

Columbia River Instream Atlas Project

Washington Department of Fish and Wildlife

Final Report – APPENDIX G

WRIA 49 OKANOGAN

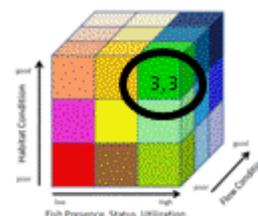
4923 - Similkameen River (Reach 1)

Fish	Habitat	Flow
3	3	3



Washington
Department of
**FISH and
WILDLIFE**

Fish Status/Utilization and
Habitat Condition scores
use this color scheme:



Flow Condition score
uses line thickness

- Good 3
- Fair
- Poor

Columbia River Instream Atlas Project - Final Report Appendix G –WRIA 49 Okanogan

September 23, 2011

Washington Department of Fish and Wildlife CRIA Team:

Teresa Scott (Habitat Water Resources Policy Coordinator)

Jonathan Kohr (Habitat Water Science Team)

Dayv Lowry (Fish Science; Habitat Science)

Andrew Weiss (Fish Science)

Aaron Bosworth (King County District Fish Biologist)

Jim Cummins (Yakima District Fish Biologist)

Dale Gombert (Fish Science)

Paul La Riviere (Habitat Water Science Team)

Peggy Miller (Habitat Major Projects)

Brianna Murphy (Fish Science)

Funding provided by Ecology Office of Columbia River as part of the 2011 Columbia Basin Long-term Water Supply and Demand Forecast

Ecology Contract C1000090

WDFW Contract 09-1471

Ecology Publication Number: 11-12-015

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Appendix G - WRIA 49 - Okanogan

September 23, 2011

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1. Description¹

The Okanogan River is the third largest of the Columbia River tributaries. The Okanogan originates in British Columbia and flows through Okanogan, Skaha, Vaseaux, and Osoyoos lakes before crossing into the State of Washington. Within Washington, the Okanogan watershed encompasses about 2,600 square miles (1.65 million acres), which represents 26% of the total watershed for this basin. The Okanogan River is considered

1 Adapted from Okanogan Watershed Plan, Okanogan Watershed Planning Unit, 2009; Northwest Power and Conservation Council 2005c; and Upper Columbia Salmon Recovery Board 2007

the northernmost geologic dividing line between the Cascade and Rocky Mountain Ranges. Within Washington State, the Okanogan runs primarily north to south approximately 79 miles from Lake Osoyoos to its confluence with the Columbia River between Wells Dam and Chief Joseph Dam at Columbia River mile 533.5.

The Similkameen River, located primarily in Canada, contributes 75% of the flow to the Okanogan River. There are numerous important tributaries that drain directly into the Okanogan River. Some of the more significant and larger tributaries draining from the west are Johnson, Salmon, Loup Loup, and Chiliwist Creeks. Dams impound Salmon Creek in Conconully Lake and Conconully Reservoir for irrigation. Important tributaries from the east include Tonasket, Antoine, Siwash, Bonaparte, Tunk, Omak, and Nine Mile Creeks.

2. Reach Definitions

Within WRIA 49 reaches were mainly defined using uppermost diversions, but there were a variety of reach differences within the Okanogan watershed. Many of the streams contained natural barriers to migrating salmonids. In these cases, reaches were separated into two reaches, or ended at those points. Some streams upper reach extents would end at a reservoir or lake such as Bonaparte, Spectacle, or Osoyoos Lakes. As with other stream reach lengths in other WRIA's, upper extents would conclude at national borders, tribal lands, or USFS boundaries. Other stream reaches would end at dams such as Fanchers and Conconully dams, while others would end with landmarks such as road crossings or stream gages nearest to the uppermost water withdrawal diversion points.

Reach 4911 is Palmer Lake, which was not evaluated for this project.

Table G-1 Reach Definitions

Stream Name	Code	Stream Reach Description
Okanogan River (Reach 1)	4901	Mouth to Salmon Creek
Okanogan River (Reach 2)	4902	Salmon Creek to Bonaparte Creek
Okanogan River (Reach 3)	4903	Bonaparte Creek to Canada border
Tonasket Creek	4904	Mouth to USFS boundary
Bonaparte Creek	4905	Mouth to Bonaparte Lake
Loup Loup Creek	4906	Mouth to Helensdale ID weir
Ninemile Creek	4907	Mouth to diversion at 119°18'52.096"W, 48°59'02.9"N
Aeneas Creek	4908	Mouth to North Lamanasky Road
Omak Creek	4909	Mouth to USGS gauging station 12445900
Palmer Creek	4910	Mouth to Palmer Lake - conduit for Sinlahekin River
Antoine Creek	4912	Mouth to Fanchers Dam
Siwash Creek	4913	Mouth to South and Middle Forks Siwash Creek
Tunk Creek (Reach 1)	4914	Mouth to Natural Barrier at 119°28'32.9"W 48°33'48.5"N
Tunk Creek (Reach 2)	4915	Natural Barrier to Colville Indian Reservation
Salmon Creek (Reach 1)	4916	Mouth to OID diversion dam

Stream Name	Code	Stream Reach Description
Salmon Creek (Reach 2)	4917	OID diversion dam to Conconully Reservoir
Chiliwist Creek	4918	Mouth to Chiliwist Road
Tallant Creek	4919	Mouth to northernmost crossing of SR 20
Reed Creek	4920	Mouth to road crossing above Reed Pond
Whitestone Creek	4921	Mouth to mouth of Spectacle Lake
Chewiliken Creek	4922	Mouth to USFS boundary
Similkameen River (Reach 1)	4923	Mouth to Enloe Dam
Similkameen River (Reach 2)	4924	Enloe Dam to Canada border
Toats Coulee	4925	Mouth to DNR boundary
Sinlahekin Creek	4926	Palmer Lake (inclusive) to Cecile Creek

3. WRIA Results

Fish Status and Utilization

Components of the fish status/utilization score and ranking are SaSI status, ESA status, fish diversity, and time spent in the reach for spawning/incubation, rearing/smolt migration and adult migration. TRT designation was not considered in this rating but is available on the spreadsheets for inclusion in future evaluations.

