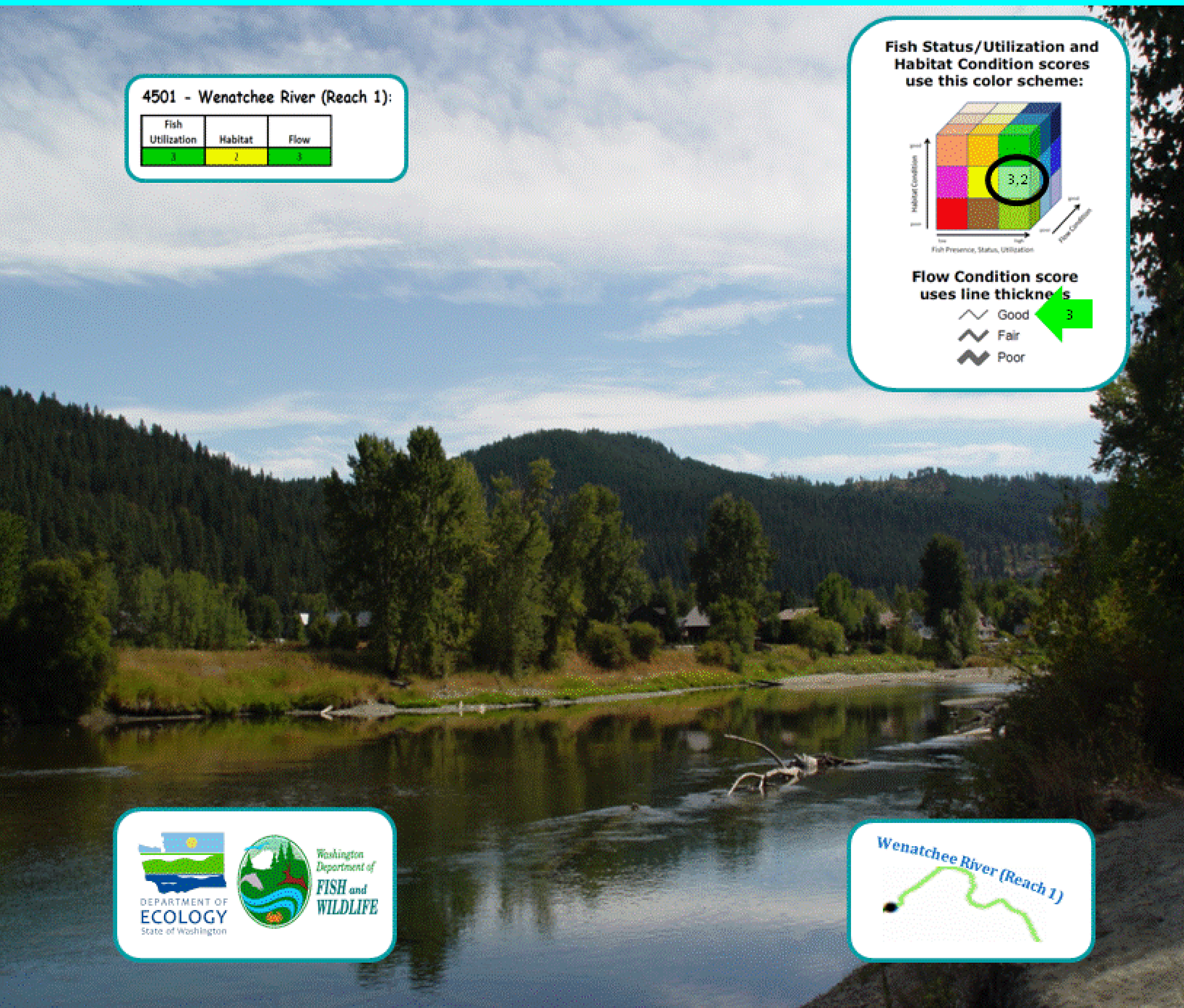
# Columbia River Instream Atlas Project

## Washington Department of Fish and Wildlife

## Final Report – APPENDIX A METHODOLOGY

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# Columbia River Instream Atlas Project - Final Report
# Appendix A – Methodology September 23, 2011

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# Columbia River Instream Atlas Project

## Final Report

# Appendix A – Methodology

September 23, 2011

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# I. Introduction

In 2002, WDFW was asked to help Ecology choose projects for stream flow restoration. In response, a method was developed whereby stream reaches were defined and scored based on the relative likelihood that flow restoration, through acquisition or other means, would be successful in benefiting instream flow and fish.[1]

To develop the 2011 Columbia River Instream Atlas (CRIA), the team considered the components identified as ideal for developing a stream reach prioritization scheme in 2002, the components ultimately employed in 2002, and potential surrogates when direct measurements were not available.

The first substantial deviation from the 2002 methodology was to choose to score fish status/utilization, habitat condition, and flow condition separately rather than summing them into a grand total reach score. By doing this, CRIA becomes more than just a flow restoration tool; it can answer general questions about salmon and habitats, and can also inform other types of decisions being considered by managers.

The second major deviation was to eliminate speculation on future conditions, thus limiting CRIA to elements that can be scored as objectively as possible with regard to current condition.

So, although the 2011 CRIA effort represents an updating or continuation of the previous method, several changes were made that make comparisons with 2002 scores difficult. Attributes within the 2002 matrices were consulted frequently, however, to provide validation as we developed the newer assessment components.

# II. CRIA Data Structure

The four foundational data elements are: Stream Reach Definition (distinguishing stream segments for which scoring will occur), Fish Status/Utilization (providing information on anadromous salmonid species diversity, habitat utilization by life history stage, and population status); Habitat Condition (representing riparian and aquatic habitat functions and values); and Flow Condition (assessing overall flow as well as seasonal flow regime limitations). CRIA data are contained within five workbook (Excel spreadsheet) types:

**<u>Fish Status/Utilization ("Fish Prioritization")</u>**

The Fish Status/Utilization workbooks contain reach-scale data on fish stock occurrence, utilization by life history stage, and status, plus roll-up tabs for scores and seasonal periodicity tables. Data are organized into one workbook per WRIA; with one CRIA reach per tab, plus "References," "Fish Priority Score," and "Periodicity" tabs.

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[11] Reprinted from the 2003 Ecology publication 03-11-005, "Washington Water Acquisition Program, Finding Water to Restore Streams" Appendix II. Prioritizing Where and When to Acquire Water Rights (Page 63). Credit goes to WDFW biologist Perry Harvester for developing the original scheme.

**Habitat scoring ("Habitat Scores")**

One workbook contains a tab for each WRIA. Within each tab, data include reach number, name, and descriptions, as well as scores for each of the six habitat attributes and a final score. Bins are indicated using color codes.

**Water Rights ("WR")**

Contains the water rights data records gleaned from the Ecology Water Rights Tracking System (WRTS) database on September 10, 2010; one workbook per WRIA, one CRIA reach per tab plus a rollup tab.

**Flow**

One workbook per WRIA contains a tab for each flow gauge, plus tabs for web links, flow rules, and the roll-up "Reaches" tab containing summarized flow data and the scoring components.

**All_Encompassing_Reach_Information**

This workbook contains the reach definitions, data from NHD landcover analysis and the 305b Water Quality Inventory, Habitat scores by attribute and reach, and the raw and binned fish status/utilization, habitat condition, and flow condition scores. Scores from this file have been incorporated into georeferenced layers and are accessible as underlying attribute tables for each WRIA.

# III. CRIA Scoring and Binning

In general, scoring for each CRIA element was conducted using simple integers. Fish scores were tallied based on each stock/life-stage/month occurrence, summed across stock-months, weighted by stock status, then summed for all stocks, yielding one reach score.

Habitat scores were assigned a value of one through four for each habitat attribute based on the rubric developed for each attribute. Habitat scores were then summed across attributes for each reach.

Flow condition is scored using five metrics, each of which is scored from 0.5 to 4.0 depending on the rubric. Scores for four of the metrics are summed, then multiplied by the fifth, yielding a total score for flow condition for each reach.

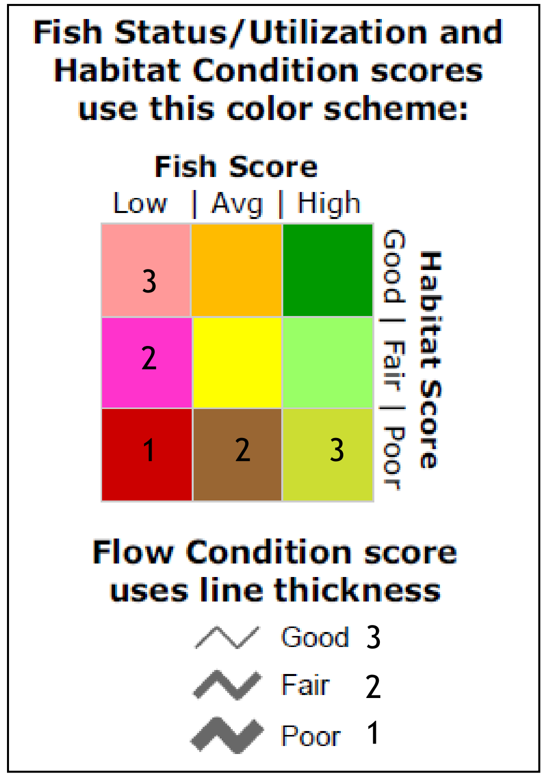
Reaches within each watershed are not ranked ordinally as was done for the 2002 effort. Instead, reach scores are sorted into bins, as shown on Figure A-1 for each CRIA element.

| Score | Color | Name |
|---|---|---|
| 3 | Green | Good / High |
| 2 | Yellow | Fair / Average |
| 1 | Red | Poor / Low |

**Figure A-1 Scoring Bins**

Each reach has three “bin” scores, one each for fish status/utilization, habitat condition, and flow condition. Each triplet score is mapped using unique color/line-width symbology, as shown in Figure A-2.

**Figure A-2 CRIA Scoring “Cube”**




## IV. Stream Reach Definitions

Stream reaches were selected based on the presence or absence of salmonids, their relevance to benefit salmonid production, and their potential for flow restoration. Upstream boundaries for most reaches were determined based on the next obvious landmark above which no practical contributions to stream flow could be achieved (e.g., no additional upstream water diversions, or diversions occur on federal land). This means uppermost stream reaches that may be critical to salmonid production and/or may be flow-impaired are excluded from CRIA scoring because they don’t contain water supply opportunities that would contribute to stream flow.

Despite the selection criteria just mentioned not all CRIA stream reaches support salmonids, or may support salmonids only in a limited part of a reach. Still, the focus was on locations where acquisition of water may benefit fish downstream.

Stream reaches that extend into Oregon, Idaho, and British Columbia end at the Washington State border. The upstream end of some reaches may extend beyond anthropogenic or natural fish migration barriers because those barriers may be removed as part of fish recovery projects or because water that flows downstream will benefit downstream fish populations. Human-caused or natural fish migration barriers above upstream most diversions are often used as convenient upstream boundaries for some reaches.

The 2002 reach definitions, modified by more current literature, provided a starting point for identifying CRIA stream reaches. Subdivisions of stream segments were determined using natural (e.g., confluences, waterfalls) and human-made (e.g., flow gauges, bridges, major points of diversion) features of the landscape. Attempts were made to divide stream reaches with significantly different habitat characteristics, to shorten reaches at the confluence of tributaries that significantly change reach character, and to partition reaches to optimize water acquisition opportunities. The result is that CRIA stream reach scoring and prioritization contains more defined reaches than did the 2002 “Priority Stream Reach” product – 189 compared with 116 in the 2002 effort.

Reaches are identified by a code for data management purposes. Codes are four digits, with the first two digits representing the WRIA code, and the last two digits designating a unique stream reach, generally starting at each WRIA's mouth and moving upstream.

Stream reach definitions, plus a summarization of all scores, are provided in the "All_Encompassing_Reach_Information" workbook (Table A-1; all tables are located at the end of the document). The spreadsheet lists all of the stream reaches defined by the CRIA project, a short description of the reach, the associated WRIA, the CRIA reach identification code, the LLID (WDFW stream ID number), GIS river miles (RM), and reach length in feet and miles.

Reach definitions with descriptive details are found on Table A-2. Further details about reach definitions for each WRIA are included in the WRIA appendices.

# V. Fish Status and Utilization

The fish status and utilization score was generated from a variety of information sources. WDFW's Salmonid Stock Inventory (SaSI) formed the basis for identifying populations/stocks of Chinook, steelhead, coho, sockeye, and bull trout in each WRIA. Only wild stocks (fish spawning naturally), or artificially produced fish stocks intended to spawn naturally, are included in CRIA, including all introduced sockeye and coho in the mid- and upper-Columbia.

The known, documented distribution of these stocks, vetted through contact with regional WDFW and tribal biologists, was then used to assign presence/absence values for each stock to each reach. Substantial knowledge gaps with regard to the distribution of specific bull trout stocks, and ambiguity about the independence of stocks, lead to bull trout being considered as a single unit in each WRIA. Occurrence was reported for three life stage categories: adult in-migration, spawning and incubation, and rearing and outmigration. Occurrence was also partitioned monthly. When stock-specific incubation and outmigration timing were unavailable, local expertise was used to assign values to reaches based "typical" behavior of other stocks of the same species/run/race elsewhere in the Columbia Basin. Occurrence across all life history stages for all months was then summed and weighted by an ESA status factor and a SaSI status factor. The final scoring spreadsheet was designed to allow for easy manipulation of these weighting factors to reprioritize reaches based on federal, state, or other status evaluations.

## *A. Basic Structure and Function*

**Components**: Data components include stock-specific evaluations of:

- Months spent in the reach for spawning/incubation
- Months spent rearing/smolt migration
- Months spent in adult migration
- SaSI status
- ESA status

**Updates/improvements relative to 2002 assessment:** Monthly, life-stage specific evaluations were not included in the 2002 assessment. For a given reach, a stock was recorded simply as present or absent, with its SaSI status used as a weighting factor. For reaches in which a given stock was known only to rear this was recorded, but this was not done systematically or comprehensively. Because some stocks have prolonged in-migration periods but brief temporal spawning windows, we felt it was important in the 2011 CRIA to partition this information into two components and formalize handling of rearing information.

The 2002 assessment included ESA status by performing 'blanket' upgrading or downgrading of SaSI status based on ESA status. This approach is flawed in that the demographic unit of ESA listing is the Evolutionarily Significant Unit (ESU) or Distinct Population Segment (DPS), which are discrete from SaSI "stocks." Though as a whole the ESU/DPS may be threatened or endangered, individual SaSI stocks within this aggregation have the potential to have a range of viabilities. By incorporating both an ESU/DPS-specific ESA status and a stock-specific SaSI status component into the 2011 CRIA score, we allow the flexibility to adequately characterize subtle variation in status, making finer-scale prioritization possible.

## *B. Assumptions*

The following are the assumptions made while populating the CRIA Fish Prioritization Worksheet.

**Juvenile migration**: We assumed that after juvenile fish become mobile and begin to emigrate to the ocean, they don't ascend any other reaches, tributaries or rivers upstream from their natal reaches. They may hold in the mouths of downstream reaches, tributaries, or rivers during their emigration and therefore may also rear in those same areas (e.g., Naches Spring Chinook might rear in Toppenish Creek, in lower Yakima reaches, or in the Walla Walla, but not in Upper Yakima or the Wenatchee).

**Bull trout life history**: Bull trout (*Salvelinus confluentus)* have a complex life-history composed of multiple strategies. They exhibit four forms of life-history: anadromous, adfluvial, fluvial, and resident. Anadromous bull trout leave their natal streams to rear in the ocean then migrate upriver again to spawn. Anadromy has not been noted within any bull trout stocks occurring in the interior Columbia River or Snake River basins but is common in Puget Sound bull trout stocks. The adfluvial form of bull trout leaves the natal stream to rear in larger bodies of freshwater (e.g., lakes, large rivers) and migrate back to spawn. The fluvial form rears in streams to which their natal stream is a tributary, but does not rear in mainstem or lake habitats. The resident form lives its entire life in their natal streams. Since it is difficult to tell adfluvial, fluvial, and resident forms apart without detailed individual tracking data, we assumed that bull trout may rear anywhere they are found, downstream of that site, and most likely into the mouths of downstream tributaries.

**Bull trout distribution**: Bull trout predominantly seek out high elevation, cold, clear streams for their life stages and are not as prevalent as other salmonid species in the lower reaches defined by CRIA. Since bull trout ascend to the highest reaches of streams and have very strong site fidelity, there is the opportunity for rapid onset genetic divergence. In all basins, we combined all known and potentially unknown stocks of bull trout into one set of generalized bull trout information instead of separating them out into distinct populations. However, emphasis can add value to individual stocks by increasing the weighted scoring. Research into the genetic variation now recognized in bull trout populations is currently ongoing and we expect that substantial improvement in our handling of bull trout stock information could be possible within the next several years.

**Sockeye salmon rearing**: Sockeye salmon (*Oncorhynchus nerka)* rear in lakes and rivers. We assumed that they rear in Cle Elum Lake (above the dam) due to the difficulty of finding suitable rearing habitat downstream and of passing the dam. Fish are now trucked up over the dam as adults and pass down through a flume as juveniles. We also assume rearing in the main rivers or tributaries during outmigration is minimal because of the rearing time spent in Cle Elum Lake.

## C. Caveats

**Resident fish excluded**: Resident fish species like rainbow and cutthroat trout, perch and other warmwater fish are not addressed in CRIA. They are presumed to reside uniformly across the Columbia Basin, and are generally not assessed for distribution and status. Furthermore, Chapter 90.90 RCW limits the focus of Office of Columbia River (OCR) to salmonids.

**Weighting for status:** A reach having one important stock is difficult to distinguish from reaches having several less important stocks in the aggregate scoring. However, data are provided that allow drill-down to the stock level for each reach.

**Cross-watershed comparisons problematic**: High fish status/utilization scores in two watersheds don't necessarily mean they are of equal importance in overall salmonid recovery because of differences in the numbers of stocks present in each WRIA. See "It depends on the question" in the main report for a fuller discussion of this issue.

**Insufficient monitoring data**: We used the best available monitoring data, but as noted for bull trout, monitoring might be infrequent or limited in geographic area. We have strived to ensure that assumptions are conservative in this regard, meaning we assume presence where presence has not been confirmed through monitoring but is possible based on available habitat and adjacent monitoring data. This is a common concern for fish stocks for which active restoration efforts are occurring, and better coordination is leading to better monitoring information for those stocks. Still, natural resource monitoring will always necessarily be limited by available financial resources, so not all questions important to all species/stocks will be answered.

**Current stock status**: State SASI status reviews were last done in 2002 (few exceptions) so state status information may be a bit out of date. Federal ESA status review for Interior Columbia domain was last published in 2007, though updates are occurring periodically as new assessments are completed by NMFS. Data represented in CRIA are best available data as it exists in June 2011.

**Introduced coho and sockeye**: Coho salmon, and sockeye introduced into the Yakima Basin, were not included in SaSI. The CRIA team developed new information for these stocks for inclusion in the SaSI database. These are the sole exceptions to the 2002 status limitation noted above.

## *D. Workbook Description*

As mentioned above, data components include stock-specific evaluations of months spent in the reach for spawning/incubation, months spent rearing/smolt migration, months spent in adult migration, SaSI status, and ESA status.

Scores are organized into an Excel workbook – one for each Basin – with tabs for each stream reach, a tab for references, and a tab containing a roll-up of reach-scale scoring. The notes provide observations for each stock on spawning, rearing, and migration, along with information regarding unique characteristics of the given stock. The roll-up tab shows fish use timing data for each stream reach. Each workbook also has tabs containing a basin-wide periodicity spreadsheet visually charting the fish use timing by species, the 2002 rating worksheet for reference purposes, and a list of references.

The basic elements of the rating workbook follow (The Walla Walla worksheets have been provided as examples):

### 1. Fish Priority Score Tab

The fish priority score spreadsheet is the summary sheet for the entire fish biodiversity ranking workbook (Table A-3). There is only one fish priority score worksheet in each rating workbook. The fish priority score worksheet has three primary components: 1) a list of each reach under review with total and monthly ranking scores, 2) a list of each relevant fish stock (and its associated SaSI Stock number and Status) that is present in the WRIA, and 3) an Endangered Species Act (ESA) weighting factor. An additional component is a weighting factor for major or minor spawning areas designated by the local Technical Recovery Team (TRT).

**Reach Scores:** These are the raw final scores that will be used to assess relative fish Status/Utilization value, and will be converted to some normalized scale so they can be used in conjunction with the habitat and flow scores. The final and monthly scores on the summary sheet for each reach will change automatically as values are assigned in the individual reach specific worksheets (or as weighting factors for different fish stocks are modified). The scores are calculated in the individual reach-specific worksheets, and are linked to these cells located on the summary sheet. It might be a good idea to check once in awhile to make sure the final scores are still linked to the appropriate reach-specific worksheets.

**SaSI Stock Rating Factor:** The SaSI stock status rating numbers that are assigned to each fish stock are crucial to the CRIA system, as they are linked to each individual rating sheet and act as one of the primary "weighting" factors in this ranking workbook. The stock-specific weighting factors are meant to be changed (if desired) on the summary sheet only rather than in the individual worksheets, resulting in the new weighting factor being automatically

| SaSI Status Rating | Weighting Factor |
|---|---|
| Healthy | 1 |
| Depressed | 2 |
| Unknown | 2 |
| Critical | 3 |

**Figure A-3 Weight Factor Values for SaSI Stocks**

applied to the individual reach-specific worksheets. This feature is also useful because these weighting factors can be turned "off" by changing them all to a "0." This allows the user to look at rating scores using just one stock at a time, or with some smaller sub-set of stocks.

**ESA Weighting Factor:** The ESA weighting factor provides an optional mechanism for elevating the scores of reaches used by fish stocks listed as threatened or endangered under the Endangered Species Act. The ESA weighting factor is meant to be used in the same way as the SaSI stock status weighting values. It can be turned "off" by entering "0", it can be turned on by entering "1", or it can be given a higher value than "1" if the user wants to give ESA-listed fish relatively more importance in the rating scheme.

| **Weighting Factor for Federally Listed Species** | |
|---|---|
| Assign additional weight to stocks that are listed as Threatened or Endangered under the ESA? | Yes=1; No=0 |

**Figure A-4 Weight Factor Values for ESA Listing Status**

**TRT-Designated Major/Minor Spawning Areas** (MaSA, MiSA): Fish stocks that use reaches designated by the TRT as Major or Minor Spawning Areas can be given additional influence to their score by increasing/decreasing the weight factor associated with the relevant Major/Minor Spawning Areas.

| **Weighting Factor for Spatial Structure and Diversity of Fish Stocks** | |
|---|---|
| Assign additional weight to reaches within Interior Columbia TRT-designated Major or Minor Spawning Areas (MaSAs or MiSAs)? | Yes=1; No=0 |

**Figure A-5 Weight Factor Values for TRT-Designated Major/Minor Spawning Areas**

## 2. Reach-specific Tabs

The reach specific fish prioritization worksheets (Table A-4) have the same main components as the Fish Priority Score Worksheet; the monthly life history usage of each relevant fish stock, and its TRT, SaSI and ESA designations. There is one worksheet for each priority stream reach, which directs all data into the Fish Priority Score Worksheet.

## 3. Basin-wide Periodicity Tab

This worksheet (Table A-5) provides a visual summarization of fish use timing by life stage by species/stock across the entire basin. It also displays peak timing of habitat use during each life history stage.

## 4. Reference Tab

The reference sheet (Table A-6) contains a list of all the literature that is cited in the reach specific worksheets. Literature is usually cited in the "notes" section associated with each fish stock listed on each reach-specific worksheet. The literature provides the best available information concerning run timing and geographic distribution of all the relevant stocks. There is only one reference sheet in each rating workbook. References to personal communications with local biologists may not always be listed on the reference sheet.

