populations and locations of spawning habitats are presently unknown.

Other species found by Scholz 2004 and WDFW 2005 include pumpkinseed (*Lepomis gibbosus*), and bluegill (*Lepomis macrochirus*). These species were considered uncommon migrants from Fish or Queen Lucas Lakes. WDFW survey work did not include the upper reaches of the watershed and Scholz only found a few speckled dace (*Rhinichthys osculus)* in the mainstem of Minnie Creek. Maughn and Laumeyer 1974 inventoried grass pickerel (*Esox americanus vermiculatus*) and yellow perch (*Perca flavescens*). Both of these species were considered to be rare occurrences.

WDFW conducted genetic testing of rainbow trout in Marshall Creek. The testing indicated that the historic rainbow trout population was impacted by the stocking of non-native coastal origin strains; but that a portion of the native type genetics is still present (McClellan, 2005).

Table 14. Marshall/Minnie Creek Watershed Fish Stocking Records

Species	Location	# of Fish	Year(s)
Rainbow trout (*Oncorhynchus mykiss*)	Marshall Creek	37,000(+)	1936-1960
	Fish Lake	3,145	1970-1994
Brown trout (*Salmo trutta)*	Fish Lake	4,200	1970-1994
	Marshall Creek	301	1989
	Fish Lake	5,936	1995-2007
Eastern brook trout (*Salvelinus fontinalis*)	Marshall Creek	61,000	1935-1941
	Fish Lake	506,659	1970-1994
	Fish Lake	281,702	1995-2008
Tiger trout (*Salmo trutta* X *Salvelinus fontinalis*)	Fish Lake	73,920	1995-2008
Cutthroat trout (*Oncorhynchus clarki*)	Marshall Creek	82,450	1957
	Total	**1,056,313**	
*Fish stocking records provided by Jason McClellan, WDFW, 2009			

Although the Marshall/Minnie Creek Watershed does not contain genetically pure strains of interior redband trout, it does support significant populations of fish including rainbows and brook trout (Table 15.). Despite the number of fish passage barriers, the watershed is designated as a high priority fisheries due to its' significant fish usable habitat. WDFW plans to continue stocking Fish Lake into the foreseeable future.

Table 15. Marshall/Minnie Creek Fish Species

Common Name	Scientific Name	Native	Introduced	Common	Uncommon	Rare
Rainbow trout	*Oncorhynchus mykiss*	X		M,L	U	
Eastern brook trout	*Salvelinus fontinalis*		X	M,L	U	
Tiger trout	*Salmo trutta* X *Salvelinus fontinalis*		X		M	U,L
Pumkinseed	*Lepomis gibbosus*	X			M	U,L
Bluegill	*Lepomis macrochirus*	X			M	U,L
Yellow Perch	*Perca flavescens*	X			M	U,L
Speckled dace	*Rhinichthys osculus*	X			U,M	L
Grass (redfin) pickerel	*Esox americanus vermiculatus*		X		L	U,M

Notes:

1. Common, Uncommon, and Rare refer to occurrence in the watershed according to survey work of Scholz 2004; WDFW 2004; Laumeyer and Maughan 1973; Maughan 1974; Gilbert and Evermann 1893.

4.5 Rattler Run Creek Basin Priority # 10

Rattler Run Creek is a small agricultural watershed of 8,820 acres. Seventy-five percent (6,640 acres) is annually cropped. Most of the small drainages and headwater tributaries are under cultivation and do not have any natural stream channels or instream habitat (Figure 32). Water collects in these drainages and eventually forms the main channel of Rattler Run Creek above the Town of Fairfield. Rattler Run flows directly through the Town of Fairfield. Once the creek leaves the town, it flows back into agricultural lands and then into a small rather undisturbed canyon-like environment. The lower portion of the creek provides the best habitat including riparian shrubs and trees.

The watershed has forty stream crossings. One crossing is a barrier (Spokane County culvert), but seven crossings (mostly private and County culverts) are determined to be possible barriers that need further evaluation. The remaining crossings are mostly non-barriers (29) and three unknowns. As the creek winds through the Town of Fairfield, it is channelized and performs the basic function of a ditch (Figure 33).

Rattler Run has approximately 13.3 miles of fish usable habitat. This habitat is threatened by several possible barriers. The first one is located near the mouth of Rattler Run Creek and poses a significant impact to the fisheries (99% blockage). The others are spread throughout the watershed and consist of private access to farm fields and County culverts with velocity and outfall issues.

Figure 32. Tributary in cropland

Figure 33. Town of Fairfield channel

Fish Passage Barrier Replacement/Removal Potential

There is only one fish barrier currently recognized in the watershed (Figure 34). It is not rated as a high priority for replacement or removal due to the low amount of fish usable habitat above it and the fact that there is not a significant fishery in the watershed. However, RR-1 is a possible barrier that requires a more detailed evaluation due to its potential threat to fish usable habitat in the basin.

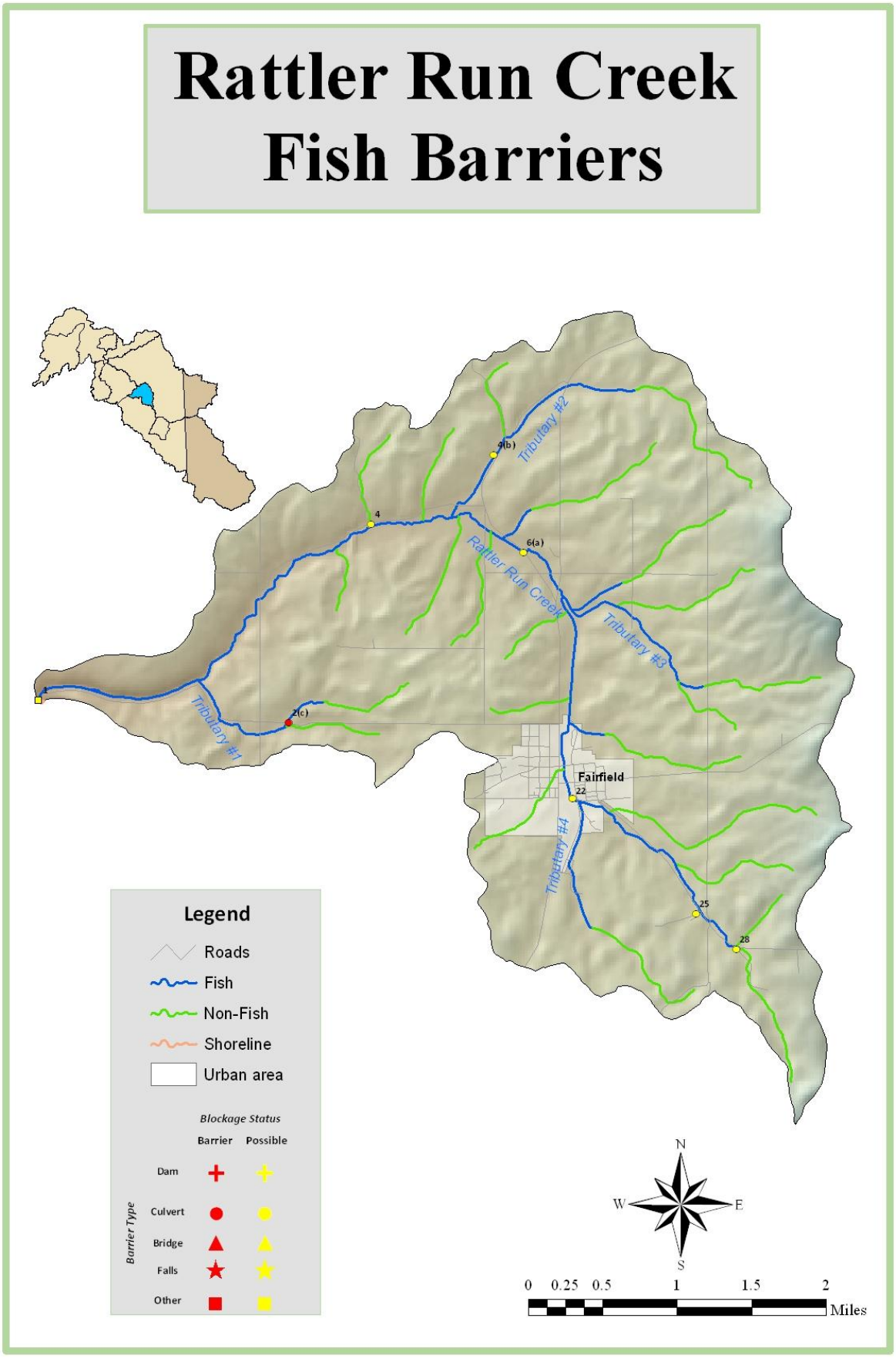


Figure 34. Rattler Run Creek Fish Barriers

Table 16. Rattler Run Creek Barrier Removal Ratings

Crossing ID#	Fish Usable Habitat Benefit (mi)	Removal Potential Rating	Removal Priority
RR-2(c)	0.3	Low	1
Total	**0.3**		

RR-2(c)
This is the only confirmed barrier in the watershed. It is located on a small unnamed tributary (#1) and is comprised of a Spokane County culvert under Bradshaw Rd. The culvert has an outfall of over .5' and is also a barrier for slope and velocity.

RR-1
This is a possible barrier located approximately 100' from the confluence of Rattler Run Creek. It is an active hardened field access (farm equipment) that crosses the creek. The crossing has created a wide shallow area with a small head-cut on the downstream end. The head-cut may be an issue for fish to gain access upstream. If this crossing is determined as a barrier, then it impacts approximately 99% of the basin.


Figure 35. Rattler Run Canyon Area


Figure 36. RR-25. Possible barrier

High Quality/Priority Fisheries Areas: **NO**

Scholz, 2004 surveyed Rattler Run Creek and found very few fish (Table 17). The only fish found in the watershed are speckled dace (*Rhinichthys osculus*). They are located in two different sites in the lower section of the creek. Due to the relatively few fish (no salmonids) found in the creek and the lack of habitat, Rattler Run is not considered to be a high quality or priority fish area.

Table 17. Rattler Run Creek Fish Species

Common Name	Scientific Name	Native	Introduced	Common	Uncommon	Rare
Speckled dace	*Rhinichthys osculus*	X		L,	U, M	

Notes:
1. U,M,L refers to Upper, Middle and Lower portions of the watershed.
2. Common, Uncommon, and Rare refer to occurrence in the watershed according to survey work of Scholz 2004; WDFW 2004; Laumeyer and Maughan 1973; Maughan 1974; Gilbert and Evermann 1893.

4.6 Rock Creek **Basin Priority # 4**

Rock Creek is the largest tributary to the Hangman Creek watershed and provides nearly half the stream flow to the mainstem. It is approximately 114,000 acres in size with the upper third of the subwatershed located in Idaho. The barrier inventory work did not extend into Idaho. Rock Creek had approximately 81,000 acres of forested land before 1900 (SCCD, 2003). Today, the forested land is approximately 11,000 acres. Dryland agriculture now governs the landscape (80%).

Rock Creek flows from its headwaters in Idaho through the Town of Rockford. The upper watershed is primarily cropland with rural residential homesites and livestock pasture. The mainstem enters a deep basalt canyon just before its confluence with Hangman Creek. The canyon area has relatively good habitat, but the upper portion and its associated tributaries are dominated by agricultural croplands and poor to absent habitat conditions. The current land uses and the numerous crossings in this subwatershed have created habitat and fish passage concerns.

The inventory identified 112 crossings in Rock Creek and its tributaries. There are 16 known barriers and 27 possible barriers, all located within the many tributaries (Figure 39). The barriers are primarily Spokane County Rd. culverts with outfall, slope and velocity problems. Two of the barriers are located on private property. There are 49 non-barriers and 20 unknown crossings. The mainstem of Rock Creek is fully accessible.

Rock Creek contains approximately 95 miles of fish usable habitat. Nearly half of this habitat (44.2 mi. or 46%) is contained within the numerous tributaries. Every fish passage barrier identified in the Rock Creek subwatershed is located in the tributaries (16). These barriers block approximately 23.0 mi. or 54% of fish usable habitat within the tributaries (24% within the entire subwatershed). This may be considered a significant loss of habitat, but a large portion of the habitat that is currently blocked is extremely poor or absent (Figure 37). Only a few tributaries have quality habitat in need of protection or expansion.

Figure 37. Head-cut near Murphy Creek

Figure 38. Outfall drop on RC-13(f)

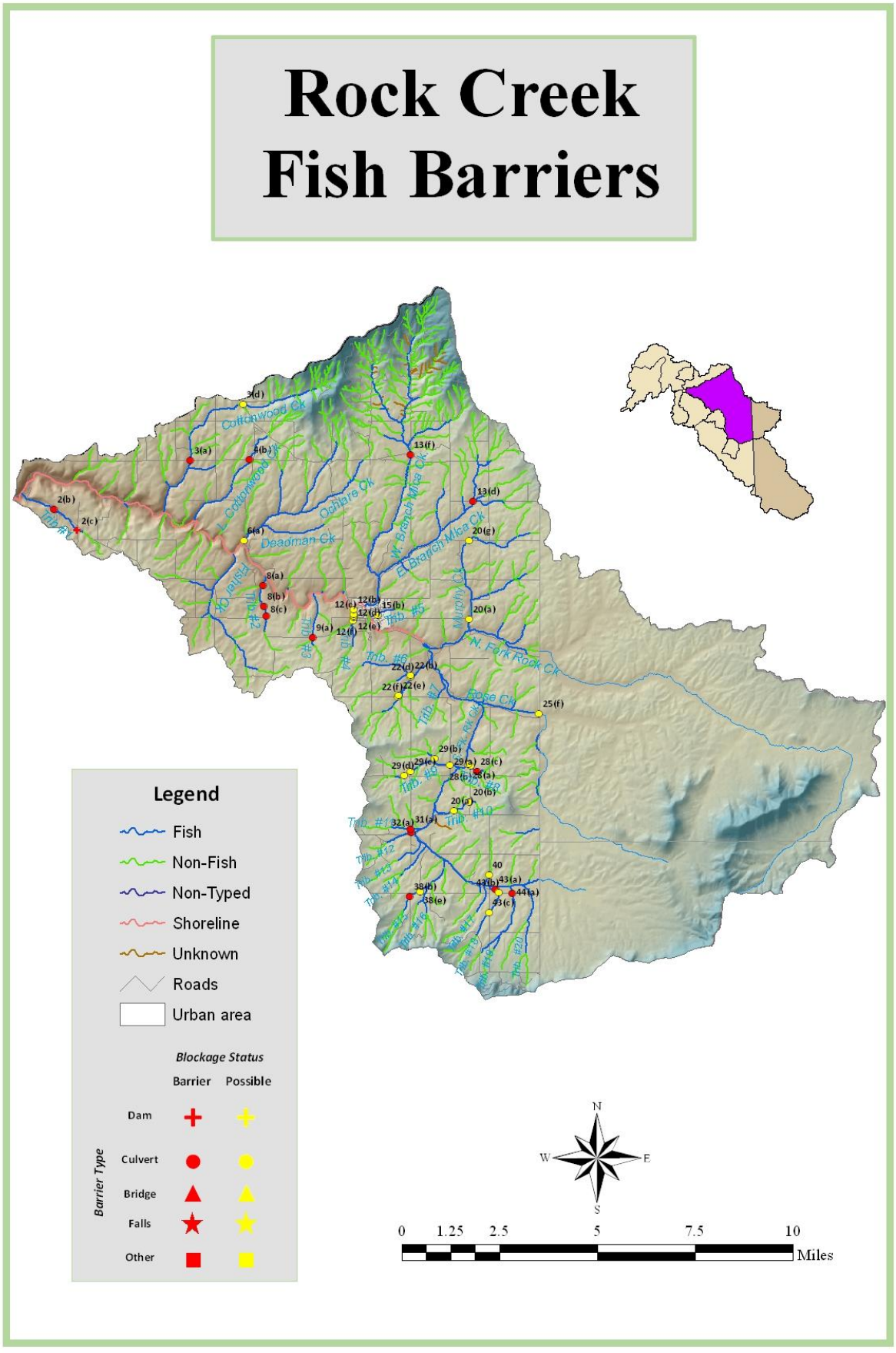


Figure 39. Rock Creek Fish Barriers

Fish Passage Barrier Replacement/Removal Potential

Despite the large quantity of habitat blocked, only a few barriers are ranked as high for replacement/removal (Table 18). The correction of these barriers will either open up large amounts of stream, provide quality habitat, or has known populations of salmonids. A majority of the tributaries and drainages in the Rock Creek Watershed are little more than agricultural ditches. Most of the riparian and stream habitat is subjected to intense cropland production and is in poor condition.

Table 18. Rock Creek Barrier Removal Ratings

Crossing ID#	Fish Usable Habitat Benefit (mi)	Removal Potential Rating	Removal Priority
RC-2(b)	0.9	High	5
RC-2(c)	0.2	Low	15
RC-3(a)	4.4	High	1
RC-4(b)	0.9	High	4
RC-8(a)	0.5	Medium	6
RC-8(b)	0.3	Medium	7
RC-8(c)	0.4	Medium	8
RC-9(a)	0.2	Low	14
RC-13(d)	2.1	High	3
RC-13(f)	7.5	High	2
RC-28(c)	0.2	Low	16
RC-31(a)	0.5	Medium	9
RC-32(a)	0.7	Medium	10
RC-38(b)	0.4	Low	13
RC-43(a)	1.5	Low	12
RC-44(a)	2.3	Low	11
Total	**23.0**		

RC-2(b), RC-2(c)
These barriers are both Spokane County culverts located on unnamed tributary # 1. This tributary is approximately 44% blocked. There is some quality habitat within this tributary although the fish abundance and species present are unknown. RC-2(b) is a higher priority than RC-2(c).

RC-3(a)
This barrier is located on Cottonwood Creek. The Spokane County culvert has a significant outfall drop of 3' and blocks approximately 63% of the habitat within this basin. Cottonwood Creek has some excellent habitat and the only known rainbow trout population within the Rock Creek subwatershed. This is the highest priority barrier within Rock Creek. WDFW should be consulted to discuss the removal of this barrier

RC-4(b)
This barrier exists on Little Cottonwood Creek. There is good quality habitat within this tributary. No salmonids were found during the survey work of Scholz in 2004. They may have been missed. The removal of this barrier would increase fish usable habitat by nearly a mile (28%). It is rated as high.

RC-8(a), (b), (c)
These barriers are located on a small tributary approximately 1.5 mi. in length. The habitat is poor and the barriers are located on Spokane County roads. The culverts have outfall and slope barriers. Approximately 35% of the basin is blocked. These barriers rated medium.

RC-9(a)
This box culvert has a sheet flow and outfall drop barrier. It is located on unnamed tributary # 3. It is a small drainage within agricultural cropland. The barrier blocks approximately 14% of the fish usable habitat. The existing habitat is poor and the rating is low.

RC-13(d), (f)
These Spokane County culverts are slope and velocity barriers in the Mica Creek basin. RC-13(d) blocks approximately 28% of the east branch and RC-13(f) blocks approximately 67% of the west branch (See Figure 38). Mica Creek contains both good and questionable habitats. The removal of both barriers is considered to be high priority due to the amount of fish usable habitat above them. There are fish present in the system, but no salmonids are present.

RC-28(c)
This barrier is located on a very small drainage of half a mile. The culvert is a slope and velocity barrier and blocks nearly 34% of the basin (Figure 41 below). The habitat gained by removal is questionable. The rating is determined as low.

RC-31(a)
This Spokane County crossing is a barrier for slope, velocity and outfall (0.8'). It is located on unnamed tributary # 11. It is a small drainage under a mile in length. The barrier blocks approximately 66% of the basin. However, the habitat is under intense agricultural production. The rating is medium.

RC-32 (a)
The barrier is located on unnamed tributary # 12. The Spokane County culvert is a barrier for slope, velocity and outfall. Additionally, there is a small head-cut forming upstream. The drainage is small (under a mile) and the habitat gained is poor quality. Although the basin is over 90% blocked, the rating is medium.

RC-38(b)
This barrier blocks approximately 15% of the basin. It is a Spokane County culvert with a slope, velocity and outfall barrier. It is located on unnamed tributary # 15and is in the upper portion of the basin. The habitat is poor to questionable in quality. The rating is low.

RC-43(a)
This is another small drainage under two miles in length (unnamed tributary # 18). The crossing is a private field access culvert with a slope, velocity and outfall barrier (Figure 43 below). The habitat is poor due to agricultural production, but the gain in habitat is nearly 1.5 miles. The rating is medium to low.

RC-44(a)
This barrier is located on unnamed tributary # 19. It is a Spokane County culvert with a slope, velocity and outfall barrier. It blocks over 90% of the basin (2.3 miles), yet the quality of habitat gained is questionable. The rating is low.


Figure 40. RC-43(a). Private field access


Figure 41. RC-28(c). Velocity barrier

High Quality/Priority Fisheries Areas: **NO (With Exception of Cottonwood Creek)**

Rock Creek has an extensive stream network including many small tributaries. WDFW historically stocked Rock Creek with approximately 120,000 eastern brook trout (*Salvelinus fontinalis*) from the late 30s to the 70s (McClellan, 2005). Apparently, the brook trout did not establish any self-sustaining population as none were collected in any recent fish surveys. Other species known to exist in the mainstem of Rock Creek include; longnose dace (*Rhinichthys cataractae*), mottled sculpin (*Cottus bairdi*), chiselmouth, (*Acrocheilus alutaceus*), northern squawfish (*Ptchocheilus oregonensis*), redside shiner (*Richardsonius balteatus*), bridgelip sucker (*Catostomus columbianus*), and largescale sucker (*Catostomus macrocheilus*). All the fish found are native, but no salmonids were present during any collections (Scholz, 2004; McClellan, 2005).

Only one tributary of Rock Creek contains salmonids. Scholz, 2004 found rainbow trout (*Oncorhynchus mykiss*) in Cottonwood Creek. The other tributaries such as Mica Cr, Cottonwood, and Ochlare did not have salmonids present. They did have other species such as speckled dace (*Rhinichthys osculus*), redside shiners, and bridgelip suckers. In Idaho, the Coeur d'Alene tribe reported finding a few speckled dace and longnose suckers (*Catostomus catostomus*) in the North Fork tributary of the Rock Creek subwatershed;

Rock Creek, according to the fish survey work, does not have significant amounts of salmonids present in the system and establishing brook trout populations failed (Table 19). Additional fish survey work may be warranted for some of the unnamed tributaries as they may also contain salmonids. But, based on the facts that the habitat is poor to absent in a majority of the tributaries and that there are only a few salmonids present, Rock Creek is not a high quality or priority fishery. Cottonwood Creek is the only known exception at this time.