Three SaSI stocks are found in the Okanogan River Basin, Okanogan Summer Chinook, Okanogan Summer Steelhead and Okanogan Sockeye. They are rated as healthy, unknown, and depressed respectively. As for ESA status Okanogan summer steelhead are ESA listed as threatened whereas Okanogan summer Chinook and Okanogan sockeye are not listed under ESA.

Spring Chinook in the Okanogan River Basin are not considered in this project. Spring Chinook are considered extirpated from the Okanogan watershed (Salmon and Steelhead Habitat Limiting Factors Assessment Watershed Resource Inventory 49: Okanogan Watershed, Entrix 2004; Columbia River Hatchery Reform Project, Okanogan Spring Chinook Population Project, 2009). Limited efforts have been made in some years to re-introduce this stock using Carson Broodstock from the Winthrop hatchery. Residual individuals of spring Chinook return to the Okanogan, and some have been observed spawning in Omak Creek. However, a full re-introduction program has not been implemented, the number of returning fish is small (e.g., 17 fish), and their distribution is not well documented. This population is not recognized by the ESA or by SaSI, and will not be considered here. This stock can be included in following iterations of the atlas as information becomes available.

The components of the fish status/utilization score, SaSi status, and ESA listing will remain the same throughout the Okanogan Basin and will not be repeated for each stream designation.

Table G-2 SaSI Stock Name, Status, ESA Listing Unit, & Listing Status

SaSI Stock name	SaSI Status	ESA Unit Name	ESA Listing Status
Okanogan Summer Chinook	Healthy	Upper Columbia River Summer and Fall Run Chinook	Not Warranted
Okanogan Sockeye	Depressed	Okanogan River Sockeye	Not Warranted
Okanogan Summer Steelhead	Unknown	Upper Columbia Steelhead	Endangered

Table G-3 Fish status & utilization periodicity for five life stages

Fish Species - SaSI Stock (SaSI)	Life Stage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Okanogan Summer Chinook (ESA Not Warranted; 1 Healthy SaSI Stock)	Adult In-Migration												
	Spawning												
	Egg Incubation & Fry Emergence												
	Rearing												
	Juvenile Out-Migration												
Okanogan Summer Steelhead (ESA Threatened; 1 Unknown SaSI Stock)	Adult In-Migration												
	Spawning												
	Egg Incubation & Fry Emergence												
	Rearing												
	Juvenile Out-Migration												
Okanogan Sockeye (ESA Not Warranted; 1 Depressed SaSI Stock)	Adult In-Migration												
	Juvenile Out-Migration												

Note: Stock presence varies by stream reach

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

Color / Bin Score

3 = High/Good

2 = Average / Fair

1 = Low / Poor

Table G-4 Fish status/utilization score & bin by stream reach

Reach Code	Reach Name	Prioritization Score	Normalized Score	Bin
4901	Okanogan River (Reach 1)	106	1.00	3
4902	Okanogan River (Reach 2)	106	1.00	3
4903	Okanogan River (Reach 3)	106	1.00	3
4904	Tonasket Creek	57	0.54	2
4905	Bonaparte Creek	75	0.71	3
4906	Loup Loup Creek	75	0.71	3
4907	Ninemile Creek	75	0.71	3
4908	Aeneas Creek	12	0.11	1
4909	Omak Creek	75	0.71	3
4910	Palmer Creek	0	0.00	1
4912	Antoine Creek	75	0.71	3
4913	Siwash Creek	12	0.11	1
4914	Tunk Creek (Reach 1)	54	0.51	2
4915	Tunk Creek (Reach 2)	48	0.45	2
4916	Salmon Creek (Reach 1)	75	0.71	3
4917	Salmon Creek (Reach 2)	69	0.65	2
4918	Chiliwist Creek	42	0.40	2
4919	Tallant Creek	42	0.40	2
4920	Reed Creek	42	0.40	2
4921	Whitestone Creek	15	0.14	1
4922	Chewiliken Creek	12	0.11	1
4923	Similkameen River (Reach 1)	88	0.83	3
4924	Similkameen River (Reach 2)	0	0.00	1
4925	Toats Coulee Creek	0	0.00	1
4926	Sinlahekin Creek	0	0.00	1

Habitat Condition

Information on fish habitat conditions in the Okanogan watershed was gleaned from literature review such as the 2004 Limiting Factors Analysis (LFA), personal communications with area biologists during meetings in Twisp in 2010, and direct personal observation documented during the 2003 “Okanogan River Tributary Fish Passage And Diversion Screening Prioritization Inventory” survey work. Sub-basin habitat conditions were rated as ‘Excellent,’ ‘Good,’ ‘Fair,’ or ‘Poor’ based on CRIA habitat criteria. Most streams reviewed had low summer flows and dry land shrub-steppe riparian conditions. The climatic conditions of the Okanogan naturally restrict salmonid habitat use by imposing thermal and flow barriers that can affect the overall production in the watershed. In some portions of the Okanogan watershed, human alterations to the landscape have exacerbated the naturally limiting conditions by further reducing habitat quality and quantity available for salmonid life history needs. These alterations have primarily occurred in the lower gradient, lower reaches of subwatersheds. Low amounts of LWD loading and habitat impacts are mostly the result of past timber harvest operations, road building and placement, and grazing. In the end, a limited amount of documented stream data was available, which supports the assertion made in the 2004 LFA that a quantitative reach-by-reach assessment of habitat conditions in most of the Okanogan basin is needed.