## *E. Binning*

Once a fish status and utilization score was assigned to each reach using the process described above the reach-specific scores were standardized and binned into high, medium, and low categories for use in mapping and overview assessments of the WRIA (Table A-7). Each reach score was divided by the highest score of any single reach in the WRIA. Breaks between bins were defined as thirds of this highest reach score such that, theoretically, all reaches in a WRIA could potentially fall into a single bin. In practice this did not occur. While binned scores for reaches allow a quick assessment tool it should be noted that reach scores often fall immediately adjacent to the separations between bins. When evaluated in light of habitat and flow scores, it is these 'cusp' reaches in which small changes in another factor might drive fish use into the next higher strata of fish utilization.

## *F. For Further Information*

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# VI. Habitat Condition

Many components of habitat condition represent important limiting factors for stream reaches within the Columbia River Basin. It is critical for quantity and condition of the important habitat parameters necessary for salmonid productivity to be known and considered when evaluating flow restoration projects within a reach.

Habitat scoring was based on literature review of the *Washington Water Acquisition Program* report (Ecology 2003), Washington Conservation Commission Limiting Factors Analyses, and *Fish Life Qualitative Parameters for Assessment of Instream Flow Proposals* (WDFW 2007), enhanced by first- and second-hand field knowledge collected from local WDFW biologists.

In order to score habitat within a limited timeframe for the numerous reaches identified in the CRIA assessment, many steps were taken. A team of three biologists reviewed as much relevant literature as possible for an initial habitat reference point. Where there were little, outdated, or no data for a stream reach, local biologists were consulted to determine current habitat condition scores. Those contacts were documented, and represent best available science and best professional knowledge (BPK) about the given stream reach. If after these steps, there still wasn't sufficient evidence to definitively score reach habitat condition, a CRIA team member conducted a site visit to determine scores.

Habitat scoring for all WRIAs is contained in one workbook having one tab per WRIA. Within each tab, data include reach ID number, name, and length descriptions, as well as scores for each of the six habitat attributes and a final score. Bins of low, medium, and high scores are indicated using color codes.

## *A. Habitat Scoring Attributes*

After much consideration, six habitat attributes were chosen by the CRIA team as best representing overall habitat condition relative to salmonid utilization: Off-channel habitat; Floodplain connectivity; Riparian condition; Spawning suitability; Rearing suitability; and Passage conditions.

A four step scale of poor, fair, good, and excellent (scores 1, 2, 3, and 4, respectively) was developed to score each component. Scoring criteria for each attribute are detailed below. Definitions remain the same throughout the evaluation process.

## *B. Workbook Description*

All habitat condition scores are contained in one workbook having separate tabs for each WRIA/group (Table A-8). The worksheet contains rows for each reach within a WRIA, and habitat attributes are assigned to columns, with an additional column for the raw sum score, which is color-coded to identify bins.

## C. Habitat Scoring Criteria

In order to score the habitat of stream reaches with regard to the habitat needs of fishes, a standardized protocol was developed to ensure repeatability for each review. The six parameters chosen describe the habitat needs most easily identified without major field data collection. Following are descriptions of the scoring rubrics for each habitat attribute.[2]

### Floodplain Zone

### 1. Off Channel Habitat (OCHs)

Off-channel habitats provide important flood and winter refuge for fish as well as spawning habitat for some salmon species. OCH's are considered as side channels or backwaters (including floodplain sloughs, oxbows, ponds, and wetlands).

**1=Poor** - Reach has few or no (<10% of reach length) OCHs.

**2=Fair** - Reach has OCHs that are present within 10-50% of the reach, including both side channels and backwaters.

**3=Good** - Reach has OCHs are present within 50-80% of reach length, including both side channels and backwaters.

**4=Excellent** - Reach is virtually undisturbed (near-pristine), such that OCHs (including both side channels and backwaters) are present in over 80% of reach length.

### 2. Floodplain Connectivity

Floodplain connectivity addresses the relative condition of native flora, streambank erosion, stream crossings, and roads. These are visible signs of the relative value of wetland function in preserving water quality, temperature, and cover for rearing and migrating salmonids.

Floodplain connectivity addresses the relative condition of native flora, streambank erosion, stream crossings, and roads. These are visible signs of the relative value of wetland function in preserving water quality, temperature, and cover for rearing and migrating salmonids.

**1=Poor** - Reach has a severe reduction in hydrologic surface water connectivity and wetland function via loss of overbank (channel-forming) flows, such that riparian vegetation is altered significantly (<25% natural vegetation within the riparian corridor) . Greater than 50% of floodplain surface water connectivity is lost due to incision/channelization, roads, trails, powerlines, dikes, bank armoring, etc., such that streambank erosional damage is extensive (>50%), stream crossings (by roads, trails, powerlines, etc.) greatly exceed 3 per stream mile, and road density is high (>3 $mi/mi^2$ of watershed area).

**2=Fair** - Reach has a moderate reduction in hydrologic surface water connectivity and wetland function via loss of overbank (channel-forming) flows, such that

[2] References for habitat attribute development and scoring criteria include Vadas (1991, 1997); Vadas and Orth (1998); WDOE and WDFW (2003); and Vadas et al. (2008), as well as findings of the fish-landscape Priority Habitats and Species (PHS) project (Vadas, unpubl.).

riparian vegetation is altered significantly (25-50% natural vegetation within the riparian corridor). Up to 50% of floodplain surface water connectivity is lost, such that streambank erosional damage is moderate (20-50%), stream crossings exceed 3 per stream mile, and road density is moderately high (2-3 $mi/mi^2$ of watershed area).

**3=Good** - Reach has a moderately low reduction in hydrologic surface water connectivity and wetland function via loss of overbank (channel-forming) flows, such that riparian vegetation is altered to some extent (50-85% natural vegetation within the riparian corridor). Up to 20% of floodplain surface water connectivity is lost, such that streambank erosional damage is moderately low (10-20%), stream crossings are below 3 per stream mile, and road density is moderately low (1-2 $mi/mi^2$ of watershed area).

**4=Excellent** - Reach is virtually undisturbed (near-pristine), such that hydrologic surface water connectivity and wetland function are excellent and riparian vegetation is virtually unaltered (>85% natural vegetation within the riparian corridor). There is little or no loss of floodplain surface water connectivity, such that streambank shows minor (<10%) erosion damage and stream crossings (<<3 per stream mile), and road density (<1 $mi/mi^2$ of watershed area) are both low.

## 3. Riparian Condition

Riparian vegetation provides shade, cover (including large wood that later provides channel complexity), and food-sources to salmonids, all of which are needed for adequate spawning and rearing. The right kind of vegetation can shield streams from adjacent land use impacts.

**1=Poor** - Reach has a severe reduction in riparian condition (<70% intactness of native-growth forms), by being fragmented (poor connectivity) and with little woody vegetation, thus providing inadequate habitat (shade, refugia, and wood- and food-source) protection (buffering of land-use impacts) for sensitive aquatic species.

**2=Fair** - Reach has a moderate reduction of riparian condition, with moderately low woody vegetation, intactness of native-growth forms (70-80%), and thus habitat protection for sensitive aquatic species.

**3= Good** - Reach has a moderately low reduction of riparian condition, with moderately high woody vegetation, intactness of native-growth forms (>80%), and thus habitat protection for sensitive aquatic species.

**4=Excellent** - Reach is virtually undisturbed (near-pristine), such that the riparian corridor has a good mix of taller (including woody) and shorter vegetation, i.e., obvious growth-form diversity and high intactness of native-growth forms (>>80%).

## Aquatic Zone

### 4. Spawning Suitability

Spawning salmonids need good hyporheic flow (mixing of shallow groundwater and surface water) free of fine sediments that can smother eggs. Substrates having large rocks and/or a high degree of fine sediment are poor for salmonid spawning.

**1=Poor** - Reach has a major reduction in suitable salmonid and riffle-invertebrate (salmonid-food) substrata, because lotic-reach embeddedness (% sandy/muddy fines) and/or large-rock composition (LRC) greatly exceeds 30%. Reach is lacking in hyporheic flow, and thus salmonid spawning and zoobenthic rearing. Fast-water (riffle/run) habitats show embeddedness levels of 50% or more.

**2=Fair** - A moderate portion of the reach is suitable for salmonid spawning because reach embeddedness and LRC are both moderately high (<30% each) and fast-water habitats show embeddedness levels of 15-50%.

**3= Good** – A majority of the reach is suitable for salmonid spawning because reach embeddedness and LRC are both moderately low (<20% each) and fast-water habitats show embeddedness levels of 5-15%.

**4=Excellent** - Reach is is virtually undisturbed (near-pristine), with reach embeddedness and LRC both low (<<20% each), such that gravel recruitment and substratum conditions are optimal for salmonid spawning and riffle-zoobenthic rearing. Fastwater habitats show embeddedness levels under 5%.

### 5. Rearing Suitability

High mesohabitat diversity (i.e. various morphological stream habitats such as a pool, riffle, pool tail-out, or glides/runs) and moderate cover levels (e.g., large-woody debris) are important components for salmonid rearing because they provide food and refuge for juvenile fish. Stream reaches having swift flow and few pools do not provide enough sanctuary or feeding sites.

**1=Poor** - A majority of the reach is unsuitable for salmonid and pool zoobenthic rearing, for which aquatic cover (consisting of woody debris, undercut banks, boulders, overhanging vegetation, etc.) is low (<2%) or causes major choking (>>25%). Large-woody debris (LWD) is low (<<80 vs. <<20 pieces/mi on the West- vs. East-side, respectively). Few (<<3) mesohabitat types are evident here, and the reach is dominated by swiftly-moving water.

**2=Fair** - A moderate portion of the reach length is suitable for salmonid and pool-zoobenthic rearing, for which aquatic cover is moderately low (2-5%) or causes moderate choking (>25%). LWD is moderately low (<80 vs. <20 pieces/mi on the West- vs. East-side, respectively). Few (<3) mesohabitat types are evident here, and the reach is somewhat dominated by swiftly moving water.

**3= Good** - A majority of the reach is suitable for salmonid and pool-zoobenthic rearing, for which aquatic cover is moderate (5-10%) or with moderately low choking (<25%). LWD is moderately high (>80 vs. >20 pieces/mi on the West- vs. East-side, respectively). Several (>3) mesohabitat types should be important here, notably a good mix of pools and riffles, with less dominance of swiftly moving water.

**4=Excellent** - Reach is virtually undisturbed (near-pristine), with moderately high (10-25%) levels of vegetative and other aquatic cover for fishes and pool zoobenthos. LWD is high (>>80 vs. >>20 pieces/mi on the West- vs. East-side, respectively). Several (>>3) mesohabitat types are evident here, notably a good mix of pools and riffles, without dominance by swiftly moving water.

### 6. Passage Conditions

Passage conditions can be affected by barriers (both natural and artificial) and presence of shallow or long riffles that inhibit fish distribution. Some barriers only become impassable at lower flow levels, while others are impassable only at high flows. Some stream reaches without visible barriers can inhibit adult fish movement when flows are too low, either because the water level is too low for swimming through dewatered riffles, or because there is not enough flow attracting fish to move upstream to their spawning grounds. The ability to freely move up and/or downstream is critical for anadromous salmonids returning to spawn or migrating to the ocean, but is also important for resident salmonids in order to find food, refuge, and avoid predation.

**1=Poor** - Numerous (> 3) artificial barriers and/or critical riffles exist within the reach that impede up- and/or downstream salmonid migrations at a broad range of flows (i.e., including one or more complete barriers for all fishes). Much money and time will be needed in repairs or project completion for salmonid passage.

**2=Fair** - A few (2-3) artificial barriers and/or critical riffles exist that reduce up- and/or downstream salmonid migrations at low (late summer/early fall) flows (i.e., no complete barriers). Minimal amounts of time and money will be needed for repairs or project completion.

**3= Good** - Minor impediments to salmonid passage exist, as artificial barriers have passage structures that allow adequate up- and/or downstream salmonid migrations at all but perhaps extremely low (‘drought’) flows.

**4=Excellent** - Reach lacks impediments to upstream and/or downstream salmonid migrations (i.e., no partial or complete barriers).

## *D. Binning*

Bins are determined using a range between the lowest and highest reach scores within a watershed, then stratified into thirds (Figure A-6). For example, if the lowest reach habitat score is 6 and the highest score is 20, the range is 6-20, which when divided evenly among three units (low, medium, high) yields bins with scores ranging from 6-10 (poor), 11-15 (fair), and 16-20 (good).

| WRIA Score Range | Description /Color |
|---|---|
| Top 1/3 | Good |
| Middle 1/3 | Fair |
| Lowest 1/3 | Poor |

**Figure A-6 Habitat Score Binning Criteria**

Bin scores for each stream reach within a WRIA are shown as the last column in the Habitat Scoring workbook under each WRIA tab, and copied to the "All_Encompassing_Reach_Information" workbook.

## *E. Caveats*

One weakness in the above scoring attributes is the absence of a metric for water quality – specifically, for temperature. Temperature can be a major limiting factor for these Eastern Washington WRIAs; for example, mid- to late-summer thermal blockages can prevent upstream migration of summer Chinook and sockeye returning to spawn, leading to significant pre-spawning mortality, low fecundity and increased vulnerability to disease.

Another weakness was our inability, through lack of time, to seek broader peer review of reach scoring. This is still a step that needs to be taken in order to broaden the acceptance of the scoring results CRIA presents, and therefore CRIA's application across a broader audience.

## *F. Other Methodologies Available*

The CRIA Team invested significant time into attempts to employ two additional data sets in habitat scoring, either in lieu of BPK or in addition. These data sets were the National Land Cover Dataset developed by USGS and the EPA (NLCD 2001, http://www.mrlc.gov/, Homer et al 2004) and the Washington Dept. of Ecology / EPA Clean Water Act section 305(b) Water Quality Inventory Report. These were used to complement the BPK scoring by the habitat team by providing replicable quantitative metrics for each CRIA priority reach, such as the proportion of human modified land within certain distances along that reach, or what percentage of the reach has Dissolved Oxygen below the standard. The team was able to compare several of the BPK attributes (especially riparian condition) with selected landscape and water quality metrics, and to reevaluate the BPK scores where there were large discrepancies.

It was eventually determined that not enough time was available to fully develop these methods, but the Team recommends further investigation. In particular, deriving physical stream attributes via GIS modeling (such as gradient, bank-full width, confinement, sinuosity, or measuring toe widths via high resolution orthophotography) could expand the ability of biologists to provide this level of stream reach assessment in the absence of on-the-ground information. In particular, we might be able to derive metrics to address habitat attributes such as off channel habitat, floodplain connectivity, spawning suitability and rearing suitability.

### 1. NHD Land Cover

The National Land Cover Dataset (NLCD) was developed by USGS and the EPA to provide consistent land cover / land use data across the conterminous U.S. at a 30-m resolution. There are 16 types based on physiognomic vegetation structure and human modification. Depending on the analysis, we aggregated these types to more general classes, as well as natural versus human-modified landscapes (Table A-9).

Potentially useful streamside metrics include percent canopy closure within 50 m of the stream as a surrogate for stream shading; percent impervious surfaces within 50 m of the stream and percent developed as a surrogate for bank modification, armoring, and runoff; and percent agriculture within 50 m as a surrogate for sediment / nutrient inputs and agricultural modifications to the channel and banks.  At 500 m, we looked at percent human modified landcover types (agriculture + developed) to develop a metric for 'naturalness', as well as the broad classes of landcover to indicate the landscape context through which the stream reach runs (primarily shrub steppe, forested, agriculture).

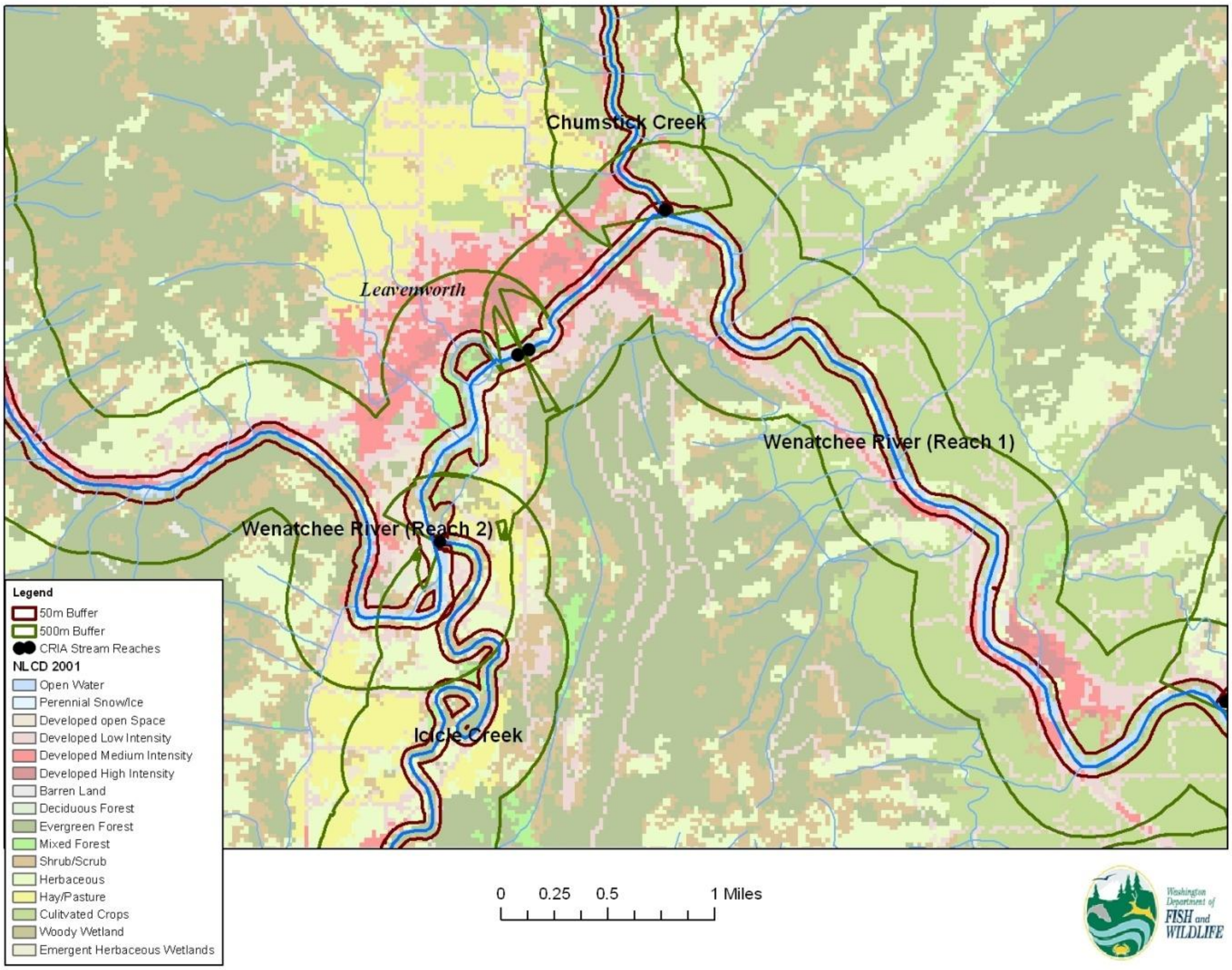


**Figure A-7  Example CRIA analysis of 50 m (red line) and 500 m (green line) NLCD data by cover type**

For each CRIA reach, we measured the proportions and areas for different land cover types and classes within 50 m of the stream as a metric for immediate streamside land cover and condition and within 500 m as a metric for the overall landscape context (Figure A-7).  Figure A-7 provides a detail of the Leavenworth area (WRIA 45) showing landcover classes within the 50 m (dark red line) and 500 m (dark green line) widths.  We used GIS to compute areas by type, and then standardized the sums of each landcover class to percent cover. For example, this NLCD 2001 data show that Wenatchee River Reach 1 is dominated by agriculture and developed land, whereas lower Icicle Creek runs primarily through pasture. Similar analyses were done using the NLCD impervious surface layer, and the NLCD canopy cover layer.

These metrics provided important supplementary data for the habitat team's BPK attribute scores. In particular, for each WRIA we compared the rank order of the GIS derived landcover metrics for each CRIA reach to the rank order of the BPK attribute scores (particularly riparian condition) and overall BPK combined score. Discrepancies were then re-examined by the Habitat Team to understand the differences, and as appropriate, change the BPK scores.

Example box plots comparing the BPK attribute scores (X-axis) with the distribution of GIS landscape metrics (in this case, percent of human modified landscape within 500 m of the stream) are shown in Figure A-8. These plots demonstrate that as BPK attribute scores increase (better habitat), the percent of human modified land cover decreases.

Most of the BPK habitat attribute scores, especially spawning and rearing suitability, reflect combinations of factors such as bank armoring, canopy shading, stream gradients, width, sinuosity, substrate (gravel size, sediment loads), water temperature, and dissolved oxygen. Combining these land cover metrics with physical stream attributes and water quality data has great potential to help biologists score habitat attributes directly, and in a quantitative and repeatable way. This would involve modeling detailed physical stream attributes, preferably on a high resolution LiDAR derived DEM (digital elevation model), and applying hydrologic models for attributes like stream power, bed load transport, erosion / sediment delivery, and large woody debris inputs using the NetMap/NetTrace program. There is also the possibility of applying some of the more sophisticated hydrologic and ground water models such as those developed by USGS in the Yakima Basin.

Ideally, initial prioritization mapping using habitat scores could be developed directly from these quantitative, replicable landscape metrics. However, many of the BPK attributes are difficult or impossible to adequately measure using GIS-derived landcover metrics, at least without significant investment of time and resources. For the current activity, the CRIA Team believes that BPK scores combining literature with on-the-ground knowledge by field biologists gives a better, and more cost-effective, measure of habitat condition.