Table 19. Rock Creek Fish Species

Common Name	Scientific Name	Native	Introduced	Common	Uncommon	Rare
Rainbow trout	*Oncorhynchus mykiss*	X			X	
Chiselmouth	*Acrocheilus alutaceus*	X		X		
Longnose sucker	*Catostomus catostomus*	X			X	
Bridgelip sucker	*Catostomus columbianus*	X		X		
Largescale sucker	*Catostomus macrocheilus*	X		X		
Mottled sculpin	*Cottus bairdi*	X			X	
Northern squawfish	*Ptchocheilus oregonensis*	X		X		
Longnose dace	*Rhinichthys cataractae*	X			X	
Speckled dace	*Rhinichthys osculus*	X		X		
Redside shiner	*Richardsonius balteatus*	X		X		

Notes:

1. Common, Uncommon, and Rare refer to occurrence in the watershed according to survey work of Scholz 2004; WDFW 2004; Laumeyer and Maughan 1973; Maughan 1974; Gilbert and Evermann 1893.

4.7 Spangle Creek **Basin Priority # 9**

Spangle Creek is an agricultural subwatershed (67%). It is approximately 11,920 acres in size with 7,950 acres of dryland agriculture. The headwaters start south of the Town of Spangle in cropland that lacks riparian vegetation, natural channel form, and aquatic habitat. The stream is not perennial and typically runs approximately 3-4 months of the year dependent upon runoff and precipitation events in the winter and spring. The Spangle Wastewater Treatment Plant discharges into the creek on a daily basis (approximately 20,000 gallons a day). This additional flow eventually goes subsurface before it reaches Hangman Creek.

The inventory found 38 crossings over Spangle Creek and its tributaries. Twenty-five are various railroad and County road bridges. Five of these are considered possible barriers, but most are non-barriers. The inventory included 12 Spokane County road culverts, of which two are considered to be barriers and four are possible barriers. The remaining culverts are non-barriers. There is only one unknown crossing in the watershed. There are a few, unique features in the watershed (a road without a culvert, farmland, and a natural waterfall), that are also considered to be fish passage barriers

Spangle Creek is designated by the DNR maps as having approximately 17.5 miles of fish bearing habitat in the watershed. However, the first fish passage barrier in the watershed occurs at RM 2.0. This is a series of natural waterfalls that would have precluded any historic upstream movement by fish. One falls in particular is approximately 20 ft high (Figure 43). Four other fish passage barriers are located in the Spangle Creek watershed (Figure 44). These barriers are located on unnamed tributaries and do prevent a minor amount of fish passage (1.9 mi). A larger problem in this watershed is the loss of habitat to cropland uses. Most of the headwaters in this watershed are under cultivation. The remaining channels are actually ditches that are mechanically manipulated (on a frequent basis) to convey water off the fields. There is very little riparian vegetation (shrubs, trees) along the creek until the stream reaches the canyon area. The canyon provides excellent vegetative communities and stream habitats all the way to the confluence with Hangman Creek.

Figure 42. SPC-6. County Road Culvert

Figure 43. Spangle Cr. Canyon waterfall

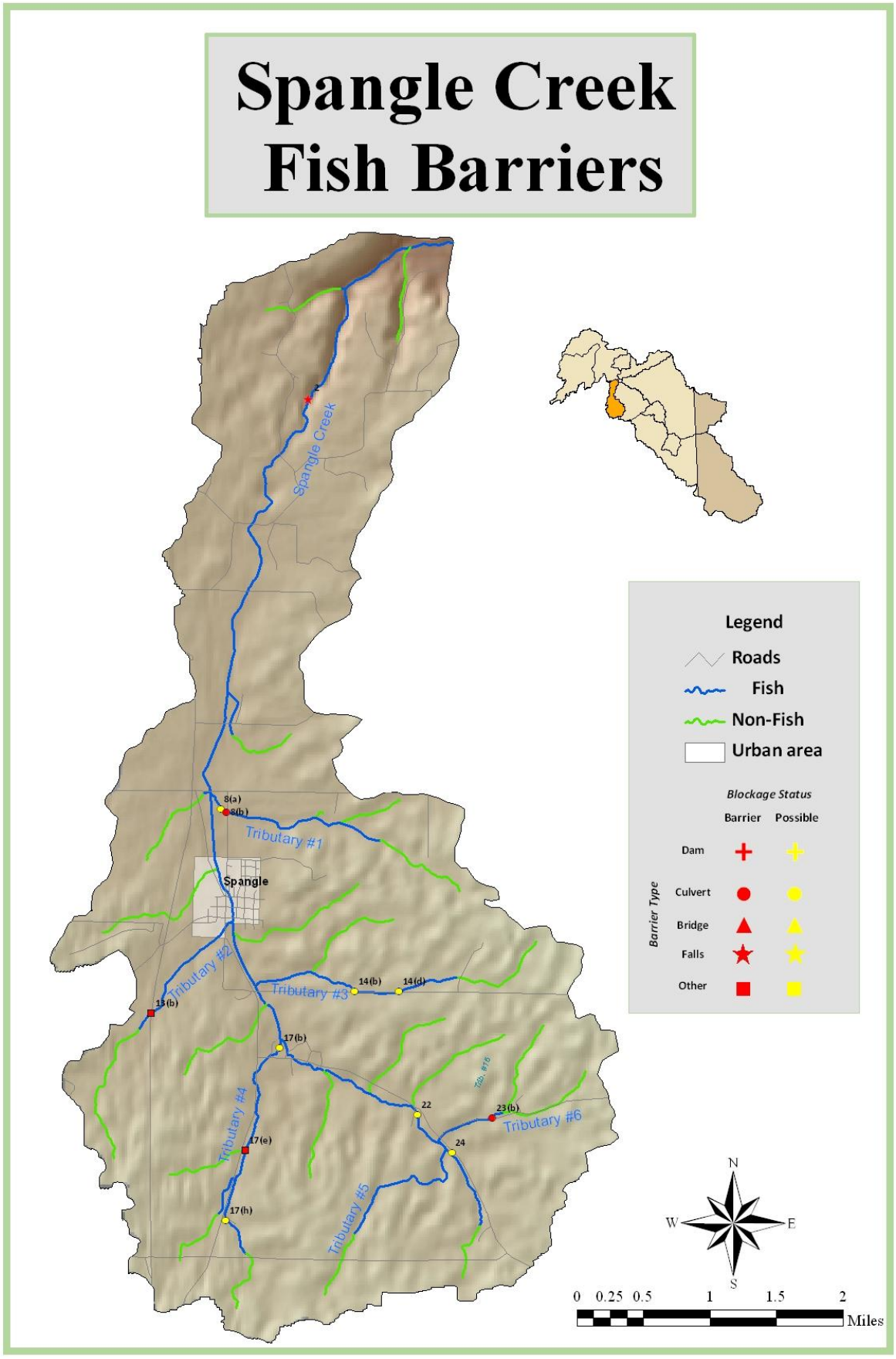


Figure 44. Spangle Creek Fish Barriers

Fish Passage Barrier Replacement/Removal Potential

The fish barriers present in the Spangle Creek watershed are of minor consequence due to the lack of quality instream habitat (Table 20). The locations of the barriers are located within areas of intense agriculture. The tributaries in the upper portion of the watershed are basically farm ditches with no riparian vegetation. Many areas are frequently maintained as ditches (dredged every couple years to prevent sedimentation build-up. The instream habitat is absent to poor above the canyon reaches. Fisheries information does not indicate any fish presence in the upper reaches of Spangle Creek. Major riparian and instream habitat restoration measures would be required to provide suitable conditions.

Table 20. Spangle Creek Barrier Removal Ratings

Crossing ID#	Fish Usable Habitat Benefit (mi)	Removal Potential Rating	Removal Priority
SPC-2	15.5	N/A	NA
SPC-8(b)	1.0	Medium-Low	1
SPC-13(b)	0.01	Low	4
SPC-17(e)	0.9	Medium-Low	2
SPC-23(b)	.01	Low	3
Total	**17.5**		

Fish Passage Barrier Replacement/Removal Potential

SPC-2
This is an area within the canyon that contains a series of small to large waterfalls. The site has extensive riparian vegetation, but the large waterfalls naturally prevent any upstream fish passage (Figure 43 above). This barrier essentially blocks approximately 15.5 mi of habitat above it.

SPC-8(b)
This site is a Spokane County Road crossing with an under-sized culvert. The culvert is placed too low and is submerged during spring runoff and storm events. It is a barrier for velocity and slope. It has the potential to be removed and replaced with a larger culvert, but the amount of quality habitat above it is questionable since no fish are present.

SPC-13(b)
US 195 crosses unnamed tributary #3 near the end of the DNR fish bearing designation. There is no culvert or other conveyance measure for water at the site. The highway was built directly across it. The tributary is completely blocked and segmented. However, there is little fish-bearing status above it and the site is dominated by agriculture. The existing channel has no stream or riparian habitat. It is basically a field ditch.

SPC-17(e)
This is an unusual barrier located on unnamed tributary #5. The site has no visual channel for approximately 200 ft. There is channel above and below it, but the site is farmed by a local producer. Above it, the channel ends and the water flows freely across the ground (sheetflow) until it converges and reaches the channel below. This site is considered to be a medium to low potential for correction

due to the lack of quality habitat and fish presence. However, it would be a straightforward correction to create connecting channels.

SPC-23(b)

This barrier is located at Rowher Rd (Figure 45 below). The site is a Spokane County culvert (3' diameter) with an outfall, slope, and velocity barrier. No fish are present and there is currently a lack of instream and riparian habitat. The area is under intense agricultural production and therefore deemed as a low to medium priority for removal/replacement.

Figure 45. SPC-23(b) Rowher Rd. crossing

Figure 46. SPC-3, Stentz Rd. crossing

High Quality/Priority Fisheries Areas: **NO**

Spangle Creek does not receive a lot of attention for its fisheries. The watershed is highly agricultural and the relative habitat features are absent until the stream reaches beyond the midpoint of the watershed (approximately Spangle Creek Rd. crossing). The stream crossings in this area allow for good fish passage (Figure 46). The instream and riparian habitat at this point is excellent, except for some current livestock disturbance. Fisheries information from Scholz, 2004 indicates a lack of fisheries in the upper watershed (Table 21). Several sites were sampled and no fish were present. In the canyon, Scholz found speckled dace (*Rhinichthys osculus*), rainbow trout (*Oncorhynchus mykiss*) and eastern brook trout (*Salvelinus fontinalis*). These are all located below the waterfall near its confluence with Hangman Creek. The absence of fish in the upper watershed, the presence of a natural waterfall (barrier), the lack of perennial flow, and the deficiency in known spawning habitat indicates that Spangle Creek is not a high quality or priority for fisheries.

Table 21. Spangle Creek Fish Species

Common Name	Scientific Name	Native	Introduced	Common	Uncommon	Rare
Speckled dace	*Rhinichthys osculus*	X		L		U,M
Rainbow trout	*Oncorhynchus mykiss*	X			L	U,M
Eastern brook trout	*Salvelinus fontinalis*		X		L	U,M

Notes:
1. U,M,L refers to Upper, Middle and Lower portions of the watershed.
2. Common, Uncommon, and Rare refer to occurrence in the watershed according to survey work of Scholz 2004; WDFW 2004; Laumeyer and Maughan 1973; Maughan 1974; Gilbert and Evermann 1893.

4.8 Stevens Creek **Basin Priority # 3**

Stevens Creek is a small perennial stream that winds through 19,994 acres, of which approximately 30% (5600 acres) is cropland. The headwaters of this basin are Krell and Silver Hill located just southwest of Spokane Valley. The headwaters contain some forested areas mixed with many private rural residential homes. The creek is paralleled by Steven's Creek Rd for a considerable portion of its course before it crosses the Palouse Highway and winds through more pastoral and dryland agricultural land uses. It enters Hangman Creek just south of the Hangman Hills development and upstream of the Hangman Valley Golf Course.

Steven's Creek has 30 crossings and the most barriers (9 or 30% of crossings) of any sub-watershed within the Hangman Creek Watershed. Three of these barriers are private dams utilized for ponds and livestock watering. Dams are rather unusual in the Hangman Creek watershed and these are still active. California Creek is the only other sub-watershed that has any known dams located in it. The other barriers are Spokane County roads and private crossing culverts with outfall (Figure 47 below), velocity and slope issues. There are five possible barriers. Two belong to Spokane County and three are privately owned (driveway access). There are eight unknown and eight non-barrier crossings. Overall, this basin is highly impacted by barriers.

The fish usable habitat in this sub-watershed, compared to its acreage, is relatively low at 9.1 mi. The first barrier in the sub-watershed is located near the mouth. It blocks approximately 99% of the watershed making Steven's Creek one of the most highly impacted fish bearing streams in the Hangman Creek Watershed.

Figure 47. STC-12. Kiesling Rd

Figure 48. STC-4. Head gate dam

Fish Passage Barrier Replacement/Removal Potential

Stevens Creek has many barriers preventing fish movement throughout the basin (Figure 49). Many are rated as high for removal/replacement due to significant gains in habitat and the known presence of salmonids (Table 22). However, some barriers are rated lower even though they may have much habitat to gain. This is because of the difficulty of the site solution and the possibility of a legal diversion or dam.

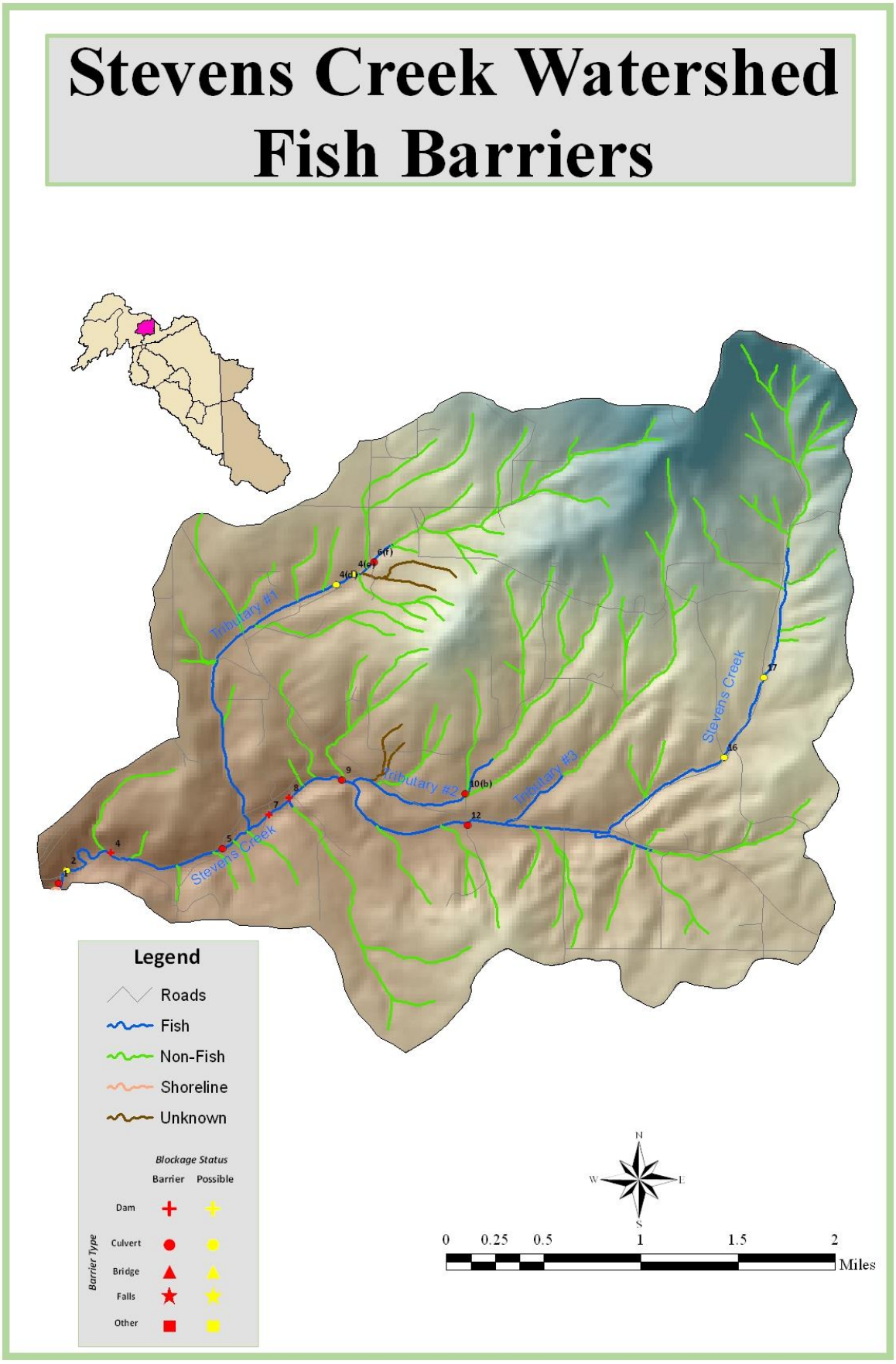


Figure 49. Stevens Creek Fish Barriers

Table 22. Stevens Creek Barrier Removal Ratings

Crossing ID#	Fish Usable Habitat Benefit (mi)	Removal Potential Rating	Removal Priority
STC-1	0.5	High	4
STC-4	0.6	Medium-High	5
STC-5	2.2	High	2
STC-6(f)	0.1	Low	9
STC-7	0.2	Medium-High	6
STC-8	0.3	Medium	7
STC-9	1.5	High	3
STC-10(b)	0.2	Low	8
STC-12	3.4	High	1
Total	**9.0**		

STC-1
This barrier is located near the confluence of Stevens Creek. It is a large Spokane County box culvert (Figure 50). Sheet flow and an outfall filled with basalt rock prevent fish movement through the culvert. Removal/replacement of this barrier would open approximately 0.5 mi. of habitat to next barrier.

STC-4
This barrier is substantial. It is a large earthen dam built directly across the creek with a head gate connected to a 4' CST culvert (Figure 48 & 51). This was built over 30 years ago as a private pond for fish. Removal may be extremely difficult (potentially legal structure). WDFW should be consulted for applicable solutions (fish ladder).

STC-5
This is a 6' Spokane County box culvert located under Valley Chapel Rd. The sheet flow prevents fish passage. Removal of this barrier would open significant habitat to salmonids.

STC-6(f)
This barrier is a private driveway access across unnamed tributary # 1. The culvert is a barrier for outfall, slope and velocity. It is rated low for removal due to limited habitat gain in this small tributary.

STC-7, 8, 9
STC-7 is a located on a private drive. There is a concrete grade control structure (dam) in the mainstem of Stevens Creek. Removal of this barrier is not highly rated due to the low habitat gains, but its removal in combination with STC-8 would rate it higher. STC-8 is a legally recognized dam. It is a CPC dam which is currently utilized for stock water purposes. It is rated medium for removal/replacement because it may be possible to work with the landowner to correct this site. STC-9 is another private driveway located on the mainstem. The site has two culverts with slope, velocity and outfall issues.

STC-10(b)
This barrier is a Spokane County culvert under S. Kiesling Rd. It is located on unnamed tributary # 2 and has a limited amount of habitat gain. It is rated low for removal/replacement.

STC-12
This barrier is located on the mainstem of Stevens Creek under Kiesling Rd. The culvert has an 8' outfall drop and is rated high for removal/replacement. A habitat gain of over three miles is significant in the basin.


Figure 50. STC-1. Box culvert barrier


Figure 51. STC-4. Culvert outlet from dam

High Quality/Priority Fisheries Areas: **YES**

Stevens Creek contains salmonids (Table 23). Scholz, 2004 documented the presence of the following fish species; rainbow trout (*Oncorhynchus mykiss*), speckled dace (*Rhinichthys osculus*), redside shiner (*Richardsonius balteatus*), largescale sucker (*Catostomus macrocheilus*), and an unidentified sucker species. Both sampling sites are located in the lower portions of the watershed before the confluence of unnamed tributary # 1 (north fork). There is no fishery information elsewhere for the middle and upper portions of the creek. The dominant species are the speckled dace and the trout. It is unknown as to whether or not the trout are native or planted by local residents. No spawning habitats are currently indentified, but the presence of a potentially self-sustaining population of salmonids in the subwatershed designates it as a high priority fisheries area.

Table 23. Stevens Creek Fish Species

Common Name	Scientific Name	Native	Introduced	Common	Uncommon	Rare
Speckled dace	*Rhinichthys osculus*	X		L		
Rainbow trout	*Oncorhynchus mykiss*	X		L		
Redside shiner	*Richardsonius balteatus*	X		L		
Largescale sucker	*Catostomus macrocheilus*	X		L		

Notes:
1. U,M,L refers to Upper, Middle and Lower portions of the watershed.
2. Common, Uncommon, and Rare refer to occurrence in the watershed according to survey work of Scholz 2004; WDFW 2004; Laumeyer and Maughan 1973; Maughan 1974; Gilbert and Evermann 1893.

4.9 Idaho

The Idaho portions of this inventory are incomplete. There is not enough information regarding fish-bearing streams. Without this information, it is difficult to accurately assess which stream crossings may affect fish passage. To conduct this work in Idaho would have taken considerable resources to complete assessments of actual fish bearing streams and their crossings. It was not within the scope of this work. It is, however, recommended that this work be conducted on the headwater portions of Rock Creek, Little Hangman Creek, and all the Hangman Creek mainstem and associated headwater tributary streams located in Idaho.

Partial information was provided by Bruce Kinkead, of the Coeur d'Alene Tribe. He provided barrier information regarding seven sites on tributaries of Hangman Creek within the Reservation boundaries. Other information on fisheries was taken from BPA Project Report # 2001-032-00, CDA Tribe Natural Resources Fisheries Program Year–End Report (2001-2002).