Table G-5 Habitat condition score & bin by stream reach

Reach Code	Reach Name	Prioritization Score	Bin
4901	Okanogan River (Reach 1)	9	1
4902	Okanogan River (Reach 2)	11	2
4903	Okanogan River (Reach 3)	13	3
4904	Tonasket Creek	10	2
4905	Bonaparte Creek	9	1
4906	Loup Loup Creek	11	2
4907	Ninemile Creek	11	2
4908	Aeneas Creek	11	2
4909	Omak Creek	12	2
4910	Palmer Creek	13	3
4912	Antoine Creek	10	2
4913	Siwash Creek	10	2
4914	Tunk Creek (Reach 1)	13	3
4915	Tunk Creek (Reach 2)	8	1
4916	Salmon Creek (Reach 1)	8	1
4917	Salmon Creek (Reach 2)	14	3
4918	Chiliwist Creek	8	1
4919	Tallant Creek	12	2

Color / Bin Score
 3 = High/Good
 2 = Average / Fair
 1 = Low / Poor

Reach Code	Reach Name	Prioritization Score	Bin
4920	Reed Creek	12	2
4921	Whitestone Creek	8	1
4922	Chewiliken Creek	6	1
4923	Similkameen River (Reach 1)	15	3
4924	Similkameen River (Reach 2)	13	3
4925	Toats Coulee Creek	14	3
4926	Sinlahekin Creek	13	3

Flow Condition

The hydrology of the Okanogan River Watershed is characterized by high springtime run-off due to spring rains and melting snowpack, with low summer and early fall flows due to nearly absent precipitation and diminishing snowpack. Irrigation diversions also reduce summer flows. Hydrology may be altered from historical patterns, increasing peak flows and changing overall water yield and timing of runoff. Landscape changes such as timber harvest and road construction can cause dramatic changes in certain portions of a drainage, such as in small headwater subbasins with southerly aspects.

WRIA 49 is comprised of numerous drainage basins. The Similkameen River is considered a major tributary to the Okanogan River. Its flow is, on average, actually more than 4 times the flow of the Okanogan where the two rivers join south of Oroville. About 90 percent of the Similkameen River drainage is from Canada; only 10 percent of the drainage is within Washington from Sinlahekin Creek and its primary tributary, Toats Coulee Creek, as well as from other streams (Paysaten and Ashnola). Sinlahekin Creek drains into Palmer Lake, which empties into the Similkameen River through Palmer Creek. There are numerous other important tributaries that drain directly into the Okanogan River and some of the more significant and larger ones draining from the west are Johnson, Salmon, Loup Loup, and Chiliwist Creeks. Dams impound Salmon Creek in Conconully Lake and Conconully Reservoir for irrigation. Important tributaries from the east include Tonasket, Antoine, Siwash, Bonaparte, Tunk, and Omak Creeks.

There are several data sets with long-term continuous records, short-term continuous records, individual point data from throughout the year, or only very short-term seasonal data regarding flow that are available from various entities (Ecology, Okanogan Conservation District, Colville Confederated Tribes, Reclamation, and USGS). For those tributary streams for which data are available, the estimated mean annual flows per square mile are highest in the Sinlahekin Creek (~448 ac-ft/sq mi), Similkameen River (~433 to 478 ac-ft/sq mi), and North Fork Salmon Creek (~460 to 491 ac-ft/sq mi). Mean annual flows are lowest in Bonaparte Creek (~21 to 37 ac-ft/sq mi) and Tunk Creek (~21 to 52 ac-ft/sq mi). Peak discharges typically occur during the 4-month period from April through July, reflecting primarily snowmelt or

rain-on-snow events, when streams contribute about 70-80 percent of their average annual discharge. Low flows generally occur from August (Johnson Creek) to October (Okanogan River) depending on the stream, but prior to the beginning of autumn rainy periods. In some cases, the streamflow hydrographs are influenced by upstream diversions or regulation (e.g., Whitestone Creek). Some smaller streams freeze up during winter and have no flow until the spring thaw.²

Of the twenty-five stream reaches evaluated for this project, fourteen have gauges with data sufficient for analysis, and four reaches have minimum instream flow rules set by Ecology. Instream flows were set on the main stem Okanogan River in 1976 (Chapter 173-549 WAC) (Table G-6).

The Upper Columbia Salmon Recovery Board’s Regional Technical Team identified Bonaparte, Loup Loup, and Antoine Creeks as specifically needing instream flow enhancement, in addition to a general need for strategic acquisition of water for instream benefits throughout the Okanogan basin.³

Table G-6 Minimum Instream Flows set in Chapter 173-549 WAC

Time period	Reach 4901 Okanogan River at Malott USGS 12447200	Reach 4902 Okanogan River near Tonasket USGS 12445000	Reach 4903 Okanogan River at Oroville USGS 12439500	Reach 4924 Similkameen River near Nighthawk USGS 12442500	
Jan	1	860	800	320	400
	15	830	800	320	400
Feb	1	820	800	320	400
	15	850	800	320	400
Mar	1	880	800	320	425
	15	900	800	320	450
Apr	1	925	910	330	510
	15	1,100	1,070	340	640
May	1	1,750	1,200	350	1,100
	15	3,800	3,800	500	3,400
Jun	1	3,800	3,800	500	3,400
	15	3,800	3,800	500	3,400
Jul	1	2,100	2,150	420	1,900
	15	1,200	1,200	350	1,070
Aug	1	800	840	320	690
	15	600	600	300	440
Sept	1	620	600	300	400
	15	700	600	300	400
Oct	1	750	730	330	450

² Adapted from Okanogan Watershed Plan, Okanogan Watershed Planning Unit, 2009.

³ RTT Summary of Priority Reaches and Actions, UCSRB RTT, 2009.