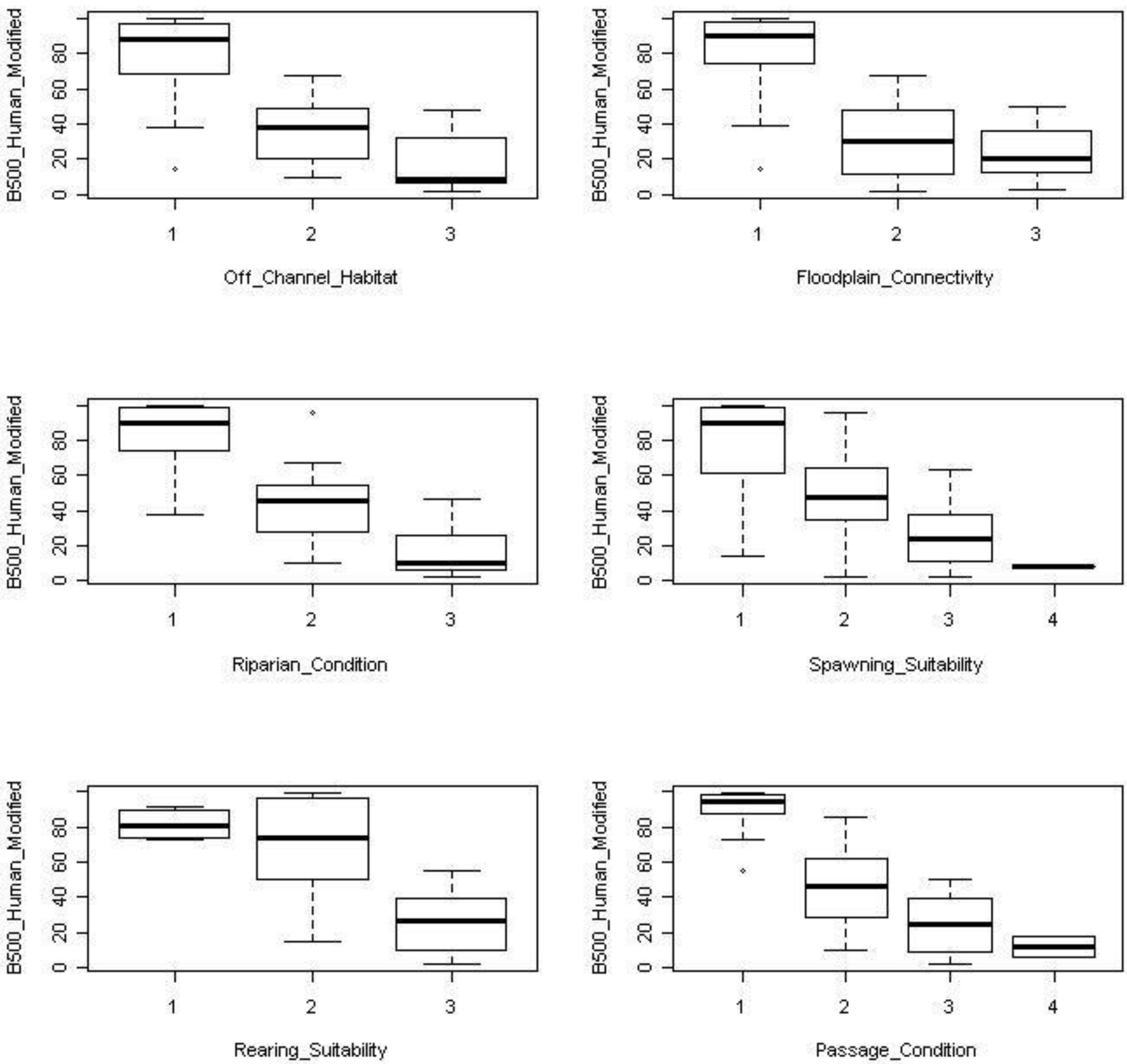


**Figure A-8 Example box plots comparing the BPK scores for each habitat attribute with the distribution of GIS landscape metrics for the "human modified" attribute**

## 2. 305(b) Water Quality Inventory

Water quality parameters, such as temperature, dissolved oxygen, and turbidity can have a direct impact on fish distributions, suitability for various life stages, and health. Water quality standards under the federal Clean Water Act, as administered by Washington State Department of Ecology, are set in part by effects on fish. To investigate this, we used Ecology's 305(b) Water Quality Inventory[3]. The 305(b) list includes the location, the parameter of concern (temperature, DO2, Flow, and/or turbidity), and the severity of the impairment using categories 2, 4, 4a, 4b, 4c, and 5, standards described on Table A-10. The 303(d) impaired waters list is a subset of the 305(b) Water Quality Inventory where the severity category = 5 (polluted waters that require a TMDL).

For our analysis we included all of the 305(b) categories. Even if a TMDL is in place, we included that impairment as an indicator of "something is wrong in this reach that requires active monitoring and management." For each CRIA reach, and for each of the four WQ parameters, we computed the percent of the length of that reach that had a potential impairment. Example results are provided on Figure A-9 and Figure A-10. Figure A-9 shows the maximum (worst) category of impairment for each reach; Figure A-10 is keyed for the water quality parameter that is impaired.

We did not have sufficient time to develop this analysis further, but we believe this is another data source with potential to inform habitat condition scoring in the future.

[3] http://apps.ecy.wa.gov/wats08/

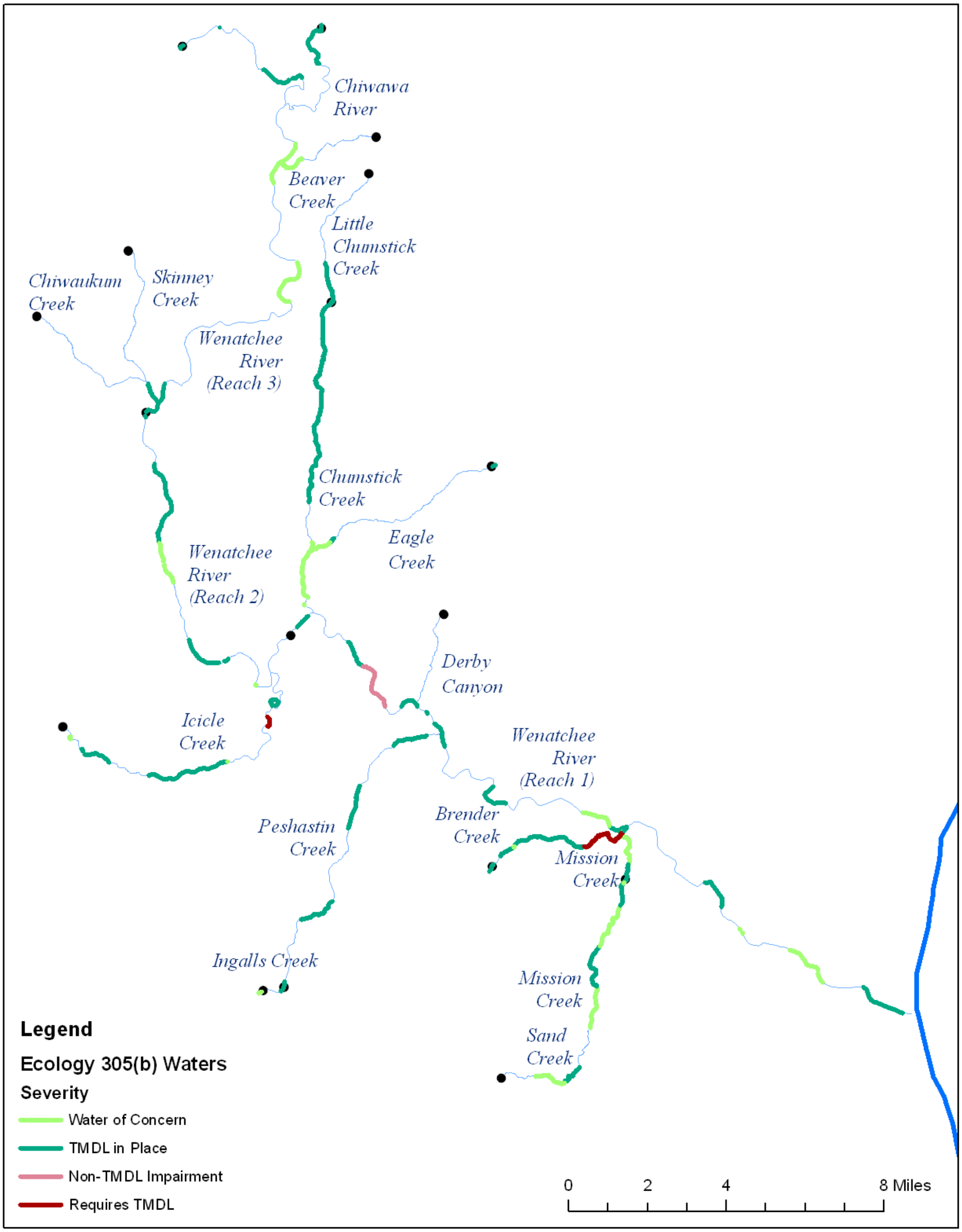


**Figure A-9 Example (WRIA 45) stream reaches showing 305(b) water quality inventory data**

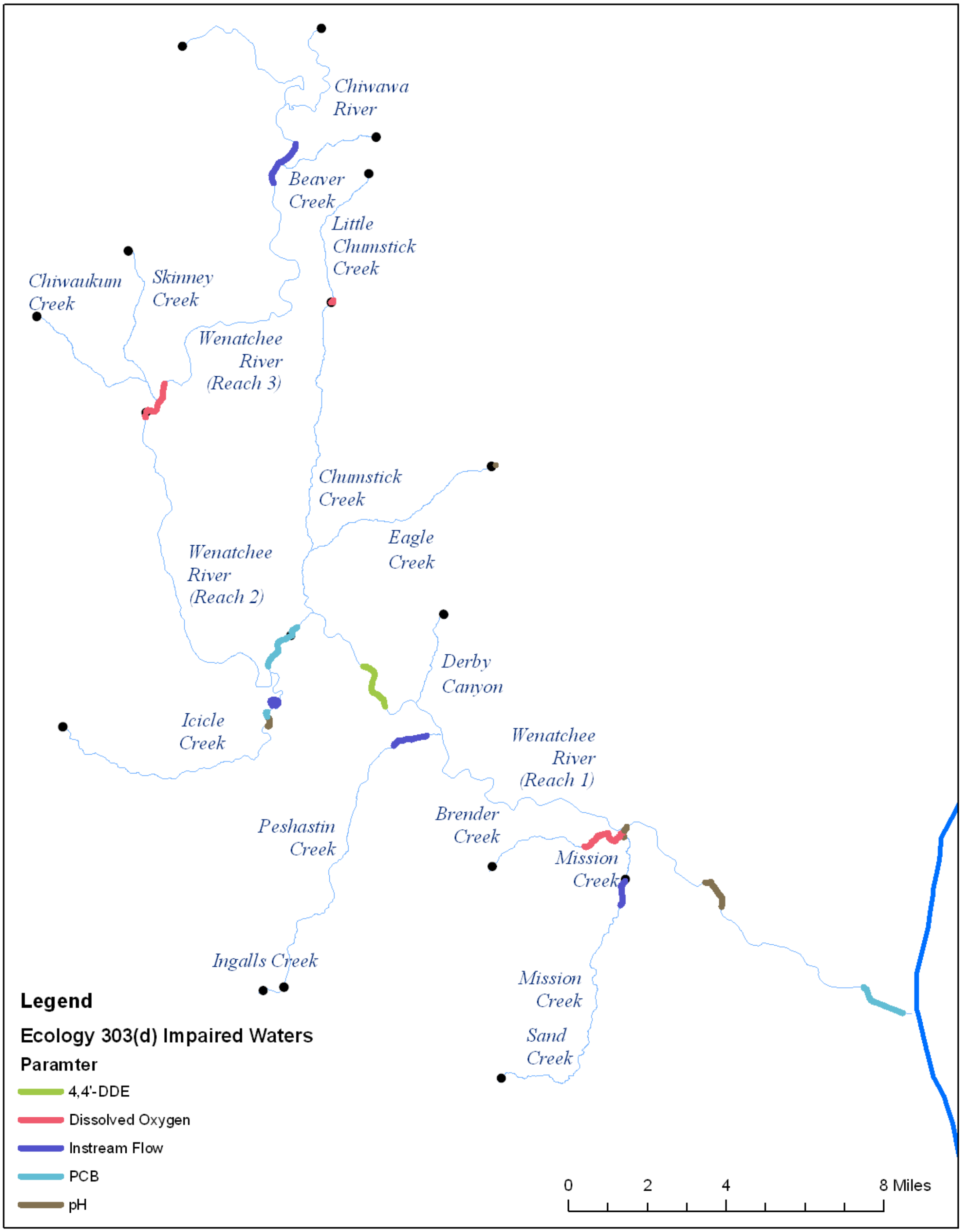


**Figure A-10 Example (WRIA 45) CRIA stream reaches showing 303(d) Category 5 impaired waters by impairment type**

## 3. Potential future investigations

Five additional parameters affecting salmonid productivity should be considered for future iterations. They are: 1) fine sediment loading; 2) temperature; 3) channel complexity or presence of Large Woody Debris to expand rearing habitat; 4) flood scour usually from a channelized system; and 5) predation and poaching.

**Fine sediment loading -** This parameter would be difficult to measure and is not readily known in all reaches; currently sediment loading is used indirectly (if known to be a detriment) for scoring the "spawning condition" attribute.

**Temperature** – Stream temperature is a limiting factor commonly encountered, especially in eastern Washington. Input of cooler water is necessary in substantial amounts in order to decrease stream temperatures. The amount and temperature of increased flow would be unique to each reach and therefore difficult to score. Also, providing enough water volume to decrease temperatures may conflict with other salmonid-directed flow management objectives (i.e. when flow is higher than optimal for fish). Providing additional instream flow to a stream where temperature is a limiting factor may not improve conditions if no other measures are implemented to maintain/decrease water temperatures (e.g., riparian vegetation complexity and maturity, stream cover).

**Lack of LWD or instream cover** - Preservation of riparian vegetation and production of aquatic invertebrates that provide important cover and food for salmonids may be important, even if temperature thresholds are exceeded. Hish-resolution GIS-based land cover information may enhance our ability to score this metric in future iterations.

**Flood scour** – A channelized stream will scour more readily than a sinuous stream when flows are high. This parameter is important in measuring suitability of substrate for spawning and can also help determine rearing suitability. This parameter was not scored as an individual parameter, but is indirectly scored in association with spawning conditions of a reach.

**Predation and Poaching** – Low flows can leave fish vulnerable to predation (concentrating predators and prey into smaller habitat) and poaching (concentrating food fish such that harvest is easy). Certain habitat parameters are associated with conditions that enable predation/poaching. These types of habitat conditions were only indirectly evaluated as part of the "rearing suitability" parameter.

## G. References

Literature sources used to score habitat included but were not limited to:

- Northwest Power and Conservation Council Subbasin Plans, (http://www.nwcouncil.org/fw/subbasinplanning/Default.htm),
- Salmon Recovery Plans (http://www.nwr.noaa.gov/Salmon-Recovery-Planning/index.cfm) developed by local Salmon Recovery Boards, and
- Limiting Factors Analysis reports (http://www.scc.wa.gov/).

In addition, a large number of reports produced by the Colville Tribes Fish and Wildlife Department (http://nrd.colvilletribes.com/obmep/default.htm), Washington Department of Fish and Wildlife (http://wdfw.wa.gov/publications/), and Annual Reports of Projects funded by Bonneville Power (http://www.efw.bpa.gov/IntegratedFWP/technicalreports.aspx) were used to score habitat. Specific citations are provided in the bibliography, below.

## H. For Further Information

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# VII. Flow Condition

The flow data manipulation and scoring process involved five steps for each WRIA as follows:

1) Collect and summarize water rights data;
2) Collect, review, and summarize flow gauge data;
3) Collect instream flow rule data;
4) Collect and summarize NHD+ normative flow data;
5) Scoring and binning

For this report, the following definitions apply:

**Period of record**: The years for which data are summarized for CRIA scoring.

**Mean Monthly Flow**: The average of flows for a particular month in the period of record.

**Mean Annual Flow**: The average of flows over the year in the period of record (average of "mean monthly flows" for all months)

**Mean August Flow**: The average of August flows in the period of record.

These terms may or may not have been used consistently or correctly within any of the workbooks. In particular, the term "average Mean Monthly Flow" is often used when the term "Mean Annual Flow" is more correct.

## *A. Workbook Description*

Excel workbooks were created to contain water right data for each WRIA. Reach-specific water right data are grouped under individual reach tabs (Table A-11), and a rollup of scoring for all reaches occurs as the first spreadsheet tab (Table A-12).

The flow workbooks are organized into tabs, including separate tabs for each stream reach for which flow gauge data are available, a tab containing flow targets copied from workbooks provided by Ecology OCR, and a "reaches" tab containing data used in scoring, along with the final scoring metrics, and bins. Other tabs that might occur include data for gauges that were not used for scoring, and a tab for references and/or gauge data web links.

## *B. Data Manipulation*

### 1. Water Rights Data

Water rights data records were copied from Ecology's Water Rights Tracking System (WRTS) database on September 10, 2010. At that time, we were not able to download annual (Qa) or instantaneous (Qi) water quantity data for records identified as claims. Steps to manipulate the data included:

1) Extract water rights data from WRTS by WRIA
2) Apportion water right data records to CRIA reach;
3) Create workbook; Format and summarize records: number of claims, total Qa, number of records for each reach. Excluded Categories and Purposes as noted

in Table A-11 and Table A-12. Summarized data appear at the top of each reach spreadsheet.

4) Scan for irregularities: Qa or Qi too high for acreage, purpose of use questionable, GPM units; noted disposition, corrected as appropriate

5) Copy summary results to "reaches" tab.

WRTS Data are available online at: http://www.ecy.wa.gov/programs/wr/rights/tracking-apps.html. The following information for each data record was examined when scoring for CRIA:

**Type of water right:** Only "S" code (surface water) rights were examined, even though groundwaters in continuity with surface flow are also important.

**Status:** Document type and status (see Table A-13)

**Q(i) (Instantaneous Quantity):** the maximum diversion or withdrawal rate requested by the applicant; in cubic feet per second for surface water and gallons per minute for ground water.

**Q(a) (Acre Feet/Year):** the annual volume or quantity of water requested by the applicant; one acre foot per year is equal to one foot of water over one acre of land or 325,850 gallons of water.

**Purpose of Use:** See Table A-14 for codes and definitions.

In general, many records were missing withdrawal Qi (instantaneous flow) data, not just for "stock watering" uses but for other purposes as well, and this anomaly was fairly consistent within a WRIA. In some cases it was difficult to apportion records to CRIA reaches; questionable records were investigated and decisions noted on the spreadsheet.

As noted above, data were summarized at the top of each spreadsheet. Metrics include "Claims," which is a count of records of the document type "Claim," "Claim L," and "Claim S;" a sum of the instantaneous flow (cfs) permitted within that reach ("Qi"); and a count of the number of records for each reach. The sum of flow did not include document types and purposes of use as noted in Table A-13 and Table A-14. Once summarization was completed for each reach tab, those results were copied to an opening "Reaches" tab containing CRIA reach number, reach name, number of claims, sum of instantaneous flow, and number of records. Data from this water rights "Reaches" tab are copied into the "Flow" workbook, "Reaches" tab.

## 2. Flow gauge data

Flow data collected from stream flow gauges for each WRIA were copied into a "Flow" workbook, with one tab for each CRIA reach (Table A-15). The data were then formatted, a "period of record" chosen for use when comparing monthly mean flows to flow targets, and summarized. When two or more gauges were located within a particular reach, we chose the one with the period of record that best matched our needs, the one with the specific location more aligned with our reach boundaries, or a gauge designated as a control point for stream flow monitoring. A roll-up "Reaches" tab contains mean monthly flow, mean August flow, and mean annual flow, plus other metrics summarized from the individual reach tabs.

Figure A-11 shows a graphic depiction of a typical hydrograph. Table A-15 shows a sample flow data tab.

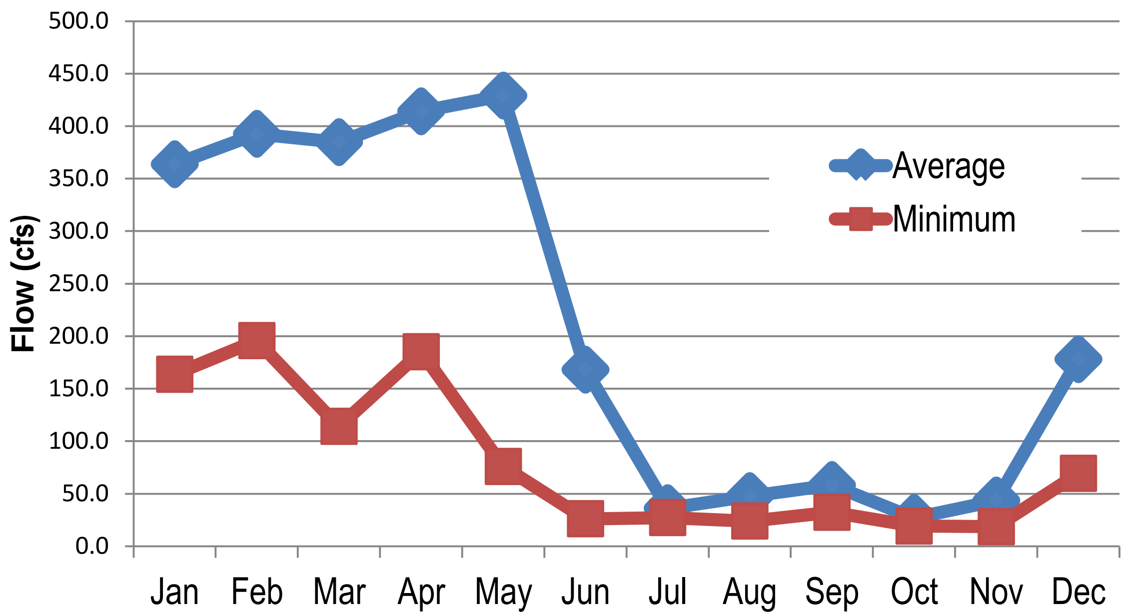


**Figure A-11 Sample Hydrograph (Walla Walla at Beet Road; 2002-2009)**

## 3. Instream flow rule data

Data for instream flow targets (rules) was provided by Ecology in a series of Excel spreadsheets called “Processed Data;” one for each gauge within a WRIA. Ecology recorded instream flow rules for each week of the year. These data were copied to the CRIA “Flow” workbook into the “Flow Rules” tab (Table A-16), and copied to individual reach tabs, as appropriate.

## 4. NHDPlus Flow Estimates for Non-gauged Reaches

To provide estimates of Mean Annual Flow (MAF) for non-gauged stream reaches, we used NHDPlus[4]. While the hydrography we used was not exactly congruent with NHDPlus, it was easy to visually identify those NHDPlus reaches that corresponded to the downstream extent of the CRIA reach and extract the estimated MAF.

To estimate the monthly flow for non-gauged reaches, we developed annual hydrographs for the gauged streams in a given WRIA, calculated the ratio of each month’s flow to the MAF, then computed the mean ratio for each month across all the gauged streams in that WRIA. This mean ratio was then applied to the estimated MAF of non-gauged stream reaches in that WRIA to create the monthly estimates. We used

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4 http://www.horizon-systems.com/nhdplus/, ftp://ftp.horizon-systems.com/NHDPlus/documentation/NHDPLUS_UserGuide.pdf

the MAF estimate and the mean August flow as metrics for scoring in the absence of gauge data.

While these estimates often give quite reasonable results, there are several problems with this methodology. First, it assumes that all the annual hydrographs are the same shape, with similar monthly contributions to the annual total. In reality, different reaches in different positions in the watershed (e.g., lower main stems vs. upper tributaries) can have different shaped hydrographs (i.e. peak flow earlier in the year for upper tributaries responding to snowmelt, later attenuated peak flow for mainstem tributaries). Second, this method does not account for managed hydrography, where flows are controlled by dam releases rather than natural runoff (September releases on the Tieton River from Bumping Reservoir are a good example of this). Third, this model does not account for groundwater base flows, which can be significant both for flows and for water temperature.

A possible future approach would be to model monthly flows directly using the upstream contributing area of each reach as computed from the DEM, along with the monthly precipitation grids from the PRISM dataset (Daly et al 2008, http://www.prism.oregonstate.edu). The same software package we propose to use to develop physical stream attributes (NetTrace/ Netmap, http://www.netmaptools.org/, Miller 2003a, 2003b) would be helpful in processing these data. Comparing the results of this model with gauged stream reaches will allow calibration of the model results to true field measurements.

Direct measurements of flow will always be superior to estimates such as the ones we made for CRIA. WDFW will work with Ecology to identify currently non-gauged reaches that should be gauged in order to better manage fish and water resources.

Summarized NHDPlus data for Mean Annual Flow and Mean August Flow in each reach were copied into the “Reaches” tab of the “Flow” workbook.

## 5. Information not used in scoring

Several summarization results, that are interesting in themselves, were left out of the final scoring method but remain in the workbook as artifacts. In particular, Limiting Factors Analysis and Ecosystem Diagnostic and Treatment results were evaluated for use in scoring, as discussed below.

Limiting Factors Analysis (LFA): While LFA reports were a critical data source for habitat scoring, an attempt to develop a meaningful metric from LFA summaries was not successful. LFAs available for the CRIA watersheds were reviewed, and a summary table created for each WRIA that among other things indicated whether instream flow is the primary factor (3), a secondary factor, or “one of the primary factors,” (2), one of many factors (1), or not a factor (0) limiting salmonid production in that WRIA.

Similarly, 2006 Ecosystem Diagnostic and Treatment (EDT) model results were assessed based on the level of salmonid production benefits provided by increasing stream flow. High benefits scored “3,” medium benefits scored “2,” low level of benefits scored “1,” and indirect or general benefits scored “0.”