Fish survey work has been conducted on the reservation and the headwaters east of the reservation by the Tribe and the Idaho Department of Environmental Quality (DEQ). Salmonids are found within four different tributaries within the reservation and outside the reservation. The species found included; speckled dace (*Rhinichthys osculus*), redside shiner (*Richardsonius balteatus*), longnose sucker (*Catostomus catostomus*), sculpin (*Cottus spp.),* rainbow trout (*Oncorhynchus mykiss*), and cutthroat trout (*Salmo clarki*).

Salmonids (in low abundance) are found in the Middle and West Fork of Mission Creek, Sheep Creek, Squaw Creek, Indian Creek, and the North Fork of Indian Creek. DEQ found rainbow trout in the mainstem of Hangman Creek (just downstream of the confluence with S.F. Hangman), Bunnel Creek, and the South Fork of Hangman Creek. These rainbows have been genetically tested and confirmed as remnant populations of interior redband trout (*Oncorhynchus mykiss gairdneri*). Squaw Creek and Mission Creek are the only streams where cutthroats have been found in the entire watershed. These populations are small but appear to be self-sustaining.

Fish barrier data within Idaho is limited. The CDA Tribe provided general information on seven different barriers located within the reservation. Three of the barriers are located on Indian Creek, Three are located on Upper Hangman Creek, and one is located on Little Hangman Creek. All of these barriers are reported as 36" round CST culverts.

5.0 FISH BARRIER ACTION PLAN

The establishment of the hydroelectric dams, the advent of agriculture and the sprawl of rural residential homes and roads has had a cumulative negative impact on the salmonid populations within the Hangman Creek Watershed. Although current salmonid populations are found within a few of the subwatersheds, they are scattered, isolated, and relatively low in abundance. Additionally, the loss of fish usable habitat goes far beyond what is blocked above known fish passage barriers. The habitat is fragmented, but a great deal of it is lost to various land uses, primarily agriculture. The amount of tributary stream habitat lost to this land use is estimated as substantial and likely a significant factor limiting current salmonid production in the watershed. The removal of these barriers is a positive step towards revitalizing the fisheries.

The removal of fish passage barriers has many direct benefits.

- Unrestricted access to preferred habitats and food sources
- The ability of passage for spawning and seasonal migration
- Reduces the potential of predation and disease
- Increase the genetic flow between populations

But, there are challenges and disadvantages to removing barriers as well.

- Short-term sediment release
- Introgressive hybridization with introduced salmonids
- Loss of isolated genetic pools
- Encroachment of invasive non-native fish

Barrier removal requires a thorough evaluation of the benefits and disadvantages. In Hangman Creek, there are several subwatersheds that will benefit more from barrier removal projects than others. These basins either have existing quality habitats or a known population of salmonids. There are also situations where the basin may have a few salmonids, and fragmented habitats in some of the tributaries. All of these types of subwatersheds received higher priority than those without salmonids or poor habitats. Some barriers had substantial fish bearing stream reaches above them, yet the habitat was poor. This type of field information is critical to making informed decisions regarding the priority for barrier removal within subwatersheds. The SCCD utilized a combination of field knowledge regarding habitat and fisheries information to prioritize the basins and each barrier for removal. The basins are ranked as follows. The individual barrier prioritization is found in Appendix A.

1. California Creek
2. Marshall/Minnie Creek
3. Stevens Creek
4. Rock Creek
5. Hangman Creek (middle)
6. Hangman Creek (lower)
7. Hangman Creek (upper)
8. Cove Creek
9. Spangle Creek
10. Rattler Run Creek

It is important to note that there are many crossings listed as unknown and possible barriers within the watershed. This information is lacking and is beneficial for future management decisions to protect, conserve and enhance the fishery and fish habitat of the basin. It is highly recommended that both of these categories are further evaluated and added to the barrier database for Hangman Creek. The existing possible barriers, once evaluated, can completely change the priority and rankings completed in this document.

Other recommendations include:

- The general public and local governments are aware of the existing barriers and how they can prevent creating future ones.
- Continue and expand comprehensive inventories that locate, assess, evaluate, and prioritize barriers

- Secure long-term funding, with emphasis on correction of high priority projects first to maximize salmonid production benefits, regardless of ownership.
- Broaden the understanding of fish passage needs, especially juvenile salmonid migration habits and limitations and knowledge of fish passage.
- Contact WSDOT to address the barriers created by their work and have them added to their 20 year barrier reduction program.

6.0 LITERATURE CITED

APPENDIX A

Detailed Hangman Creek Watershed Barrier List

Crossing ID#	Waterbody	Crossing Location	Jurisdiction	Barrier Priority Ranking	Crossing Type/Field Notes
STC-1	Stevens Creek	Hangman Valley Rd, R.M. 0.1	Spokane County	4	5' CPC Box Culvert, velocity, 2' outfall drop
STC-4	Stevens Creek	Private Pond Control, R.M. 0.5	Private	5	Head Gate Dam to 4' RND, CST Culvert (Pond Control)
STC-5	Stevens Creek	Valley Chapel Rd, R.M. 1.0	Spokane County	2	6' CPC Box Culvert, sheet flow inside (velocity), 1.0 outfall drop
STC-6(f)	Stevens Creek, Trib. #1	Private Drive	Private	9	3' RND CST Culvert, 1' outfall, velocity, tree grown around it
STC-7	Stevens Creek	Driveway, R.M 1.4	Private	6	Dam, Grade control, private drive
STC-8	Stevens Creek	Emtman Rd, R.M. 1.6	Spokane County	7	CPC Dam, Man-made grade control, 5' drop
STC-9	Stevens Creek	Driveway, R.M. 1.85	Private	3	2-36" RND CST Culvert, 3' outfall drop
STC-10(b)	Stevens Creek, Trib. #2	S. Kiesling Rd.	Spokane County	8	3' RND CAL Culvert, 2' outfall drop, plowed ag field, no channel
STC-12	Stevens Creek	Kiesling Rd, R.M. 2.6	Spokane County	1	4' RND CST Culvert, 8' outfall drop
SPC-2	Spangle Creek	Natural Water Fall	Private	NA	25' Drop (Bedrock)
SPC-8(b)	Spangle Creek, Trib. #2	North Spangle Rd.	Spokane County	1	2.5' CST RND Culvert, Submerged "Shotgun" pipe, Slope/velocity
SPC-13(b)	Spangle Creek, Trib. #3	US 195	Wash. DOT	3	Blockage, no apparent crossing structure under highway
SPC-17(e)	Spangle Creek, Trib. #5	Cultivated Field, no crossing structure	Private	2	Ag. Field, plowed and filled in channel, natural channel u/s & d/s
SPC-23(b)	Spangle Creek, Trib. #6	Rowler Rd.	Spokane County	4	3' CST RND Culvert, slope/velocity, 0.7 outfall drop
CVC-11	Cove Creek	Wheeler Rd	Spokane County	2	5' RND, CST Culvert, slope , outfall drop 0.5'
CVC-13	Cove Creek	Ham Rd.	Spokane County	1	4' RND CST Culvert, outfall drop approx. 2'
CVC-16	Cove Creek	Private Crossing	Private	3	36" RND CST Culvert, 0.8' outfall drop, slope/velocity
MC-1	Marshall Creek	US Hwy 195 @ Confl.	Wash. DOT	1	60" CPC Box Culvert, barrier for velocity/outfall
MIN-6(a)	Minnie Creek, Trib. #1	RR Access Rd.	BNSF	6	3-36" RND CST Culvert, outfall drop
MIN-6(g)	Minnie Creek, Trib. #1, EB	Taylor Rd.	Spokane County	7	36" RND CST Culvert, slope, velocity, outfall, 12 ft plunge pool
MIN-16	Minnie Creek	BNSF access Rd.	BNSF	3	(1) 2.5' RND CST (main) & (1) 2' RND CST (overflow), velocity
MIN-17	Minnie Creek	RR Crossing/BNSF access Rd.	BNSF	4	(2) 4' RND CAL Culverts, velocity, outfall
MIN-18	Minnie Creek	BNSF access Rd.	BNSF	2	Road cut through stream channel, created artificial falls (2' drop)
MIN-19(b)	Minnie Creek, Trib. #2	near WWTF Rd	City of Cheney	5	1.5' RND SST Culvert, 2' outfall drop, velocity, plunge pool
CAC-7(e)	California Creek, Trib. #2	Bruna Rd.	Spokane County	2	2 - 2.5' CST, RND Culverts, Slope/Velocity, 0.8' Outfall drop
CAC-8(f)	California Creek, Trib. #3	Private Drive	Private	3	Diversion into Chester Cr. watershed, dewatering Ag. Field??
CAC-16(a)	California Creek, Trib. #4	Belmont Rd.	Spokane County	5	48" CPC Box Culvert w/Aprons, Velocity, 1' Outfall drop
CAC-16(b)	California Creek, Trib. #4	S. Linke Rd.	Spokane County	11	"Shotgun" Culvert (Unknown dimension), Slope/Velocity
CAC-18	California Creek	Chapman Rd	Spokane County	6	5' RND CST Culvert, Barrier for Outfall Drop/Velocity
CAC-19	California Creek	Jons Rd	Spokane County	4	5' RND CST Culvert, Dam/Grade Control @ US end (60" Drop)
CAC-20(a)	California Creek, Trib. #5	Jons Rd	Spokane County	9	24" CST, RND Culvert, Slope/Velocity, 60" Outfall drop
CAC-21	California Creek	Belmont Rd	Spokane County	7	6' RND CST Culvert, 12" drops on US & DS
CAC-23	California Creek	Driveway off Belmont Rd	Private	8	24" RND CST Culvert, slope/velocity
CAC-24	California Creek	50' off Belmont Rd	Private	10	Wier/Dam/Headgate diversion w/36" drop (for pond)
CAC-25	California Creek	Driveway off Belmont Rd	Private	1	24" RND CST Culvert, slope/velocity

Crossing ID#	Waterbody	Crossing Location	Jurisdiction	Barrier Classification	Crossing Type/Field Notes
RR-2(c)	Rattler's Run Creek, Trib. #1	Bradshaw Rd	Spokane County	1	3' RND CST Culvert, 0.6' outfall drop, slope/velocity
HCL-1(d)	Indian Creek	Palisades Park, Natural Feature	City of Spokane	NA	50-60' Waterfall
HCL-1(e)	Indian Creek	Unimproved road	Private	5	Road fill, no culvert or bridge (semi-permeable dam)
HCL-1(f)	Indian Creek	Bonnie Dr.	City of Spokane	6	3' RND CST Culvert, 0.8 outfall drop, rock placement
HCL-2(b)	Garden Springs Creek	Natural Feature	Private	NA	Series of Waterfalls, 6', 10', 3'.
HCL-15(b)	Un-named Trib. #2	Gibbs Rd.	Spokane County	1	18" RND CST Culvert, 2' Outfall drop, set on top plugged culvert
HCL-16(h)	Un-named Trib. #3	Private Res. Driveway	Private	4	4' RND CST Mated to 4' PCC RND, 1' outfall drop, slope/velocity
HCL-16(i)	Un-named Trib. #3	Private Res. Driveway	Private	2	Wood/CPC Dam with Control Gate (opened). 2' tall
HCL-16(n)	Un-named Trib. #3	Hilby Rd	Spokane County	3	4' RND CST, 2' outfall drop, slope/velocity
HCM-2(c)	WB Courtney Canyon Ck	Cornwall Rd.	Spokane County	1	4' RND CST Culvert, Pond upstream with stand pipe (drop)
HCM-4(c)	S. Fork Un-named Trib #3	Lewis Rd	Spokane County	3	(2) 3.5' RND CST Culvert, 1.5' outfall drop
HCM-4(d)	S. Fork Un-named Trib #3	Private Ag field access	Private	2	4.5' RND CST Culvert, 0.8' outfall drop
HCU-9(e)	Un-named Trib #5	Old RR Crossing	BNSF	1	(2) 3' CST RND Culverts, slope/velocity, 3' Outfall drop
HCU-13(c)	Un-named Trib #9	Marsh Rd	Spokane County	2	(2) 2' CST RND Culverts, slope/velocity, 0.6' Outfall drop
RC-2 (b)	Un-named Trib. #1	Valley Chapel Rd.	Spokane County	4	3' CPC BOX Culvert w/aprons, 1 ft drop
RC-2 (c)	Un-named Trib. #1	Forsland Rd./Private Pond d/s	Private	15	4' CST RND Culvert (slope/velocity)/Earth Dam (pond control)
RC-3(a)	Cottonwood Creek	Elder Rd.	Spokane County	2	8' CST RND Culvert, 2.5' outfall drop
RC-4(b)	Little Cottonwood Creek	Elder Rd.	Spokane County	5	(2) 24" CST RND Culverts, 3' drop
RC-8(a)	Un-named Trib. #2	Driveway/Cameron Rd.	Private	10	8' Span, 6' rise CST SQSH culvert, 1' outfall drop
RC-8(b)	Un-named Trib. #2	Jackson Rd.	Spokane County	13	4.5' CST RND culvert, Slope/Velocity, outfall drop
RC-8(c)	Un-named Trib. #2	Jackson Rd.	Spokane County	11	6.5' CPC BOX Culvert, sheet flow (velocity), outfall drop
RC-9(a)	Un-named Trib. #3	Valley Chapel Rd.	Spokane County	14	36" CPC BOX Culvert, sheet flow (velocity), 1' outfall drop
RC-13(d)	Mica Creek, EB	Drumheller Rd.	Spokane County	3	(2) 7'span x 5'rise CST SQSH culverts, slope/velocity
RC-13(f)	Mica Creek, WB	Elder Rd.	Spokane County	1	10' Span CST SQSH culvert 0.6' drop, slope/velocity
RC-28(c)	Un-named Trib. #8	Bradshaw Rd.	Spokane County	16	36" CST RND culvert, slope/velocity
RC-31(a)	Un-named Trib. #11	Harvard Rd.	Spokane County	9	36" CST RND culvert, slope/velocity, 0.8 outfall drop
RC-32(a)	Un-named Trib. #12	Harvard Rd.	Spokane County	8	36" CST RND culvert, slope/velocity, 1' outfall drop, headcut u/s
RC-38(b)	Un-named Trib. #15	Harvard Rd.	Spokane County	12	(2) 2.5' CST RND culverts, slope/velocity, 0.6' outfall drop
RC-43(a)	Un-named Trib. #18	Private x-ing/Ag. Field access	Private	7	4' CST RND Culvert, slope/velocity, 0.6' Outfall drop
RC-44(a)	Un-named Trib. #19	Truax Rd.	Spokane County	6	5' CST RND Culvert, slope/velocity, 1' Outfall drop

APPENDIX B

Hangman Creek Watershed Stream Crossing Inventory

Crossing ID#	Waterbody	Crossing Location	Jurisdiction	Barrier Classifications	Crossing Type/Field Notes
STC-1	Stevens Creek	Hangman Valley Rd, R.M. 0.1	Spokane County	Barrier	5' CPC Box Culvert, velocity, 2' outfall drop
STC-2	Stevens Creek	Private Driveway	Private	Possible	4' PCC RND, slope/velocity
STC-3	Stevens Creek	Private Driveway	Private	Unknown	Unknown
STC-4	Stevens Creek	Private Pond Control, R.M. 0.5	Private	Barrier	Head Gate Dam to 4' RND, CST Culvert (Pond Control)
STC-5	Stevens Creek	Valley Chapel Rd, R.M. 1.0	Spokane County	Barrier	6' CPC Box Culvert, sheet flow inside (velocity), 1.0 outfall drop
STC-6(a)	Stevens Creek, Trib. #1	Valley Chapel Rd.	Spokane County	Non-Barrier	4' CPC Bottomless arch culvert
STC-6(b)	Stevens Creek, Trib. #1	E. Clark Rd.	Spokane County	Non-Barrier	6' RND CST Culvert
STC-6(b)	Stevens Creek, Trib. #1	Palouse Hwy.	Spokane County	Non-Barrier	3.5' RND PCC Culvert
STC-6(c)	Stevens Creek, Trib. #1	E. Hoffman Ln.	Private	Possible	3' RND SST Culvert, slope/velocity
STC-6(d)	Stevens Creek, Trib. #1	Private Drive	Private	Possible	2' RND CST Culvert, slope/velocity
STC-6(e)	Stevens Creek, Trib. #1	Private Driveway to shop	Private	Non-Barrier	3' RND CST Culvert
STC-6(f)	Stevens Creek, Trib. #1	Private Drive	Private	Barrier	3' RND CST Culvert, 1' outfall, velocity, tree grown around it
STC-6(g)	Stevens Creek, Trib. #1	S. Hilby Rd.	Spokane County	Unknown	Unknown
STC-7	Stevens Creek	Driveway, R.M 1.4	Private	Barrier	Dam, Grade control, private drive
STC-8	Stevens Creek	Emtman Rd, R.M. 1.6	Spokane County	Barrier	CPC Dam, Man-made grade control, 5' drop
STC-9	Stevens Creek	Driveway, R.M. 1.85	Private	Barrier	2-36" RND CST Culvert, 3' outfall drop
STC-10(a)	Stevens Creek, Trib. #2	Palouse Hwy.	Spokane County	Non-Barrier	4' RND CST Culvert
STC-10(b)	Stevens Creek, Trib. #2	S. Kiesling Rd.	Spokane County	Barrier	3' RND CAL Culvert, 2' outfall drop, plowed ag field, no channel
STC-11	Stevens Creek	Driveway, R.M. 2.2	Private	Non-Barrier	CPC Dam, Occasional diversion to fill pond
STC-12	Stevens Creek	Kiesling Rd, R.M. 2.6	Spokane County	Barrier	4' RND CST Culvert, 8' outfall drop
STC-13	Stevens Creek	S. Weger Rd.	Spokane County	Non-Barrier	4' RND CST Culvert
STC-14(a)	Stevens Creek, Trib. #3	Palouse Hwy.	Spokane County	Unknown	Unknown
STC-15	Stevens Creek	Palouse Hwy.	Spokane County	Non-Barrier	4' RND CST Culvert
STC-16	Stevens Creek	Sharon Rd.	Spokane County	Possible	4' RND CST Culvert, slope/velocity
STC-17	Stevens Creek	Stevens Creek Rd.	Spokane County	Possible	4' RND CST Culvert, slope/velocity, outfall drop
STC-18	Stevens Creek	Private Driveway	Private	Unknown	Unknown
STC-19	Stevens Creek	Private Driveway	Private	Unknown	Unknown
STC-20	Stevens Creek	Private Driveway	Private	Unknown	Unknown
STC-21	Stevens Creek	Private Driveway	Private	Unknown	Unknown
STC-22	Stevens Creek	Private Driveway	Private	Unknown	Unknown
SPC-1	Spangle Creek	Valley Chapel Rd.	Spokane County	Non-Barrier	New PCC Bridge
SPC-2	Spangle Creek	Natural Water Fall	Private	Barrier	25' Drop (Bedrock)
SPC-3	Spangle Creek	Stentz Rd.	Spokane County	Non-Barrier	24' Span Bottomless Arch Multiplate Culvert
SPC-4	Spangle Creek	Spangle Cr. Rd.	Spokane County	Non-Barrier	(1) 5' and (1) 2' RND, CST Culverts
SPC-5(a)	Spangle Creek, Trib. #1	Cornwall Rd.	Spokane County	Unknown	Unknown
SPC-6	Spangle Creek	Cornwall Rd.	Spokane County	Non-Barrier	10' SQSH CST Culvert

Crossing ID#	Waterbody	Crossing Location	Jurisdiction	Barrier Classifications	Crossing Type/Field Notes
SPC-7	Spangle Creek	Watt Rd.	Spokane County	Non-Barrier	7' RND Culvert, wider than bank full width
SPC-8(a)	Spangle Creek, Trib. #2	RR Crossing	BNSF	Possible	3' CST RND Culvert, Slope/velocity
SPC-8(b)	Spangle Creek, Trib. #2	North Spangle Rd.	Spokane County	Barrier	2.5' CST RND Culvert, Submerged "Shotgun" pipe, Slope/velocity
SPC-9	Spangle Creek	N. Main St.	Town of Spangle	Non-Barrier	CPC Bridge w/(2) 3' CST RND Culverts (overflows)
SPC-10	Spangle Creek	E. 3rd St	Town of Spangle	Non-Barrier	CPC Bridge
SPC-11	Spangle Creek	E. 2nd St.	Town of Spangle	Non-Barrier	CPC Bridge
SPC-12	Spangle Creek	E. 1st St.	Town of Spangle	Non-Barrier	CPC Bridge
SPC-13(a)	Spangle Creek, Trib. #3	South Spangle Rd.	Town of Spangle	Non-Barrier	5' CPC Box Culvert, Channel u/s is cultivated and not evident
SPC-13(b)	Spangle Creek, Trib. #3	US 195	Wash. DOT	Barrier	Blockage, no apparent crossing structure under highway
SPC-14(a)	Spangle Creek, Trib. #4	RR Crossing	BNSF	Non-Barrier	Wood Bridge, near confluence
SPC-14(b)	Spangle Creek, Trib. #4	Keevy Rd.	Spokane County	Possible	(2) 2.5' CST RND Culverts, Slope/velocity
SPC-14(c)	Spangle Creek, Trib. #4	Ag. field access from Keevy Rd.	Private	Non-Barrier	2.5' CST RND Culvert, Streambed material throughout
SPC-14(d)	Spangle Creek, Trib. #4	Keevy Rd.	Spokane County	Possible	3' CST RND Culvert, velocity, outfall drop, no evident channel u/s
SPC-15	Spangle Creek	Spangle-Waverly & Keevy Rd. intersection	Spokane County	Non-Barrier	Full span wood bridge
SPC-16	Spangle Creek	RR Crossing	BNSF	Non-Barrier	Wood bridge
SPC-17(a)	Spangle Creek, Trib. #5	RR Crossing	BNSF	Non-Barrier	Wood bridge
SPC-17(b)	Spangle Creek, Trib. #5	Spangle-Waverly Rd.	Spokane County	Possible	6' PCC Box Culvert, velocity (sheetflow)
SPC-17(c)	Spangle Creek, Trib. #5	RR Crossing	BNSF	Non-Barrier	Wood bridge
SPC-17(d)	Spangle Creek, Trib. #5	RR Crossing	BNSF	Non-Barrier	Wood bridge
SPC-17(e)	Spangle Creek, Trib. #5	Cultivated Field, no crossing structure	Private	Barrier	Ag. Field, plowed and filled in channel, natural channel u/s & d/s
SPC-17(f)	Spangle Creek, Trib. #5	RR Crossing	BNSF	Non-Barrier	Wood bridge
SPC-17(g)	Spangle Creek, Trib. #5	Old US 195	Spokane County	Non-Barrier	CPC bridge
SPC-17(h)	Spangle Creek, Trib. #5	Old US 195	Spokane County	Possible	4' PCC Box Culvert, velocity (sheetflow)
SPC-17(i)	Spangle Creek, Trib. #5	RR Crossing	BNSF	Non-Barrier	Wood bridge
SPC-18	Spangle Creek	Upper Columbia Academy entrance	Private	Non-Barrier	CPC Bridge
SPC-19	Spangle Creek	Footbridge & Spangle-Waverly Rd.	Spokane County	Non-Barrier	CPC Bridge
SPC-20	Spangle Creek	Upper Columbia Academy Footbridge	Private	Non-Barrier	CPC Bridge
SPC-21	Spangle Creek	Private Footbridge	Private	Non-Barrier	CPC Bridge
SPC-22	Spangle Creek	Private Driveway/Residence	Private	Possible	(2) 4' CST RND Culverts, partial debris blockage, slope/velocity
SPC-23(a)	Spangle Creek, Trib. #6	Spangle-Waverly Rd.	Spokane County	Non-Barrier	3' CST RND Culvert
SPC-23(b)	Spangle Creek, Trib. #6	Rowler Rd.	Spokane County	Barrier	3' CST RND Culvert, slope/velocity, 0.7 outfall drop
SPC-24	Spangle Creek	Ag. field access from Spangle-Waverly Rd.	Spokane County	Possible	3' CST RND Culvert, slope/velocity
CVC-1	Cove Creek	Old RR Grade	BNSF	Non-Barrier	Wooden Trestle Bridge
CVC-2	Cove Creek	100' downstream of SR 27	Private	Non-Barrier	footbridge
CVC-3	Cove Creek	SR 27	Wash. DOT	Non-Barrier	CPC Bridge