Time period	Reach 4901 Okanogan River at Malott USGS 12447200	Reach 4902 Okanogan River near Tonasket USGS 12445000	Reach 4903 Okanogan River at Oroville USGS 12439500	Reach 4924 Similkameen River near Nighthawk USGS 12442500
15	960	900	370	500
Nov 1	950	900	370	500
15	950	900	320	500
Dec 1	930	900	320	500
15	900	850	320	450

Table G-7 Flow condition score & bin by stream reach

Reach Codes	Reach Name	Prioritization Score	Bin
4901	Okanogan River (Reach 1)	4	3
4902	Okanogan River (Reach 2)	4	3
4903	Okanogan River (Reach 3)	10	3
4904	Tonasket Creek	32	1
4905	Bonaparte Creek	36	1
4906	Loup Loup Creek	27	1
4907	Ninemile Creek	20	2
4908	Aeneas Creek	20	2
4909	Omak Creek	21	2
4910	Palmer Creek	6	3
4912	Antoine Creek	32	1
4913	Siwash Creek	20	2
4914	Tunk Creek (Reach 1)	12	3
4915	Tunk Creek (Reach 2)	32	1
4916	Salmon Creek (Reach 1)	15	3
4917	Salmon Creek (Reach 2)	24	1
4918	Chiliwist Creek	36	1
4919	Tallant Creek	24	1
4920	Reed Creek	32	1
4921	Whitestone Creek	24	1
4922	Chewiliken Creek	24	1
4923	Similkameen River (Reach 1)	3	3
4924	Similkameen River (Reach 2)	4	3
4925	Toats Coulee Creek	18	2
4926	Sinlahekin Creek	21	2

Color / Bin Score

3 = High/Good
2 = Average / Fair
1 = Low / Poor

4. Reach Results

4901 - Okanogan River (Reach 1):

Fish	Habitat	Flow
3	1	3

Fish Status/Utilization

This stream reach is rated high for fish utilization. Okanogan summer Chinook and Okanogan summer steelhead spawn and rear in this reach of the Okanogan River mainstem. In addition it is part of the adult and juvenile migration corridor for Okanogan summer Chinook, Okanogan summer steelhead and Okanogan sockeye. Okanogan River (Reach 1) is not part of an Okanogan summer Chinook, Okanogan summer steelhead or Okanogan sockeye designated Major or Minor Spawning Area. Additional fish biodiversity scoring information is provided on Table G-8.

Habitat

The lower Okanogan River reach was given a poor overall habitat condition score, mainly due to the known water quality issues. Ecology's 1998 Section 303(d) list (Impaired and Threatened Waterbodies Requiring Additional Pollution Controls) includes the Okanogan River for "failure to meet water quality standards for temperature, dissolved oxygen, pH, and fecal coliform." Okanogan River water temperatures often exceed lethal tolerance levels for salmonids in the mid to- late summer. These exceedences are partly a result of natural phenomena (low gradient and solar radiation on the upstream lakes), but are exacerbated by sedimentation and summer low flows caused by dam operations and irrigation. High water temperatures in late summer and fall form a thermal barrier, effectively excluding juvenile salmon from rearing in most of the basin, except during the first few weeks after emergence (Chapman et al. 1994a). At times, high water temperatures in the lower Okanogan River have blocked adult anadromous salmonid passage. The most extreme example is in adult sockeye that are sometimes thermally blocked through the lower Okanogan River (downstream of Lake Osoyoos) during late July and early August (Pratt et al. 1991).

The reach is mostly channelized and contains poor floodplain connectivity, few Off-Channel Habitats (OCH) for rearing, and is inundated with warmwater species such as smallmouth bass that prey on outmigrating salmonids. Spawning scored low due to the high sediment levels. This reach is primarily used as a migration corridor, and passage scored a 'good'. Some rearing occurs, providing a 'fair' score for that attribute. Habitat scoring detail can be found on Table G-9.

Flow

Gauge:Yes Rule:Yes The minimum of monthly mean flows in this reach is 1,117 cfs in September and the peak is 9,680 cfs in June . Minimum flow is 38 percent of the

average. Diversions evaluated for this project represent 4 percent of the Mean Annual Flow; reaches with diversions less than 5% of Mean Annual Flow scored ‘good’ for this scoring component. On average, actual flows exceed minimum instream flow rules in every month. Flow scores are presented on Table G-10.

4902 - Okanogan River (Reach 2)

Fish	Habitat	Flow
3	2	3

Fish Status/Utilization

The Okanogan River (Reach 2) is rated ‘high’ for fish utilization. As with Okanogan River (Reach1), Okanogan summer Chinook and Okanogan summer steelhead spawn and rear in this reach of the Okanogan River mainstem. In addition it is part of the adult and juvenile migration corridor for Okanogan summer Chinook, Okanogan summer steelhead, and Okanogan sockeye. Additional fish biodiversity scoring information is provided on Table G-8.

Habitat

The channelization of reach 2 of the Okanogan River is similar to reach 1 morphologically and rates ‘poor’ for floodplain connectivity and OCH. Riparian, spawning, and rearing conditions were scored ‘fair’ after review with local biologists. Passage was rated ‘good’ with no unnatural barriers; there are possible riffle barriers at lower flow. Overall, habitat conditions are ‘fair’ at present. Habitat scoring detail can be found on Table G-9.

Flow

Gauge:Yes Rule:Yes The minimum of monthly mean flows in this reach is 1,083 cfs in October and the peak is 9,680 cfs in June . Minimum flow is 37 percent of the average. Diversions evaluated for this project represent 8 percent of the Mean Annual Flow; reaches with diversions between 5% and 15% of Mean Annual Flow scored ‘fair’ for this scoring component. On average, actual flows exceed minimum instream flow rules in every month. Flow scores are presented on Table G-10.