In general, CRIA reaches and LFA/EDT geographic subdivisions were difficult to correlate. Also, both LFA and EDT resulting scores tended to vary little among reaches within a WRIA, and were therefore not of much help as a component of flow scoring to distinguish among WRIA reaches. We determined that we would expect little value-added from further consideration, so abandoned these two tools for use in flow scoring.

## *C. Flow Scoring and Binning*

The "Reaches" tab of the "Flow" workbook contains all the summary information used to score for flow condition (Table A-17). This spreadsheet contains the reach number and name; mean monthly and mean annual flow data copied from gauge tabs; NHD+ flow estimates copied from the "All_Encompassing_Reach_Information" workbook; and several intermediate computations. Scoring for the key attributes represents a measure of flow impairment, meaning high scores = high impairment (poor condition). The key attributes for reach flow scoring are:

- "Flow-For-Scoring" = Mean Annual Flow and Mean August Flow, or NHD estimates thereof.
- Count of months when Mean Monthly Flow is lower than instream flow rule.
- "Qi" = sum of appropriate Qi for each reach from WRTS data.
- "Claims" = number claims in a reach. We interpreted a higher number of claims as meaning a potentially higher risk that withdrawals are higher than Qi.
- "August Deviation" is Mean August Flow / Mean Annual Flow; as a measure of severity of difference from low summer flows to mean

The five CRIA scoring metrics and their rubrics are

| Item | Criteria | Score = |
|---|---|---|
| A | Percent of months Mean Monthly Flow is below rule | |
| | >.75 | 4 |
| | >.5 | 3 |
| | >.25 | 2 |
| | else | 1 |
| B | Qi Deviation from (divided by) Mean Annual Flow | |
| | >.15 | 3 |
| | >.05 | 2 |
| | else | 1 |
| C | Number of Claims in reach | |
| | <2 | 1 |
| | <9 | 2 |
| | else | 3 |

| | | | |
|---|---|---|---|
| D | August as a proportion of (divided by) Mean Annual Flow | | |
| | | >.66 | 1 |
| | | >.33 | 2 |
| | | else | 3 |
| E | Flow Volume (cfs for Mean Annual Flow) | | |
| | | >1000 | 0.5 |
| | | >100 | 1 |
| | | >50 | 2 |
| | | >5 | 3 |
| | | else | 4 |

Because we scored for impairment (low score = low impairment = good condition), scores are inverted in the next step to align with other CRIA scores (low score = poor condition, high score = good condition). Reaches lacking gauge data and for which reliable NHD+ estimates could not be made were given high impairment scores for the relevant attribute.

A raw score for each reach is derived by summing items A through D, then multiplying by item E. Raw scores are stratified into percentiles (using Excel spreadsheet functions) in order to determine scoring bins. The highest 1/3 of scores (interpreted as the most flow impaired) are assigned to the "1" (poor condition) bin, the middle 1/3 to the "2" (average condition) bin, and the lowest 1/3 (least flow impaired) to the "3" (good condition) bin. In this way, scores are transformed to coincide with the other CRIA scores, which use a low-to-high condition convention (i.e. a high score for flow impairment indicates poor flow condition status).

## *D. Caveats*

**Inverse scoring**: The current scoring scheme, with higher scores denoting worse condition, is admittedly awkward in context with scoring schemes developed for the other components. However, it is easier to develop measures of impairment than it is to find measures of "goodness." Although this approach provides a useful lens through which to view stream reach attributes, we would probably look for other ways to score in future iterations that are not so counter-intuitive with scoring for the other CRIA elements..

**Flow targets**: Absence of an instream flow rule doesn't inhibit ability to score flow condition, but does reduce the applicability of CRIA for the water demand forecast.

**Claims attribute**: The use of the count of claims for a reach (rather than including sums of Qa - water volume) is a surrogate that seems to help capture the vulnerability of flows in smaller reaches. This is especially true in reaches lacking flow targets. The team considered whether to retrace our steps to collect the Qa and Qi for claims, but decided that because these values have not been reviewed for extent and validity, using these values could lead us even farther astray than the current metric.

**Lowest-flow month**: Use of August as the month for which to compute deviation from "monthly average" flow is inappropriate in some WRIAs or reaches where low flow occurs in September, July, or even December.

**Opportunities for improvement**: The three best flow metrics, if they could be developed for all reaches, would be a) Qi relationship to mean flow on a monthly or seasonal basis instead of annual, b) deviation between low-month flow (not always August) and Mean Annual Flow (or peak annual flow), c) deviation between Mean Annual Flow and the flow associated with some physical metric of channel capacity, d) a more rigorous comparison of Mean Monthly Flows to instream flow rules and/or other surrogates for instream flow rules where they don't currently exist, all in some combination with e) flow volume factor.

### *E. For Further Information*

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## VIII. Suggested Improvements

Should further work on this activity be commissioned, the CRIA team suggests several improvements.

- First, all data should be stored in a single database that can be dynamically updated as water right, flow gauge data, SaSI, and fish distribution data are updated. It would be ideal if these individual data points could be displayed in interactive geospatial applications.
- CRIA scoring criteria and results should be more broadly vetted among WDFW biologists, Ecology water resources specialists, and tribal and local partners.
- Theoretically, CRIA should reflect habitat improvements over time as improving habitat scores. To this end, a mechanism should be created to dynamically link other external inventories (e.g., fish passage barriers, fish screen locations/status, Habitat Work Schedule information on salmon habitat restoration projects) and incorporate those data into habitat scoring.
- We recommend expansion of CRIA into the Entiat (WRIA 46) in the short term (because ESA-listed salmonid stocks originate there), to Westside salmonid streams (particularly those that contain ESA-listed salmonids), and finally to additional WRIAs containing other ESA-listed fish stocks.

Finally, work should be done to evaluate changes in timing of peak flows and other hydrological attributes, and whether those fluctuations represent trends that negatively affect fish at the population scale.

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# X. Tables

# Table A-1 Sample of All_Encompassing_Reach_Information spreadsheet

| | A | B | C | D | E | F | G | H | I | J | K | L | AS | AT | AU | AV | AW | AX | AY | AZ | BA | BB | BC | BD | BE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | CRIA_ID | WRIA | Reach_Name | LLID | GAUGE | OLD_STUDY | REACH_DESCR | TRIBUTARY_TO | GIS_BEG | GIS_END | RCH_LNGTH_FT | RCH_LNGTH_MI | Off_Channel_Habitat | Floodplain_Connectivity | Riparian_Condition | Spawning_Suitability | Rearing_Suitability | Passage_Condition | FISH_SCO | FISH_BIN | FLOW_SCO | FLOW_Old | FLOW_BIN | HAB_SCO | HAB_BIN |
| 2 | 3224 | 32 | Blue Creek | 1181536460611 | USGS 14013500 | Yes | Mouth to Laird Creek | Mill Creek (Reach 2) | 0.0 | 5.0 | 26,586 | 5.04 | 1 | 1 | 2 | 2 | 3 | 2 | 0.66 | 2 | 9 | 3 | 2 | 15 | 3 |
| 3 | 3234 | 32 | Caldwell Creek | 1183374460341 | | No | Mouth to Shelton Road (whole strea | Yellowhawk Creek | 0.0 | 2.4 | 12,623 | 2.39 | 1 | 1 | 2 | 2 | 2 | 1 | 0.40 | 2 | 12 | 1 | 1 | 11 | 2 |
| 4 | 3223 | 32 | Cold Creek | 1184604460466 | | No | To upper extent of frog ponds E of M | Mill Creek (Reach 1) | 0.0 | 3.5 | 18,656 | 3.53 | 1 | 1 | 1 | 2 | 1 | 1 | 0.50 | 2 | 20 | 1 | 1 | 12 | 2 |
| 5 | 3208 | 32 | Coppei Creek | 1181741462722 | ECY 32G060 | Yes | Mouth to Coppei Creek forks | Touchet River (Reach 2) | 0.0 | 8.0 | 42,323 | 8.02 | 1 | 1 | 2 | 2 | 2 | 2 | 0.50 | 2 | 18 | 1 | 1 | 11 | 2 |
| 6 | 3229 | 32 | Cottonwood Creek | 1183638460272 | ECY 32M100 | Yes, but NF is exclude | Mouth to North Fork Cottonwood Cre | Yellowhawk Creek | 0.0 | 6.6 | 35,111 | 6.65 | 1 | 1 | 2 | 1 | 2 | 2 | 0.40 | 2 | 12 | 3 | 1 | 10 | 1 |
| 7 | 3222 | 32 | Doan Creek | 1184710460409 | | No | Mouth to Last Chance Road? At lon | Mill Creek (Reach 1) | 0.0 | 4.4 | 23,184 | 4.39 | 1 | 1 | 1 | 1 | 2 | 1 | 0.50 | 2 | 12 | 1 | 1 | 12 | 2 |
| 8 | 3215 | 32 | Dry Creek | 1185925460511 | ECY 32F150 | Yes | Mouth to North Fork Dry Creek | Walla Walla River (Reach 2) | 0.0 | 35.2 | 185,668 | 35.16 | 2 | 2 | 2 | 1 | 2 | 2 | 0.50 | 2 | 18 | 1 | 1 | 10 | 1 |
| 9 | 3225 | 32 | East Little Walla Walla River | 1184113460197 | ECY 32H090 | No | Mouth to Oregon border | Walla Walla River (Reach 3) | 0.0 | 2.0 | 10,568 | 2.00 | 1 | 2 | 1 | 2 | 2 | 1 | 0.50 | 2 | 32 | 1 | 1 | 15 | 3 |
| 10 | 3218 | 32 | Mill Creek (Reach 1) | 1184778460386 | ECY 32C070 | Yes, but as two reache | Mouth to Bennington Dam | Walla Walla River (Reach 2) | 0.0 | 12.4 | 65,410 | 12.39 | 1 | 1 | 1 | 2 | 2 | 1 | 1.00 | 3 | 14 | 1 | 1 | 8 | 1 |
| 11 | 3219 | 32 | Mill Creek (Reach 2) | 1184778460386 | USGS 14015000, US | Yes, but as two reache | Bennington Dam to Blue Creek | Mill Creek (Reach 1) | 12.4 | 18.3 | 31,268 | 5.92 | 2 | 2 | 2 | 3 | 3 | 2 | 0.88 | 3 | 6 | 3 | 3 | 16 | 3 |
| 12 | 3220 | 32 | Mill Creek (Reach 3) | 1184778460386 | USGS 14013000 | Yes, but as two reache | Blue Creek to Oregon border | Mill Creek (Reach 2) | 18.3 | 23.5 | 27,185 | 5.15 | 3 | 2 | 2 | 3 | 3 | 2 | 1.00 | 3 | 10 | 1 | 2 | 16 | 3 |
| 13 | 3214 | 32 | Mud Creek | 1186189460476 | | No | Mouth (lower) to Locher Road | Walla Walla River (Reach 2) | 0.0 | 10.1 | 53,089 | 10.05 | 1 | 1 | 1 | 1 | 1 | 1 | 0.27 | 1 | 16 | 1 | 1 | 6 | 1 |
| 14 | 3209 | 32 | North Fork Coppei Creek | 1181085461900 | | Yes | Confluence to falls above Coppei Sp | Coppei Creek | 0.0 | 4.5 | 23,756 | 4.50 | 2 | 2 | 2 | 3 | 3 | 2 | 0.40 | 2 | 12 | 1 | 1 | 16 | 3 |
| 15 | 3216 | 32 | North Fork Dry Creek | ############ | | No | Mouth to tributary at GIS RM 3.0 | Dry Creek | 0.0 | 3.0 | 15,979 | 3.03 | 1 | 1 | 1 | 1 | 1 | 1 | 0.40 | 2 | 6 | 3 | 3 | 16 | 3 |
| 16 | 3211 | 32 | North Fork Touchet River (Reach 1) | 1179588463015 | ECY 32E050 | Yes | Mouth to Wolf Fork | Touchet River (Reach 3) | 0.0 | 3.9 | 20,357 | 3.86 | 1 | 1 | 1 | 3 | 3 | 2 | 0.88 | 3 | 4 | 3 | 3 | 13 | 2 |
| 17 | 3212 | 32 | North Fork Touchet River (Reach 2) | 1179588463015 | ECY 32E150 | Yes | Wolf Fork to Forest Service boundry | North Fork Touchet River (Reach 1) | 3.9 | 15.4 | 60,813 | 11.52 | 2 | 2 | 2 | 3 | 3 | 2 | 1.00 | 3 | 12 | 3 | 1 | 16 | 3 |
| 18 | 3226 | 32 | Patit Creek | 1179841463198 | | Yes | Mouth to confluence of North and W | Touchet River (Reach 3) | 0.0 | 7.8 | 41,297 | 7.82 | 1 | 1 | 1 | 2 | 2 | 1 | 0.50 | 2 | 12 | 2 | 1 | 8 | 1 |
| 19 | 3213 | 32 | Pine Creek | 1186528460280 | | Yes | Mouth to Oregon border | Walla Walla River (Reach 2) | 0.0 | 5.3 | 27,817 | 5.27 | 1 | 1 | 1 | 1 | 1 | 2 | 0.50 | 2 | 12 | 1 | 1 | 6 | 1 |
| 20 | 3210 | 32 | South Fork Touchet River | 1179588463025 | ECY 32L070 | Yes | Mouth to Griffen Fork | Touchet River (Reach 3) | 0.0 | 14.8 | 78,014 | 14.78 | 1 | 2 | 1 | 3 | 3 | 3 | 0.86 | 3 | 15 | 2 | 1 | 15 | 3 |
| 21 | 3231 | 32 | Titus Creek (Reach 1) | 1182772460768 | | No | Mouth to Five Mile Bridge | Mill Creek (Reach 1) | 0.0 | 2.7 | 14,441 | 2.74 | 1 | 1 | 2 | 1 | 2 | 1 | 0.40 | 2 | 0.5 | 1 | 3 | 8 | 1 |
| 22 | 3232 | 32 | Titus Creek (Reach 2) | 1182772460768 | | No | Five Mile Bridge to Mill Creek | Mill Creek (Reach 1) | 2.7 | 4.5 | 9,357 | 1.77 | 1 | 1 | 2 | 1 | 2 | 1 | 0.40 | 2 | 0.5 | 2 | 3 | 15 | 3 |
| 23 | 3205 | 32 | Touchet River (Reach 1) | 1186823460337 | ECY 32B075 | Yes, but as two reache | Mouth to Hofer Dam | Walla Walla River (Reach 1) | 0.0 | 5.0 | 26,341 | 4.99 | 1 | 1 | 1 | 1 | 1 | 2 | 0.94 | 3 | 4 | 3 | 3 | 8 | 1 |
| 24 | 3206 | 32 | Touchet River (Reach 2) | 1186823460337 | ECY 32B100 | Yes, but as two reache | Hofer Dam to Coppei Creek | Touchet River (Reach 1) | 5.0 | 50.7 | 241,441 | 45.73 | 1 | 1 | 2 | 2 | 2 | 3 | 0.78 | 3 | 7 | 1 | 2 | 11 | 2 |
| 25 | 3207 | 32 | Touchet River (Reach 3) | 1186823460337 | ECY 32B110 | Yes, but as two reache | Coppei Creek to Touchet River forks | Touchet River (Reach 2) | 50.7 | 64.2 | 70,972 | 13.44 | 2 | 2 | 2 | 3 | 3 | 3 | 0.85 | 3 | 6 | 1 | 3 | 14 | 2 |
| 26 | 3201 | 32 | Walla Walla River (Reach 1) | 1189393460624 | USGS 14018500 | Yes | Mouth to Touchet River | Columbia River | 0.0 | 23.1 | 122,219 | 23.15 | 2 | 2 | 2 | 2 | 2 | 2 | 0.94 | 3 | 6 | 1 | 3 | 9 | 1 |
| 27 | 3202 | 32 | Walla Walla River (Reach 2) | 1189393460624 | ECY 32A100 | Yes | Touchet River to Mill Creek | Walla Walla River (Reach 1) | 23.1 | 37.5 | 75,984 | 14.39 | 1 | 1 | 1 | 2 | 2 | 2 | 0.94 | 3 | 7 | 1 | 2 | 10 | 1 |
| 28 | 3203 | 32 | Walla Walla River (Reach 3) | 1189393460624 | ECY 32A105, ECY 32 | Yes | Mouth to Oregon border | Walla Walla River (Reach 2) | 37.5 | 44.5 | 36,912 | 6.99 | 1 | 1 | 1 | 2 | 2 | 2 | 0.85 | 3 | 6 | 1 | 3 | 11 | 2 |
| 29 | 3233 | 32 | Walsh Creek | 1184406460167 | | No | Mouth to pond on farm bordering Or | West Little Walla Walla River | 0.0 | 2.8 | 14,720 | 2.79 | 1 | 1 | 1 | 1 | 1 | 1 | 0.40 | 2 | 16 | 1 | 1 | 13 | 2 |
| 30 | 3217 | 32 | West Little Walla Walla River | 1184802460383 | | No | Mouth to Oregon border | Walla Walla River (Reach 2) | 0.0 | 5.7 | 30,328 | 5.74 | 1 | 1 | 1 | 1 | 2 | 1 | 0.50 | 2 | 3 | 3 | 3 | 10 | 1 |
| 31 | 3227 | 32 | West Patit Creek | 1178565463363 | | No | Mouth to Forest Service boundary | Patit Creek | 0.0 | 9.3 | 49,310 | 9.34 | 1 | 1 | 1 | 1 | 2 | 1 | 0.50 | 2 | 6 | 3 | 3 | 15 | 3 |
| 32 | 3230 | 32 | Whisky Creek | 1181170462728 | | Yes | Mouth to tributary at GIS RM 6.0 | Touchet River (Reach 3) | 0.0 | 6.0 | 31,505 | 5.97 | 1 | 1 | 2 | 2 | 2 | 2 | 0.47 | 2 | 12 | 2 | 1 | 11 | 2 |
| 33 | 3235 | 32 | Wolf Fork | 1178953462742 | ECY 32K070 | No | Mouth to USFS boundary | North Fork Touchet River (Reach 1) | 0.0 | 12.5 | 65,926 | 12.49 | 1 | 2 | 2 | 3 | 3 | 2 | 1.00 | 3 | 15 | 3 | 1 | 17 | 3 |
| 34 | 3228 | 32 | Yellowhawk Creek | 1183998460169 | ECY 32D060 | Yes | Mouth to Mill Creek | Walla Walla River (Reach 3) | 0.0 | 9.0 | 47,319 | 8.96 | 1 | 1 | 1 | 1 | 1 | 3 | 0.61 | 2 | 21 | 1 | 1 | 10 | 1 |
| 35 | 3511 | 35 | Alkali Flat Creek | 1180869465756 | | Yes | Mouth to Little Alkalai Flat Creek | Snake River (Reach 1) | 0.0 | 30.5 | 160,915 | 30.48 | 1 | 1 | 1 | 1 | 1 | 1 | 0.51 | 2 | 12 | 1 | 1 | 8 | 1 |
| 36 | 3512 | 35 | Almota Creek | 1174691466997 | ECY 35L050 | No | Mouth to La Follette Road | Snake River (Reach 1) | 0.0 | 7.9 | 41,705 | 7.90 | 1 | 2 | 2 | 2 | 2 | 3 | 0.46 | 2 | 12 | 3 | 1 | 16 | 3 |
| 37 | 3513 | 35 | Alpowa Creek | 1171999464202 | ECY 35K050 | Yes, but as two reache | Mouth to Road 128 crossing | Snake River (Reach 1) | 0.0 | 23.5 | 124,167 | 23.52 | 2 | 2 | 2 | 2 | 2 | 3 | 0.46 | 2 | 21 | 1 | 1 | 14 | 2 |
| 38 | 3508 | 35 | Asotin Creek (Reach 1) | 1170531463443 | USGS 13335050 | Yes | Mouth to George Creek | Snake River (Reach 2) | 0.0 | 3.2 | 16,759 | 3.17 | 1 | 1 | 1 | 1 | 2 | 3 | 0.58 | 2 | 10 | 2 | 2 | 13 | 2 |
| 39 | 3509 | 35 | Asotin Creek (Reach 2) | 1170531463443 | ECY 35D100 | Yes | George Creek to Asotin Creek forks | Asotin Creek (Reach 1) | 3.2 | 15.3 | 63,847 | 12.09 | 2 | 1 | 2 | 3 | 3 | 2 | 0.38 | 2 | 12 | 2 | 1 | 15 | 3 |