Crossing ID#	Waterbody	Crossing Location	Jurisdiction	Barrier Classifications	Crossing Type/Field Notes
CVC-4	Cove Creek Trib #1	Wheeler Rd	Spokane County	Non-Barrier	2.5' RND CST Culvert
CVC-5	Cove Creek	Knight Rd.	Spokane County	Non-Barrier	Bridge
CVC-6	Cove Creek	Wheeler Rd.	Spokane County	Non-Barrier	2 - 10' CPC Box Culverts
CVC-7(a)	Cove Creek, Trib. #2	Bibbee Rd.	Spokane County	Possible	3' RND CST Culvert, slope, velocity
CVC-8(a)	Cove Creek, Trib. #3	Wheeler	Spokane County	Non-Barrier	5' RND CST Culvert
CVC-8(b)	Cove Creek, Trib. #3	Bibbee Rd.	Spokane County	Non-Barrier	4' RND CST Culvert
CVC-8(c)	Cove Creek, Trib. #3	Knight Rd.	Spokane County	Unknown	Unknown
CVC-9	Cove Creek	Bibbee Rd, R.M. 3.1	Spokane County	Non-Barrier	6' RND, CST Culvert
CVC-10	Cove Creek	Private Ag field	Spokane County	Non-Barrier	Wooden Puncheon Bridge
CVC-11	Cove Creek	Wheeler Rd	Spokane County	Barrier	5' RND, CST Culvert, slope , outfall drop 0.5'
CVC-12	Cove Creek	Private Crossing	Private	Non-Barrier	Wooden Bridge
CVC-13	Cove Creek	Ham Rd.	Spokane County	Barrier	4' RND CST Culvert, outfall drop approx. 2'
CVC-14	Cove Creek	Private Crossing	Private	Non-Barrier	Wooden Footbridge
CVC-15	Cove Creek	Private Crossing	Private	Unknown	Unknown
CVC-16	Cove Creek	Private Crossing	Private	Barrier	36" RND CST Culvert, 0.8' outfall drop, slope, velocity
MC-1	Marshall Creek	US Hwy 195 @ Confl.	Wash. DOT	Barrier	60" CPC Box Culvert, barrier for velocity/outfall
MC-2	Marshall Creek	RR Crossing/Cheney-Spokane Rd	Spokane Co./BNSF	Possible	36" CPC Box Culvert, possible barrier for velocity
MC-3	Marshall Creek	RR Crossing	BNSF	Unknown	Unknown
MC-4	Marshall Creek	Cheney-Spokane Rd	Spokane County	Possible	36" CPC Box Culvert, possible barrier for velocity
MC-5	Marshall Creek	Cheney-Spokane Rd	Spokane County	Possible	5' CST RND Culvert w/aprons, velocity, outfall drop (plunge pool)
MC-6	Marshall Creek	RR Crossing	BNSF	Unknown	Wooden bridge
MC-7	Marshall Creek	Marshall Rd	Spokane County	Non-Barrier	Wooden bridge
MC-8	Marshall Creek	RR Crossing	BNSF	Non-Barrier	Wooden bridge
MC-9	Marshall Creek	Cheney-Spokane Rd	Spokane County	Non-Barrier	48" CPC Box Culvert, pond diversion D/S of x-ing
MC-10	Marshall Creek	Cheney-Spokane Rd	Spokane County	Possible	36" CST RND Culvert, possible barrier for velocity
MC-11	Marshall Creek	Cheney-Spokane Rd	Spokane County	Non-Barrier	Bridge
MC-12	Marshall Creek	BNSF RR access Rd. (McKenzie Rd.)	BNSF	Non-Barrier	Wooden bridge for BNSF RR access road
MC-13	Marshall Creek	RR Crossing	BNSF	Unknown	Unknown
MC-14	Marshall Creek	Driveway 50' off Marshall Cr. Ln	Private	Non-Barrier	48" CST RND Culvert for private access (observed fish)
MC-15	Marshall Creek	RR Crossing	BNSF	Unknown	Unknown
MC-16	Marshall Creek	Goss Rd.	Spokane County	Non-Barrier	(2) 36" CST RND Culvert, possible barrier for velocity
MC-17	Marshall Creek	Anderson Rd.	Spokane County	Non-Barrier	48" CST RND Culvert, no flow
MC-18	Marshall Creek	RR Crossing	BNSF	Unknown	Unknown
MC-19	Marshall Creek	Short Rd.	Spokane County	Possible	2.5' CST RND Culvert, Ag. Field d/s, plowed and filled in channel
MIN-1	Minnie Creek	RR Crossing	BNSF	Non-Barrier	Wood bridge w/treated wood abutments
MIN-2	Minnie Creek	RR Crossing	BNSF	Non-Barrier	Wood bridge
MIN-3	Minnie Creek	Private Driveway, near BNSF RR yard	Private	Possible	(2) 5' RND CST Culverts, velocity, outfall

MIN-4	Minnie Creek	Scribner Rd.	Spokane County	Possible	(2) 3' RND CST Culverts, velocity
MIN-5	Minnie Creek	RR Crossing	BNSF	Unknown	Unknown
MIN-6(a)	Minnie Creek, Trib. #1	RR Access Rd.	BNSF	Barrier	3-36" RND CST Culvert, outfall drop
MIN-6(b)	Minnie Creek, Trib. #1	RR Crossing	BNSF	Possible	36" RND SST Culvert, No Flow
MIN-6(c)	Minnie Creek, Trib. #1	Cheney-Spokane Rd.	Spokane County	Unknown	burried
MIN-6(d)	Minnie Creek, Trib. #1	Spotted Rd.	Spokane County	Unknown	burried
MIN-6(e)	Minnie Creek, Trib. #1	Andrus Rd.	Spokane County	Non-Barrier	2.5' RND PCC Culvert
MIN-6(f)	Minnie Creek, Trib. #1	Andrus Rd.	Spokane County	Unknown	burried
MIN-6(g)	Minnie Creek, Trib. #1, EB	Taylor Rd.	Spokane County	Barrier	36" RND CST Culvert, slope, velocity, outfall, 12 ft plunge pool
MIN-4(h)	Minnie Creek, Trib. #1, EB	Thomas Mallon Rd.	Spokane County	Unknown	no flow, crossing location unknown
MIN-6(i)	Minnie Creek, Trib. #1, WB	Taylor Rd.	Spokane County	Unknown	no flow, crossing location unknown

Crossing ID#	Waterbody	Crossing Location	Jurisdiction	Barrier Classifications	Crossing Type/Field Notes
MIN-7	Minnie Creek	RR Crossing/BNSF access Rd.	BNSF	Non-Barrier	6' Span CPC Arch Culvert (possibly aprons to CST Culvert)
MIN-8	Minnie Creek	RR Crossing/BNSF access Rd.	BNSF	Non-Barrier	12' Span CPC Arch Culvert (possibly aprons to CST Culvert)
MIN-9	Minnie Creek	RR Crossing	BNSF	Unknown	Unknown
MIN-10	Minnie Creek	Scablands Nature Corridor Trail (Old RR Grade)	Wa State Parks	Unknown	Unknown
MIN-11	Minnie Creek	RR Crossing	BNSF	Non-Barrier	Bridge
MIN-12	Minnie Creek	Anderson Rd.	Spokane County	Non-Barrier	CPC Bridge
MIN-13	Minnie Creek	RR Crossing	BNSF	Unknown	Unknown
MIN-14	Minnie Creek	RR Crossing	BNSF	Unknown	Unknown
MIN-15	Minnie Creek	Milo Ball Rd.	Spokane County	Unknown	Unknown
MIN-16	Minnie Creek	BNSF access Rd.	BNSF	Barrier	(1) 2.5' RND CST (main) & (1) 2' RND CST (overflow), velocity
MIN-17	Minnie Creek	RR Crossing/BNSF access Rd.	BNSF	Barrier	(2) 4' RND CAL Culverts, velocity, outfall
MIN-18	Minnie Creek	BNSF access Rd.	BNSF	Barrier	Road cut through stream channel, created artificial falls (2' drop)
MIN-19(a)	Minnie Creek, Trib. #2	WWTF Rd	City of Cheney	Non-Barrier	1.5' RND PCC Culvert
MIN-19(b)	Minnie Creek, Trib. #2	near WWTF Rd	City of Cheney	Barrier	1.5' RND SST Culvert, 2' outfall drop, velocity, plunge pool
MIN-19(c)	Minnie Creek, Trib. #2	Near Old Cheney Spangle Rd	City of Cheney	Possible	Control Gate, Transfer Structure 1. 3' RND PCC Culvert
MIN-19(d)	Minnie Creek, Trib. #2	Old Cheney Spangle Rd	Spokane County	Non-Barrier	8' CPC Box Bridge
MIN-19(e)	Minnie Creek, Trib. #2	Cheney Spangle Rd.	Spokane County	Non-Barrier	5.5' RND CST Culvert
MIN-19(f)	Minnie Creek, Trib. #2	Old RR Grade	BNSF	Unknown	Unknown
MIN-19(g)	Minnie Creek, Trib. #2	Cheney Plaza Rd., near Turnbull NWR	Spokane County	Non-Barrier	36" RND CST Culvert
MIN-19(h)	Minnie Creek, Trib. #2	Mulnix Rd	Spokane County	Possible	2.5' RND CST Culvert, slope, velocity
MIN-19(i)	Minnie Creek, Trib. #2	Private Drive off of Mulnix Rd	Private	Unknown	18" RND CST Culvert
MIN-19(j)	Minnie Creek, Trib. #2	Private Drive off of Mulnix Rd	Private	Unknown	18" RND CST Culvert
MIN-20	Minnie Creek	Cheney-Spokane Rd	Spokane County	Possible	36" RND CST Culvert
MIN-21	Minnie Creek	Betz Rd	Spokane County	Non-Barrier	5' CST RND Culvert

Crossing ID#	Waterbody	Crossing Location	Jurisdiction	Barrier Classifications	Crossing Type/Field Notes
MIN-22	Minnie Creek	Ag field crossing	Private	Non-Barrier	5' CST RND Culvert
MIN-23	Minnie Creek	SR 904	Wash. DOT	Non-Barrier	4' RND CST Culvert
MIN-24	Minnie Creek	RR Crossing	BNSF	Non-Barrier	4' RND CST Culvert
MIN-25	Minnie Creek	Jensen Rd	Spokane County	Non-Barrier	3-5' CST RND Culverts
MIN-26	Minnie Creek	Meadow Lake Rd., near source (Meadow Lk.)	Spokane County	Non-Barrier	4' CPC BOX Culvert
CAC-1	California Creek	Valley Chapel Rd, near Confl.	Spokane County	Non-Barrier	Bridge, near Confluence w/ Hangman Cr.
CAC-2	California Creek	4812 Elder Rd.	Spokane County	Non-Barrier	Steel RR Bridge for Private Access
CAC-3	California Creek	Elder Rd.	Spokane County	Non-Barrier	PCC Bridge
CAC-4(a)	California Creek, Trib. #1	Private Rd.	Private	Non-Barrier	Fjord Crossing
CAC-5	California Creek	Private Rd., RM 3.5	Private	Possible	2 - 48" CST, RND Culverts, Slope/Velocity
CAC-6	California Creek	Dunn Rd.	Parks & Rec.	Non-Barrier	Wood Bridge
CAC-7(a)	California Creek, Trib. #2	Conner Rd.	Spokane County	Non-Barrier	1 - 3.5' PCC, RND & 1 - 36" CST, RND Culverts
CAC-7(b)	California Creek, Trib. #2	Palouse Hwy.	Spokane County	Non-Barrier	48" CST, RND Culvert
CAC-7(c)	California Creek, Trib. #2	Bruna Rd.	Spokane County	Possible	48" PCC, RND Culvert w/Rock Aprons, Slope/Velocity
CAC-7(d)	California Creek, Trib. #2	Bruna Rd.	Spokane County	Possible	48" CST, RND Culvert, Slope/Velocity
CAC-7(e)	California Creek, Trib. #2	Bruna Rd.	Spokane County	Barrier	2 - 2.5' CST, RND Culverts, Slope/Velocity, 0.8' Outfall drop
CAC-7(f)	California Creek, Trib. #2	Excelsior Rd.	Spokane County	Possible	2 - 36" CST, SQSH Culverts, LB Culvert plugged, Slope/Velocity
CAC-8(a)	California Creek, Trib. #3	Conner Rd.	Spokane County	Non-Barrier	36" RND CST Culvert
CAC-8(b)	California Creek, Trib. #3	Palouse Hwy.	Spokane County	Non-Barrier	3.3' PCC, RND Culvert
CAC-8(c)	California Creek, Trib. #3	Old RR Grade	Spokane County	Possible	36" RND PCC Culvert, Slope/Velocity, Outfall drop
CAC-8(d)	California Creek, Trib. #3	E. Washington Rd.	Spokane County	Possible	2 - 24" CST, RND Culverts, Slope/Velocity
CAC-8(e)	California Creek, Trib. #3	Gibbs Rd. (Summer)	Spokane County	Unknown	Unknown
CAC-8(f)	California Creek, Trib. #3	Private Drive	Private	Barrier	Diversion into Chester Cr. watershed, dewatering Ag. Field??
CAC-9	California Creek	Connor Rd.	Spokane County	Non-Barrier	Wood Bridge
CAC-10	California Creek	Sands Rd.	Spokane County	Non-Barrier	PCC Bridge
CAC-11	California Creek	Palouse Hwy	Spokane County	Non-Barrier	2 - 5' CPC Box Culverts
CAC-12	California Creek	Old Palouse Hwy	Spokane County	Non-Barrier	6' CPC Box Culvert
CAC-13	California Creek	Madison Rd	Spokane County	Non-Barrier	Bridge
CAC-14	California Creek	SR 27/RR Crossing	Wa. DOT/BNSF	Possible	8' CPC Box Culvert w/Aprons
CAC-15	California Creek	Jackson Rd	Spokane County	Non-Barrier	Bridge
CAC-16(a)	California Creek, Trib. #4	Belmont Rd.	Spokane County	Barrier	48" CPC Box Culvert w/Aprons, Velocity, 1' Outfall drop
CAC-16(b)	California Creek, Trib. #4	S. Linke Rd.	Spokane County	Barrier	"Shotgun" Culvert (Unknown dimension), Slope/Velocity
CAC-17	California Creek	Linke Rd	Spokane County	Non-Barrier	8' RND CST Culvert
CAC-18	California Creek	Chapman Rd	Spokane County	Barrier	5' RND CST Culvert, Barrier for Outfall Drop/Velocity
CAC-19	California Creek	Jons Rd	Spokane County	Barrier	5' RND CST Culvert, Dam/Grade Control @ US end (60" Drop)

Crossing ID#	Waterbody	Crossing Location	Jurisdiction	Barrier Classifications	Crossing Type/Field Notes
CAC-20(a)	California Creek, Trib. #5	Jons Rd	Spokane County	Barrier	24" CST, RND Culvert, Slope/Velocity, 60" Outfall drop
CAC-20(b)	California Creek, Trib. #5	Ag. Field access off Jons Rd.	Private	Possible	18" CST, RND Culvert, Slope/Velocity
CAC-21	California Creek	Belmont Rd	Spokane County	Barrier	6' RND CST Culvert, 12" drops on US & DS
CAC-22	California Creek	Driveway off Belmont Rd	Private	Non-Barrier	12' Arch CST Culvert
CAC-23	California Creek	Driveway off Belmont Rd	Private	Barrier	24" RND CST Culvert, slope/velocity
CAC-24	California Creek	50' off Belmont Rd	Private	Barrier	Wier/Dam/Headgate diversion w/36" drop (for pond)
CAC-25	California Creek	Driveway off Belmont Rd	Private	Barrier	24" RND CST Culvert, slope/velocity
CAC-26	California Creek	200' off Belmont Rd	Private	Unknown	Unknown
CAC-27	California Creek	Driveway off Belmont Rd	Private	Non-Barrier	36" RND CST Culvert
RR-1	Rattler's Run Creek	Hardened Crossing/Ford	Private	Possible	100' U/S of Confluence w/ Hangman Cr.
RR-2(a)	Rattler's Run Creek, Trib. #1	W. Bradshaw Rd.	Spokane County	Non-Barrier	4' RND CST Culvert
RR-2(b)	Rattler's Run Creek, Trib. #1	Darknell Rd.	Spokane County	Non-Barrier	8' CPC BOX Culvert
RR-2(c)	Rattler's Run Creek, Trib. #1	Bradshaw Rd	Spokane County	Barrier	3' RND CST Culvert, 0.6' outfall drop, slope/velocity
RR-3	Rattler's Run Creek	Darknell Rd.	Spokane County	Non-Barrier	PCC Bridge
RR-4	Rattler's Run Creek	50' off Rattler's Run Rd	Private	Possible	8' RND CST Culvert, Ag. Field Access
RR-4(a)	Rattler's Run Creek, Trib. #2	Rattler's Run Rd	Private	Non-Barrier	4' RND CST Culvert, material throughout
RR-4(b)	Rattler's Run Creek, Trib. #2	Private Ag field	Private	Possible	3' RND CST Culvert, slope, velocity
RR-4(c)	Rattler's Run Creek, Trib. #2	Jackson Rd	Spokane County	Non-Barrier	3' RND CST Culvert
RR-4(d)	Rattler's Run Creek, Trib. #2	RR Crossing	BNSF	Non-Barrier	3' RND PCC Culvert
RR-4(e)	Rattler's Run Creek, Trib. #2	Old Palouse Highway	Spokane County	Non-Barrier	3' RND PCC Culvert
RR-4(f)	Rattler's Run Creek, Trib. #2	SR 27	Wash. DOT	Non-Barrier	4' RND CST Culvert
RR-5	Rattler's Run Creek	Rattler's Run Rd	Spokane County	Non-Barrier	Bridge
RR-6(a)	Rattler's Run Creek, Trib. #3	Jackson Rd	Spokane County	Possible	2.5' RND CST Culvert, slope, velocity
RR-6(b)	Rattler's Run Creek, Trib. #3	BNSF Railroad Access	BNSF	Unknown	unknown
RR-6	Rattler's Run Creek	Jackson Rd	Spokane County	Non-Barrier	12' Concrete Box Culvert
RR-7	Rattler's Run Creek	RR Crossing	BNSF	Non-Barrier	Wood Bridge
RR-8	Rattler's Run Creek	Morris Rd.	Spokane County	Non-Barrier	6' RND CST Culvert
RR-9	Rattler's Run Creek	SR 27	Wash. DOT	Non-Barrier	PCC Bridge
RR-10(a)	Rattler's Run Creek, Trib. #4	RR Crossing	BNSF	Non-Barrier	Wood Bridge
RR-10(b)	Rattler's Run Creek, Trib. #4	Fruitland Rd	Spokane County	Unknown	unknown
RR-11	Rattler's Run Creek	CHS Seed	Town of Fairfield	Non-Barrier	6' RND CST Culvert with CPC Aprons
RR-12	Rattler's Run Creek	Wilbur Ellis	Town of Fairfield	Non-Barrier	2-4' RND CST Culverts with CPC Aprons
RR-13	Rattler's Run Creek	Fairfield Stockpile Site	Town of Fairfield	Non-Barrier	2- 5' RND CST Culverts
RR-14	Rattler's Run Creek	NU Chem, 1st St	Town of Fairfield	Non-Barrier	2-4' RND CST Culverts
RR-15	Rattler's Run Creek	Tire Factory	Town of Fairfield	Non-Barrier	2- RND PCC Culverts