4903 - Okanogan River (Reach 3)

Fish	Habitat	Flow
3	3	3

Fish Status/Utilization

The fish status/utilization rates ‘high’ for the Okanogan River Reach 3. Okanogan summer Chinook and Okanogan summer steelhead continue to spawn and rear in this reach of the Okanogan River mainstem. All three species utilize Okanogan River

Reach 3 for adult and juvenile migration. Additional fish biodiversity scoring information is provided on Table G-8.

Habitat

Reach 3 contains slightly better salmonid spawning and rearing suitability and was rated ‘good’ based on discussions of known salmonid use and past site reviews. Riparian score was scored as ‘fair’ and other scores of floodplain connectivity and OCH’s were still considered ‘poor,’ similar to downstream reach scores. Habitat scoring detail can be found on Table G-9.

Flow

Gauge:Yes Rule:Yes The minimum of monthly mean flows in this reach is 453 cfs in January and the peak is 1,125 cfs in May. Minimum flow is 68 percent of the average. Diversions evaluated for this project represent 41 percent of the Mean Annual Flow; reaches with diversions more than 15% of Mean Annual Flow scored ‘poor’ for this scoring component. The instream flow rule is higher than Mean Annual Flow in 7 months of the year, on average. Reaches with flow rules greater than Mean Annual Flow between 6 and 9 months of the year are considered to be in ‘fair’ condition. In spite of difficulty meeting the minimum instream flows, average flow volume is large relative to other reaches in this WRIA, and this attribute strongly influences the overall flow condition score. Flow scores are presented on Table G-10.

4904 - Tonasket Creek

Fish	Habitat	Flow
2	2	1

Fish Status/Utilization

The Tonasket Creek reach fish status/utilization rates ‘average’ compared to the mainstem Okanogan reaches. Okanogan summer steelhead is the only stock to spawn, rear, and use this reach as an adult migration corridor. Okanogan summer Chinook juveniles may use Tonasket Creek as a rearing area for a portion of the year. Okanogan sockeye do not utilize this stream reach at all. Additional fish biodiversity scoring information is provided on Table G-8.

Habitat

Direct observation reveals very few OCH’s within the creek, so this attribute scored ‘poor.’ Floodplain connectivity and riparian conditions were rated as ‘poor’ to ‘fair’ in the 2004 LFA, and we settled on ‘fair’ scores after consultations with local biologists. Spawning and rearing suitability are ‘fair’ in the lower reach but there is a natural gradient barrier that drops the passage score to a ‘poor’ rating. Habitat scoring detail can be found on Table G-9.

Flow

Gauge:Yes Rule:No An NHD+ estimated 3 cfs Mean Annual Flow was used to score this reach. Diversion data used for this evaluation exceed the Mean Annual Flow. Flow scores are presented on Table G-10.

4905 - Bonaparte Creek

Fish	Habitat	Flow
3	1	1

Fish Status/Utilization

Fish status/utilization in Bonaparte Creek is high, even though Okanogan sockeye does not utilize this reach and Okanogan summer Chinook use is limited to rearing during a portion of the year. Okanogan summer steelhead use carries most of the rating with yearlong rearing, 7 months of spawning to emergence, and four months of use as an adult migration corridor. Additional fish biodiversity scoring information is provided on Table G-8.

Habitat

Habitat conditions were not scored within the LFA for Bonaparte Creek, so our scores are based entirely on direct observation and consultation with local biologists. The creek is mostly channelized and lacks pools and sinuosity, leading to morphological scores of 'poor.' Lack of riparian growth due to cultivation at the stream edge, and low utility for spawning and rearing in the lower reach, lead to 'fair' scores for these parameters. Since there is a natural barrier at RM 1.0, passage was rated 'poor.' Habitat scoring detail can be found on Table G-9.

Flow

Gauge:Yes Rule:No The minimum of monthly mean flows in this reach is less than 1 cfs in August and the peak is 8 cfs in May. Minimum flow is 9 percent of the average. Diversion data used for this evaluation exceed the Mean Annual Flow. Bonaparte is one creek recommended by the RTT for instream flow enhancement. Flow scores are presented on Table G-10.

4906 - Loup Loup Creek

Fish	Habitat	Flow
3	2	1

Fish Status/Utilization

Loup Loup Creek also rates high for fish utilization. Fish status/utilization and timing is the same as for Bonaparte Creek. Okanogan summer Chinook utilize this reach for limited juvenile rearing and Okanogan sockeye not at all. Okanogan summer

steelhead use carries most of the rating with yearlong rearing, 7 months of spawning to emergence and four months of use as an adult migration corridor. Additional fish biodiversity scoring information is provided on Table G-8.

Habitat

The Loup Loup Creek habitat was evaluated to the upper most diversion weir at RM 10.2. The historic terminus for steelhead fish passage is Loup Loup Falls @ RM 2.04. Therefore, the lower portion was more heavily weighted in scoring determination of the six habitat parameters. Through onsite observations, corroborated through consultations with local biologists, floodplain connectivity and passage is considered ‘poor.’ Spawning conditions are ‘fair’ and rearing suitability in the lower reach is limited, but considered good value. The LFA rates floodplain connectivity as ‘good,’ but we downgraded that score to ‘fair’ after site review and consultations. Riparian conditions were graded ‘fair’ in the LFA, and verified by personal site visits. Habitat scoring detail can be found on Table G-9.

Flow

Gauge:No Rule:No An NHD+ estimated 8 cfs Mean Annual Flow was used to score this reach. Diversions evaluated for this project represent 42 percent of the Mean Annual Flow; reaches with diversions more than 15% of Mean Annual Flow scored ‘poor’ for this scoring component. Loup Loup Creek was specifically identified by the RTT as needing instream flow enhancement. Flow scores are presented on Table G-10.