Reach_Data_Aggregate | Non-GIS_Scores | NHD_Flow | Dictionary | Reachstatstls

Ready 70%

## Table A-2 CRIA Stream Reach Definitions

| CRIA_ID | Reach_Name | LLID | GAUGE | OLD_STUDY | REACH_DESCR | Start RM | End RM | Length (Ft.) | Length (Mi.) |
|---|---|---|---|---|---|---|---|---|---|
| 3201 | Walla Walla River (Reach 1) | **1189393460624** | USGS 14018500 | Yes | Mouth to Touchet R | 0.0 | 23.1 | 122,219 | 23.15 |
| 3202 | Walla Walla River (Reach 2) | 1189393460624 | ECY 32A100 | Yes | Touchet R to Mill Ck | 23.1 | 37.5 | 75,984 | 14.39 |
| 3203 | Walla Walla River (Reach 3) | 1189393460624 | ECY 32A105, ECY 32A120 | Yes | Mouth to Oregon border | 37.5 | 44.5 | 36,912 | 6.99 |
| 3205 | Touchet River (Reach 1) | 1186823460337 | ECY 32B075 | Yes, but as two reaches, not three | Mouth to Hofer Dam | 0.0 | 5.0 | 26,341 | 4.99 |
| 3206 | Touchet River (Reach 2) | 1186823460337 | ECY 32B100 | Yes, but as two reaches, not three | Hofer Dam to Coppei Ck | 5.0 | 50.7 | 241,441 | 45.73 |
| 3207 | Touchet River (Reach 3) | 1186823460337 | ECY 32B110 | Yes, but as two reaches, not three | Coppei Ck to Touchet R forks | 50.7 | 64.2 | 70,972 | 13.44 |
| 3208 | Coppei Creek | 1181741462722 | ECY 32G060 | Yes | Mouth to Coppei Ck forks | 0.0 | 8.0 | 42,323 | 8.02 |
| 3209 | North Fork Coppei Creek | 1181085461900 | | Yes | Confluence to falls above Coppei Springs | 0.0 | 4.5 | 23,756 | 4.50 |
| 3210 | South Fork Touchet River | 1179588463025 | ECY 32L070 | Yes | Mouth to Griffen Fork | 0.0 | 14.8 | 78,014 | 14.78 |
| 3211 | North Fork Touchet River (Reach 1) | 1179588463015 | ECY 32E050 | Yes | Mouth to Wolf Fork | 0.0 | 3.9 | 20,357 | 3.86 |
| 3212 | North Fork Touchet River (Reach 2) | 1179588463015 | ECY 32E150 | Yes | Wolf Fork to Forest Service boundary | 3.9 | 15.4 | 60,813 | 11.52 |
| 3213 | Pine Creek | 1186528460280 | | Yes | Mouth to Oregon border | 0.0 | 5.3 | 27,817 | 5.27 |
| 3214 | Mud Creek | 1186189460476 | | No | Mouth (lower) to Locher Rd | 0.0 | 10.1 | 53,089 | 10.05 |
| 3215 | Dry Creek | 1185925460511 | ECY 32F150 | Yes | Mouth to North Fork Dry Ck | 0.0 | 35.2 | 185,668 | 35.16 |
| 3216 | North Fork Dry Creek | 1203967462535 | | No | Mouth to tributary at GIS RM 3.0 | 0.0 | 3.0 | 15,979 | 3.03 |
| 3217 | West Little Walla Walla River | 1184802460383 | | No | Mouth to Oregon border | 0.0 | 5.7 | 30,328 | 5.74 |
| 3218 | Mill Creek (Reach 1) | 1184778460386 | ECY 32C070 | Yes, but as two reaches, not three | Mouth to Bennington Dam | 0.0 | 12.4 | 65,410 | 12.39 |
| 3219 | Mill Creek (Reach 2) | 1184778460386 | USGS 14015000, USGS 14013700 | Yes, but as two reaches, not three | Bennington Dam to Blue Ck | 12.4 | 18.3 | 31,268 | 5.92 |
| 3220 | Mill Creek (Reach 3) | 1184778460386 | USGS 14013000 | Yes, but as two reaches, not three | Blue Ck to Oregon border | 18.3 | 23.5 | 27,185 | 5.15 |
| 3222 | Doan Creek | 1184710460409 | | No | Mouth to Last Chance Rd? At long. 118°24' 17.3" W | 0.0 | 4.4 | 23,184 | 4.39 |
| 3223 | Cold Creek | 1184604460466 | | No | To upper extent of frog ponds E of McKinney Rd | 0.0 | 3.5 | 18,656 | 3.53 |
| 3224 | Blue Creek | 1181536460611 | USGS 14013500 | Yes | Mouth to Laird Ck | 0.0 | 5.0 | 26,586 | 5.04 |

| CRIA_ID | Reach_Name | LLID | GAUGE | OLD_STUDY | REACH_DESCR | Start RM | End RM | Length (Ft.) | Length (Mi.) |
|---|---|---|---|---|---|---|---|---|---|
| 3225 | East Little Walla Walla River | 1184113460197 | ECY 32H090 | No | Mouth to Oregon border | 0.0 | 2.0 | 10,568 | 2.00 |
| 3226 | Patit Creek | 1179841463198 | | Yes | Mouth to confluence of North and West Patit Cks | 0.0 | 7.8 | 41,297 | 7.82 |
| 3227 | West Patit Creek | 1178565463363 | | No | Mouth to Forest Service boundary | 0.0 | 9.3 | 49,310 | 9.34 |
| 3228 | Yellowhawk Creek | 1183998460169 | ECY 32D060 | Yes | Mouth to Mill Ck | 0.0 | 9.0 | 47,319 | 8.96 |
| 3229 | Cottonwood Creek | 1183638460272 | ECY 32M100 | Yes, but NF is excluded here | Mouth to North Fork Cottonwood Ck | 0.0 | 6.6 | 35,111 | 6.65 |
| 3230 | Whisky Creek | 1181170462728 | | Yes | Mouth to tributary at GIS RM 6.0 | 0.0 | 6.0 | 31,505 | 5.97 |
| 3231 | Titus Creek (Reach 1) | 1182772460768 | | No | Mouth to Five Mile Bridge | 0.0 | 2.7 | 14,441 | 2.74 |
| 3232 | Titus Creek (Reach 2) | 1182772460768 | | No | Five Mile Bridge to Mill Ck | 2.7 | 4.5 | 9,357 | 1.77 |
| 3233 | Walsh Creek | 1184406460167 | | No | Mouth to pond on farm bordering Oregon | 0.0 | 2.8 | 14,720 | 2.79 |
| 3234 | Caldwell Creek | 1183374460341 | | No | Mouth to Shelton Rd (whole stream) | 0.0 | 2.4 | 12,623 | 2.39 |
| 3235 | Wolf Fork | 1178953462742 | ECY 32K070 | No | Mouth to USFS boundary | 0.0 | 12.5 | 65,926 | 12.49 |
| 3501 | Snake River (Reach 1) | 1190296461886 | | No | Palouse R (WRIA boundary) to Clearwater R | 57.3 | 136.5 | 418,159 | 79.20 |
| 3502 | Snake River (Reach 2) | 1190296461886 | USGS 13334300 | No | Clearwater R to Oregon border | 136.5 | 173.3 | 194,504 | 36.84 |
| 3503 | Tucannon River (Reach 1) | 1181740465575 | USGS 13344500 | Yes | Mouth to SR 12 bridge in Tucannon | 0.0 | 14.1 | 74,276 | 14.07 |
| 3504 | Tucannon River (Reach 2) | 1181740465575 | ECY 35B150 | Yes | SR 12 bridge to Turner Rd / SR 126 bridge, Marengo | 14.1 | 25.9 | 62,556 | 11.85 |
| 3505 | Tucannon River (Reach 3) | 1181740465575 | | Yes | Turner Rd / SR 126 bridge to Panjab Ck | 25.9 | 48.6 | 119,572 | 22.65 |
| 3506 | Pataha Creek (Reach 1) | 1179867465091 | ECY 35F050 | Yes | Mouth to Geiger Gulch in Pomeroy | 0.0 | 23.7 | 125,300 | 23.73 |
| 3507 | Pataha Creek (Reach 2) | 1179867465091 | ECY 35F100 | Yes | Geiger Gulch in Pomeroy to USFS boundary | 23.7 | 48.3 | 129,865 | 24.60 |
| 3508 | Asotin Creek (Reach 1) | 1170531463443 | USGS 13335050 | Yes | Mouth to George Ck | 0.0 | 3.2 | 16,759 | 3.17 |
| 3509 | Asotin Creek (Reach 2) | 1170531463443 | ECY 35D100 | Yes | George Ck to Asotin Ck forks | 3.2 | 15.3 | 63,847 | 12.09 |
| 3510 | Charley Creek | 1172777462887 | | Yes | Mouth to WDFW boundary | 0.0 | 5.2 | 27,284 | 5.17 |
| 3511 | Alkali Flat Creek | 1180869465756 | | Yes | Mouth to Little Alkali Flat Ck | 0.0 | 30.5 | 160,915 | 30.48 |
| 3512 | Almota Creek | 1174691466997 | ECY 35L050 | No | Mouth to La Follette Rd | 0.0 | 7.9 | 41,705 | 7.90 |
| 3513 | Alpowa Creek | 1171999464202 | ECY 35K050 | Yes, but as two reaches, not one | Mouth to Rd 128 crossing | 0.0 | 23.5 | 124,167 | 23.52 |
| 3514 | Penawawa Creek | 1176836467017 | | Yes | Mouth to Little Penewawa Ck | 0.0 | 6.3 | 33,480 | 6.34 |

| CRIA_ID | Reach_Name | LLID | GAUGE | OLD_STUDY | REACH_DESCR | Start RM | End RM | Length (Ft.) | Length (Mi.) |
|---|---|---|---|---|---|---|---|---|---|
| 3515 | Deadman Creek | 1178006466242 | ECY 35M060 | Yes | Mouth to forks with Deadman Gulch and N Deadman Ck | 0.0 | 13.0 | 68,652 | 13.00 |
| 3516 | North Deadman Creek | 1175832465906 | | No | Mouth to small gulch about 1 mile | 0.0 | 1.1 | 6,005 | 1.14 |
| 3517 | Deadman Gulch | 1175832465916 | | No | Mouth to small gulch about 1 mile | 0.0 | 1.1 | 5,630 | 1.07 |
| 3518 | Tenmile Creek | 1169884462992 | ECY 35J050 | Yes | Mouth to Mill Ck | 0.0 | 10.8 | 57,035 | 10.80 |
| 3519 | Mill Creek | 1170448461697 | | Yes | Mouth to USGS gauge 13334400 | 0.0 | 5.3 | 27,972 | 5.30 |
| 3520 | Couse Creek | 1169650462050 | ECY 35H050 | No | Mouth to Montgomery Gulch | 0.0 | 3.2 | 17,100 | 3.24 |
| 3521 | Tumalum Creek | 1176872463591 | | No | Mouth to GIS RM 8.0 | 0.0 | 8.0 | 42,266 | 8.00 |
| 3522 | Grande Ronde River | 1169845460718 | | No | Mouth to Oregon border | 0.0 | 36.7 | 194,010 | 36.74 |
| 3523 | Buford Creek | 1172530460346 | | No | Mouth to Oregon border | 0.0 | 3.0 | 15,915 | 3.01 |
| 3524 | Menatchee Creek | 1173643460072 | | No | Mouth to barrier falls at 117°22'45.0"W 46°1'42.7"N | 0.0 | 1.7 | 9,074 | 1.72 |
| 3525 | Joseph Creek | 1170059460526 | ECY 35G060 | No | Mouth to Oregon border | 0.0 | 8.4 | 44,530 | 48.34 |
| 3526 | Cottonwood Creek | 1172943460388 | | No | Mouth to Cottonwood Ck forks | 0.0 | 2.7 | 14,184 | 2.69 |
| 3527 | Cougar Creek | 1173185460326 | | No | Mouth to confluence of Swank Springs inflow | 0.0 | 2.1 | 11,182 | 2.12 |
| 3528 | Rattlesnake Creek | 1172521460418 | | No | Mouth to gulch about 1.5 miles past West Branch Rattlesnake Ck | 0.0 | 3.2 | 16,761 | 3.17 |
| 3529 | West Branch Rattlesnake Creek | 1172368460606 | | No | Mouth to gulch at about 1.5 miles | 0.0 | 1.4 | 7,383 | 1.40 |
| 3701 | Lower Yakima River (Reach 1) | 1192269462537 | USBR Kiona (KIOW) | Yes, but as three reaches, not 5 | Mouth to Chandler Canal Return | 0.0 | 36.6 | 193,411 | 36.63 |
| 3702 | Lower Yakima River (Reach 2) | 1192269462537 | USBR Prosser (YRPW) | | Chandler return to Prosser Dam | 36.6 | 47.7 | 58,329 | 11.05 |
| 3703 | Lower Yakima River (Reach 3) | 1192269462537 | USGS 12508990 Mabton | | Prosser Dam to Toppenish Ck | 47.7 | 81.8 | 179,963 | 34.08 |
| 3704 | Lower Yakima River (Reach 4) | 1192269462537 | USBR Parker (PARW) | | Toppenish Ck to Parker (Sunnyside) Dam | 81.8 | 107.1 | 133,873 | 25.35 |
| 3705 | Lower Yakima River (Reach 5) | 1192269462537 | USGS 12500450 (Union Gap) | | Parker (Sunnyside) Dam to Naches R | 107.1 | 120.0 | 68,008 | 12.88 |
| 3706 | Satus Creek | 1201103462619 | | No | Mouth to Logy Ck | 0.0 | 25.7 | 135,833 | 25.73 |
| 3707 | Toppenish Creek | 1201675463242 | | Yes | Mouth to Simcoe Ck | 0.0 | 34.0 | 179,309 | 33.96 |
| 3708 | Simcoe Creek | 1206172463768 | | Yes | Mouth to Wahtum Ck | 0.0 | 13.7 | 72,347 | 13.70 |
| 3709 | Ahtanum Creek | 1204721465289 | USGS 12502500 | Yes | Mouth to Ahtanum Ck forks | 0.0 | 24.5 | 129,479 | 24.52 |
| 3710 | North Fork Ahtanum Creek | 1208534465232 | USGS 12500500 | Yes | Mouth to Nasty Ck | 0.0 | 4.9 | 25,987 | 4.92 |

| CRIA_ID | Reach_Name | LLID | GAUGE | OLD_STUDY | REACH_DESCR | Start RM | End RM | Length (Ft.) | Length (Mi.) |
|---|---|---|---|---|---|---|---|---|---|
| 3711 | Wide Hollow Creek | 1204693465374 | | No | Mouth to Dazet Rd, Harwood | 0.0 | 11.5 | 60,757 | 11.51 |
| 3801 | Naches River (Reach 1) | 1205138466304 | USBR Naches (NRYW) | Yes, but as one reach, not two | Mouth to Tieton R | 0.0 | 18.3 | 96,799 | 18.33 |
| 3802 | Naches River (Reach 2) | 1205138466304 | USBR Naches @ Cliffdell (CLFW) | | Tieton R to source | 18.3 | 45.4 | 143,025 | 27.09 |
| 3803 | Cowiche Creek | 1205675466279 | ECY 38G070 | Yes | Mouth to Cowiche Ck forks | 0.0 | 7.5 | 39,353 | 7.45 |
| 3804 | South Fork Cowiche Creek | 1206808466479 | ECY 38H050 | Yes | Mouth to Reynolds Ck | 0.0 | 12.5 | 65,973 | 12.49 |
| 3805 | Tieton River | 1207857467464 | USBR Tieton (TICW) | No | Mouth to Tieton Dam | 0.0 | 21.7 | 114,435 | 21.67 |
| 3806 | Rattlesnake Creek | 1209291468203 | ECY 38C070 | Yes | Mouth to McDaniel Diversion at 120°57'15.3"W 46°48'47.1"N | 0.0 | 1.3 | 7,060 | 1.34 |
| 3807 | Gold Creek | 1210488469231 | | No | Mouth to first left bank tributary | 0.0 | 0.6 | 3,133 | 0.59 |
| 3808 | Little Naches River | 1210935469898 | USBR Little Naches (LNRW) | No | Mouth to North Fork Naches R | 0.0 | 14.3 | 75,538 | 14.31 |
| 3809 | Bumping River | 1210935469888 | USBR Bumping (BUM) | No | Mouth to Bumping Dam | 0.0 | 15.9 | 83,864 | 15.88 |
| 3901 | Upper Yakima River (Reach 1) | 1192269462537 | USBR Roza (RBDW) | Yes | Naches R to Roza Dam | 120.0 | 131.5 | 60,859 | 11.53 |
| 3902 | Upper Yakima River (Reach 2) | 1192269462537 | USBR Umtanum (UMTW) | Yes | Roza Dam to Teanaway R | 131.5 | 180.2 | 256,920 | 48.66 |
| 3903 | Upper Yakima River (Reach 3) | 1192269462537 | USBR Cle Elum (YUMW) | Yes | Teanaway to Cle Elum R | 180.2 | 190.4 | 53,955 | 10.22 |
| 3904 | Upper Yakima River (Reach 4) | 1192269462537 | USBR Easton (EASW) | Yes | Cle Elum R to Easton Dam | 190.4 | 205.5 | 79,730 | 15.10 |
| 3905 | Upper Yakima River (Reach 5) | 1192269462537 | USBR Martin (KEE) | Yes | Easton Dam to Keechelus Dam | 205.5 | 217.1 | 61,466 | 11.64 |
| 3906 | Wenas Creek | 1204907466951 | ECY 39F050 | Yes | Mouth to Wenas Dam | 0.0 | 15.0 | 79,457 | 15.05 |
| 3907 | Burbank Creek | 1204494467688 | | No | Mouth to GIS RM 1.9 | 0.0 | 1.9 | 10,030 | 1.90 |
| 3908 | Wilson Creek | 1204996469262 | | Yes, as part of Wilson/Cherry/Naneum Complex | Mouth to upper confluence with Naneum Ck | 0.0 | 18.1 | 95,420 | 18.07 |
| 3909 | Cherry Creek | 1205084469164 | USBR Cherry (CHRW) | | Mouth to Parke Ck / Cooke Ck confluence | 0.0 | 1.8 | 9,529 | 1.80 |
| 3910 | Parke Creek | 1204747469396 | | | Mouth to Mundy Rd, near East Kittitas | 0.0 | 6.6 | 34,771 | 6.59 |
| 3911 | Cooke Creek | 1204591469539 | | | Mouth to KRD North Branch Canal | 0.0 | 10.3 | 54,233 | 10.27 |
| 3912 | Caribou Creek | 1204591469529 | | | Mouth to KRD North Branch Canal | 0.0 | 9.8 | 51,588 | 9.77 |
| 3913 | Naneum Creek | 1205030469443 | USGS 12483800 | | Mouth to USGS gauge 12483800 near Naneum Rd | 0.0 | 15.3 | 80,913 | 15.32 |

| CRIA_ID | Reach_Name | LLID | GAUGE | OLD_STUDY | REACH_DESCR | Start RM | End RM | Length (Ft.) | Length (Mi.) |
|---|---|---|---|---|---|---|---|---|---|
| 3914 | Coleman Creek | 1204991469477 | | | Mouth to KRD North Branch Canal | 0.0 | 10.5 | 55,195 | 10.45 |
| 3915 | Schnebly Creek | 1204441470284 | | | Mouth to KRD North Branch Canal | 0.0 | 4.0 | 21,379 | 4.05 |
| 3916 | Mercer Creek | 1205541469864 | | | Mouth to KRD North Branch Canal | 0.0 | 8.6 | 45,650 | 8.65 |
| 3917 | Reecer Creek | 1205793469955 | | No | Mouth to KRD North Branch Canal | 0.0 | 9.5 | 50,183 | 9.50 |
| 3918 | Whiskey Creek | 1205661470032 | | Yes, as part of Wilson/Cherry/Naneum Complex | Mouth to Wilson Ck | 0.0 | 9.4 | 49,802 | 9.43 |
| 3919 | Currier Creek | 1205819470067 | | No | Mouth to KRD North Branch Canal | 0.0 | 7.8 | 41,143 | 7.79 |
| 3920 | Manastash Creek | 1205793469945 | ECY 39J090 | Yes | Mouth to Manastash Ck forks | 0.0 | 8.7 | 45,836 | 8.68 |
| 3921 | Dry Creek | 1206092470196 | | No | Mouth to KRD North Branch Canal | 0.0 | 7.9 | 41,808 | 7.92 |
| 3922 | Taneum Creek | 1207081470923 | ECY 39P080 | Yes | Mouth to Knudson Diversion | 0.0 | 3.5 | 18,738 | 3.55 |
| 3923 | Swauk Creek | 1207370471233 | ECY 39M100 | Yes | Mouth to Williams Ck. | 1.0 | 11.0 | 57,817 | 10.95 |
| 3924 | First Creek | 1206994472081 | | No | Mouth to First Ck Water User Diversion | 0.0 | 2.0 | 10,565 | 2.00 |
| 3925 | Williams Creek | 1206954472430 | | Yes, as part of Wilson/Cherry/Naneum Complex | Mouth to the Rd crossing 2.4 miles above Liberty | 0.0 | 4.4 | 23,412 | 4.43 |
| 3926 | Teanaway River | 1208336471670 | USBR Teanaway/Forks (TNAW) | Yes | Mouth to Teanaway R forks | 0.0 | 11.3 | 59,527 | 11.27 |
| 3927 | North Fork Teanaway River | 1208768472513 | | Yes | Mouth to Jack Ck | 0.0 | 6.2 | 32,675 | 6.19 |
| 3928 | Cle Elum River | 1209901471771 | USBR Yakima @ Cle Elum (CLE) | No | Mouth to Cle Elum Dam | 0.0 | 7.8 | 41,060 | 7.78 |
| 3929 | Big Creek | 1210966472175 | ECY 39Q060 | Yes | Mouth to removed dam site | 0.0 | 2.9 | 15,313 | 2.90 |
| 3930 | Little Creek | 1210761472100 | | No | Mouth to KRD Main Canal | 0.0 | 1.6 | 8,356 | 1.58 |
| 4501 | Wenatchee River (Reach 1) | 1203156474560 | USGS 12462500 | Yes | Mouth to middle of Leavenworth | 0.0 | 24.3 | 128,311 | 24.30 |
| 4502 | Wenatchee River (Reach 2) | 1203156474560 | USGS 12459000 | Yes | Middle of Leavenworth to Tumwater Canyon / Campground | 24.3 | 35.4 | 58,841 | 11.14 |
| 4503 | Wenatchee River (Reach 3) | 1203156474560 | USGS 12457000 | Yes | Tumwater Canyon / Campground to Lake Wenatchee | 35.4 | 53.8 | 96,836 | 18.34 |
| 4504 | Mission Creek | 1204734475234 | ECY 45E070 | Yes | Mouth to Sand Ck | 0.0 | 8.0 | 42,014 | 7.96 |
| 4505 | Brender Creek | 1204748475215 | ECY 45D070 | Yes | Mouth to Brisky Canyon Ck | 0.0 | 4.3 | 22,631 | 4.29 |
| 4506 | Peshastin Creek | 1205732475578 | ECY 45F070 | Yes | Mouth to Ingalls Ck | 0.0 | 9.1 | 48,154 | 9.12 |
| 4507 | Ingalls Creek | 1206599474630 | | Yes | Mouth to Ingalls Ck trailhead | 0.0 | 0.6 | 3,379 | 0.64 |

| CRIA_ID | Reach_Name | LLID | GAUGE | OLD_STUDY | REACH_DESCR | Start RM | End RM | Length (Ft.) | Length (Mi.) |
|---|---|---|---|---|---|---|---|---|---|
| 4508 | Derby Canyon | 1205875475692 | | Yes | Mouth to North Fork Derby Canyon | 0.0 | 2.7 | 14,346 | 2.72 |
| 4509 | Chumstick Creek | 1206431476022 | ECY 45C060 | Yes | Mouth to Little Chumstick Ck | 0.0 | 9.0 | 47,636 | 9.02 |
| 4510 | Eagle Creek | 1206439476252 | ECY 45Q060 | Yes | Mouth to Van Ck | 0.0 | 5.8 | 30,465 | 5.77 |
| 4511 | Little Chumstick Creek | 1206322477166 | | Yes | Mouth to headwaters | 0.0 | 4.0 | 21,177 | 4.01 |
| 4512 | Icicle Creek | 1206661475803 | ECY12458000 | Yes | Mouth to Bridge Ck | 0.0 | 9.5 | 50,174 | 9.50 |
| 4513 | Chiwaukum Creek | 1207271476789 | ECY 45G060 | Yes | Mouth to Barrier | 0.0 | 4.5 | 23,882 | 4.52 |
| 4514 | Sand Creek | 1205061474300 | | No | Mouth to GIS RM 2 | 0.0 | 2.0 | 10,560 | 2.00 |
| 4515 | Skinney Creek | 1207345476870 | | Yes | Mouth to SW of Winton | 0.0 | 4.1 | 21,649 | 4.10 |
| 4516 | Beaver Creek | 1206608477671 | | Yes | Mouth to Beaver Ck forks | 0.0 | 3.1 | 16,414 | 3.11 |
| 4517 | Chiwawa River | 1206585477882 | USGS 12456500 | Yes | Mouth to Deep Ck | 0.0 | 4.3 | 22,443 | 4.25 |
| 4801 | Methow River (Reach 1) | 1198933480501 | USGS 12449950 | Yes | Mouth to Twisp R | 0.0 | 41.8 | 220,930 | 41.84 |
| 4802 | Methow River (Reach 2) | 1198933480501 | USGS 12449500 | Yes | Twisp R to Chewuch R | 41.8 | 52.1 | 54,100 | 10.25 |
| 4803 | Methow River (Reach 3) | 1198933480501 | USGS 12448500 | Yes | Chewuch R to Early Winters Ck | 52.1 | 70.4 | 96,819 | 18.34 |
| 4804 | Squaw Creek | 1200168480905 | | No | Mouth to Squaw Ck Rd crossing | 0.0 | 1.6 | 8,501 | 1.61 |
| 4805 | French Creek | 1200060481359 | | No | Mouth to DNR boundary | 0.0 | 4.8 | 25,197 | 4.77 |
| 4806 | Petes Creek | 1200309481381 | | No | Mouth to Highway 123 | 0.0 | 0.9 | 4,759 | 0.90 |
| 4807 | McFarland Creek | 1200647481537 | | No | Mouth to 2nd McFarland Rd Crossing | 0.0 | 2.4 | 12,570 | 2.38 |
| 4808 | Cow Creek | 1200945481894 | | No | Mouth to Rd crossing at 120°03’10.24”, 48°11’40.18” | 0.0 | 2.3 | 11,965 | 2.27 |
| 4809 | Libby Creek | 1201133482280 | | Yes | Mouth to uppermost extent of USFS boundary | 0.0 | 6.1 | 32,012 | 6.06 |
| 4810 | Texas Creek | 1201024482488 | | No | Mouth to North Fork Texas Ck | 0.0 | 4.6 | 24,202 | 4.58 |
| 4811 | Puckett Creek | 1201156482494 | | No | Mouth to Biggers Rd | 0.0 | 0.3 | 1,329 | 0.25 |
| 4812 | Leecher Canyon | 1200889482669 | | No | Mouth to USFS boundary | 0.0 | 2.5 | 13,369 | 2.53 |
| 4813 | Benson Creek | 1200645482929 | | No | Mouth to USFS boundary | 0.0 | 2.9 | 15,089 | 2.86 |
| 4814 | Alder Creek | 1200688483070 | | No | Mouth to USFS boundary | 0.0 | 5.9 | 31,070 | 5.88 |
| 4815 | Beaver Creek (Reach 1) | 1200653483267 | USGS 12449710 | Yes, but as one reach, not two | Mouth to Frazer Ck | 0.0 | 3.0 | 15,712 | 2.98 |
| 4816 | Beaver Creek (Reach 2) | 1200653483267 | USGS 12449600 | | Frazer Ck to South Fork Beaver Ck | 3.0 | 9.4 | 34,154 | 6.47 |
| 4817 | Black Canyon Creek | 1200086480794 | | Yes | Mouth to USFS boundary | 0.0 | 0.4 | 2,356 | 0.45 |
| 4818 | Booth Canyon Creek | 1200804482810 | | No | Mouth to Booth Canyon Ck forks | 0.0 | 1.0 | 5,502 | 1.04 |