RR-16	Rattler's Run Creek	Private (Behind Shop)	Town of Fairfield	Non-Barrier	10' RND CST Culvert
RR-17	Rattler's Run Creek	Ticknor St	Town of Fairfield	Non-Barrier	10' span CPC Arch Bridge
RR-18	Rattler's Run Creek	City Park	Town of Fairfield	Non-Barrier	PCC Foot Bridge
RR-19	Rattler's Run Creek	10' DS of Main St	Town of Fairfield	Non-Barrier	Wooden Foot Bridge set on CPC Abutments
RR-20	Rattler's Run Creek	Main St	Town of Fairfield	Non-Barrier	CPC Bridge
RR-21	Rattler's Run Creek	RR Crossing	BNSF	Non-Barrier	Wood Bridge
RR-22	Rattler's Run Creek	Railroad Acess	BNSF	Possible	1.5' RND CST Culvert, slope Velocity
RR-23	Rattler's Run Creek	Rattler's Run Rd	Spokane County	Unknown	unknown
RR-24	Rattler's Run Creek	Good Samaritan Rd	Spokane County	Non-Barrier	6' RND CST Culvert with CPC apron on Up Stream side
RR-25	Rattler's Run Creek	Private Ag field access	Private	Possible	4' RND CST Culvert
RR-26	Rattler's Run Creek	Truax Rd.	Spokane County	Non-Barrier	4' RND CST Culvert
RR-27	Rattler's Run Creek	Truax Rd.	Spokane County	Unknown	unknown
RR-28	Rattler's Run Creek	Private Drive	Private	Possible	3' RND CST with Aprons 0.2 outfall drop, slope velocity
RR-29	Rattler's Run Creek	Truax Rd.	Spokane County	Non-Barrier	3' RND CST Culvert
RR-30	Rattler's Run Creek	Truax Rd.	Spokane County	Unknown	unknown
HCL-1(a)	Indian Creek	Government Way	City of Spokane	Possible	3' RND CST Culvert, slope, velocity
HCL-1(b)	Indian Creek	Greenwood Rd.	City of Spokane	Non-Barrier	8' BOX CPC Culvert
HCL-1(c)	Indian Creek	Greenwood Rd./ Indian Canyon Dr Intersection	City of Spokane	Possible	Old rock/concrete mix Culvert, 1' hydraulic jump.
HCL-1(d)	Indian Creek	Palisades Park, Natural Feature	City of Spokane	Barrier	50-60' Waterfall
HCL-1(e)	Indian Creek	Unimproved road	Private	Barrier	Road, no culvert or bridge
HCL-1(f)	Indian Creek	Bonnie Dr.	City of Spokane	Barrier	3'RND CST Culvert, 0.8 outfall drop, poor rock placement
HCL-2(a)	Garden Springs Creek	Private Driveway	Private	Possible	3' RND CST Culvert encased in concrete, slope velocity
HCL-2(b)	Garden Springs Creek	Natural Feature	Private	Barrier	Series of Waterfalls, 6', 10', 3'.
HCL-2(c)	Garden Springs Creek	Highway 195	Wash. DOT	Possible	2-3' RND CST Culvert, slope, velocity

Crossing ID#	Waterbody	Crossing Location	Jurisdiction	Barrier Classifications	Crossing Type/Field Notes
HCL-3	Hangman Creek, Mainstem	Riverside Ave.	City of Spokane	Non-Barrier	Bridge
HCL-4	Hangman Creek, Mainstem	Sunset Blvd.	City of Spokane	Non-Barrier	Bridge
HCL-5	Hangman Creek, Mainstem	RR Crossing	BNSF	Non-Barrier	Bridge/Trestle
HCL-6	Hangman Creek, Mainstem	I-90	Wash. DOT	Non-Barrier	Bridge
HCL-7	Hangman Creek, Mainstem	11th Ave	City of Spokane	Non-Barrier	Bridge
HCL-8	Hangman Creek, Mainstem	Chestnut St.	City of Spokane	Non-Barrier	Bridge
HCL-9	Hangman Creek, Mainstem	Inland Empire Way	City of Spokane	Non-Barrier	Bridge
HCL-10	Hangman Creek, Mainstem	RR Crossing	BNSF	Non-Barrier	Bridge/Trestle
HCL-11	Hangman Creek, Mainstem	Private Road Crossing	City of Spokane	Non-Barrier	Kampa's Bridge
HCL-12	Hangman Creek, Mainstem	Bridlewood Ln.	City of Spokane	Non-Barrier	Bridge
HCL-13	Hangman Creek, Mainstem	Hatch Rd.	City of Spokane	Non-Barrier	Bridge

HCL-14(a)	Un-named Trib. #1	Private Drive (Horse Boarding)	Spokane County	Non-Barrier	2' CPC Arch Culvert with Aprons
HCL-14(b)	Un-named Trib. #1	Hangman Valley Rd	Spokane County	Unknown	unknown
HCL-15(a)	Un-named Trib. #2	US 195	Wash. DOT	Unknown	unknown
HCL-15(b)	Un-named Trib. #2	Gibbs Rd.	Spokane County	Barrier	18" RND CST Culvert, 2' Outfall drop, set on top plugged culvert
HCL-16(a)	Un-named Trib. #3	Hangman Valley Rd	Spokane County	Unknown	unknown
HCL-16(b)	Un-named Trib. #3	Palouse Highway	Spokane County	Unknown	unknown
HCL-16(c)	Un-named Trib. #3	Driveway, 200' upstream of Hwy	Private	Unknown	unknown
HCL-16(d)	Un-named Trib. #3	Regal Rd	Spokane County	Possible	5' RND PCC Culvert, slope/velocity
HCL-16(e)	Un-named Trib. #3	Private Res. Driveway	Private	Possible	4' RND PCC Culvert
HCL-16(f)	Un-named Trib. #3	Private Res. Driveway	Private	Possible	4' RND PCC Culvert
HCL-16(g)	Un-named Trib. #3	Private Res. Driveway	Private	Possible	4' RND PCC Culvert
HCL-16(h)	Un-named Trib. #3	Private Res. Driveway	Private	Barrier	4' RND CST Mated to 4' PCC RND, 1' outfall drop, slope, velocity
HCL-16(i)	Un-named Trib. #3	Private Res. Driveway	Private	Barrier	Wood/CPC Dam with Control Gate (opened). 2' tall
HCL-16(j)	Un-named Trib. #3	Palouse Highway	Spokane County	Non-Barrier	4' RND PCC Culvert
HCL-16(k)	Un-named Trib. #3	Ellis Rd	Spokane County	Possible	5' RND CST, slope, velocity
HCL-16(l)	Un-named Trib. #3	Driveway off Jameson Rd	Private	Unknown	unknown
HCL-16(m)	Un-named Trib. #3	Clare Center Driveway	Private	Possible	2.5' RND PCC Culvert, slope, velocity, H2O covered at d.s. end
HCL-16(n)	Un-named Trib. #3	Hilby Rd	Spokane County	Barrier	4' RND CST, 2' outfall drop, slope velocity
HCL-16(o)	Un-named Trib. #3	Prarie View Rd	Private	Unknown	unknown
HCL-16(p)	Un-named Trib. #3	Hangman Valley Rd	Spokane County	Unknown	unknown
HCL-17(a)	Un-named Trib. #4	Private Drive	Private	Possible	18" RND CST Culvert, slope, velocity
HCL-18	Hangman Creek, Mainstem	Sunburst Ln. (Hangman Valley GC)	Parks & Rec.	Non-Barrier	Bridge
HCL-19	Hangman Creek, Mainstem	Valley Chapel Rd.	Spokane County	Non-Barrier	Bridge
HCM-1	Hangman Creek, Mainstem	Valley Chapel Rd.	Spokane County	Non-Barrier	Bridge
HCM-2	Courtney Canyon Cr.	Latah Creek Rd.	Spokane County	Unknown	unknown
HCM-2(a)	EB Courtney Canyon Cr.	Heaton Rd	Spokane County	Non-Barrier	3' RND CST Culvert
HCM-2(b)	WB Courtney Canyon Cr.	Heaton Rd	Spokane County	Non-Barrier	6' RND CST Culvert

Crossing ID#	Waterbody	Crossing Location	Jurisdiction	Barrier Classifications	Crossing Type/Field Notes
HCM-2(c)	WB Courtney Canyon Ck	Cornwall Rd.	Spokane County	Barrier	4' RND CST Culvert, Pond upstream with stand pipe
HCM-3	Un-named Trib. #2	Private Ag field access off Watt Rd	Private	Possible	3' RND CST Culvert, slope, velocity.
HCM-4(a)	Mid. Fork Un-named Trib. #3	N. Kentuck Trails Rd	Spokane County	Non-Barrier	3.5' RND CST Culvert material inside
HCM-4(b)	S. Fork Un-named Trib #3	N. Kentuck Trails Rd	Spokane County	Non-Barrier	3.5' RND CST Culvertchannel ditched upstream
HCM-4(c)	S. Fork Un-named Trib #3	Lewis Rd	Spokane County	Barrier	(2) 3.5' RND CST Culvert, 1.5' outfall drop
HCM-4(d)	S. Fork Un-named Trib #3	Private Ag field access	Private	Barrier	4.5' RND CST Culvert, 0.8' outfall drop
HCM-4(e)	S. Fork Un-	Private Ag field access	Private	Non-Barrier	3' RND PCC Culvert, material inside

	named Trib #3				
HCM-4(f)	S. Fork Un-named Trib #3	Lewis Rd	Spokane County	Non-Barrier	3' RND CST Culvert, material inside
HCM-5(a)	Un-named Trib. #4	Cahill Rd	Spokane County	Possible	5' RND CST Culvert, slope, velocity, no material inside
HCM-5(b)	Un-named Trib. #4	Keevey Rd	Spokane County	Unknown	summer road
HCM-6	Hangman Creek, Mainstem	Keevey Rd.	Spokane County	Non-Barrier	PCC Bridge
HCM-7(a)	Un-named Trib. #5	Cahill Rd	Spokane County	Non-Barrier	Wood Bridge with PCC pile ends/abutments
HCM-7(b)	Un-named Trib #5	Private Crossing	Private	Non-Barrier	PCC Bridge
HCM-7(c)	Un-named Trib #5	Driveway	Private	Possible	2.5' RND PCC Culvert, slope velocity, completely full of water
HCM-7(d)	Un-named Trib #5	Bradwhaw Rd	Spokane County	Possible	(2) 3' CST RND, slope, velocity
HCM-7(e)	Un-named Trib #5	Spangle Waverly Rd	Spokane County	Non-Barrier	4' BOX CPC Culvert
HCM-7(f)	Un-named Trib #5	Old Bridge 25' upstream of Spangle Waverly Rd	Private	Non-Barrier	Failed PCC Bridge
HCM-7(g)	Un-named Trib #5	N. Pine Cr. Rd	Spokane County	Non-Barrier	3' RND CST Culvert
HCM-7(h)	Un-named Trib #5	Priavte Ag Access Rd	Private	Unknown	unknown
HCM-7(i)	Un-named Trib #5	Private Ag Access Rd	Private	Unknown	unknown
HCM-8	Hangman Creek, Mainstem	Kentuck Trails Rd.	Spokane County	Non-Barrier	Bridge
HCM-9	Hangman Creek, Mainstem	West Bradshaw Rd.	Spokane County	Non-Barrier	Bridge
HCU-1(a)	Un-named Trib #1	Private Pond Control	Spokane County	Possible	Man-made pond near confluence, possible stand pipe (barrier)
HCU-1(b)	Un-named Trib #1	Private Ag./Forestland access (Loy Rd?)	Private	Possible	(2) 3' CST RND Culvert, slope/velocity
HCU-1(c)	Un-named Trib #1	E Hays Rd	Spokane County	Non-Barrier	3' CST RND Culvert, material inside
HCU-1(d)	Un-named Trib #1	Kentuck Trails Rd	Spokane County	Non-Barrier	4' CST RND Culvert, material inside
HCU-2	Hangman Creek, Mainstem	Hays Rd.	Spokane County	Non-Barrier	Bridge
HCU-3(a)	Un-named Trib #2	Private Ag. Field access	Private	Possible	(2) 3' PCC RND Culvert, slope/velocity
HCU-3(b)	Un-named Trib #2	Hays Rd.	Spokane County	Non-Barrier	5.5' CPC Box Cu;vert
HCU-3(c)	Un-named Trib #2	Private Barn	Private	Non-Barrier	Large Barn built over stream channel
HCU-3(d)	Un-named Trib #2	Hays Rd.	Spokane County	Non-Barrier	5.5' CST RND Culvert into 5' CPC Box Culvert
HCU-3(e)	Un-named Trib #2	Hays Rd.	Spokane County	Non-Barrier	4' CPC Box Culvert
HCU-3(f)	S. Fork Un-named Trib #2	Old RR Crossing	BNSF	Non-Barrier	(2) 3' PCC RND Culvert, material inside
HCU-3(g)	S. Fork Un-named Trib #2	Prairie View Rd	Spokane County	Non-Barrier	3' PCC RND & partially plugged CPC Box Culvert, material inside
HCU-3(h)	N. Fork Un-named Trib #2	E Loy Rd	Spokane County	Possible	3' CST RND Culvert, slope/velocity
HCU-3(i)	N. Fork Un-named Trib #2	E Prairie View Rd	Spokane County	Non-Barrier	3' CST RND Culvert, slight damage on u/s end
HCU-4	Hangman Creek, Mainstem	Spangle-Waverly Rd.	Spokane County	Non-Barrier	Bridge
HCU-5(a)	Un-named Trib #3	Waverly Cemetary Rd	Spokane County	Possible	5' CAL RND Culvert, slope/velocity, plunge pool

Crossing ID#	Waterbody	Crossing Location	Jurisdiction	Barrier Classifications	Crossing Type/Field Notes
HCU-5(b)	Un-named Trib #3, Trib.	Waverly Plaza Rd	Spokane County	Possible	(2) 2' CST RND Culvert, slope/velocity
HCU-5(c)	Un-named Trib #3	Clausen Farms, Inc. Rd.	Private	Non-Barrier	9' CPC Box Culvert

HCU-5(d)	Un-named Trib #3	Waverly Plaza Rd	Spokane County	Non-Barrier	7.5' CPC Box Culvert
HCU-5(e)	Un-named Trib #3, Trib.	Private Driveway	Private	Possible	(2) 2' PCC RND Culvert w/aprons, slope/velocity
HCU-5(f)	Un-named Trib #3	Private X-ing access to shop	Private	Non-Barrier	Steel Bridge
HCU-5(g)	Un-named Trib #3	Prairie View Rd	Spokane County	Non-Barrier	(2) 3' CST RND Culvert w/grates
HCU-5(h)	Un-named Trib #3	Morrison Rd.	Spokane County	Non-Barrier	3.5' PCC RND Culvert
HCU-5(i)	Un-named Trib #3	Private Ag. Field access	Private	Non-Barrier	3.5' PCC RND Culvert
HCU-6	Hangman Creek, Mainstem	Prairie View Rd.	Spokane County	Non-Barrier	Bridge
HCU-7(a)	Un-named Trib #4	Waverly Rd	Spokane County	Unknown	unknown
HCU-7(b)	Un-named Trib #4	Sanders Rd	Spokane County	Unknown	unknown
HCU-8	Hangman Creek, Mainstem	Roberts Rd.	Spokane County	Non-Barrier	Bridge
HCU-9(a)	Un-named Trib #5	Waverly Rd	Spokane County	Non-Barrier	6' CST RND Culvert
HCU-9(b)	Un-named Trib #5	Spokane Co. Pit site access off of SR 27	Spokane County	Possible	(2) 2.5' PCC RND Culvert w/aprons, slope/velocity
HCU-9(c)	Un-named Trib #5	Private Driveway off of SR 27	Private	Possible	(2) 2.5' PCC RND Culvert w/aprons, slope/velocity
HCU-9(d)	Un-named Trib #5	SR 27	Wash. DOT	Non-Barrier	10' CPC Box Culvert
HCU-9(e)	Un-named Trib #5	Old RR Crossing	BNSF	Barrier	(2) 3' CST RND Culverts, slope/velocity, 3' Outfall drop
HCU-9(f)	Un-named Trib #5	Private Driveway off of SR 27	Private	Unknown	unknown
HCU-10(a)	Un-named Trib #6	SR 27/BNSF	Wa. DOT/BNSF	Unknown	unknown
HCU-10(b)	Un-named Trib #6	Adams Rd.	Spokane County	Non-Barrier	4' CST RND Culvert
HCU-10(c)	Un-named Trib #6	Private Driveway off of Adams Rd.	Private	Unknown	unknown
HCU-11(a)	Un-named Trib #7	Roberts Rd	Spokane County	Possible	5' CST RND Culvert, slope/velocity, plunge pool
HCU-11(b)	Un-named Trib #7	Private Driveway (36710 S. Roberts Rd.)	Private	Possible	3' PCC RND Culvert, slope/velocity, outfall drop
HCU-11(c)	Un-named Trib #7	Roberts Rd	Spokane County	Non-Barrier	4' CST RND Culvert
HCU-11(d)	Un-named Trib #7	Kelso Rd	Spokane County	Non-Barrier	3' CST RND Culvert, material inside
HCU-11(e)	Un-named Trib #7	Darknell Rd	Spokane County	Unknown	unknown (summer road)
HCU-12(a)	Un-named Trib #8	Old RR Crossing	BNSF	Non-Barrier	Wood Bridge
HCU-12(b)	Un-named Trib #8	SR 27	Wash. DOT	Non-Barrier	5' CPC Box Culvert
HCU-12(c)	Un-named Trib #8	Adams Rd	Spokane County	Non-Barrier	4' CST RND Culvert
HCU-12(d)	Un-named Trib #8	Marsh Rd	Spokane County	Unknown	unknown
HCU-13(a)	Un-named Trib #9	Old RR Crossing	BNSF	Non-Barrier	Wood Bridge
HCU-13(b)	Un-named Trib #9	SR 27	Wash. DOT	Non-Barrier	5' CPC Box Culvert
HCU-13(c)	Un-named Trib #9	Marsh Rd	Spokane County	Barrier	(2) 2' CST RND Culverts, slope/velocity, 0.6' Outfall drop
HCU-14(a)	Un-named Trib #10	SR 27	Spokane County	Non-Barrier	5' Wooden Box Culvert
HCU-14(b)	Un-named Trib #10	Marsh Rd.	Spokane County	Non-Barrier	6' CPC Box Culvert
HCU-15(a)	Un-named Trib #11	Griffith	Spokane County	Unknown	unknown
HCU-15(b)	N. Fork Un-named Trib #11	Kelso Rd	Spokane County	Unknown	unknown
HCU-16(a)	Un-named Trib	SR 27	Wash. DOT	Unknown	unknown

Crossing ID#	Waterbody	Crossing Location	Jurisdiction	Barrier Classifications	Crossing Type/Field Notes
	#12				
HCU-17(a)	Un-named Trib #13	Spring Valley Rd	Spokane County	Unknown	unknown
HCU-17(b)	Un-named Trib #13	Bourne Rd	Spokane County	Unknown	unknown
HCU-18	Hangman Creek, Mainstem	Spring Valley Rd.	Spokane County	Non-Barrier	Bridge
HCU-19	Hangman Creek, Mainstem	Marsh Rd.	Spokane County	Non-Barrier	Bridge
HCU-20	Hangman Creek, Mainstem	Fairbanks Rd.	Whitman County	Non-Barrier	Bridge
HCU-21(a)	Un-named Trib #14	SR 27	Wash. DOT	Unknown	unknown
HCU-22(a)	Un-named Trib #16	Lone Pine Rd	Spokane County	Unknown	unknown
HCU-23	Hangman Creek, Mainstem	Line St.	City of Tekoa	Non-Barrier	Bridge
HCU-24	Hangman Creek, Mainstem	400' U/S of Little Hangman Confl.	City of Tekoa	Possible	Utility x-ing w/ CPC Re-enforcement
HCU-25	Hangman Creek, Mainstem	200' D/S of Little Hangman Confl.	City of Tekoa	Possible	Utility x-ing w/ CPC Re-enforcement
HCU-26	Little Hangman Creek	Washington St.	City of Tekoa	Non-Barrier	Bridge
HCU-27	Little Hangman Creek	SR 27/Crosby St.	City of Tekoa	Non-Barrier	Bridge
HCU-28(a)	Un-named Trib #17	SR 27	Wash. DOT	Unknown	unknown
HCU-28(b)	Un-named Trib #17	Desire St	Spokane County	Unknown	unknown
HCU-28(c)	Un-named Trib #17	County Rd	Spokane County	Unknown	unknown
HCU-28(d)	Un-named Trib #17	Jamison Rd	Spokane County	Unknown	unknown
HCU-28(e)	Un-named Trib #17	Morris Rd.	Spokane County	Unknown	unknown
HCU-28(f)	Un-named Trib #17	SR 27	Wash. DOT	Unknown	unknown
HCU-29(a)	Un-named Trib #18	Tekoa-Farmington Rd.	Spokane County	Unknown	unknown
HCU-29(b)	Un-named Trib #18	Cambell Rd	Spokane County	Unknown	unknown
HCU-30	Hangman Creek, Mainstem	Elizabeth St.	City of Tekoa	Non-Barrier	Bridge
HCU-31	Hangman Creek, Mainstem	SR 27	Wash. DOT	Non-Barrier	Bridge
HCU-32	Hangman Creek, Mainstem	Tekoa-Farmington Rd.	Whitman County	Non-Barrier	Bridge
HCU-33	Hangman Creek, Mainstem	Campbell Rd.	Whitman County	Non-Barrier	Bridge
HCU-34	Hangman Creek, Mainstem	Tom Rambo Rd., near Stateline (USGS Gage)	Whitman County	Non-Barrier	Bridge
RC-1	Rock Creek, Mainstem	Valley Chapel Rd.	Spokane County	Non-Barrier	Bridge
RC-2 (a)	Un-named Trib. #1	Valley Chapel Rd.	Spokane County	Non-Barrier	3' CPC BOX Culvert w/aprons
RC-2 (b)	Un-named Trib. #1	Valley Chapel Rd.	Spokane County	Barrier	3' CPC BOX Culvert w/aprons, 1 ft drop
RC-2 (c)	Un-named Trib. #1	Forsland Rd./Private Pond d/s	Private	Barrier	4' CST RND Culvert (slope/velocity)/Earth Dam (pond control)
RC-3(a)	Cottonwood Creek	Elder Rd.	Spokane County	Barrier	8' CST RND Culvert, 2.5' outfall drop
RC-3(b)	Cottonwood Creek	Stoughton Rd.	Spokane County	Non-Barrier	36" CST RND Culvert
RC-3(c)	Cottonwood Creek	Darknell Rd.	Spokane County	Non-Barrier	36" CST RND Culvert

RC-3(d)	Cottonwood Creek	SR 27	Wash. DOT	Possible	4' CST RND, velocity, small plunge pool
RC-4(a)	Little Cottonwood Creek	Drumheller Rd.	Spokane County	Unknown	Unknown
RC-4(b)	Little Cottonwood Creek	Elder Rd.	Spokane County	Barrier	(2) 24" CST RND Culverts, 3' drop
RC-4(c)	Little Cottonwood Creek	Jackson Rd.	Spokane County	Unknown	Unknown