4907 - Ninemile Creek

Fish	Habitat	Flow
3	2	2

Fish Status/Utilization

Fish status/utilization at Ninemile Creek is the same as Loup Loup and Bonaparte Creeks. The Okanogan summer steelhead carries the ‘high’ fish status/utilization rating by utilizing this reach for spawning, rearing, and as an adult migration corridor. Okanogan sockeye do not use this reach and Okanogan summer Chinook may utilize it for a limited time for juvenile rearing. Additional fish biodiversity scoring information is provided on Table G-8.

Habitat

Ninemile Creek habitat ranked as ‘fair’ because of passage concerns, poor floodplain connectivity, and degraded off-channel habitat conditions related to agricultural practices, cattle intrusion, and channelizing of the creek. It is ranked as ‘good’ for both spawning and rearing suitability as confirmed from local biologists’ recent steelhead spawning surveys. Riparian conditions are good and bad in places along the creek with an overall reach score of ‘fair.’ Habitat scoring detail can be found on Table G-9.

Flow

Gauge:Yes Rule:No The minimum of monthly mean flows in this reach is less than 1 cfs from June to December and the peak is 2 cfs in March . Minimum flow is 38 percent of the average. Basically, this creek has very low flows year-round. No diversion data are available in this reach. Flow scores are presented on Table G-10.

4908- Aeneas Creek

Fish	Habitat	Flow
1	2	2

Fish Status/Utilization

Aeneas Creek reach rates ‘low’ for fish utilization. Fish status/utilization is limited to juvenile use by both Okanogan summer Chinook and Okanogan summer steelhead. During low flow in late summer Aeneas Creek becomes a complete fish passage barrier and is only passable during May through July. Additional fish biodiversity scoring information is provided on Table G-8.

Habitat

The reach described and evaluated for Aeneas Creek flows through an area referred to as the “lime belt region.” The affect of this lime belt is evident by the accumulation of calcium carbonate along the streambed channel (Entrix, 2003). The majority of the land in the watershed is privately owned and used primarily for farming and ranching, and rural development. These are likely reasons for the average scores (fair) for spawning and rearing conditions and low scores (poor) for OCH and passage conditions. Habitat scoring detail can be found on Table G-9.

Flow

Gauge:No Rule:No An NHD+ estimated 0.4 cfs Mean Annual Flow was used to score this reach. No diversion data are available in this reach. Flow scores are presented on Table G-10.

4909 - Omak Creek

Fish	Habitat	Flow
3	2	2

Fish Status/Utilization

Fish status/utilization in Omak Creek is a repetition of Bonaparte, Loup Loup, and Ninemile Creeks. Okanogan sockeye do not use this reach whereas Okanogan summer Chinook may utilize it for a limited time for juvenile rearing. Okanogan summer steelhead utilize this reach for spawning, rearing and as an adult migration corridor. Additional fish biodiversity scoring information is provided on Table G-8.

Habitat

All reviewed habitat parameters scored 'fair' except off-channel habitat, which scored 'poor,' and rearing suitability, which scored 'good.' Mission Falls, located 5.4 miles upstream of the confluence with the Okanogan River, remains an effective barrier to Chinook salmon and a major impediment to summer steelhead. The reach reviewed for the project extended to the USGS gage at RM 5.7. Since this barrier was so far upstream into the reach, overall passage was given a 'fair' score. Habitat scoring detail can be found on Table G-9.

Flow

Gauge:Yes Rule:No The minimum of monthly mean flows in this reach is 2 cfs in August-September and the peak is 55 cfs in April. Minimum flow is 13 percent of the average; reaches with August flows less than 33% of average scored 'poor' for this component of the flow element score. Diversions evaluated for this project represent 4 percent of the Mean Annual Flow; reaches with diversions less than 5% of Mean Annual Flow scored 'good' for this scoring component. Flow scores are presented on Table G-10.

4910 - Palmer Creek

Fish	Habitat	Flow
1	3	3

Fish Status/Utilization

Okanogan anadromous salmon stocks do not utilize Palmer Creek because passage in the Similkameen is blocked by Enloe Dam. Palmer Creek is included in this evaluation because there may be potential water sources that would benefit downstream reaches. Additional fish biodiversity scoring information is provided on Table G-8.

Habitat

Palmer Creek literature review revealed little to no information on its habitat conditions and therefore we were reliant on consultation with local biologists. The reach was given 'fair' ratings on most habitat attributes, which yield an overall 'good' bin score when compared with other reaches in this WRIA. Additional direct observation is necessary for higher confidence evaluation of this creek. Habitat scoring detail can be found on Table G-9.

Flow

Gauge:No Rule:No An NHD+ estimated 62 cfs Mean Annual Flow was used to score this reach. No diversion data are available in this reach. The relatively good estimated flow volume carried the 'good' bin score for Palmer Creek. Flow scores are presented on Table G-10.

4912 - Antoine Creek

Fish	Habitat	Flow
3	2	1

Fish Status/Utilization

Antoine Creek is another repeat of Bonaparte, Loup Loup, Ninemile, and Omak creeks. Okanogan summer Chinook may use the reach for limited juvenile rearing contrasted by Okanogan summer steelhead, which uses the reach for spawning, rearing and as an adult migration corridor. Additional fish biodiversity scoring information is provided on Table G-8.

Habitat

There is a natural barrier found at approximately RM 3 and Fanchers Dam impounds Antoine Creek at River Mile 12; the reservoir covers approximately 20 acres and is used for irrigation. Lands adjacent to Antoine Creek are used primarily for agriculture. Using LFA and past WDFW stream inventory results, we scored Antoine Creek 'fair' for all habitat parameters except for passage and OCH, which are 'poor.' Habitat scoring detail can be found on Table G-9.