| CRIA_ID | Reach_Name | LLID | GAUGE | OLD_STUDY | REACH_DESCR | Start RM | End RM | Length (Ft.) | Length (Mi.) |
|---|---|---|---|---|---|---|---|---|---|
| 4819 | Frazer Creek | 1200396483584 | | Yes | Mouth to USFS boundary | 0.0 | 3.9 | 20,612 | 3.90 |
| 4820 | Twisp River | 1201177483686 | USGS 12448998 | Yes | Mouth to Buttermilk Ck | 0.0 | 13.4 | 70,626 | 13.38 |
| 4821 | Poorman Creek | 1201976483696 | | Yes | Mouth to USFS boundary | 0.0 | 1.4 | 7,386 | 1.40 |
| 4822 | Little Bridge Creek | 1202851483790 | | No | Mouth to upper diversion | 0.0 | 2.2 | 11,619 | 2.20 |
| 4823 | Buttermilk Creek | 1203382483627 | | No | Mouth to Buttermilk Ck forks | 0.0 | 2.6 | 13,715 | 2.60 |
| 4824 | Thompson Creek | 1202038484336 | | No | Mouth to USFS boundary | 0.0 | 5.1 | 26,735 | 5.06 |
| 4825 | Bear Creek | 1201619484547 | | No | Mouth to USFS boundary | 0.0 | 6.5 | 34,250 | 6.49 |
| 4826 | Chewuch River | 1201819484759 | USGS 12448000 | Yes | Mouth to USGS gauge 12447600 | 0.0 | 8.5 | 44,750 | 8.48 |
| 4827 | Cub Creek | 1201847485474 | | No | Mouth to USFS boundary | 0.0 | 2.4 | 12,641 | 2.39 |
| 4828 | Ramsey Creek | 1201810485510 | | No | Mouth to Rd crossing at USFS boundary | 0.0 | 3.0 | 16,007 | 3.03 |
| 4829 | Little Boulder Creek | 1203796485714 | | No | Mouth to USFS boundary | 0.0 | 0.8 | 4,256 | 0.81 |
| 4830 | Wolf Creek | 1202305484907 | USGS 12447387 | Yes | Mouth to diversion dam | 0.0 | 4.3 | 22,491 | 4.26 |
| 4831 | Little Falls Creek | 1203152485266 | | No | Mouth to South Fork Little Falls Ck | 0.0 | 0.8 | 4,293 | 0.81 |
| 4832 | Fawn Creek | 1203491485599 | | No | Mouth to USFS boundary | 0.0 | 0.7 | 3,494 | 0.66 |
| 4833 | Goat Creek | 1203780485742 | | Yes | Mouth to Goat Cr Rd (AKA FR 52) | 0.0 | 1.4 | 7,369 | 1.40 |
| 4834 | Gold Creek | 1200941481881 | | Yes | Mouth to South Fork Gold Ck | 0.0 | 1.1 | 5,863 | 1.11 |
| 4835 | Early Winters Creek | 1204364486012 | USGS 12447382 | Yes | Mouth to Early Winters Diversion | 0.0 | 0.5 | 2,743 | 0.52 |
| 4901 | Okanogan River (Reach 1) | 1197334480985 | USGS 12447200 | Yes, but as two reaches, not three | Mouth to Salmon Ck | 0.0 | 25.9 | 136,734 | 25.90 |
| 4902 | Okanogan River (Reach 2) | 1197334480985 | USGS 12445000 | | Salmon Ck to Bonaparte Ck | 25.9 | 57.7 | 167,946 | 31.81 |
| 4903 | Okanogan River (Reach 3) | 1197334480985 | USGS 12439500 | | Bonaparte Ck to Canada border | 57.7 | 83.3 | 134,975 | 25.56 |
| 4904 | Tonasket Creek | 1194229489371 | ECY49H080 | Yes | Mouth to USFS boundary | 0.0 | 12.2 | 64,525 | 12.22 |
| 4905 | Bonaparte Creek | 1194456487053 | ECY49F070 | Yes | Mouth to Bonaparte Lake | 0.0 | 28.9 | 152,556 | 28.89 |
| 4906 | Loup Loup Creek | 1197043482804 | | Yes | Mouth to weir | 0.0 | 10.2 | 53,764 | 10.18 |
| 4907 | Ninemile Creek | 1194333489670 | USGS 12438900 | Yes | Mouth to diversion at 119°18'52.096"W, 48°59'02.9"N | 0.0 | 6.1 | 32,412 | 6.14 |
| 4908 | Aeneas Creek | 1194730486588 | | Yes | Mouth to North Lamanasky Rd | 0.0 | 5.8 | 30,632 | 5.80 |
| 4909 | Omak Creek | 1195003484078 | ECY49C100 | Yes | Mouth to USGS gauging station 12445900 | 0.0 | 5.7 | 30,061 | 5.69 |
| 4910 | Palmer Creek | 1196576489408 | | No | Mouth to Palmer Lake - conduit for Sinlahekin | 0.0 | 3.5 | 18,468 | 3.50 |
| 4912 | Antoine Creek | 1194112487614 | ECY49G060 | Yes | Mouth to Fanchers Dam | 0.0 | 11.9 | 63,060 | 11.94 |

| CRIA_ID | Reach_Name | LLID | GAUGE | OLD_STUDY | REACH_DESCR | Start RM | End RM | Length (Ft.) | Length (Mi.) |
|---|---|---|---|---|---|---|---|---|---|
| 4913 | Siwash Creek | 1194384487121 | | Yes | Mouth to South and Middle Forks Siwash Ck | 0.0 | 12.8 | 67,510 | 12.79 |
| 4914 | Tunk Creek (Reach 1) | 1194868485618 | | Yes, but as one reach, not two | Mouth to Natural Barrier at 119°28'32.9"W 48°33'48.5"N | 0.0 | 0.6 | 3,133 | 0.59 |
| 4915 | Tunk Creek (Reach 2) | 1194868485618 | ECY49E080 | | Natural Barrier to Colville Indian Reservation | 0.6 | 14.1 | 71,354 | 13.51 |
| 4916 | Salmon Creek (Reach 1) | 1195804483599 | | Yes | Mouth to OID diversion dam | 0.0 | 4.1 | 21,494 | 4.07 |
| 4917 | Salmon Creek (Reach 2) | 1195804483599 | | Yes | OID diversion dam to Conconully Reservoir | 4.1 | 17.0 | 68,345 | 12.94 |
| 4918 | Chiliwist Creek | 1197369482463 | | No | Mouth to Chiliwist Rd | 0.0 | 6.4 | 33,920 | 6.42 |
| 4919 | Tallant Creek | 1196594482977 | | No | Mouth to northernmost crossing of SR 20 | 0.0 | 6.1 | 31,978 | 6.06 |
| 4920 | Reed Creek | 1196643484138 | | No | Mouth to Rd crossing above Reed Pond | 0.0 | 8.5 | 44,861 | 8.50 |
| 4921 | Whitestone Creek | 1194047487762 | USGS 12444100 | Yes | Mouth to mouth of Spectacle Lake | 0.0 | 6.7 | 35,553 | 6.73 |
| 4922 | Chewiliken Creek | 1194627486305 | | No | Mouth to USFS boundary | 0.0 | 11.7 | 61,956 | 11.73 |
| 4923 | Similkameen River (Reach 1) | 1194285488918 | ECY49B070-MDQ | Yes, but as one reach, not two | Mouth to Enloe Dam | 0.0 | 9.3 | 49,318 | 9.34 |
| 4924 | Similkameen River (Reach 2) | 1194285488918 | USGS 12442500 | | Enloe Dam to Canada border | 9.3 | 28.6 | 101,780 | 19.28 |
| 4925 | Toats Coulee Creek | 1196483488390 | ECY49K090 | No | Mouth to DNR boundary | 0.0 | 4.5 | 23,505 | 4.45 |
| 4926 | Sinlahekin Creek | 1196456489112 | 49L100 | No | Palmer Lake (inclusive) to Cecile Ck | 0.0 | 11.1 | 58,391 | 11.06 |

## Table A-3 Sample fish status/utilization score worksheet

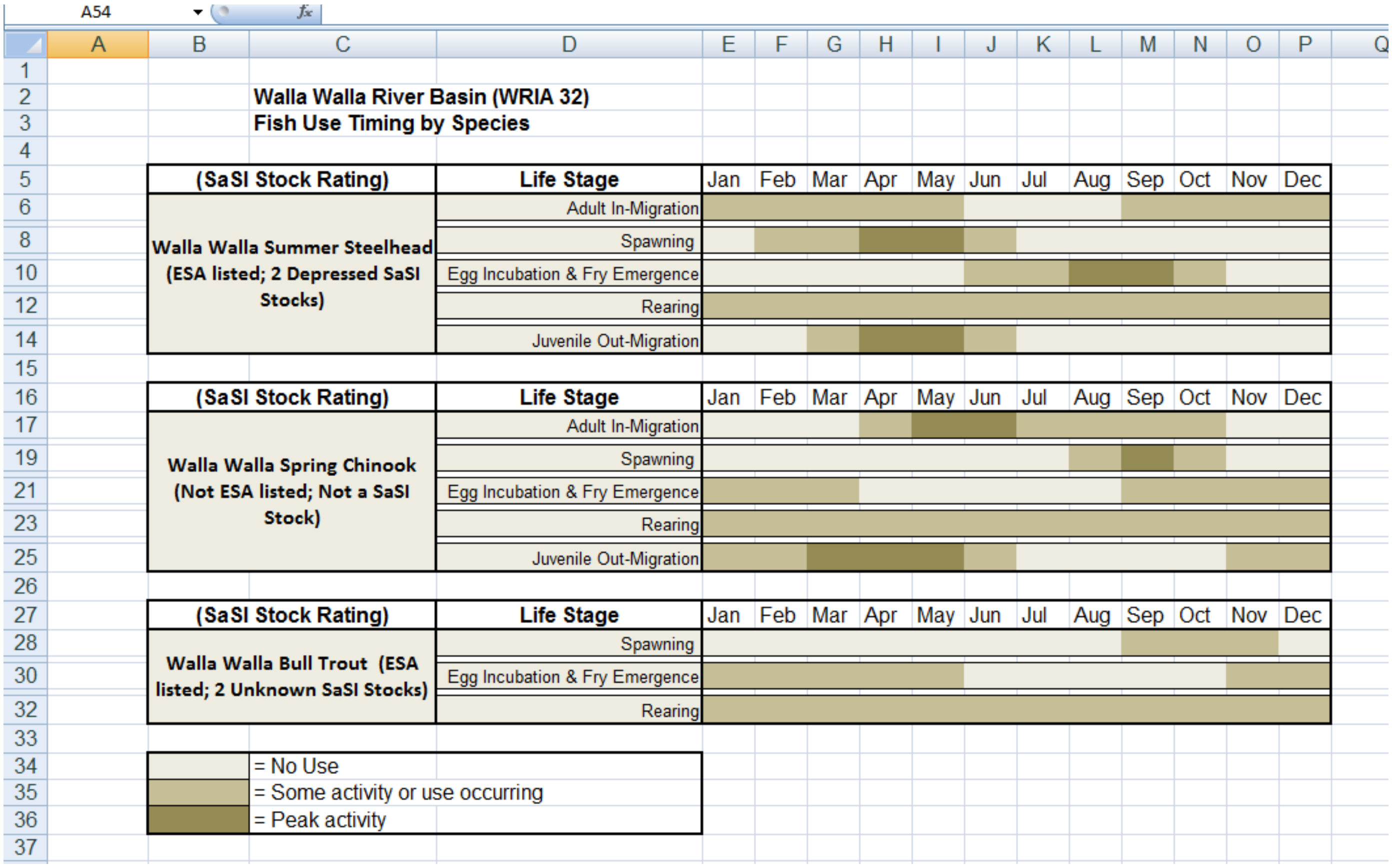
| Reach Name | Prioritization Score | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| North Fork Touchet River (Reach 2) | 225 | 16 | 19 | 19 | 19 | 19 | 16 | 16 | 18 | 24 | 24 | 19 | 16 |
| Mill Creek (Reach 3) | 225 | 16 | 19 | 19 | 19 | 19 | 16 | 16 | 18 | 24 | 24 | 19 | 16 |
| Wolf Fork | 225 | 16 | 19 | 19 | 19 | 19 | 16 | 16 | 18 | 24 | 24 | 19 | 16 |
| Mill Creek (Reach 2) | 225 | 13 | 16 | 16 | 16 | 16 | 16 | 16 | 18 | 21 | 21 | 16 | 13 |
| Touchet River (Reach 1) | 224 | 17 | 20 | 20 | 22 | 22 | 19 | 16 | 16 | 19 | 19 | 17 | 17 |
| Walla Walla River (Reach 1) | 224 | 20 | 20 | 20 | 22 | 22 | 16 | 13 | 13 | 19 | 19 | 20 | 20 |
| Walla Walla River (Reach 2) | 224 | 17 | 20 | 20 | 22 | 22 | 19 | 16 | 16 | 19 | 19 | 17 | 17 |
| Walla Walla River (Reach 3) | 204 | 0 | 19 | 19 | 19 | 19 | 16 | 13 | 15 | 18 | 18 | 16 | 16 |
| Touchet River (Reach 3) | 204 | 16 | 19 | 19 | 19 | 19 | 16 | 13 | 15 | 18 | 18 | 16 | 16 |
| Mill Creek (Reach 1) | 198 | 16 | 19 | 19 | 19 | 19 | 16 | 16 | 18 | 24 | 24 | 19 | 16 |
| North Fork Touchet River (Reach 1) | 198 | 13 | 16 | 16 | 16 | 16 | 16 | 16 | 18 | 21 | 21 | 16 | 13 |
| South Fork Touchet River | 195 | 14 | 17 | 17 | 17 | 17 | 14 | 14 | 14 | 20 | 20 | 17 | 14 |
| Touchet River (Reach 2) | 188 | 14 | 17 | 17 | 19 | 19 | 16 | 13 | 13 | 16 | 16 | 14 | 14 |
| Blue Creek | 150 | 11 | 14 | 14 | 14 | 14 | 11 | 11 | 11 | 14 | 14 | 11 | 11 |
| Yellowhawk Creek | 138 | 11 | 14 | 14 | 14 | 14 | 11 | 8 | 8 | 11 | 11 | 11 | 11 |
| East Little Walla Walla River | 114 | 8 | 11 | 11 | 11 | 11 | 8 | 8 | 8 | 11 | 11 | 8 | 8 |
| West Little Walla Walla River | 114 | 8 | 11 | 11 | 11 | 11 | 8 | 8 | 8 | 11 | 11 | 8 | 8 |
| Dry Creek | 114 | 8 | 11 | 11 | 11 | 11 | 8 | 8 | 8 | 11 | 11 | 8 | 8 |
| Pine Creek | 114 | 8 | 11 | 11 | 11 | 11 | 8 | 8 | 8 | 11 | 11 | 8 | 8 |
| Patit Creek | 114 | 8 | 11 | 11 | 11 | 11 | 8 | 8 | 8 | 11 | 11 | 8 | 8 |
| Coppei Creek | 114 | 8 | 11 | 11 | 11 | 11 | 8 | 8 | 8 | 11 | 11 | 8 | 8 |
| Cold Creek | 114 | 8 | 11 | 11 | 11 | 11 | 8 | 8 | 8 | 11 | 11 | 8 | 8 |
| Doan Creek | 114 | 8 | 11 | 11 | 11 | 11 | 8 | 8 | 8 | 11 | 11 | 8 | 8 |
| West Patit Creek | 114 | 8 | 11 | 11 | 11 | 11 | 8 | 8 | 8 | 11 | 11 | 8 | 8 |
| Whisky Creek | 114 | 8 | 11 | 11 | 11 | 11 | 8 | 8 | 8 | 11 | 11 | 8 | 8 |
| Titus Creek (Reach 1) | 90 | 6 | 9 | 9 | 9 | 9 | 6 | 6 | 6 | 9 | 9 | 6 | 6 |
| Titus Creek (Reach 2) | 90 | 6 | 9 | 9 | 9 | 9 | 6 | 6 | 6 | 9 | 9 | 6 | 6 |
| Walsh Creek | 90 | 6 | 9 | 9 | 9 | 9 | 6 | 6 | 6 | 9 | 9 | 6 | 6 |
| North Fork Coppei Creek | 90 | 6 | 9 | 9 | 9 | 9 | 6 | 6 | 6 | 9 | 9 | 6 | 6 |
| North Fork Dry Creek | 90 | 6 | 9 | 9 | 9 | 9 | 6 | 6 | 6 | 9 | 9 | 6 | 6 |
| Cottonwood Creek | 90 | 6 | 9 | 9 | 9 | 9 | 6 | 6 | 6 | 9 | 9 | 6 | 6 |
| Caldwell Creek | 90 | 6 | 9 | 9 | 9 | 9 | 6 | 6 | 6 | 9 | 9 | 6 | 6 |
| Mud Creek | 60 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| **Monthly Grand Total** | | 337 | 446 | 446 | 454 | 454 | 361 | 340 | 356 | 470 | 470 | 374 | 353 |

## Table A-4 Sample fish status/utilization reach-specific worksheet (partial)

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Location (River Reach): | | **Walla Walla River (Reach 1)** | January | February | March | April | May | June | July | August | September | October | November | December | Subtotal | |
| 2 | Cumulative Total Score: | | **224** | 20 | 20 | 20 | 22 | 22 | 16 | 13 | 13 | 19 | 19 | 20 | 20 | 224 | |
| 3 | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | |
| 7 | **Stock Name** | | **Walla Walla Summer Steelhead - 6854** | Score | | Notes | | | | | | | | | | | |
| 8 | Walla Walla Summer | Is this stock listed under the ESA? (Yes=1; No=0) | | 1 | | Spawning: | Walla Walla Summer Steelhead are not known to spawn in this reach of the Walla Walla River mainstem. Spawning occurs ups | | | | | | | | | | |
| 9 | Steelhead - 6854 | SaSI Status rating: (Healthy=1; Depressed, or Unknown=2; Critical=3) | | 2 | | Rearing: | This is not a spawning area for Walla Walla Summer Steelhead, but juvenile Walla Walla Summer Steelhead use this reach as r | | | | | | | | | | |
| 10 | Part of a TRT-designated spawning area? (MaSA=1; MiSA=0.5; no=0) | | | 1 | | Migration: | Adult Walla Walla Summer Steelhead use this reach as a migration corridor from September to late April/early May, although lov | | | | | | | | | | |
| 11 | | | Total Weight Factor= | 3 | | | | | | | | | | | | | |
| 12 | | | | | | | | | Time duration of fish use | | | | | | | | |
| 13 | Species | Weight Factor | Fish use characterization for stream reach | January | February | March | April | May | June | July | August | September | October | November | December | Subtotal | Total |
| 14 | Walla Walla Summer Steelhead - 6854 | 3 | Is the reach used for Spawning and Incubation? (no=0, yes=1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 63 |
| 15 | | | Is the reach used for Rearing and/or Smolt Migration? (no=0, yes=1) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 36 | |
| 16 | | | Is the reach part of an adult migration corridor? (no=0, yes=1) | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 27 | |
| 17 | | | Monthly Total | 6 | 6 | 6 | 6 | 6 | 3 | 3 | 3 | 6 | 6 | 6 | 6 | 63 | |
| 18 | | | | | | | | | | | | | | | | | |
| 19 | **Stock Name** | | **Touchet Summer Steelhead - 6861** | Score | | Notes | | | | | | | | | | | |
| 20 | Touchet Summer | Is this stock listed under the ESA? (Yes=1; No=0) | | 1 | | Spawning: | Touchet Summer Steelhead are not known to spawn in this reach. The spawning distribution for Touchet Summer Steelhead ir | | | | | | | | | | |
| 21 | Steelhead - 6861 | SaSI Status rating: (Healthy=1; Depressed, or Unknown=2; Critical=3) | | 2 | | Rearing: | This is not a spawning area for Touchet Summer Steelhead, but juvenile Touchet Summer Steelhead may use the lower portion | | | | | | | | | | |
| 22 | Part of a TRT-designated spawning area? (MaSA=1; MiSA=0.5; no=0) | | | 0 | | Migration: | Touchet Summer Steelhead must pass through this reach to access their spawning areas in the Touchet River Basin. Adult Su | | | | | | | | | | |
| 23 | | | Total Weight Factor= | 3 | | | | | | | | | | | | | |
| 24 | | | | | | | | | Time duration of fish use | | | | | | | | |
| 25 | Species | Weight Factor | Fish use characterization for stream reach | January | February | March | April | May | June | July | August | September | October | November | December | Subtotal | Total |
| 26 | Touchet Summer Steelhead - 6861 | 3 | Is the reach used for Spawning and Incubation? (no=0, yes=1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 63 |
| 27 | | | Is the reach used for Rearing and/or Smolt Migration? (no=0, yes=1) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 36 | |
| 28 | | | Is the reach part of an adult migration corridor? (no=0, yes=1) | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 27 | |
| 29 | | | Monthly Total | 6 | 6 | 6 | 6 | 6 | 3 | 3 | 3 | 6 | 6 | 6 | 6 | 63 | |
| 30 | | | | | | | | | | | | | | | | | |
| 31 | **Stock Name** | | **Bull Trout - 8396, 8408** | Score | | Notes | | | | | | | | | | | |
| 32 | Bull Trout - 8396, 8408 | Is this stock listed under the ESA? (Yes=1; No=0) | | 1 | | Spawning: | Bull Trout do not spawn in this reach of the Walla Walla River mainstem. Bull Trout in the Walla Walla Basin primarily spawn in t | | | | | | | | | | |
| 33 | | SaSI Status rating: (Healthy=1; Depressed, or Unknown=2; Critical=3) | | 2 | | Rearing: | This reach of the Walla Walla River may be a sub-adult foraging/rearing area for small numbers of bull trout. Bull Trout are kno | | | | | | | | | | |
| 34 | Part of a TRT-designated spawning area? (MaSA=1; MiSA=0.5; no=0) | | | 0 | | Migration: | This reach of the Walla Walla River may be part of an adult migration corridor for small numbers of bull trout. Bull Trout are kno | | | | | | | | | | |
| 35 | | | Total Weight Factor= | 3 | | | | | | | | | | | | | |
| 36 | | | | | | | | | Time duration of fish use | | | | | | | | |
| 37 | Species | Weight Factor | Fish use characterization for stream reach | January | February | March | April | May | June | July | August | September | October | November | December | Subtotal | Total |
| 38 | Bull Trout - 8396, 8408 | 3 | Is the reach used for Spawning and Incubation? (no=0, yes=1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 60 |
| 39 | | | Is the reach used for sub-adult foraging or juvenile migration? (no=0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 36 | |
| 40 | | | Is the reach part of an adult migration corridor? (no=0, yes=1) | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 24 | |
| 41 | | | Monthly Total | 6 | 6 | 6 | 6 | 6 | 6 | 3 | 3 | 3 | 3 | 6 | 6 | 60 | |