Crossing ID#	Waterbody	Crossing Location	Jurisdiction	Barrier Classifications	Crossing Type/Field Notes
RC-5(a)	Fisher Creek	Darknell Rd.	Spokane County	Non-Barrier	6' CPC BOX Culvert
RC-5(b)	Fisher Creek	Valley Chapel Rd.	Spokane County	Non-Barrier	8' CPC BOX Culvert
RC-5(c)	Fisher Creek	Valley Chapel Rd.	Spokane County	Non-Barrier	24" CST RND Culvert
RC-6(a)	Ochlare Creek	Jackson Rd.	Spokane County	Possible	8' CST RND culvert, big plunge pool, slope and velocity
RC-6(b)	Ochlare Creek, Trib.	SR 27	Wash. DOT	Non-Barrier	36" CST BOX cluvert, 2' drop
RC-6(c)	Ochlare Creek, Trib.	Norski Rd./RR Crossing	Spokane Co./BNSF	Non-Barrier	36" CST RND Culvert
RC-6(d)	Ochlare Creek, Trib.	Marsh Rd.	Spokane County	Non-Barrier	36" CST RND Culvert
RC-6(e)	Ochlare Creek	SR 27	Wash. DOT	Unknown	Unknown
RC-7	Rock Creek, Mainstem	Jackson Rd.	Spokane County	Non-Barrier	Bridge
RC-8(a)	Un-named Trib. #2	Driveway/Cameron Rd.	Private	Barrier	8' Span, 6' rise CST SQSH culvert, 1' outfall drop
RC-8(b)	Un-named Trib. #2	Jackson Rd.	Spokane County	Barrier	4.5' CST RND culvert, Slope/Velocity, outfall drop
RC-8(c)	Un-named Trib. #2	Jackson Rd.	Spokane County	Barrier	6.5' CPC BOX Culvert, sheet flow (velocity), outfall drop
RC-9(a)	Un-named Trib. #3	Valley Chapel Rd.	Spokane County	Barrier	36" CPC BOX Culvert, sheet flow (velocity), 1' outfall drop
RC-10	Rock Creek, Mainstem	SR 27	Wash. DOT	Non-Barrier	Bridge
RC-11	Rock Creek, Mainstem	Old RR Crossing	BNSF	Non-Barrier	Abandoned
RC-12(a)	Un-named Trib. #4	Weaver St.	City of Rockford	Non-Barrier	48" CST RND culvert
RC-12(b)	Un-named Trib. #4	Lee St.	City of Rockford	Possible	48" CST RND (LB) & 36" CST RND (RB) culverts, slope/velocity
RC-12(c)	Un-named Trib. #4	RR Crossing	BNSF	Possible	2.5' CST RND culvert, slope/velocity
RC-12(d)	Un-named Trib. #4	SR 278	Wash. DOT	Possible	4' CST RND culvert w/grate & aprons, slope/velocity
RC-12(e)	Un-named Trib. #4	Lake St.	City of Rockford	Possible	4' CST RND culvert w/grate & aprons, slope/velocity
RC-12(f)	Un-named Trib. #4	Driveway/Ag. Field access	Private	Possible	4' CST RND culvert w/grate & aprons, slope/velocity
RC-13(a)	Mica Creek	1st St	City of Rockford	Non-Barrier	Bridge
RC-13(b)	Mica Creek, EB	Harvard Rd.	Spokane County	Non-Barrier	9' RND CST culvert
RC-13(c)	Mica Creek, EB	Molter Rd.	Spokane County	Non-Barrier	5' CST RND (main), 6' RND CAL (overflow)
RC-13(d)	Mica Creek, EB	Drumheller Rd.	Spokane County	Barrier	(2) 7'span x 5'rise CST SQSH culverts, slope/velocity
RC-13(e)	Mica Creek, WB	Old Elder Rd.	Spokane County	Non-Barrier	18' CPC BOX culvert
RC-13(f)	Mica Creek, WB	Elder Rd.	Spokane County	Barrier	10' Span CST SQSH culvert 0.6' drop, slope/velocity
RC-13(g)	Mica Creek, WB Trib.	Harvard Rd.	Spokane County	Non-Barrier	4.5' CST RND culvert
RC-13(h)	Mica Creek, WB	Stoughton Rd.	Spokane	Unknown	Unknown

	Trib.		County		
RC-13(i)	Mica Creek, WB	Stoughton Rd.	Spokane County	Unknown	Unknown
RC-13(j)	Mica Creek, WB	Harvard Rd.	Spokane County	Unknown	Crossing #1, Double Barrel Bird Ranch
RC-13(k)	Mica Creek, WB	Harvard Rd.	Spokane County	Unknown	Crossing #2, Double Barrel Bird Ranch
RC-14	Rock Creek, Mainstem	Emma St./SR 278	City of Rockford	Non-Barrier	Bridge
RC-15(a)	Un-named Trib. #5	Hoxie Rd./SR 278	City of Rockford	Non-Barrier	8' CPC BOX Culvert, material throughout
RC-15(b)	Un-named Trib. #5	Sprague St.	City of Rockford	Possible	48" CST RND culvert, slope/velocity
RC-16	Rock Creek, Mainstem	Driveway/Private Rd.	Private	Non-Barrier	Bridge
RC-17	Rock Creek, Mainstem	Hoxie Rd./SR 278	Spokane County	Non-Barrier	Bridge
RC-18	Rock Creek, Mainstem	Hoxie Rd./SR 278	Spokane County	Non-Barrier	Bridge

Crossing ID#	Waterbody	Crossing Location	Jurisdiction	Barrier Classifications	Crossing Type/Field Notes
RC-19	Rock Creek, North Fork	Hoxie Rd./SR 278	Spokane County	Non-Barrier	Bridge
RC-20(a)	Murphy Creek	Dunkle Rd., near Stateline	Spokane County	Possible	(2) 5' CST RND Culverts, headcut d/s, livestock impacts
RC-20(b)	Murphy Creek, Trib.	Rockford-Idaho Rd.	Spokane County	Unknown	Summer Rd., unable to evaluate
RC-20(c)	Murphy Creek, Trib.	Starr Rd.	Spokane County	Unknown	Summer Rd., unable to evaluate
RC-20(d)	Murphy Creek, Trib.	Rockford-Idaho Rd.	Spokane County	Unknown	Summer Rd., unable to evaluate
RC-20(e)	Murphy Creek	Rockford-Idaho Rd.	Spokane County	Non-Barrier	10' CST RND multi-plate culvert, headcut u/s, livestock impacts
RC-20(f)	Murphy Creek	Cameron Rd.	Spokane County	Unknown	Summer Rd., unable to evaluate
RC-20(g)	Murphy Creek	Stringham Rd.	Spokane County	Possible	Suspected undersized culvert, flooded out (underwater)
RC-20(h)	Murphy Creek	Stringham Rd.	Spokane County	Non-Barrier	(2) 48" CST RND Culverts
RC-20(i)	Murphy Creek	Starr Rd.	Spokane County	Unknown	Unknown
RC-20(j)	Murphy Creek	Stringham Rd.	Spokane County	Unknown	Unknown
RC-21	Rock Creek, North Fork	Dunkle Rd., near Stateline	Spokane County	Non-Barrier	Bridge
RC-22(a)	Un-named Trib. #6	Chatcolet Rd.	Spokane County	Non-Barrier	8' PCC BOX Culvert, material throughout
RC-22(b)	Un-named Trib. #6, N. Fork	Harvard Rd.	Spokane County	Possible	(2) 48" CST RND Culverts, LB plugged, slope/velocity
RC-22(c)	Un-named Trib. #6, N. Fork	Campbell Rd.	Spokane County	Unknown	Unknown
RC-22(d)	Un-named Trib. #6, S. Fork	Harvard Rd.	Spokane County	Possible	(2) 48" CST RND Culverts, plunge pool, slope/velocity
RC-22(e)	Un-named Trib. #6, S. Fork	Private x-ing/Ag. Field access	Private	Possible	48" CST RND culvert, slope/velocity
RC-22(f)	Un-named Trib. #6, S. Fork	Calumet Rd.	Spokane County	Possible	5' CST RND, headcut app. 20' u/s, slope/velocity
RC-23	Un-named Trib. #7	Chatcolet Rd.	Spokane County	Unknown	Unknown
RC-24	Rock Creek, South Fork	Chatcolet Rd.	Spokane County	Non-Barrier	Bridge
RC-25(a)	Rose Creek	Chatcolet Rd.	Spokane County	Non-Barrier	Bridge
RC-25(b)	Rose Creek	Idaho Rd.	Spokane County	Non-Barrier	Bridge
RC-25(c)	Rose Creek	Idaho Rd.	Spokane County	Non-Barrier	Bridge
RC-25(d)	Rose Creek	Idaho Rd.	Spokane County	Non-Barrier	Bridge

RC-25(e)	Rose Creek	Bradshaw Rd.	Spokane County	Non-Barrier	Wood Bridge w/concrete abutments
RC-25(f)	Rose Creek	Idaho Rd.	Spokane County	Possible	(2) 5' CST RND Culverts, slope/velocity
RC-26	Rock Creek, South Fork	Un-named spur/Private X-ing	Private	Non-Barrier	Bridge
RC-27	Rock Creek, South Fork	Bradshaw Rd.	Spokane County	Non-Barrier	Bridge
RC-28(a)	Un-named Trib. #8	Private x-ing/Ag. Field access	Private	Possible	48" CST RND culvert w/aprons, slope/velocity
RC-28(b)	Un-named Trib. #8	Starr Rd.	Spokane County	Possible	36" CST RND (LB) & 36" PCC RND (RB) culverts, slope/velocity
RC-28(c)	Un-named Trib. #8	Bradshaw Rd.	Spokane County	Barrier	36" CST RND culvert, slope/velocity
RC-29(a)	Un-named Trib. #9	Molter Rd./Bradshaw Rd.	Spokane County	Possible	5' CST RND Culvert, slope/velocity, approach
RC-29(b)	Un-named Trib. #9, Trib.	Private x-ing/Ag. Field access	Private	Possible	5' CST RND Culvert, slope/velocity, headcut near confluence
RC-29(c)	Un-named Trib. #9	Harvard Rd.	Spokane County	Possible	5' CST RND Culvert, slope/velocity
RC-29(d)	Un-named Trib. #9	Bradshaw Rd.	Spokane County	Possible	6' CPC BOX Culvert, sheet flow inside, velocity
RC-30(a)	Un-named Trib. #10	Private x-ing/Ag. Field access	Private	Possible	(3) 24" CST RND culverts, plugged, overflowed
RC-30(b)	Un-named Trib. #10	Starr Rd.	Spokane County	Possible	24" CST RND culvert, slope/velocity, questionable fish use
RC-31(a)	Un-named Trib. #11	Harvard Rd.	Spokane County	Barrier	36" CST RND culvert, slope/velocity, 0.8 outfall drop

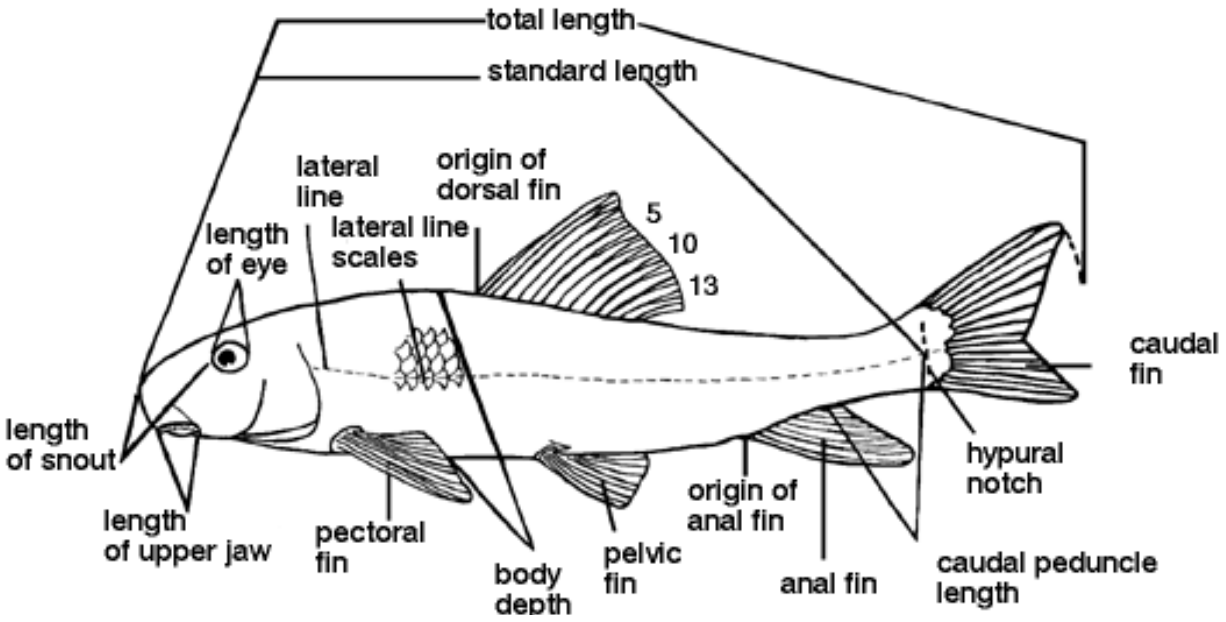
Crossing ID#	Waterbody	Crossing Location	Jurisdiction	Barrier Classifications	Crossing Type/Field Notes
RC-32(a)	Un-named Trib. #12	Harvard Rd.	Spokane County	Barrier	36" CST RND culvert, slope/velocity, 1' outfall drop, headcut u/s
RC-32(b)	Un-named Trib. #12	Truax Rd.	Spokane County	Non-Barrier	48" CST RND culvert, poor approach
RC-32(c)	Un-named Trib. #12	Private driveway	Private	Non-Barrier	36" CST RND culvert, bed material throughout
RC-33(a)	Un-named Trib. #13	Harvard Rd.	Spokane County	Unknown	Unknown
RC-34(a)	Un-named Trib. #14	Harvard Rd.	Spokane County	Unknown	Unknown
RC-35	Rock Creek, South Fork	Truax Rd.	Spokane County	Non-Barrier	Bridge
RC-36	Rock Creek, South Fork	Harvard Rd.	Spokane County	Non-Barrier	PCC Bridge
RC-37	Rock Creek, South Fork	Private driveway (Ostheller's)	Spokane County	Non-Barrier	PCC Bridge
RC-38(a)	Un-named Trib. #15	Powers Rd.	Spokane County	Non-Barrier	36" CST RND culvert, bed material throughout
RC-38(b)	Un-named Trib. #15	Harvard Rd.	Spokane County	Barrier	(2) 2.5' CST RND culverts, slope/velocity, 0.6' outfall drop
RC-38(c)	Un-named Trib. #15	Private x-ing/Ag. Field access	Private	Non-Barrier	36" CST RND culvert, bed material throughout
RC-38(d)	Un-named Trib. #15	Powers Rd.	Spokane County	Non-Barrier	36" CST RND culvert, bed material throughout
RC-38(e)	Un-named Trib. #15	Harvard Rd.	Spokane County	Possible	2.5' CST RND culvert, slope/velocity
RC-39	Rock Creek, South Fork	Truax Rd.	Spokane County	Non-Barrier	CPC Bridge w/aprons
RC-40	Un-named Trib. #16	Starr Rd.	Spokane County	Possible	2.5' CAL RND culvert, slope/velocity, poor approach
RC-41(a)	Un-named Trib. #17	Truax Rd.	Spokane County	Unknown	Unknown
RC-41(b)	Un-named Trib. #17	Powers Rd.	Spokane County	Unknown	Unknown
RC-42	Rock Creek, South Fork	Starr Rd.	Spokane County	Non-Barrier	Wood Bridge w/wooden pilings
RC-43(a)	Un-named Trib. #18	Private x-ing/Ag. Field access	Private	Barrier	4' CST RND Culvert, slope/velocity, 0.6' Outfall drop
RC-43(b)	Un-named Trib.	Truax Rd.	Spokane	Possible	4' CST RND Culvert, slope/velocity

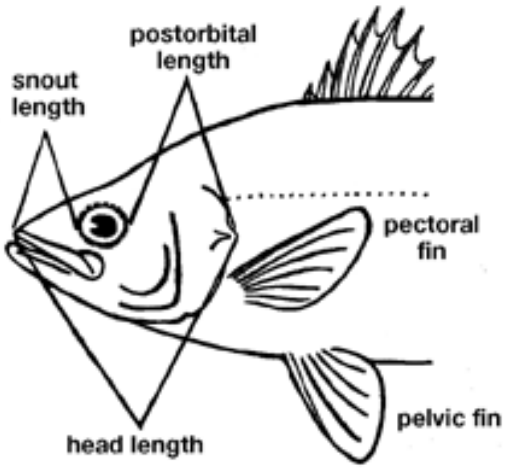
	#18		County		
RC-43(c)	Un-named Trib. #18	Starr Rd.	Spokane County	**Possible**	3' CST RND Culvert, slope/velocity
RC-44(a)	Un-named Trib. #19	Truax Rd.	Spokane County	**Barrier**	5' CST RND Culvert, slope/velocity, 1' Outfall drop
RC-44(b)	Un-named Trib. #19	Private x-ing/Ag. Field access	Private	**Non-Barrier**	4' CST RND Culvert
RC-44(c)	Un-named Trib. #19	Stafford Rd.	Spokane County	Unknown	Unknown
RC-44(d)	Un-named Trib. #19	Starr Rd.	Spokane County	Unknown	Unknown
RC-45	Rock Creek, South Fork	Idaho Rd. (State Line)	Spokane County	**Non-Barrier**	Bridge

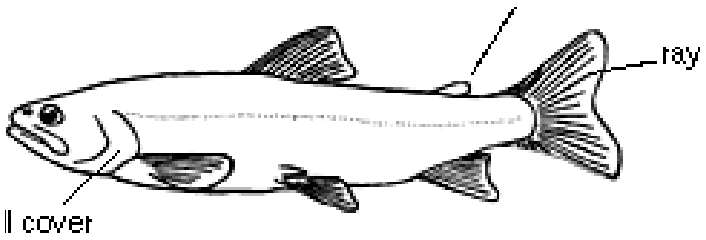
APPENDIX C

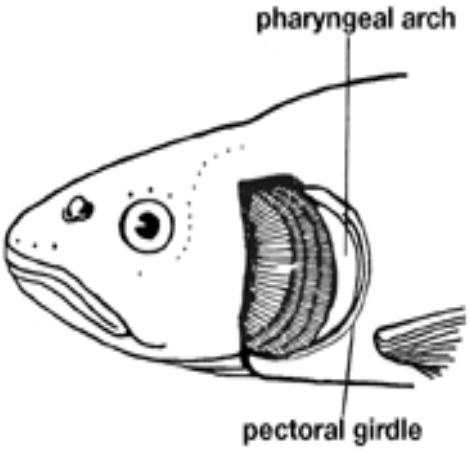
Fisheries of Hangman Creek Watershed

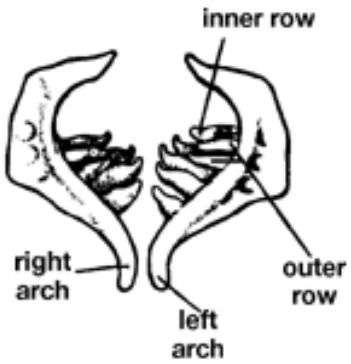
Fish Anatomy











Fish Anatomy Glossary

Adipose Fin
Rayless fin on the midline of the fish's back, between the dorsal and caudal fins.

Air Bladder
See "swim bladder."

Anal Fin
The fin on the underside of a fish, nearest to the tail.

Annulus
Ringlike markings on the scales (or spines and vertebrae) of a fish that are used to determine age.

Anterior
Placed on or near the head or front of an animal, the opposite of posterior.

Barbel
A slender, flexible projection near the mouth of certain fish. It is used for smell and taste.

Body Depth
The measurement of a fish from top to bottom (backbone to belly).

Branchiostegal Rays
The bones that support the gill membranes.

Caudal Fin
The tail fin.

Caudal Peduncle
The part of a fish's body located between the anal fin and the beginning of the caudal fin.

Cleithrum
The large bone that extends from the base of the pectoral fin and forms the posterior edge of the gill chamber. This bone is used to determine the age of some fish (for example, muskies and northern pike) because each year the fish's body adds a new layer of bone. Also see otolith.

Dorsal
Placed on or near the back of an animal, especially on the backbone. It is the opposite of ventral.

Dorsal Fin
The fin or fins on the top (dorsal) side of a fish. Some fish (like trout) have only one dorsal fin. Others (like sculpin) have two dorsal fins.

Fry
Newly-hatched young fish.

Gill Cover
The bones of the fish's head that cover the gills.

Gill Filaments
The threadlike structures connected to the gill arches, used for respiration.

Gill Rakers
Comblike projections that extend from the gill arches.

Hypural Notch
The place on a fish's body between where its backbone ends and its tail begins.

Lateral Line
A row of pores on the side of a fish's body that open into tubes containing organs that are sensitive to low vibrations.

Lateral Line Canal System
A pressure- and sound-sensitive tubular system found in most fish. It consists of the pored openings on the head and lateral line.

Length, Standard
The total length of a fish from head to tail, not including the tail.

Length, Total
The total length of a fish from head to tail, including the tail. Measurements are usually given in total length, unless stated otherwise.

Mandible
The lower jaw.

Mandibular Pores
Small sensory openings on the underside of the lower jaw (mandible).

Maxillary
The upper jaw (especially the lateral bones).

Opercle (or Operculum)
The large bone that serves as the covering of the gills of a fish.

Opercular Membrane
The thin membrane along the posterior edge of the gill cover.

Origin
The point at which the part of the fin nearest the head meets the fish's body.

Otolith
An ear stone (or calcareous concretion) in the inner ear of a bony fish. Each year, a new concretion (layer of bone) is added, which can be used to measure age. Also see cleithrum.

Pectoral Fins
Fins located directly behind the head of the fish. They come in pairs.

Pelvic Fin
A set of fins on the underside (belly) of a fish that are usually placed between the pectoral fins and anal fin.

Posterior
Placed near or on the tail or end of an animal, opposite of anterior.