Flow

Gauge:Yes Rule:No Minimum flow in this reach between 0 and 1 cfs in July-April, with a peak flow of 4 cfs in May. Minimum flow is 31 percent of the average. This site has been very difficult to monitor over the years. Even though regular discharge measurements are made, a reliable rating curve has been extremely difficult to maintain. One contributing source of difficulty to maintaining a rating curve is large seasonal variability of vegetation growth which creates backwater conditions in the gauge reach. Currently these are the only data available on which to evaluate. Diversion data used for this evaluation equal or exceed the Mean Annual Flow. Antoine Creek was specifically identified by the RTT as needing instream flow enhancement. Flow scores are presented on Table G-10.

4913 - Siwash Creek

Fish	Habitat	Flow
1	2	2

Fish Status/Utilization

Siwash Creek is rated as low for fish utilization. This can be explained by the limited use of the reach by the three stocks. Okanogan sockeye do not utilize the reach and Okanogan summer Chinook and Okanogan summer steelhead only use Siwash Creek for 3 months out of the year as juvenile rearing. During low flow in late summer Siwash Creek becomes a complete fish passage barrier and is only passable during May

through July. Additional fish biodiversity scoring information is provided on Table G-8.

Habitat

Anadromous fisheries resources are restricted due to an impassible steep gradient reach located approximately 1.4 miles upstream of the confluence with the Okanogan River. Siwash Creek is nearly impounded at RM 3 by a dam on private property. The lands adjacent to the creek are used primarily for agriculture and home sites. Scores were considered ‘fair’ for all but OCH and floodplain connectivity, which both scored ‘poor.’ Habitat scoring detail can be found on Table G-9.

Flow

Gauge:No Rule:No An NHD+ estimated 4 cfs Mean Annual Flow was used to score this reach. No diversion data are available in this reach. Flow scores are presented on Table G-10.

4914 - Tunk Creek (Reach 1)

Fish	Habitat	Flow
2	3	3

Fish Status/Utilization

Tunk Creek (Reach 1) fish status/utilization by anadromous fish is limited, hence the ‘average’ rating. Okanogan sockeye do not utilize this reach whereas juvenile Okanogan summer Chinook may be found rearing in Tunk Creek Reach 1. Okanogan summer steelhead use this reach March through September for spawning, rearing and as an adult migration corridor. In some years, Okanogan summer steelhead adult migration and spawning is prohibited by low-to-nonexistent flows in summer and fall. Additional fish biodiversity scoring information is provided on Table G-8.

Habitat

Lower Tunk Creek Reach 1 consists of only a 0.6 mile reach where a natural falls occurs near the confluence with the Okanogan River. The land adjacent to Tunk Creek is used mainly for agriculture with an apple orchard straddling the right bank. Lower Tunk Creek is considered good habitat for salmonids. Passage to the falls is also considered good, but the adjacent orchard and residential area drives the off-channel habitat and riparian condition scores down to ‘poor’ values. Habitat scoring detail can be found on Table G-9.

Flow

Gauge:No Rule:No An NHD+ estimated 3 cfs Mean Annual Flow was used to score this reach. No diversion data are available. It is primarily the degree of impairment in other reaches of this WRIA that drives this average-scoring reach to a ‘good’ flow condition bin. Flow scores are presented on Table G-10.

4915 - Tunk Creek (Reach 2)

Fish	Habitat	Flow
2	1	1

Fish Status/Utilization

Tunk Creek Reach 2 is also rated as 'average.' Okanogan summer steelhead is the only anadromous stock utilizing this reach. Spawning, rearing and adult migration is limited to March through September. Low flows during adult migration and no water available most summers precludes the use of the stream for spawning and adult migration some years. Additional fish biodiversity scoring information is provided on Table G-8.

Habitat

The land adjacent to Tunk Creek is used mainly for rangeland and other agricultural uses, leading to 'poor' scores for habitat functions and values. There is limited rearing potential and 'fair' floodplain connectivity. Much of the middle reach is degraded due to agriculture and livestock intrusion. Habitat scoring detail can be found on Table G-9.

Flow

Gauge:Yes Rule:No The minimum of monthly mean flows in this reach is 0-1 cfs in July-November and the peak is 11 cfs in May. Minimum flow is 4 percent of the average; reaches with August flows less than 33% of average scored 'poor' for this component of the flow element score. Diversions evaluated for this project represent 38 percent of the Mean Annual Flow; reaches with diversions more than 15% of Mean Annual Flow scored 'poor' for this scoring component. Flow scores are presented on Table G-10.

4916 - Salmon Creek (Reach 1)

Fish	Habitat	Flow
3	1	3

Fish Status/Utilization

Fish status/utilization rating for Salmon Creek (Reach 1) is high. The activities and duration of activities by stocks in this reach is the same as Bonaparte and other creeks in the system. Okanogan summer steelhead rear yearlong in this reach. They also utilize the reach for spawning and as an adult migration corridor. Okanogan summer Chinook utilize the reach for limited juvenile rearing. Additional fish biodiversity scoring information is provided on Table G-8.

Habitat

The Okanogan Irrigation District (OID) formerly diverted 100% of Salmon Creek at a diversion dam at RM 4.3, leaving the river downstream of the diversion dam completely dewatered. Water conservation efforts have reduced the diversion so water is retained in the lower reach. The ground porosity consists of larger rocks and boulders through the lower portion and this is considered a passage problem; therefore, the passage score is 'poor.' The lower reach habitat is degraded as it flows through the town of Okanogan. Spawning and rearing suitability was scored as 'fair' and other habitat parameters scored 'poor.' Habitat scoring detail can be found on Table G-9.

Flow

Gauge:No Rule:No An NHD+ estimated 22 cfs Mean Annual Flow was used to score this reach. No diversion data are available in this reach. Relative flow volume elevates the bin score for this reach. Flow scores are presented on Table G-10.