Fish Priority Score / Periodicity Walla Walla Basin / Sheet1 / 2010 Priority Streams / **WallaWalla (R1)** / WallaWalla (R2) / WallaWalla (R3) / Touchet (R1) / To

## Table A-5 Sample basinwide periodicity worksheet



Walla Walla River Basin (WRIA 32)
Fish Use Timing by Species

| (SaSI Stock Rating) | Life Stage | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Walla Walla Summer Steelhead (ESA listed; 2 Depressed SaSI Stocks) | Adult In-Migration | | | | | | | | | | | | |
| | Spawning | | | | | | | | | | | | |
| | Egg Incubation & Fry Emergence | | | | | | | | | | | | |
| | Rearing | | | | | | | | | | | | |
| | Juvenile Out-Migration | | | | | | | | | | | | |

| (SaSI Stock Rating) | Life Stage | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Walla Walla Spring Chinook (Not ESA listed; Not a SaSI Stock) | Adult In-Migration | | | | | | | | | | | | |
| | Spawning | | | | | | | | | | | | |
| | Egg Incubation & Fry Emergence | | | | | | | | | | | | |
| | Rearing | | | | | | | | | | | | |
| | Juvenile Out-Migration | | | | | | | | | | | | |

| (SaSI Stock Rating) | Life Stage | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Walla Walla Bull Trout (ESA listed; 2 Unknown SaSI Stocks) | Spawning | | | | | | | | | | | | |
| | Egg Incubation & Fry Emergence | | | | | | | | | | | | |
| | Rearing | | | | | | | | | | | | |

= No Use
= Some activity or use occurring
= Peak activity

**Table A-6  Sample fish status/utilization references table**

| | A | B |
|---|---|---|
| 1 | References | |
| 2 | 1 | Mahoney B.D., M.B. Lambert, T.J. Olsen, E. Hoverson, P. Kissner, and J.D.M. Schwartz. 2006. Walla Walla Basin Natural Production Monitoring and Evaluation Project Progress Report, 2004 - 2005. Confederated Tribes of the Umatilla Indian Reservation, report submitted to Bonneville Power Administration, Project No. 2000-039-00. |
| 3 | 2 | Mendel, G., J. Trump, M. Gembala, S. Blankenship, and T. Kassler. 2007. Assessment of Salmonids and Their Habitat Conditions in the Walla Walla River Basin within Washington: 2006 Annual Report (Performance Period March 1, 2006 - March 1, 2007). Prepared by Washington Department of Fish and Wildlife. Prepared for U.S. Department of Energy, Bonneville Power Administration, Portland, OR. Project Number 199802000. Contract Number 00021599. |
| 4 | 3 | Walla Walla Subbasin Plan. 2004. Prepared for the Northwest Power and Conservation Council. Prepared by the Walla Walla Watershed Planning Unit and the Walla Walla Basin Watershed Council. |
| 5 | 4 | Mahoney, B.D. 2002. Walla Walla Basin Summer Steelhead and Bull Trout Radio Telemetry Project, 2001-2002 Progress Report. Prepared by Confederated Tribes of the Umatilla Indian Reservation. Prepared for United States Department of Energy Bonneville Power Administration. |
| 6 | 5 | Mendel, G., C. Fulton, and R. Weldert. 2003. An Investigation into the Migratory Behavior of Bull Trout in the Touchet River Basin. Washington Department of Fish and Wildlife. |
| 7 | 6 | Walla Walla Subbasin Plan. 2004. Prepared for the Northwest Power and Conservation Council. Prepared by the Walla Walla Watershed Planning Unit and the Walla Walla Basin Watershed Council. Washington State Conservation Commission. |
| 8 | 7 | Columbia River Hatchery Reform Project. 2009. Walla Walla River Summer Steelhead Population Report. |
| 9 | 8 | National Marine Fisheries Service: Northwest Region. 2008. Proposed Middle Columbia River Steelhead Distinct Population Segment ESA Recovery Plan. |
| 10 | | |
| 11 | | |

## Table A-7 Sample fish status/utilization weighting and binning worksheet

| SaSI Stocks in the Walla Walla Basin | SaSI Stock Rating | Weight Factor** |
|---|---|---|
| Walla Walla Summer Steelhead - 6854 | Depressed | 2 |
| Touchet Summer Steelhead - 6861 | Depressed | 2 |
| Touchet Bull Trout - 8396 | Unknown | 2 |
| Mill Creek Bull Trout - 8408 | Healthy | |
| Walla Walla Spring Chinook- SaSI stock | Unknown | 2 |

| Weighting Factor for Federally Listed Species | ESA Weight Factor |
|---|---|
| Assign additional weight to stocks that are listed as Threatened or Endangered under the ESA? (yes=1; no=0) | 1 |
| Assign additional weight to reaches within Interior Columbia TRT-designated spawning areas (MaSAs or MiSAs)? (yes=1; no=0) | 0 |

| ** Weight Factor Values for SaSI Stocks | |
|---|---|
| SaSI Stock Rating | Weight Factor |
| Healthy | 1 |
| Depressed | 2 |
| Critical | 3 |
| Unknown | 2 |
| Enter "0" to calculate score without using a particular stock | |

| REACH | top score<br>225<br>percentage of top score |
|---|---|
| North Fork Touchet River (Reach 2) | 100.0% |
| Mill Creek (Reach 3) | 100.0% |
| Wolf Fork | 100.0% |
| Mill Creek (Reach 2) | 100.0% |
| Touchet River (Reach 1) | 99.6% |
| Walla Walla River (Reach 1) | 99.6% |
| Walla Walla River (Reach 2) | 99.6% |
| Walla Walla River (Reach 3) | 90.7% |
| Touchet River (Reach 3) | 90.7% |
| Mill Creek (Reach 1) | 88.0% |
| North Fork Touchet River (Reach 1) | 88.0% |
| South Fork Touchet River | 86.7% |
| Touchet River (Reach 2) | 83.6% |
| Blue Creek | 66.7% |
| Yellowhawk Creek | 61.3% |
| East Little Walla Walla River | 50.7% |
| West Little Walla Walla River | 50.7% |
| Dry Creek | 50.7% |
| Pine Creek | 50.7% |
| Patit Creek | 50.7% |
| Coppei Creek | 50.7% |
| Cold Creek | 50.7% |
| Doan Creek | 50.7% |
| West Patit Creek | 50.7% |
| Whisky Creek | 50.7% |
| Titus Creek (Reach 1) | 40.0% |
| Titus Creek (Reach 2) | 40.0% |
| Walsh Creek | 40.0% |
| North Fork Coppei Creek | 40.0% |
| North Fork Dry Creek | 40.0% |
| Cottonwood Creek | 40.0% |
| Caldwell Creek | 40.0% |
| Mud Creek | 26.7% |

## Table A-8 Sample habitat condition scoring worksheet

| | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Habitat Scores | | | | Off Channel | Floodplain | | | | | |
| 2 | | | | | Habitat | Connectivity | Riparian | Spawning | Rearing | Passage | |
| 3 | WRIA | Reach Name | Reach Description | RM | Conditions | Conditions | Conditions | Suitability | Suitability | Conditions | Total |
| 4 | | | | | | | | | | | |
| 5 | 32 | Blue Creek | Mouth to Laird Creek | RM 0-5.0 | 2 | 2 | 2 | 3 | 3 | 3 | 15 |
| 6 | 32 | Caldwell Creek | Mouth to School Avenue | RM 0-2.4 | 2 | 2 | 2 | 1 | 2 | 2 | 11 |
| 7 | 32 | Cold Creek | Mouth to Frog Ponds | RM 0-3.5 | 2 | 2 | 1 | 3 | 3 | 1 | 12 |
| 8 | 32 | Coppei Creek | Mouth to Coppei Creek Forks | RM 0-8.0 | 1 | 1 | 2 | 2 | 2 | 3 | 11 |
| 9 | 32 | Cottonwood Creek | Mouth to North Fork Cottonwood Cr | RM 0-6.6 | 1 | 1 | 2 | 2 | 2 | 2 | 10 |
| 10 | 32 | Doan Creek | Mouth to Last Chance Road | RM 0-4.4 | 1 | 2 | 1 | 2 | 3 | 3 | 12 |
| 11 | 32 | Dry Creek | Mouth to Dixie | RM 0-35.2 | 1 | 1 | 2 | 2 | 2 | 2 | 10 |
| 12 | 32 | East Little Walla Walla River | Mouth to Oregon Border | RM 0-2.0 | 3 | 2 | 2 | 3 | 3 | 2 | 15 |
| 13 | 32 | Mill Creek (Reach 1) | Mouth to Bennington Dam | RM 0-12.4 | 1 | 1 | 1 | 1 | 2 | 2 | 8 |
| 14 | 32 | Mill Creek (Reach 2) | Bennington Dam to Blue Creek | RM 12.4-18.3 | 2 | 2 | 3 | 3 | 3 | 3 | 16 |
| 15 | 32 | Mill Creek (Reach 3) | Blue Creek to Oregon boarder | RM 18.3-23.5 | 2 | 2 | 3 | 3 | 3 | 3 | 16 |
| 16 | 32 | Mud Creek | Mouth (lower) to Locker Road | RM 0-10.1 | 1 | 1 | 1 | 1 | 1 | 1 | 6 |
| 17 | 32 | North Fork Coppei Creek | Mouth to falls above Coppei Springs | RM 0-4.5 | 2 | 2 | 3 | 3 | 3 | 3 | 16 |
| 18 | 32 | North Fork Dry Creek | Mouth to tributary at GIS RM 3.0 | RM 0-3.0 | 2 | 2 | 3 | 3 | 3 | 3 | 16 |
| 19 | 32 | North Fork Touchet River (Reach | Mouth to Wolf Fork | RM 0-3.9 | 1 | 1 | 2 | 3 | 3 | 3 | 13 |
| 20 | 32 | North Fork Touchet River (Reach | Wolf Fork to Forest Service bounda | RM 3.9-15.4 | 2 | 2 | 3 | 3 | 3 | 3 | 16 |
| 21 | 32 | Patit Creek | Mouth to N. F/W. F. confluence | RM 0-7.8 | 1 | 1 | 1 | 1 | 2 | 2 | 8 |
| 22 | 32 | Pine Creek | Mouth to Oregon Boarder | RM 0-5.3 | 1 | 1 | 1 | 1 | 1 | 1 | 6 |
| 23 | 32 | South Fork Touchet River | Mouth to Griffen Fork | RM 0-14.8 | 2 | 2 | 2 | 3 | 3 | 3 | 15 |
| 24 | 32 | Titus Creek (Reach 1) | Mouth to Five Mile Bridge | RM 0-2.7 | 1 | 2 | 1 | 1 | 2 | 1 | 8 |
| 25 | 32 | Titus Creek (Reach 2) | Five Mile Bridge to Mill Creek | RM 2.7-4.5 | 2 | 3 | 3 | 2 | 3 | 2 | 15 |
| 26 | 32 | Touchet River (Reach 1) | Mouth to Hofer Dam | RM 0-5.0 | 1 | 1 | 1 | 1 | 1 | 3 | 8 |
| 27 | 32 | Touchet River (Reach 2) | Hofer Dam to Coppei Creek | RM 4.2-50.7 | 1 | 1 | 2 | 2 | 2 | 3 | 11 |
| 28 | 32 | Touchet River (Reach 3) | Coppei Ck to Forks | RM 50.7-64.2 | 2 | 1 | 2 | 3 | 3 | 3 | 14 |
| 29 | 32 | Walla Walla River (Reach 1) | Mouth to Touchet River | RM 0-23.1 | 1 | 1 | 1 | 1 | 2 | 3 | 9 |
| 30 | 32 | Walla Walla River (Reach 2) | Touchet River to Mill Creek | RM 23.1-37.1 | 2 | 1 | 1 | 2 | 2 | 2 | 10 |
| 31 | 32 | Walla Walla River (Reach 3) | Mill Ck to State Line | RM 37.1-44.5 | 2 | 1 | 2 | 2 | 2 | 2 | 11 |
| 32 | 32 | Walsh Creek | Mouth to pond on farm bordering Or | RM 0-2.8 | 2 | 2 | 2 | 2 | 3 | 2 | 13 |
| 33 | 32 | West Little Walla Walla River | Mouth to Oregon Boarder | RM 0-5.7 | 2 | 2 | 2 | 1 | 2 | 1 | 10 |

WRIA_32_Walla Walla | WRIA 35 Mid_Snake | WRIA_37_38_39_Yakima | WRIA__45_Wenatchee | WRIA_48_Methow | WRIA_49_Okanogan

**Table A-9  NLCD Codes, Code Descriptions, and Classes**

| NLCD Code | Code_Description | Description | Classes | Modification |
|---|---|---|---|---|
| TRS_11 | 11_Open_Water | Open Water | Water | Natural |
| TRS_12 | 12_Perennial_Snow_Ice | Perennial Snow Ice | Barren | Natural |
| TRS_21 | 21_Developed_Open_Space | Developed Open | Developed | Human_Modified |
| TRS_22 | 22_Developed_low_intensity | Developed Low | Developed | Human_Modified |
| TRS_23 | 23_Developed_Medium_Intensity | Developed Medium | Developed | Human_Modified |
| TRS_24 | 24_Developed_High_Intensity | Developed High | Developed | Human_Modified |
| TRS_31 | 31_Barren_Land | Barren Land | Barren | Natural |
| TRS_41 | 41_Deciduous_Forest | Forest Deciduous | Forest | Natural |
| TRS_42 | 42_Evergreen_Forest | Forest Evergreen | Forest | Natural |
| TRS_43 | 43_Mixed_forest | Forest Mixed | Forest | Natural |
| TRS_52 | 52_Shrub_Scrub | Shrub Scrub | Shrub | Natural |
| TRS_71 | 71_Herbaceous | Herbaceous | Shrub | Natural |
| TRS_81 | 81_Hay_Pasture | Hay Pasture | Agriculture | Human_Modified |
| TRS_82 | 82_Cultivated_Crops | Cultivated Crops | Agriculture | Human_Modified |
| TRS_90 | 90_Woody_Wetlands | Woody Wetlands | Riparian | Natural |
| TRS_95 | 95_Emergent_Herbaceous_Wetland | Emergent Herbaceous Wetland | Riparian | Natural |

**Table A-10  Water Quality - Clean Water Act Section 305(b) severity categories**

| | |
|---|---|
| Category 1 | Meets tested standards. Placement in this category means that the water body segment meets the criteria it was tested for. It does not necessarily mean that a water body is free of all pollutants. Most water quality monitoring is designed to detect a specific array of pollutants, so placement in this category means that the water body met standards for all the pollutants for which it was tested. Specific information about the monitoring results may be found in the individual listings. |
| Category 2 | Waters of concern. This category lists waterbody segments where there is some evidence of a water quality problem, but not enough to require development of a Total Maximum Daily Load (TMDL) standard. There are several reasons why a water body would be placed in this category. A water body might have pollution levels that are not quite high enough to violate the water quality standards, or there may not have been enough violations to categorize it as impaired according to Ecology's listing policy. There might be data showing water quality violations, but the data were not collected using proper scientific methods. In all of these situations, these are waters that we will want to continue to test. |
| Category 3 | Insufficient or No data. This category houses those listings where the assessed data was insufficient to determine a proper categorization of the water. Water bodies that have not been tested will not be individually listed, but if they do not appear in one of the other categories, they are assumed to belong in Category 3. |
| Category 4 | Polluted waters that do not require a TMDL. This category is for water body segments that have pollution problems that are being solved in one of three ways: |
| 4a | Water body segments that have an approved TMDL in place and are actively being implemented. |
| 4b | Water body segments that have a pollution control plan in place that is expected to solve the pollution problems. While pollution control plans are not TMDLs, they must have many of the same features and there must be some legal or financial guarantee that they will be implemented. |
| 4c | Water body segments impaired by causes that cannot be addressed through a TMDL (not due to a pollutant). These impairments include low water flow, stream channelization, and dams. These problems require complex solutions to help restore streams to more natural conditions. |
| Category 5 | Polluted waters that require a TMDL. Category 5 represents the 303(d) list, the traditional list of impaired water bodies. Placement in this category means that Ecology has data showing that the water quality standards have been violated for one or more pollutants, and there is no TMDL or pollution control plan. TMDLs are required for the water bodies in this category. |

## Table A-11 Sample water rights data by reach tab (partial)

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **Walla Walla River (Reach 1)** | | | | | | | | | | | | | | | | |
| 2 | Reported By: | | | | | | | | | | | | | | | | |
| 3 | Report Date: 9/10/2010 | | | | Claims | Qi | Records | | | | | | | | | | |
| 4 | **SELECTION CRITERIA** | | | | 2 | 153.68 | 85 | | | | | | | | | | |
| 5 | WRIA | Walla Walla | | | | | | | | | | | | | | | |
| 6 | Region | Central,Eastern,Northwest,Southwest | | | | | | | | | | | | | | | |
| 7 | WR Class | Surface water | | | | | | | | | | | | | | | |
| 8 | Status | Active | | | | | | | | | | | | | | | |
| 9 | **File #** | **Cert #** | **Person** | **Stat** | **Doc** | **Priority Dt** | **Purpose** | **Qi** | **UOM** | **Qa** | **Ir Acres** | **WRIA** | **County** | **TRS** | **QQ/Q** | **Src's** | **1stSrc** |
| 10 | S3-*19920C | 10191 | Byerley Farms Inc | A | Cert | 10/07/1966 | IR | 4.80 | CFS | 960.00 | 240 | 32 | WALLA WALLA | 06N 32E 01 | S2/SE | 1 | WALLA WALLA RIVER |
| 11 | S3-*19921C | 10190 | Byerley Farms Inc | A | Cert | 10/07/1966 | IR | 1.28 | CFS | 256.00 | 64 | 32 | WALLA WALLA | 06N 32E 01 | S2/SE | 1 | WALLA WALLA RIVER |
| 12 | S3-*18785C | 9335 | Byerley Farms Inc | A | Cert | 11/23/1964 | IR | 2.40 | CFS | 480.00 | 120 | 32 | WALLA WALLA | 06N 32E 01 | SW/NW | 1 | WALLA WALLA RIVER |
| 13 | S3-*18787C | 9327 | Byrnes Edward | A | Cert | 11/23/1964 | IR | 0.40 | CFS | 80.00 | 20 | 32 | WALLA WALLA | 06N 32E 01 | SW/NW | 1 | WALLA WALLA RIVER |
| 14 | S3-*19007 | 9515 | Byerley Richard | A | Cert | 05/10/1965 | IR | 0.60 | CFS | 150.00 | 30 | 32 | WALLA WALLA | 06N 32E 01 | SW/SE | 1 | WALLA WALLA RIVER |
| 15 | S3-*17560C | 8751 | Byrnes Edward | A | Cert | 10/04/1962 | IR | 1.06 | CFS | 320.00 | 80 | 32 | WALLA WALLA | 06N 32E 01 | S2/SE | 1 | WALLA WALLA RIVER |
| 16 | S3-*12495C | 7065 | Byerley Farms Inc | A | Cert | 08/07/1953 | IR | 3.20 | CFS | 960.00 | 240 | 32 | WALLA WALLA | 06N 32E 01 | S2/SE | 1 | WALLA WALLA RIVER |
| 17 | S3-30304 | | Byerley Farms Inc | A | NewApp | 05/03/2000 | IR | 3.00 | CFS | | 40 | 32 | WALLA WALLA | 06N 32E 01 | | 5 | WALLA WALLA RIVER |
| 18 | S3-CV1-3P86 | 10190 | Byerley Farms Inc | A | CertChg | 10/07/1966 | IR | | CFS | | | 32 | WALLA WALLA | 06N 32E 01 | NE/SW | 1 | WALLA WALLA RIVER |
| 19 | CS3-*19007 | 9515 | Billy Hindman Marital Trust | A | Chng/ROE | 06/20/2007 | IFlow | 0.50 | CFS | | 125 | 32 | WALLA WALLA | 06N 32E 01 | SW/SE | 1 | WALLA WALLA RIVER |
| 20 | S3-*19007(10-026) | 9515 | Billy Hindman Marital Trust | A | Temp Use | 05/10/1965 | IFlow | 0.10 | CFS | 25.00 | | 32 | WALLA WALLA | 06N 32E 01 | SW/SE | 1 | WALLA WALLA RIVER |
| 21 | S3-*19006 | 9508 | Byerley Farms Inc | A | Cert | 05/10/1965 | IR | 1.40 | CFS | 350.00 | 70 | 32 | WALLA WALLA | 06N 32E 02 | SE/NE | 1 | WALLA WALLA RIVER |
| 22 | S3-*16971C | 8416 | WA Ecology Department | A | Cert | 10/11/1961 | IFlow | 0.46 | CFS | 109.00 | | 32 | WALLA WALLA | 06N 32E 02 | SE/NE | 1 | WALLA WALLA RIVER |
| 23 | S3-*16972C | 8511 | Byrnes A | A | Cert | 10/11/1961 | IR | 0.36 | CFS | 140.00 | 28 | 32 | WALLA WALLA | 06N 32E 02 | SE/NE | 2 | WALLA WALLA RIVER |
| 24 | CS3-*19006 | 9508 | Billy Hindman Marital Trust | A | Chng/ROE | 06/20/2006 | IFlow | 0.07 | CFS | | 25 | 32 | WALLA WALLA | 06N 32E 02 | SE/NE | 1 | WALLA WALLA RIVER |
| 25 | S3-*19006(10-017) | 9508 | Billy Hindman Marital Trust | A | Temp Use | 05/10/1965 | IFlow | 1.30 | CFS | 325.00 | | 32 | WALLA WALLA | 06N 32E 02 | SE/NE | 1 | WALLA WALLA RIVER |
| 26 | S3-*20918CWRIS | 11286 | CONKEY V G | A | Cert | 04/23/1968 | IR | 1.41 | CFS | 210.00 | 70 | 32 | WALLA WALLA | 06N 33E 02 | NW/SW | 1 | WALLA WALLA RIVER |
| 27 | S3-*07955CWRIS | 3641 | DUNNING R | A | Cert | 07/28/1947 | IR | 1.21 | CFS | | 91 | 32 | WALLA WALLA | 06N 33E 02 | E2/NW | 2 | WALLA WALLA RIVER |
| 28 | S3-CV2P930 | 645 | Dunning Bessie | A | CertChg | 01/01/1904 | IR | 1.58 | CFS | 0.00 | | 32 | WALLA WALLA | 06N 33E 02 | | 1 | WALLA WALLA RIVER |
| 29 | S3-CV3P1051 | 645 | Dunning Rolland | A | CertChg | 01/01/1904 | IR | 1.05 | CFS | 0.00 | | 32 | WALLA WALLA | 06N 33E 02 | | 1 | WALLA WALLA RIVER |
| 30 | S3-CV1P350 | 3641 | Dunning Rolland | A | CertChg | 07/28/1947 | IR | | CFS | | | 32 | WALLA WALLA | 06N 33E 02 | NE/NW | 2 | WALLA WALLA RIVER |
| 31 | S3-*11340CWRIS | 5884 | DEERINGHOFF W L | A | Cert | 05/12/1952 | IR | 0.40 | CFS | | 20 | 32 | WALLA WALLA | 06N 33E 03 | NE/SE | 1 | WALLA WALLA RIVER |
| 32 | S3-*12701C(A) | 06523(A) | Saranto Charles | A | Cert | 12/23/1953 | IR | 3.15 | CFS | 1212.00 | 303 | 32 | WALLA WALLA | 06N 33E 03 | | 2 | WALLA WALLA RIVER |
| 33 | S3-*12701C(B) | 06523(B) | Hamada Land Co. | A | Cert | 12/23/1953 | IR | 0.15 | CFS | 53.20 | 14 | 32 | WALLA WALLA | 06N 33E 03 | | 1 | WALLA WALLA RIVER |
| 34 | S3-*10288CWRIS | 5797 | FOWLER M T | A | Cert | 05/02/1951 | IR | 0.40 | CFS | | 40 | 32 | WALLA WALLA | 06N 33E 04 | | 1 | WALLA WALLA RIVER |
| 35 | S3-*11203C | 4844 | Moore Robert | A | Cert | 04/01/1952 | IR | 0.44 | CFS | 0.00 | 40 | 32 | WALLA WALLA | 06N 33E 04 | | 1 | WALLA WALLA RIVER |
| 36 | S3-*08786CWRIS | 4920 | WORKMAN W P | A | Cert | 05/10/1949 | IR | 0.63 | CFS | | 47.2 | 32 | WALLA WALLA | 06N 33E 04 | NW/NW | 1 | WALLA WALLA RIVER |
| 37 | S3-*04450CWRIS | 1201 | MONNICH/AULT | A | Cert | 08/12/1937 | IR | 3.04 | CFS | | 155 | 32 | WALLA WALLA | 06N 33E 04 | NE/NE | 1 | WALLA WALLA RIVER |
| 38 | S3-29148 | | Stone Allen | A | NewApp | 02/18/1992 | IR | 2.80 | CFS | 244.00 | 126 | 32 | WALLA WALLA | 06N 33E 04 | | 1 | WALLA WALLA RIVER |
| 39 | S3-*20150CWRIS | 10948 | MUNNS A / H S | A | Cert | 03/03/1967 | IR | 0.78 | CFS | 47.00 | 77 | 32 | WALLA WALLA | 06N 33E 05 | NE/SW | 2 | WALLA WALLA RIVER |
| 40 | S3-*20151C | 10949 | Munns Hazel | A | Cert | 03/03/1967 | IR | 0.59 | CFS | 71.00 | 43 | 32 | WALLA WALLA | 06N 33E 05 | NE/SW | 2 | WALLA WALLA RIVER |