Rays
Flexible supports for a fin.

Scales
Small, flat plates that fit together to form the external body covering of a fish.

Sensory Pores
The tubular openings found in the lateral line canal system.

Spawn
To produce or deposit eggs; as a noun, spawn refers to the eggs of aquatic animals like fish or amphibians.

Swim Bladder
A sac containing gas and air, present in the upper part of the body cavity, that aids in creating buoyancy and in the respiration of some fishes. (Also called an "air bladder.")

Ventral
Placed near or on the belly or lower surface of an animal, opposite of dorsal.

Vermiculations
Wormlike irregular or wavy lines.

FISH SPECIES OF HANGMAN CREEK WATERSHED

Common Name	Scientific Name	Native	Introduced	Common	Uncommon	Rare	Extirpated
Rainbow trout	*Oncorhynchus mykiss*	X		X			
Redband trout	*Oncorhynchus mykiss gairdneri*	X			X		
Eastern brook trout	*Salvelinus fontinalis*		X	X			
Brown trout	*Salmo trutta*		X			X	
Cutthroat trout	*Salmo clarki*	X				X	
Chinook salmon	*Oncorhynchus tshawytscha*	X					X
Steelhead trout	*Oncorhynchus mykiss*	X					X
Sandroller perch	*Percopsis transmontana*	X					X
Yellow perch	*Perca flavescens*		X			X	
Chiselmouth	*Acrocheilus alutaceus*	X		X			
Brown bullhead	*Ictalurus nebulosus*		X	X			
Redfin pickerel	*Esox americanus*		X		X		
Longnose sucker	*Catostomus catostomus*	X		X			
Bridgelip sucker	*Catostomus columbianus*	X		X			
Largescale sucker	*Catostomus macrocheilus*	X		X			
Torrent sculpin	*Cottus rhotheus*	X			X		
Mottled sculpin	*Cottus bairdi*	X			X		
Northern squawfish	*Ptchocheilus oregonensis*	X		X			
Longnose dace	*Rhinichthys cataractae*	X		X			
Speckled dace	*Rhinichthys osculus*	X		X			
Redside shiner	*Richardsonius balteatus*	X		X			
Tench	*Tinca tinca*		X		X		
Tui chub	*Gila bicolor*		X			X	
Bluegill	*Lepomis macrochirus*		X			X	
Pumpkinseed	*Lepomis gibbosus*		X			X	
Smallmouth bass	*Micropterus dolomieu*		X			X	

Notes:

1. Fish species within the Hangman Creek Watershed according to survey work of Scholz 2004; WDFW 2004; Laumeyer and Maughan 1973; Maughan 1974; Gilbert and Evermann 1893. Some species are recorded through incidental observations.

Rainbow Trout (*Oncorhynchus mykiss*)
Native

Other Names: bows or freshwater salmon
Average size: 2-4 lbs, up to 8 lbs
Spring spawner

Rainbow Trout are actually a land-locked form of the anadromous Steelhead. Their diet consists of eating such things as minnows, crayfish, insects, and other small aquatic life.
Rainbow Trout get their name from the reddish stripe along their sides, but not all Rainbow Trout have really bright red stripes. Mature males who are ready to spawn have the most pronounced red striping while the females are much less dramatic in coloration. The rest of the fish body is usually silvery, darker on top and lighter on bottom for camouflage (if they are dark on top, they are hard to see against the dark back ground of the bottom of the stream, and their light undersides make them hard to see from the bottom looking up because they are hard to see against the light of the sun and sky) with black spots along the back.

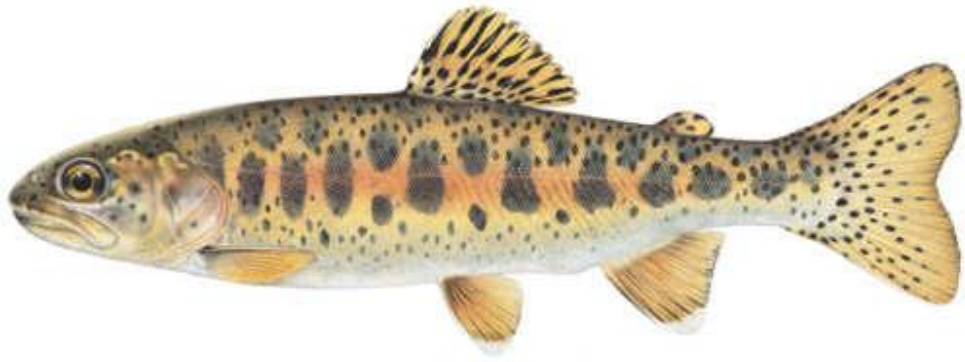
Rainbows actually prefer cold, clear, swift-moving water to live in, but they can survive in fairly warm water as well if they can get enough oxygen. They are found most often in water 55-60 degrees Fahrenheit, but can tolerate temperatures up to 75 degrees.

To spawn, rainbows return to the stream where they were born (they can find it by SMELLING it!!). Here, the female makes a nest called a "redd" by scooping out the gravel with her tail (she doesn't actually use her tail as a shovel in the gravel, but she pumps it so hard that the water forces the gravel to move so that a hole is soon made). Then she lays her eggs in her redd and a male fish fertilizes them.

Known Occurrence:
Mainstem of Hangman Creek, Marshall Creek, Garden Springs Creek, Stevens Creek, California Creek, Cottonwood Creek

Redband Trout (*Oncorhynchus mykiss gairdneri*)
Native

Other Names: redsides
Average size: 6-8"(.3 lb)
Spring spawner



The historic range of the redband trout (RBT) extended from the eastern slope of the Cascade Range south to the Sacramento-San Joaquin basin, east into northwestern Montana, and north into upper north British Columbia, Canada. In Washington State, the range extends from the upper Columbia River Basin, primarily in the Spokane River Drainage.

Redband trout spawn in rivers and streams during the spring (March, April and May). Cool, clean, well-oxygenated water is necessary for the eggs to survive. Redband trout fry emerge from the gravel in June and July. For the most part, they live near where they were spawned. Age at maturity is 3 years with size varying depending on productivity of individual waters. Few redband Trout exceed 10 inches in length. Good redband habitat is associated with higher gradient channels, often in riffles or with substrates dominated by boulders, cobbles, and pocket water. Redband trout also occupy lower gradient streams. Pools, which provide important holding and rearing habitat, resting places, overwintering areas, and refuges from floods, drought, and extreme temperatures for juvenile and adult salmonids, should be available, and requirements for spawning include loose gravelly substrates to provide for oxygenation of stream water.

Redband trout have evolved in a variety of habitats characterized by unpredictable and intermittent flows, high summer water temperatures, high alkalinity, drought, and fire. As a result, they have historically been subject to naturally high levels of population fluctuation, and have evolved traits that allow them to survive in conditions inhospitable to other types of trout.

Known Occurrence:
California Creek, Marshall Creek, Minnie Creek, Upper Hangman Creeks in Idaho (Mission Creek, Indian Creek, Sheep Creek, Nehchen "Squaw" Creek)

Eastern Brook Trout (*Salvelinus fontinalis*)
Introduced

Other names: speckled trout, aurora trout, brookie, square-tail, speckled char, sea trout, common brook trout, mud trout
Average size: 1-5 lbs, up to 4 lbs
Fall spawner

Brook trout are an introduced fish species that were first stocked in the early 1900's. They are widely distributed from high mountain lakes to headwater tributaries. They are found in all stream systems and most major lakes where water quality is suitable. They are the most prevalent fish in both wilderness and non-wilderness high lakes.

Brook trout spawn in October and early November and redds are typically built in headwater streams and springs with spring-fed cold streams preferred. Eggs hatch in early winter and juveniles emerge from the gravel in the spring. Sexual maturity is reached at age 3 with size varying depending on productivity of the individual water.

The Brook trout are easily identified by worm-shaped markings called vermiculations along their back and upper sides. Brook trout grow rapidly when conditions are right, reaching 6 or 7 inches in a year and sometimes growing to 5 pounds. They are also subject to stunting from overpopulation in some lakes. Insect larvae and nymphs make up a large part of their diet, so they are a logical favorite of fly fishers.

Known Occurrence:
Marshall Creek, Mainstem of Hangman Creek (lower watershed), Indian Creek (near mouth), Spangle Creek, California Creek

Westslope Cutthroat Trout *(Oncorhynchus clarki)* Introduced to Hangman Creek, Native to Coeur d'Alene Lake

Other Names: unknown
Average size: 15-30 cm, 2-3 lbs
Spring spawner

Westslope cutthroat trout have three possible life forms, adfluvial (migrates to lakes), fluvial (migrates to rivers) or resident (stays in streams). All three life forms spawn in tributary streams in the springtime when water temperature is about 10 Celsius and flows are high (Liknes and Graham 1988). Cutthroat trout spawn when they are about 4 or 5 years old and only a few survive to spawn again (McIntyre and Rieman 1995). Fry emerge in late June to mid July and then may spend one to four years in their natal streams. While resident fish spend their entire life in tributary streams, migratory life forms can travel several hundred kilometers as they move between adult and spawning habitat.

Spawning and rearing streams tend to be cold and nutrient poor. Westslope cutthroat trout primarily eat insects and zooplankton and do not grow very large, usually just between 6 and 12 inches. Westslope cutthroat trout seek out gravel substrate in riffles and pool crests for spawning habitat. Cutthroat trout have long been regarded as sensitive to fine sediment (generally defined as 6.3 mm or less).

Westslope cutthroat trout also require cold water, although it has proven elusive to define exact temperature requirements or tolerances. Likewise, cutthroat trout tend to thrive in streams with more pool habitat and cover than uniform, simple habitat (Shepard, Pratt and Graham 1984). Juvenile cutthroat trout overwinter in the interstitial spaces of large stream substrate. Adult cutthroat trout need deep, slow moving pools that do not fill with anchor ice in order to survive the winter (Brown and Mackay 1995).

The cutthroat population in Hangman Creek is unique due to an unofficial infusion by a landowner who brought the fish to Nehchen Creek (Also called Squaw Creek) after dewatering it approximately 20 years ago (B. Kinkead, personal communication). These fish appear to be confined to small reaches.

Known Occurrence: (All in Upper Hangman Creek in Idaho)
Nehchen (Squaw) Creek, Mission Creek (upper watershed)

Steelhead Trout (*Oncorhynchus mykiss*) Native/Extirpated

Other Names: Steelhead, sea-run rainbow trout
Average size: 30-90 cm, 8-11 lbs (up to 40 lbs)
Spring spawner

The steelhead trout (*Oncorhynchus mykiss*) is a rainbow trout that has spent a part of its life in the sea. There are no major physical differences between rainbow and steelhead trout; however, the nature of their differing lifestyles has resulted in subtle differences in color, shape, and general appearance.

Steelhead are the anadromous (migrating) version of rainbow trout. Rainbow trout are the "land locked" version, and remain in freshwater throughout their life. Steelhead migrate from the ocean into freshwater to spawn, and then can swim back out to the ocean again if they wish. Since steelhead are not semelparous (meaning they do not die after spawning) they are not an "official" Pacific Salmon. But, steelhead are often a favorite of local fishers for their large size and feisty attitude.

Spawning commences about mid-April and usually occurs throughout May and early June. A male may spawn with several females, and more males than females die during the spawning period.

Historically, the Coeur d' Alene Indian Tribe fished on the lower Spokane River and its tributaries for salmon and steelhead. It is estimated that before contact with European men, the Coeur d' Alene Tribe consumed between 71,100 to 124,500 salmon and steelhead annually (Scholz et al. 1985). A significant fishing site was at the confluence of Hangman Creek and the Spokane River.

Known Occurrence:
Steelhead runs were extirpated in the Hangman Creek Watershed with construction of hydro-electric dams in the early 1900s.

Chinook Salmon (*Oncorhynchus tshawytscha*) Native/Extirpated

Other Names: King, Tyee, Blackmouth
Average size: 40-120 cm, 10-15 lbs (up to 135 lbs)
Fall spawner; spring, fall, and summer runs

Chinook salmon are the largest of the Pacific salmon, with some individuals growing to more than 100 pounds. These huge fish are rare, as most mature chinook are under 50 pounds.

Most chinook spawn in large rivers such as the Columbia and Snake, although they will also use smaller streams with sufficient water flow. They tend to spawn in the mainstem of streams, where the water flow is high. Because of their size they are able to spawn in larger gravel than most other salmon.

Chinook spawn on both sides of the Cascade Range, and some fish travel hundreds of miles upstream before they reach their spawning grounds. Because of the distance, these fish enter streams early and comprise the spring and summer runs. Fall runs spawn closer to the ocean and more often use small coastal streams. All chinook reach their spawning grounds by fall, in time to spawn.

Chinook fry rear in freshwater from three months to a year, depending on the race of chinook and the location. Spring chinook tend to stay in streams for a year; fish in northern areas, where the streams are less productive and growth is slower, also tend to stay longer. Rearing chinook fry use mainstems and their tributaries.

Historically, the Coeur d' Alene Indian Tribe fished on the lower Spokane River and its tributaries for salmon and steelhead. It is estimated that before contact with European men, the Coeur d' Alene Tribe consumed between 71,100 to 124,500 salmon and steelhead annually (Scholz et al. 1985). A significant fishing site was at the confluence of Hangman Creek and the Spokane River.

Known Occurrence:
Chinook salmon runs were extirpated in the Hangman Creek Watershed with construction of hydro-electric dams in the early 1900s.

Brown Trout (*Salmo trutta*)
Introduced

Other names: English brown trout, European brown trout, Brownie, Browns
Average size: 20-38 cm. 4-40 lbs
Fall spawner

Brown trout spawn in rivers and streams during the fall (October-November) and prefer cold spring-fed streams. Eggs are deposited in a redd and fry usually emerge in March. They are generally sexually mature at 3 years of age with an average length of 15 inches. Brown trout are very piscivorous (fish eating), and long-lived which accounts for them reaching large sizes. They are highly regarded by anglers as a trophy trout. Typical coloring is olive-green to dark brown on the back with silvery sides and pale spotting. All colors intensify at spawning time.

For the wide variety of foods the brown trout will eat, it can be very difficult to catch. For one, many larger browns are primarily nocturnal feeders, and, for two, during prolific insect hatches, Browns can be extremely selective about what they'll eat.

Known Occurrence:
Brown trout in the Hangman Creek Watershed is uncommon to rare. There has been one observation reported in the lower portion of the mainstem on Hangman Creek.

Tiger Trout (*Salmo trutta X Salvelinus fontinalis*) Introduced

Other names: None
Average size: unknown
Fall spawner

Tiger trout are a hybrid between female brown trout and male brook trout. These trout are relatively new, but are known to be highly piscivorous (fish-eating), and are a good control against rough fish populations. They are popular with many fish stocking programs because they can effectively keep rough fish populations in check, while their own population numbers can be tightly controlled as well, since they are sterile.

Known Occurrence:
Fish Lake (Marshall/Minnie Creek Watershed) is the only site within the Hangman Creek Watershed. WDFW stocks this species.

Speckled dace (*Rhinichthys osculus*)
Native

Other names: unknown
Average size: usually less than 8 cm, sometimes more than 11 cm.
Spring/Summer spawner

The speckled dace, *Rhinichthys osculus*, is a small minnow native to the western United States, as well as to parts of southwestern Canada and northern Mexico. In Washington, the species is quite common, occurring in many of the state's major streams. In the Hangman Creek Watershed, it is probably the most widespread species. The speckled dace has adapted to many different types of habitat, ranging from cold swift-flowing mountain headwaters to warm intermittent streams and springs.

Speckled dace are benthic feeders (they feed on the bottom), eating primarily insect larvae and other invertebrates, although algae and fish eggs are also consumed. The species spawns during the spring and summer over gravel areas that have been cleaned by territorial males. The speckled dace is a schooling species that is most active at night. In many parts of their range, speckled dace are important forage fish for sport fish species.

Known Occurrence:
Entire Mainstem of Hangman Creek, Minnie Creek, Stevens Creek, California Creek, Spangle Creek, Rock Creek, SF Rock Creek, NF Rock Creek (ID, WA), Mica Creek, Rattler Run Creek, Cove Creek, Little Hangman, Smith Creek (ID), Mineral Creek (ID), Rose Creek (ID), Sheep Creek (ID), SF Hangman Creek (ID)

Tui chub (*Gila bicolor*)
Introduced

Other names: unknown
Average size: 10-25 cm, some up to 45 cm
Spring/Summer spawner

The Tui chub is a cyprinid fish native to western North America. Widespread in many areas, it is an important food source for other fish, including the cutthroat trout.

The form and appearance of the Tui chub is variable; many were originally described as different species by J. O. Snyder, but have since been reduced to subspecies. In general, the color is deep olive above and white below, with a smooth variation in shading along the sides, and a brassy reflection. Fins are olive and sometimes tinted with red. The pectoral fins are far forward and low on the body. Length has been recorded at up to 45 cm, but 25 cm is more typical.

Tui chub diet is varied; young fish eat mostly invertebrates, adding plant material and especially algae as they mature. Habits also vary by location and the fineness of the gill rakers, so for instance fine-rakered forms feed more on plankton in open water than the coarse-rakered forms, who live near the botton and eat more plants and algae. The largest individuals will eat other fish also.

Tui chubs are found in a variety of habitats, including anything from small streams to large lakes and reservoirs, and both high cold lakes and warmer desert streams.

The tui chub's range includes the Lahontan and Central system of the Great Basin, as well as the Owens and Mojave Rivers. It is found in the Pit River and Goose Lake of the upper Central Valley, in the Klamath River system, and in the Columbia River drainage.

Known Occurrence:
Only reported occurrence is lower portion of Cove Creek (Scholz, 2004).

Redside shiner (*Richardsonius balteatus*)
Native

Other names: unknown
Average size: 5-8 cm.
Summer/Fall spawner

The redside shiner is native to Washington. It likely was given its common name because red develops on its sides during the breeding season. The preferred habitat of this fish is cold, clear ponds, lakes and the slow water of streams. It can often be found in schools. The largest redside shiners are about 7 inches long. Populations of these fish can reach nuisance proportions in some lakes.

Redside shiners are usually dark olive to brown on back; dark midside band from snout to tail fin with a narrow light stripe above it; lower sides silver with a reddish wash; underside silvery. Breeding fish highly colored; male has brilliant red and yellow on sides and belly, female is less striking. Body moderately deep and flat sided, front of dorsal fin well behind front of pelvic fins.

Redside shiners are important forage fish for salmonids. Young feed mainly on plankton and adults eat mostly aquatic insects and snails. Sexually mature in 2-3 yrs. Redside shiners usually spawn in schools around June-July but may spawn as early as May and as late as August.

Known Occurrence:
Mainstem Hangman Creek (all), Stevens Creek, California Creek (lower), Rock Creek, SF Rock Creek, NF Rock Creek, Cove Creek (lower), Smith Creek (ID), Mineral Creek (ID, Rose Creek (ID), Sheep Creek (ID), SF Hangman Creek (ID).

Northern Pikeminnow (*Ptchocheilus oregonensis*) Native

Other names: northern squawfish
Average size: 21-30 cm
Spring/early Summer spawner

The predaceous Northern pikeminnow is native to Washington State. It is somewhat pike-like in appearance with its large mouth and elongated body. They are considered to be highly undesirable in some situations because they feed on young sport fish. They are effective predators despite their lack of teeth. Northern pikeminnow are among the largest native North American minnows. Weights of over 7 pounds have been reported in Washington, with weights of nearly 30 pounds reported from Canada. Northern pikeminnows are readily caught on bait, fly, or lure and put up a good fight but are poor table fare.

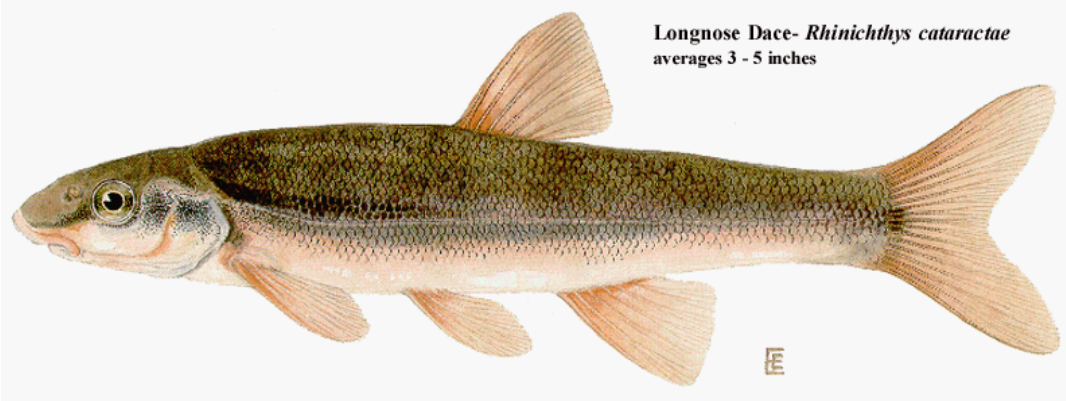
Northern pikeminnows have dark greenish backs, silvery below. Young have prominent dark spot at base of tail fin. No barbels. Northern pikeminnows prefer lakes and slow-flowing streams of moderate size. Young usually school in shallow water near lake shores and in quiet backwaters of streams. Some Northern pikeminnows migrate from lakes into tributary streams to spawn.

Northern pikeminnows feed on most kinds of aquatic invertebrates. Adults frequently eat small fish. They are considered a serious predator on young salmon and trout. Sexually mature 5-6 yrs. Spawns May-early July over gravelly areas in streams or lakes.

Known Occurrence:
Hangman Creek Mainstem (lower, middle), California Creek (lower), Rock Creek (lower, middle, upper), SF Rock Creek, Little Hangman Creek (lower)

Longnose dace (*Rhinichthys cataractae)*
Native

Other names: unknown
Average size: usually less than 8 cm, sometimes more than 11 cm
Spring/early Summer spawner



The longnose dace has one of the most widespread distributions of all freshwater fish in Washington State. However, in the Hangman Watershed, it is present but not overly abundant as compared to speckled dace populations. It is very adaptable, inhabiting almost every conceivable habitat: muddy and warm, clear and cold, streams and lakes. The preferred habitat is riffles with rocky substrates. The largest longnose dace are about 6 inches long. They are well-adapted for living on the bottom of fast-flowing streams among the stones. Longnose dace eat mostly immature aquatic insects. They are probably one of the most important forage minnows for larger predatory game fish.

The back of the longnose dace is olive to black, shading to white or yellow underneath. Sides may have dark blotches. Breeding males have reddish orange on head and fins. Juveniles have a black midside stripe starting at the tip of the snout and ending at the base of the tail fin. Adults often have a dark stripe ahead of eye and a small barbel at each corner of the mouth.

Longnose dace primarily eat immature aquatic insects picked off the rocks. Small amounts of algae and a few fish eggs are also eaten (Brown 1971). They sexually mature in approximately 3 years and spawn late spring or early summer at 53 degrees F. in shallow riffle areas over gravel beds (Brown 1971).

Known Occurrence:
Mainstem of Hangman Creek (lower, middle, upper), California Creek (lower), Rock Creek (lower)

Largescale sucker (*Catostomus macrocheilus)*
Native

Other names: unknown
Average size: 2-3 lbs, up to 5 lbs
Spring spawner

The largescale sucker is native to Washington State. Like other suckers, it is present in both rivers and lakes. It has limited distribution in Hangman Creek. In Washington, the maximum size in this species is usually around 5 pounds. The food habits of largescale suckers are similar to those of other suckers. It will eat almost any available organism found on the substrate. They are found in both lakes and streams. These suckers spawn in gravel riffles with strong current or along lake margins.

Physically, the largescale sucker has a back and sides that are dark olive gray, changing abruptly to white or yellowish on underside. The dorsal fin usually has 13 to 15 rays, its base is long. Scales are medium sized, 62 to 80 in lateral line.

Largescale suckers sexually mature in 4-5 years. They spawn in April-May and provide no parental care. The eggs stick to bottom and hatch in approximately 2 weeks. The young tend to rear in quiet backwaters or in lakes. Largescale suckers then migrate upstream after spawning.

Known Occurrence:
Mainstem of Hangman Creek (lower, middle), Stevens Creek, Rock Creek (upper), SF Rock Creek (upper)

Bridgelip sucker (*Catostomus columbianus*)
Native

Other names: unknown
Average size: usually 12 cm to 43 cm
Late Spring spawner

Bridgelip suckers are a native species that inhabit the Columbia River system. In the Hangman Watershed, it is widely abundant throughout the mainstem and the larger tributaries. Bridgelip suckers tend to dwell in deeper waters during the day and move into shallower water at night. As adults they eat periphyton (algae and microbes found on submerged substrata). Juveniles, however, eat aquatic insect larvae and zooplankton. Adult bridgelip suckers range in size from 12 to 43 centimeters. They spawn around May, when the water temperature is between 8-13 ºC, and lay between 9,955 and 21,040 eggs. Within the Columbia River system, the bridgelip sucker shares much of its habitat with another similar looking sucker, the largescale sucker.

This species inhabits lakes and rivers in backwaters and edges of the main current with sandy or muddy substrates. The body is cylindrical in shape that reaches an average length of 30 cm. Bridgelip suckers mature at as little as 13 cm in length, and spawn during late spring after ice breakup. Breeding males develop an orange lateral band and tubercles on their anal, lower caudal fin, and scales on posterior portions of the body as breeding season approaches. It is thought that females broadcast spawn their small yellow eggs like other catostomid species.

Known Occurrences:
Hangman Creek mainstem (lower, middle, upper), California Creek (lower, middle, upper), Rock Creek (lower, middle, upper), SF Rock Creek (ID), Mica Creek, NF Rock Creek (ID), Cove Creek, Little Hangman Creek (lower)

Mottled sculpin (*Cottus bairdi*); Torrent sculpin (*Cottus rhotheus*) Native

Other names: Millers thumb, Columbia sculpin, blob, gudgeon, and freshwater sculpin.
Average size: 10-12 cm (up to 15 cm)
Late Spring spawner

Mottled sculpin

Torrent sculpin

The Torrent and the Mottled sculpins are native fish to Washington State and have been identified in the Hangman Creek Watershed. The Mottled sculpin appears to be more predominant in the current survey work. As with all sculpins, both species present a somewhat grotesque appearance with their large heads, huge pectoral fins, and bulging eyes. Sculpins have a much flattened hydrodynamic shape, which serves them well as they dart along the bottom between the cracks and crevices of rocks.

The Mottled sculpin's back and sides are slate to brown with mottling and dark blotches. They may have two or three dark saddles under the second dorsal fin. The underside is whitish. The first dorsal fin is fringed with orange or red on breeding males. Palatine teeth are present. The Torrent sculpin is gray-brown with black speckling. The underside is light and the chin strongly mottled. The first dorsal fin is fringed with orange on spawning males. Palatine teeth are usually present. The body is robust. They usually have coarse prickles on the back, sides, and sometimes on the caudal peduncle.

Both species consume a variety of immature aquatic organisms (larvae) and plankton but larger individuals often eat small fish. Mottled and Torrent sculpin prefer riffle areas of fast-flowing streams that are clear and have rocky bottoms. They are an important species as they serve as a forage fish for predators, often trout. Both species become sexually mature in 2 years. Spawning occurs in May-June. The eggs hatch in 20-30 days at 50-60 degrees ºF.

Known Occurrence: Mainstem of Hangman Creek (lower, middle), California Creek (lower, middle), Rock Creek (lower), Smith Creek (ID), Indian Creek (ID)

Bluegill (*Lepomis macrochirus*); Pumpkinseed (Lepomis gibbosus) Introduced

Other names: (Bluegill) Sunfish, red-breasted bream, red-spotted sunfish, long-eared sunfish, bream, panfish, copperbelly, and sunny; (Pumpkinseed) punky, pond perch, sun bass
Average size: 10-20 cm (up to 41 cm)
Spring spawner

Pumpkinseed

Bluegill

These smaller sunfishes were introduced into the Pacific Northwest in the early 1890s by the U.S. Fish Commission. However, it is now found across most of eastern Washington. And, like the others sunfish species, they are spring spawners. They sexually mature mostly in 2 years and spawn in May - July when water temperatures approach 70° F, congregating in large groups on common spawning grounds in water six to 12 inches deep. Males begin the nest-building by fanning the bottom with their fins to clear a shallow, bowl-like depression. The male guards the nest tenaciously until the fry hatch out, and any type of intruder will be viciously attacked during the nesting season.

These brightly-colored little fish may be told apart most easily by remembering that the bluegill has a blue-black spot on the margin of the gill cover. On the pumpkinseed, that spot is bright orange-red. Subtle differences in coloration are noticeable too; the pumpkinseed is usually lighter and more brilliantly hued, with turquoise and orange cheek stripes in larger individuals. Males can be distinguished from females, especially during spawning time, by the brighter color of the male bluegill and the larger red spot of the male pumpkinseed. Both fish characteristically inhabit vegetated, quiet or slow-moving waters.

Of the two species, bluegills attain a larger size and are therefore more desirable for sport and at the table. Pumpkinseeds seldom exceed six inches. They both eat just about anything that will fit into their small mouths, especially aquatic insects and terrestrial insects that fall into the water. They are prey to many animals, such as largemouth bass, birds and turtles.

Known Occurrence:
Marshall Creek has the only reported occurrence. These collections indicate anomalies. They are both likely migrants from Queen Lucas or Fish Lake.

Brown bullhead (*Ameiurus nebulosus)*
Introduced

Other names: Creek cat, Mud cat, Horned pout, Speckled cat, Brown catfish, Bullhead, Catfish, Common bullhead, Common catfish, Marbled bullhead, Minister, Northern brown bullhead, Red cat,
Average size: 20-35 cm
Late Spring spawner

The brown bullhead is a medium sized fish - averaging about 20 to 35 cm. in length. It has the typical catfish appearance of a broad, flat head and dark barbels around the face. Its square tail and mottled side coloration distinguishes it from other members of the catfish family. The brown bullhead is generally dark brown above and yellow to white on its belly, but as is the case with most fishes, its color may vary with its surroundings.

Brown bullheads are probably the most adaptable member of the catfish family and live in a wide variety of habitats. They exemplify the hardiness of catfishes in general, tolerating high water temperatures, higher pollution and carbon dioxide levels, and lower oxygen levels than most other fish species. They occur in areas with or without aquatic vegetation and can be found over both muddy and gravelly bottoms.

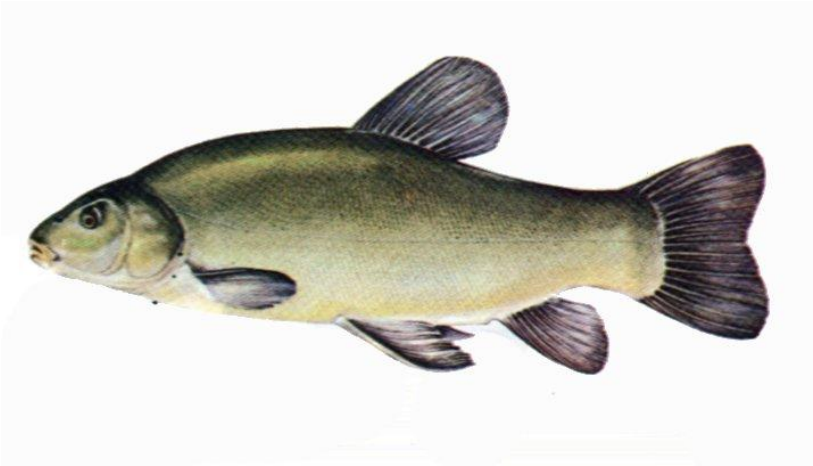
Brown bullheads reach sexual maturity around three years of age. Spawning takes place in May or June when the water temperature approaches 70 degrees Fahrenheit. The entire process can take as much as several weeks, with one or both parents remaining for the whole time.
Brown bullheads are nocturnal bottom feeders. They consume algae, plants, mollusks, insects, fish eggs and fish, although they probably do not prey heavily on fish eggs. They do, of course, compete for food with other bottom-feeding fish.

Known Occurrences:

The only reported occurrence was in the mainstem of Hangman Creek (lower) in 1973 (Laumeyer and Maughan).

Tench (*Tinca tinca*)
Introduced

Other names: Doctor fish
Average size: 18-35 cm
Spring and Summer spawner



The tench is native to streams and lakes of Europe, but rare in Hangman Creek. It was cultivated in the U.S. as early as 1883. The species was introduced into northern Idaho in the late 1880's. Currently they are found in the Pend Oreille and Coeur d'Alene River systems and at least one farm pond in Latah County. This species inhabits the shallow areas of lakes and slow-moving rivers where aquatic vegetation is abundant. It is a hardy fish and can tolerate warm and poorly oxygenated waters. Tench can live for 20-30 years.

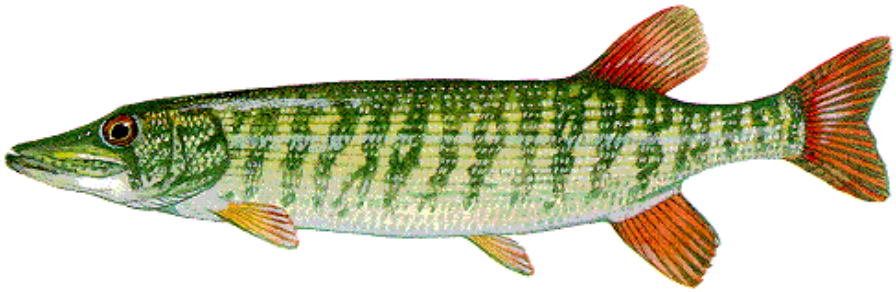
The tench is a stout, small-scaled fish with a barbel at each corner of its mouth and a thick, slimy skin. It is greenish or blackish and usually 18–35 cm long with a weight of about 2 kg (4 $^{1}/_{2}$ pounds). Most abundant in quiet, mud-bottomed waters thick with plants, it feeds mainly on small animals and plants. Its slime was once thought able to cure injured fishes and was also applied to human wounds.

Males and females reach sexual maturity at 3-4 years of age, with females producing up to 900,000 eggs. Spawning occurs in spring and summer. The small eggs are deposited in shallows, with the females releasing their eggs in several batches at two week intervals. Hatching takes up to 7 days and newly-hatched larvae initially attach themselves to water plants. A furtive fish, not very active during the day, but easily alarmed. Tench are carnivorous, juvenile fish feeding on small crustaceans. Larger fish eat aquatic insects.

Known Occurrences:
The only reported occurrence was in the mainstem of Hangman Creek (lower) in 1973 (Laumeyer and Maughan).

Redfin Pickerel (*Esox americanus)*
Introduced

Other names: little pickerel, mud pickerel, grass pickerel, banded pickerel, redfinned pike
Average size: 20-35 cm
Early Spring spawner



The Redfin pickerel is an introduced species that is highly uncommon to Hangman Creek. Redfin pickerels grow slowly. The maximum age is about eight years, but the usual life span is seven to eight years. There is little difference in growth between males and females, although females live longer. Redfin pickerels rarely exceed 30 cm long and have 15 to 36 dark, wavy vertical bars and reddish-orange lower fins. Otherwise the coloration is much the same as that of chain pickerels. There is a dark, backward slanting bar below the eye. The snout is shorter and broader than that of a chain pickerel. Normally there are 11 to 13 branchiosstegal rays on the underside of the lower jaw. The cheek and gill covers are completely scaled.

Redfins are usually found in among heavy growths of aquatic plants in sluggish streams, in shallow coves of lakes or in ponds. They prefer water from 75 to 80 degrees. Redfin pickerels may be the dominant predator fish in small creeks.

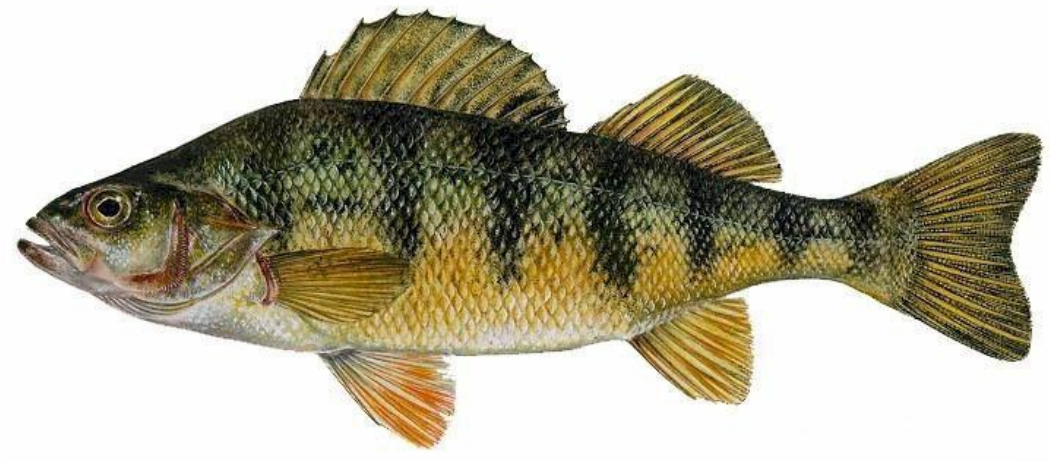
Spawning occurs in the early spring in shallow, weedy waters. Eggs are adhesive and are scattered freely among submerged vegetation. They become sexually mature by at least age two. No parental care is given to the eggs or fry.

Small fish make up most of their diet, but they also eat aquatic insects and various other invertebrates.

Known Occurrences:
Incidental observation

Yellow Perch (*Perca flavescens*)
Introduced

Other names: Lake Perch, American Perch
Average size: 10-25 cm
Spring spawner



The yellow perch is the most widely distributed member of the perch family and is common throughout Washington State lakes. Favored habitat of yellow perch is a weedy, warmwater lake. They spawn in the spring when water temperatures are in the 45° to 50°F range. The female swims among sticks and weeds in open, shallow water near shore as she emits a long, gelatinous ribbon of spawn. In this manner, the semibuoyant, adhesive egg mass is woven among the weeds and brush. Males, as many as a dozen, follow the female and fertilize the eggs. Eggs may number from 10,000 to 48,000, depending on the size of the female. No parental care is given to the eggs, which hatch in approximately 3 weeks.

Schools of young perch feed on zooplankton, immature insects, and some invertebrates (crayfish). Young perch are slow swimmers, and the schools provide abundant forage for walleye, older yellow perch, and most other predacious fish.

Yellow perch have two dorsal fins separated into a spiny and soft-rayed portion, yellow sides, seven blackish bars on the sides, no canine teeth. Perch average adult length is 10-25 cm. with a weight of 4-10 ounces, although adult size is quite variable. Perch are prolific breeders, but growth and ultimate size depend on population density and habitat productivity.

Male perch reach sexual maturity at about three years of age, females at four. Perch spawn in the spring, laying eggs in gelatinous strings over dense vegetation, roots, and fallen trees in the shallows. These spawning grounds provide some of the best perch fishing available.

Known Occurrences:
Incidental observation in Marshall Creek

Smallmouth Bass (*Micropterus dolomieu*) Introduced

Other names: Smallie, Smallmouth Black Bass, Brown Bass, Green Bass
Average size: 30-50 cm
Spring spawner

Smallmouth bass are not native to Hangman Creek. It derives its name from the fact that the rear end of the lower jaw does not extend past the eye, while that of a largemouth does. Smallmouth bass reside in lakes bays where waters are cool and clear, and the bottom is rock or gravel. Ideal smallmouth habitat contains protective cover such as shoal rocks, talus slopes, and submerged logs. Their preferred water temperature is 68-70 degrees F, cooler than that of the largemouth bass.

Smallmouth have two dorsal fins with spinous and soft-rayed portions united, body longer than deep, upper jaw doesn't extend past eye, bronze streaks in cheek. Smallmouth bass mature at age three or four, and occasionally live to be 10 to 12 years old. The typical smallmouth seen by anglers is 30 to 50 cm long, and weighs less than three pounds.

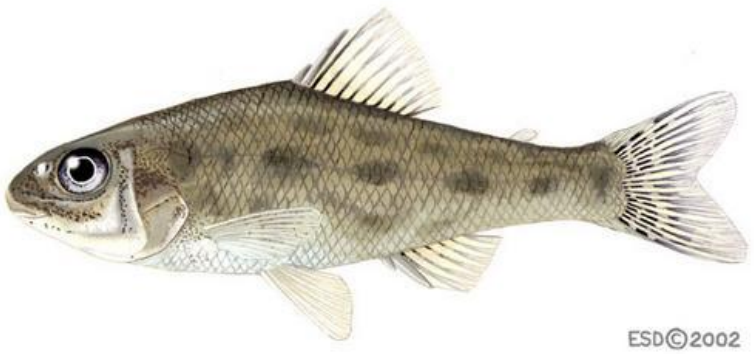
Spawning activity begins in the spring when water temperatures reach 60 degrees F or more. The male builds a nest in quiet water, usually near shore, or downstream from an obstruction that causes a break in the current. Since the male will guard the eggs and the newly hatched fry, the nest is never far from deep water, or cover, where he can retreat when frightened. The eggs, which are larger than those of the largemouth bass, hatch in 2 to 3 days.

Young smallmouth bass feed throughout the day on small crustaceans and graduate to insects and small fish by the time they are 3.8 cm. Adult smallmouths eat fish, crayfish, and insects.

Known Occurrences:
Incidental observation near Rock Creek confluence

Sandroller (*Percopsis transmontana*) Native/Extirpated

Other names: trout-perch
Average size: 10 cm
Spring, mid-Summer spawner



The sand roller, *Percopsis transmontana,* is endemic and considered rare in the lower Columbia River drainage, including the Willamette River and its tributaries. Sand rollers prefer slow-water habitats in low gradient streams and are most frequently associated with roots, other large wood, and undercut banks over sand or gravel substrates. Infrequent reporting of this species is thought to be related to its secretive daytime behavior rather than to actual rarity.

The sand roller is a small perch-like fish, usually measuring 10 cm long, with spiny rays and speckles on the sides and fins. Sand rollers have blue-green coloration, ctenoid scales, and an incomplete lateral line. An unusual feature of this fish is that it has an adipose fin. Males tend to be smaller and more slender than the females.

These fish are active nocturnally and are most often found in pool margins of low gradient reaches of small to large rivers. They are found around submerged roots, complex woody debris and brush, and undercut banks and generally over sandy or rocky substrates. They are also found near vegetation over sand. During the day, they have been found in pools up to 4 m deep in small depressions over sandy substrates. In deep rivers, sand rollers may exhibit diel periodicity, moving into deep waters as cover during the day and into shallow waters at night.

Sand roller spawning commences in the spring and continues through mid-summer. Egg numbers range between approximately 1,100 and 3,400 for females 76 to 91 mm. Sand rollers in the Columbia River mature beginning at age 2. They feed principally on aquatic insect larvae (Diptera and Trichoptera) and crustacean zooplankton.

Known Occurrences:
Thought to be extirpated in the watershed.

Chiselmouth (*Acrocheilus alutaceus)*
Native

Other names: unknown
Average size: 15-18 cm
Late Spring, early Summer spawner

The Chiselmouth is a western species of the minnow family. This species reaches a length of about 15-18 cm. They have large eyes. Their overall coloration is dark brown with lighter sides. Their lower lip is covered with a hard skin that gives them the ability to scrape algae from rocks. The average weight for this fish is between 0.022-0.268 kg.

Although this fish inhabits moderate to slow flowing streams of all sizes, Chiselmouth fish prefer faster water of warm streams, but they are also found in larger rivers, small and large lakes. Seems to prefer faster water of warm streams, but is also found in backwaters of larger rivers, small kettle lakes and large lakes.

Chiselmouth fish are considered herbivores, or a plant-eating fish. Young chiselmouth feed mainly on insects, while adults feed largely on diatoms that they scrape from rocks or other substrate with their lower chisel-like jaw. Adults feed on algae, mainly microscopic organisms, by scraping the attached material off rocks and other bottom surfaces. Young fish consume surface and free-floating microscopic organisms.

Chiselmouth maturity occurs at age 3 or 4 years and they may live to 6 years. Spawning occurs in late spring or early summer when water temperatures reach about 60 ºF. Reproduction occurs in streams over gravel or small pebbles. Each female produces about 6,000 eggs. During spawning, eggs have been found on the open bottom and buried among boulders.

Known Occurrences:
Mainstem of Hangman Creek (lower, middle, upper), California Creek (lower), Rock Creek (lower, middle),