## Table A-12  Sample water rights summary tab

| CRIA_ID | WRIA | Stream Name | Description | Claims | Qi | Records |
|---|---|---|---|---|---|---|
| 3201 | 32 | Walla Walla River (Reach 1) | Mouth to Touchet River | 2 | 153.681 | 85 |
| 3202 | 32 | Walla Walla River (Reach 2) | Touchet River to Mill Creek | 0 | 162.815 | 195 |
| 3203 | 32 | Walla Walla River (Reach 3) | Mouth to Oregon border | 1 | 157.307 | 31 |
| 3205 | 32 | Touchet River (Reach 1) | Mouth to Hofer Dam | 0 | 18.517 | 28 |
| 3206 | 32 | Touchet River (Reach 2) | Hofer Dam to Coppei Creek | 11 | 143.168 | 150 |
| 3207 | 32 | Touchet River (Reach 3) | Coppei Creek to Touchet River forks | 6 | 158.504 | 174 |
| 3208 | 32 | Coppei Creek | Mouth to Coppei Creek forks | 7 | 5.4 | 31 |
| 3209 | 32 | North Fork Coppei Creek | Confluence to falls above Coppei Springs | 0 | 1.69 | 5 |
| 3210 | 32 | South Fork Touchet River | Mouth to Griffen Fork | 5 | 5.35 | 24 |
| 3211 | 32 | North Fork Touchet River (Reach 1) | Mouth to Wolf Fork | 0 | 16.922 | 45 |
| 3212 | 32 | North Fork Touchet River (Reach 2) | Wolf Fork to Forest Service boundry | 0 | 1.85 | 8 |
| 3213 | 32 | Pine Creek | Mouth to Oregon border | 1 | 24.609 | 34 |
| 3214 | 32 | Mud Creek | Mouth (lower) to Locher Road | 2 | 43.231 | 55 |
| 3215 | 32 | Dry Creek | Mouth to North Fork Dry Creek | 5 | 80.254 | 130 |
| 3216 | 32 | North Fork Dry Creek | Mouth to tributary at GIS RM 3.0 | 1 | 0.005 | 2 |
| 3217 | 32 | West Little Walla Walla River | Mouth to Oregon border | 2 | 13.954 | 34 |
| 3218 | 32 | Mill Creek (Reach 1) | Mouth to Bennington Dam | 12 | 91.641 | 165 |
| 3219 | 32 | Mill Creek (Reach 2) | Bennington Dam to Blue Creek | 0 | 1.9 | 8 |
| 3220 | 32 | Mill Creek (Reach 3) | Blue Creek to Oregon border | 1 | 64.758 | 20 |
| 3222 | 32 | Doan Creek | Mouth to Last Chance Road? At long. 118°24' 17.3" W | 0 | 7.016 | 19 |
| 3223 | 32 | Cold Creek | To upper extent of frog ponds E of McKinney Road | 3 | 11.864 | 33 |
| 3224 | 32 | Blue Creek | Mouth to Laird Creek | 1 | 0.623 | 9 |
| 3225 | 32 | East Little Walla Walla River | Mouth to Oregon border | 1 | 2.946 | 13 |
| 3226 | 32 | Patit Creek | Mouth to confluence of North and West Patit Creeks | 3 | 1.772 | 4 |
| 3227 | 32 | West Patit Creek | Mouth to Forest Service boundary | 2 | 0.027 | 3 |
| 3228 | 32 | Yellowhawk Creek | Mouth to Mill Creek | 6 | 30.6738 | 130 |
| 3229 | 32 | Cottonwood Creek | Mouth to North Fork Cottonwood Creek | 0 | 0 | 29 |
| 3230 | 32 | Whisky Creek | Mouth to tributary at GIS RM 6.0 | 3 | 1.59 | 6 |
| 3231 | 32 | Titus Creek (Reach 1) | Mouth to Five Mile Bridge | 0 | 11.348 | 28 |
| 3232 | 32 | Titus Creek (Reach 2) | Five Mile Bridge to Mill Creek | 0 | 0 | 1 |
| 3233 | 32 | Walsh Creek | Mouth to pond on farm bordering Oregon | 0 | 5.712 | 15 |
| 3234 | 32 | Caldwell Creek | Mouth to Shelton Road (whole stream) | 1 | 1.912 | 13 |
| 3235 | 32 | Wolf Fork | Mouth to USFS boundary | 2 | 4.01 | 26 |

## Table A-13 Water right document type definitions

| Code | Definition | Use for CRIA Scoring |
|---|---|---|
| Cert | Certificate (legal record of water right) | Yes |
| Pmt | Permit (to develop a water right) | Yes |
| CertChg | Certificate of change (to a permit or claim) | Yes |
| Claim | Claim only; not confirmed | No |
| Chng/ROE | Record of Examination for a Change | No |
| Temp Use | Temporary Use | Yes |
| ChgApp | Change Application (not processed) | No |
| Adjct Cert | Adjudicated certificate (legal record of a claim or water right verified through adjudication) | Yes |
| NewApp | New application (not processed) | No, unless noted |

## Table A-14 Water right purposes of use code definitions

| Purpose Code | How the water will be used - categories include: | Purposes included for CRIA Scoring* |
|---|---|---|
| CO | Cooling for industrial purposes | Yes |
| CI | Commercial and Industrial Manufacturing (includes food processing and packaging, sand and gravel processing, asphalt plant, metal processing and manufacturing, pulp and paper manufacturing, aquatic plant culture, petroleum refining, car washes, and laundries) | Yes |
| DG | Domestic General (use of water for all domestic uses not specifically defined in the water right record or not defined by the other specific domestic use categories. Includes sewage treatment, farm supply, and laboratory use) | Yes |
| DM | Domestic Multiple (more than one dwelling, i.e. motels, trailer courts, campgrounds, parks, schools, port districts, public utility districts, diking and drainage districts, water districts, reclamation districts, and counties, none of which are under municipal control) | Yes |
| DS | Domestic Single (one dwelling with lawn and garden, up to one-half acre) | Yes |
| DY | Dairy | Yes |
| EN | Environmental Quality (includes pollution control, dust control, flood control, or any water use which improves or maintains the quality of the environment) | Yes |
| FP | Frost Protection (frost protection other than cranberries) | Yes |
| FR | Fire Protection (includes sprinkling log storage facilities) | Yes |
| FS | Fish Propagation (includes water service to ponds, reservoirs, hatcheries, and all other facilities involved in the overall purpose of fish propagation) | No; primarily non-consumptive |
| HE | Heat Exchange (use of such equipment as heat pumps, refrigeration equipment, and other cooling devices) | Yes |
| HP | Heat Protection For Crops (Water used during the summer months to protect such crops as apples and cranberries from the heat.) | Yes |
| HW | Highway (maintenance and construction) | Yes |
| IR | Irrigation (includes cranberry farming, lawn/garden watering with definite acreage, golf courses, greenhouses, etc.) | Yes |
| IF; Iflow | Instream flow | No |

| Purpose Code | How the water will be used - categories include: | Purposes included for CRIA Scoring* |
|---|---|---|
| IT | Municipal Intertie System | No |
| MI | Mining (includes washing coal, dredge mining, and hydraulic mining) | Yes |
| MU | Domestic Municipal (serves general domestic, commercial, and industrial needs of an incorporated municipality, i.e. cities, towns, and outlying areas) | Yes |
| NoID'd | No purpose identified | Yes |
| OT | Other (No purpose identified) | Yes |
| PO | Power (includes hydro-electric, hydraulic ram, and thermo-electric) | No; non-consumptive |
| RE | Recreation and Beautification (includes beautifying private and public grounds and supplying water to swimming pools, boating ponds, etc) | Yes |
| RW | Railway (use of water to serve railway equipment and facilities) | Yes |
| ST | Stock Watering (includes domestic uses of water for dairy/cattle farms, game bird farming, poultry farming, and fur-bearing animal farming) | Yes if cert or adj cert, else No |
| SR | Storage (Storage of water) | No; non-consumptive |
| TW-P | Trust Water-Permanent (Water in a permanent trust) | No |
| TW-T | Trust Water-Temporary (Water in a temporary trust.) | No |
| UN | Unknown | Yes |
| WL | Wildlife Propagation (includes water to service non-domesticated animals such as birds, game and non-game species) | Yes |
| * | Used everything I encountered EXCEPT FS (note issues), PO, IT, SR, Iflow (check codes - some codes for IF) 20100915 tls jk aw dg | |

## Table A-15 Sample flow gauge data tab

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Walla2@BeetRd ECY 32A105 | | RM 36.50 | | | https://fortress.wa.gov/ecy/wrx/wrx/flows/station.asp?sta=32A105&historical=true | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | | |
| 3 | Mean Monthly | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | AVG | PEAK | Peak Month | Count Months where Avg < Rule | Count Months where Min < Rule |
| 4 | Average | 363.6 | 392.6 | 384.7 | 414.0 | 429.0 | 168.0 | 36.1 | 47.6 | 58.2 | 26.9 | 43.5 | 178.0 | 212 | 429 | May | 0 | 0 |
| 5 | Minimum | 163.7 | 195.8 | 114.1 | 185.1 | 75.9 | 26.1 | 27.3 | 24.0 | 32.3 | 19.2 | 18.5 | 69.4 | | | | | |
| 6 | Rule | | | | | | | | | | | | | | | | | |
| 7 | Min/Avg | 0.45 | 0.50 | 0.30 | 0.45 | 0.18 | 0.16 | 0.75 | 0.50 | 0.55 | 0.71 | 0.43 | 0.39 | | | | | |
| 8 | Avg/Rule | | | | | | | | | | | | | | | | | |
| 9 | Min/Rule | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | | | | | | |
| 12 | Year | Monthly mean in cfs (Calculation period: 2002-04-01 -> 2009-12-31) | | | | | | | | | | | | | | | | |
| 13 | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | | | | | |
| 14 | 2002 | | | | | | 29.1 | 32.9 | 35.0 | 46.7 | 30.0 | 28.5 | 69.4 | | | | | |
| 15 | 2003 | 421.7 | 673.5 | 672.0 | 398.8 | 210.5 | 32.1 | 37.6 | 40.4 | 62.1 | 36.8 | 33.5 | 173.6 | | | | | |
| 16 | 2004 | 457.1 | 547.7 | 431.3 | 350.6 | 601.3 | 323.2 | 47.9 | 46.2 | 52.7 | 27.7 | 61.3 | 201.9 | | | | | |
| 17 | 2005 | 206.0 | 195.8 | 114.1 | 192.0 | 186.0 | 27.7 | 31.4 | 31.6 | 41.5 | 21.6 | 18.5 | 166.7 | | | | | |
| 18 | 2006 | 521.0 | 352.2 | 310.5 | 843.1 | 334.8 | 386.0 | 27.3 | 24.0 | 32.3 | 19.2 | 117.0 | 322.5 | | | | | |
| 19 | 2007 | 282.5 | 471.9 | 504.6 | 221.5 | 75.9 | 26.1 | 55.1 | 100.2 | 121.1 | 23.4 | 21.4 | 136.5 | | | | | |
| 20 | 2008 | 163.7 | 246.8 | 219.6 | 185.1 | 914.0 | 423.0 | 27.3 | 37.6 | 56.5 | 32.6 | 39.1 | 228.2 | | | | | |
| 21 | 2009 | 493.5 | 260.3 | 440.5 | 707.2 | 680.5 | 97.2 | 29.7 | 66.1 | 52.8 | 23.5 | 28.4 | 125.7 | | | | | |

## Table A-16 Sample flow targets tab (partial)

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | WRIA 32 | | | | | | | | | | | | | | |
| 2 | | | | | | | | | Note: used May value for summer months, even though "closed" | | | | | | |
| 3 | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4 | USGS 14018500 | 3201 | Walla Walla River (Reach 1) | | | | | | | | | | | | |
| 5 | ECY 32A100 | 3202 | Walla Walla River (Reach 2) | 250 | 250 | 350 | 350 | 250 | **250** | **250** | **250** | **250** | **250** | **250** | 250 |
| 6 | ECY 32A105 | 3203 | Walla Walla River (Reach 3) | | | | | | | | | | | | |
| 7 | ECY 32B075 | 3205 | Touchet River (Reach 1) | | | | | | | | | | | | |
| 8 | ECY 32B100 | 3206 | Touchet River (Reach 2) | 150 | 150 | 200 | 200 | 200 | 125 | 74 | 48 | 56 | 82 | 150 | 150 |
| 9 | ECY 32B110 | 3207 | Touchet River (Reach 3) | | | | | | | | | | | | |
| 10 | ECY 32G060 | 3208 | Coppei Creek | | | | | | | | | | | | |
| 11 | No | 3209 | North Fork Coppei Creek | | | | | | | | | | | | |
| 12 | ECY 32L070 | 3210 | South Fork Touchet River | | | | | | | | | | | | |
| 13 | ECY 32E050 | 3211 | North Fork Touchet River (Reach 1) | 95 | 95 | 125 | 125 | 125 | 95 | 65 | 53 | 51 | 63 | 95 | 95 |
| 14 | ECY 32E150 | 3212 | North Fork Touchet River (Reach 2) | | | | | | | | | | | | |
| 15 | No | 3213 | Pine Creek | | | | | | | | | | | | |
| 16 | No | 3214 | Mud Creek | | | | | | | | | | | | |
| 17 | ECY 32F150 | 3215 | Dry Creek | | | | | | | | | | | | |
| 18 | No | 3216 | North Fork Dry Creek | | | | | | | | | | | | |
| 19 | No | 3217 | West Little Walla Walla River | | | | | | | | | | | | |
| 20 | ECY 32C070 | 3218 | Mill Creek (Reach 1) | | | | | | | | | | | | |
| 21 | USGS 14015000 | 3219 | Mill Creek (Reach 2) | | | | | | | | | | | | |
| 22 | USGS 14013000 | 3220 | Mill Creek (Reach 3) | 110 | 125 | 150 | 150 | 125 | 100 | 53 | 41 | 41 | 48 | 100 | 110 |
| 23 | No | 3221 | Doan Creek | | | | | | | | | | | | |
| 24 | No | 3222 | Cold Creek | | | | | | | | | | | | |
| 25 | USGS 14013500 | 3224 | Blue Creek | | | | | | | | | | | | |
| 26 | ECY 32H090 | 3225 | East Little Walla Walla River | | | | | | | | | | | | |
| 27 | No | 3226 | Patit Creek | | | | | | | | | | | | |
| 28 | No | 3227 | West Patit Creek | | | | | | | | | | | | |
| 29 | ECY 32D060 | 3228 | Yellowhawk Creek | | | | | | | | | | | | |

## Table A-17  Sample flow scoring ("Reaches") tab (partial)

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | WRIA 32 Walla Walla | | Scored 20110920 tls  Corrected Column "D" computation so that Aug/Avg>66% scores low impairment, or "1" (not "3"); no-data scores "4" in cols "B" "D" "E" | | | | | | | | | | | | |
| 2 | NHD Avg Mon Mean Data Copied 20100923 tls | | | | | | | | | | | | | | |
| 3 | LFA/EDT Copied 20100920 tls | | | | | | | | GOOD IS HIGH | BAD IS HIGH; GOOD IS LOW >>> | | | >>>>>>>> | >>>>>>>> | >>>>>>>> |
| 4 | WRTS Data copied 20100920 tls | | 33 | | | | 19 | 4 | | | A | B | C | D | E |
| 5 | Reach Code | Reach Name | Stream Reach (description) | Target Reach (RM) | Gauges | RM | Gauge exists? | Rule exists? | BIN Worst 1/3 = 1 Mid 1/3 = 2 Best 1/3 = 3 | Sum scores (A:D) * E | % of Mo Avg Below Rule %> .75=4 %>.5=3 %>.25=2 Else 1 | Qi Deviation Factor Qi/Flow>.15=3 Qi/Flow>.05=2 Else 1 | No. Claims Claims<2 =1 Claims<9 =2, Else 3 | August Deviation Factor Aug/Avg>.66=1 Aug/Avg>33=2 Else 3 | Flow Volume Factor >1000=.5 >100=1 >50=2 >5=3 Else 4 |
| 6 | 3201 | Walla Walla River (Reach 1) | Mouth to Touchet River | 0.0-23.1 | USGS 14018500 | 18.2 | Yes | No | 3 | 7 | | 3 | 1 | 3 | 1.0 |
| 7 | 3202 | Walla Walla River (Reach 2) | Touchet River to Mill Creek | 23.1-37.5 | ECY 32A100 | 32.8 | Yes | Yes | 3 | 9 | 2 | 3 | 1 | 3 | 1.0 |
| 8 | 3203 | Walla Walla River (Reach 3) | Mouth to Oregon border | 37.5-44.5 | ECY 32A105 | 36.5 | Yes | No | 3 | 7 | | 3 | 1 | 3 | 1.0 |
| 9 | 3205 | Touchet River (Reach 1) | Mouth to Hofer Dam | 0.0-5.0 | ECY 32B075 | 3 | Yes | No | 3 | 6 | | 2 | 1 | 3 | 1.0 |
| 10 | 3206 | Touchet River (Reach 2) | Hofer Dam to Coppei Creek | 5.0-50.7 | ECY 32B100 | 40.4 | Yes | Yes | 3 | 11 | 2 | 3 | 3 | 3 | 1.0 |
| 11 | 3207 | Touchet River (Reach 3) | Coppei Creek to Touchet River forks | 50.7-64.2 | ECY 32B110 | 46.3 | Yes | No | 3 | 8 | | 3 | 2 | 3 | 1.0 |
| 12 | 3208 | Coppei Creek | Mouth to Coppei Creek forks | 0.0-8.0 | ECY 32G060 | 0.1 | Yes | No | 1 | 24 | | 3 | 2 | 3 | 3.0 |
| 13 | 3209 | North Fork Coppei Creek | Confluence to falls above Coppei Springs | 0.0-4.5 | No | | No | No | 1 | 24 | | 3 | 1 | 4 | 3.0 |
| 14 | 3210 | South Fork Touchet River | Mouth to Griffen Fork | 0.0-14.8 | ECY 32L070 | 1 | Yes | No | 2 | 21 | | 2 | 2 | 3 | 3.0 |
| 15 | 3211 | North Fork Touchet River (Reach 1 | Mouth to Wolf Fork | 0.0-3.9 | ECY 32E050 | 5 | Yes | Yes | 3 | 8 | 2 | 2 | 1 | 3 | 1.0 |
| 16 | 3212 | North Fork Touchet River (Reach 2 | Wolf Fork to Forest Service boundry | 3.9-15.4 | ECY 32E150 | 7.5 | Yes | No | 3 | 12 | | 1 | 1 | 2 | 3.0 |
| 17 | 3213 | Pine Creek | Mouth to Oregon border | 0.0-5.3 | No | | No | No | 1 | 24 | | 3 | 1 | 4 | 3.0 |
| 18 | 3214 | Mud Creek | Mouth (lower) to Locher Road | 0.0-10.1 | No | | No | No | 1 | 32 | | 3 | 1 | 4 | 4.0 |
| 19 | 3215 | Dry Creek | Mouth to North Fork Dry Creek | 0.0-35.2 | ECY 32F150 | ? | Yes | No | 1 | 24 | | 3 | 2 | 3 | 3.0 |
| 20 | 3216 | North Fork Dry Creek | Mouth to tributary at GIS RM 3.0 | 0.0-3.0 | No | | No | No | 2 | 18 | | 1 | 1 | 4 | 3.0 |
| 21 | 3217 | West Little Walla Walla River | Mouth to Oregon border | 0.0-5.7 | No | | No | No | 3 | 7 | | 2 | 1 | 4 | 1.0 |
| 22 | 3218 | Mill Creek (Reach 1) | Mouth to Bennington Dam | 0.0-12.4 | ECY 32C070 | 0.5 | Yes | No | 2 | 18 | | 3 | 3 | 3 | 2.0 |
| 23 | 3219 | Mill Creek (Reach 2) | Bennington Dam to Blue Creek | 12.4-18.3 | USGS 14015000 | 10.5 | Yes | No | 3 | 10 | | 1 | 1 | 3 | 2.0 |
| 24 | 3220 | Mill Creek (Reach 3) | Blue Creek to Oregon border | 18.3-23.5 | USGS 14013000 | 21.2 | Yes | Yes | 2 | 18 | 2 | 3 | 1 | 3 | 2.0 |
| 25 | 3222 | Doan Creek | Mouth to Last Chance Road? At long. 118°24' 17. | 0.0-4.4 | No | | No | No | 1 | 24 | | 3 | 1 | 4 | 3.0 |
| 26 | 3223 | Cold Creek | To upper extent of frog ponds E of McKinney Ro | 0.0-3.5 | No | | No | No | 1 | 36 | | 3 | 2 | 4 | 4.0 |
| 27 | 3224 | Blue Creek | Mouth to Laird Creek | 0.0-5.0 | USGS 14013500 | ? | Yes | No | 2 | 15 | | 1 | 1 | 3 | 3.0 |
| 28 | 3225 | East Little Walla Walla River | Mouth to Oregon border | 0.0-2.0 | ECY 32H090 | ? | Yes | No | 2 | 20 | | 3 | 1 | 1 | 4.0 |

Reaches / Flow Rules / 3201 / 3202 / 3203 / 3205 / 3206 / 3207 / 3208 / 3210 / 3211 / 3212 / 3215 / 3218 / 3219 / 3220 / 3224 / 3225 / 3228 / 3229 / 3235 / 3201-USGS14018500WWR1nrTouch

Ready

Start | Inbox - Microsoft Outlook | C:\data\Columbia River ... | CRIA_Appendix_A_Meth... | Microsoft Excel - WRI... | Links | Water | DFW