4917 - Salmon Creek (Reach 2)

Fish	Habitat	Flow
2	3	1

Fish Status/Utilization

Fish status/utilization in Salmon Creek (Reach 2) is limited to Okanogan summer steelhead even though the creek is rated as high utilization. Okanogan steelhead are found in this reach year round and all life cycle stages occur in Salmon Creek Reach2 as they do in Salmon Creek Reach 1, yielding a 'high' rating in both reaches. Additional fish biodiversity scoring information is provided on Table G-8.

Habitat

This upper Salmon Creek reach is evaluated up to Conconully Dam, approximately 15 miles upstream from the mouth. Uses of lands adjacent to the creek include range activities and agriculture, so habitat has been somewhat degraded in the lower part of the reach. Once into the forested portion upstream of the agricultural area, the creek has better-than-average habitat. Direct observation indicates spawning and rearing suitability are 'good,' as are passage conditions. Riparian habitat and floodplain conditions were rated as 'fair,' because the lower few miles of this reach is in 'poor' condition within the agriculture area. Just as many streams are limited in off-channel habitat, Salmon Creek is no exception having 'poor' overall score for OCH. Habitat scoring detail can be found on Table G-9.

Flow

Gauge:No Rule:No An NHD+ estimated 21 cfs Mean Annual Flow was used to score this reach, and the estimated mean August flow is 30% of MAF. Diversions evaluated

for this project represent 6 percent of the Mean Annual Flow, yielding a ‘fair’ score on this attribute. Flow scores are presented on Table G-10.

4918 - Chiliwist Creek

Fish	Habitat	Flow
2	1	1

Fish Status/Utilization

Chiliwist Creek fish status/utilization rating is ‘average.’ This rating is based on juvenile rearing of Okanogan summer Chinook and Okanogan summer steelhead. This creek differs from other creeks in that Okanogan summer steelhead do not use this reach for spawning or as an adult migration. Additional fish biodiversity scoring information is provided on Table G-8.

Habitat

The Okanogan Conservation District (OCD) identified a natural barrier they named Chiliwist Falls at RM 0.56. This restricts anadromous access to the lower half mile of the creek and gives this reach a passage score of ‘poor.’ Forestry, livestock grazing and irrigated agriculture are the primary uses of the Chiliwist subwatershed. Riparian conditions and rearing suitability are scored as ‘fair’ from LFA review, peer discussions, and personal observations. The off-channel and floodplain habitat conditions are ‘poor’ and spawning suitability is low. Habitat scoring detail can be found on Table G-9.

Flow

Gauge:No Rule:No An NHD+ estimated 2 cfs Mean Annual Flow was used to score this reach. Diversion data used for this exceed the Mean Annual Flow. Flow scores are presented on Table G-10.

4919 - Tallant Creek

Fish	Habitat	Flow
2	2	1

Fish Status/Utilization

Tallant Creek fish status/utilization is a repeat of Chiliwist Creek. They both received an ‘averagea rating for fish utilization. Juveniles of both Okanogan summer steelhead and Okanogan summer Chinook stocks rear in this reach. Additional fish biodiversity scoring information is provided on Table G-8.

Habitat

Very limited information was found in reviewed literature. More in-depth review is needed for habitat of this creek; scores of 'fair' were given due to lack of information or observations. Habitat scoring detail can be found on Table G-9.

Flow

Gauge:No Rule:No An NHD+ estimated 1.1 cfs Mean Annual Flow was used to score this reach. Diversions evaluated for this project represent about 9 percent of the Mean Annual Flow; reaches with diversions between 5% and 15% of Mean Annual Flow scored 'fair' for this scoring component. Flow scores are presented on Table G-10.

4920 - Reed Creek

Fish	Habitat	Flow
2	2	1

Fish Status/Utilization

The fish status/utilization rating is also 'average' for Reed Creek. As with Tallant and Chiliwist creeks, juveniles of both Okanogan summer steelhead and Okanogan summer Chinook stocks rear in this reach. Additional fish biodiversity scoring information is provided on Table G-8.

Habitat

Similar findings are noted with Reed Creek and some habitat information was discussed with local Okanogan Conservation District biologists. This creek likely needs a further habitat review for more confident scoring. Habitat scoring detail can be found on Table G-9.

Flow

Gauge:No Rule:No An NHD+ estimated 0.04 cfs Mean Annual Flow was used to score this reach. Diversion data used for this evaluation exceed the Mean Annual Flow. Flow scores are presented on Table G-10.

4921 - Whitestone Creek

Fish	Habitat	Flow
1	1	1

Fish Status/Utilization

Okanogan summer Chinook and Okanogan summer steelhead fish status/utilization in Whitestone Creek is limited to 4 months and 3 months of possible juvenile rearing respectively. Channel modifications and high irrigation pressures preclude other life

cycle stages. This results in a ‘low’ fish status/utilization rating. Additional fish biodiversity scoring information is provided on Table G-8.

Habitat

The Whitestone Creek Watershed encompasses five main bodies of water: Blue Lake, Wanancut Lake, Spectacle Lake, Whitestone Lake, and Stevens Lake (Entrix, 2003). The mainstem is approximately 2.8 miles long with a total of approximately 83.4 miles of stream channel in the subwatershed. Whitestone Creek is a heavily manipulated waterway; the water originates from a westerly stream, Toats Coulee Creek, where it is diverted subsurface for 7 miles until it is pumped into Spectacle Lake. From Spectacle Lake, Whitestone Creek begins and most flow is diverted into an irrigation canal, while some passes through a wetland into Whitestone Lake. From Whitestone Lake the creek gains velocity and empties into the mainstem Okanogan. The reach length under review extends only to the lake egress at approximately RM 6.7. The overall habitat is considered ‘poor’ due to the impacts of agriculture in much of the lower portion. Habitat scoring detail can be found on Table G-9.

Flow

Gauge:Yes Rule:No The minimum of monthly mean flows in this reach is 2 cfs in October-November and the peak is 4 cfs in July . Minimum flow is 53 percent of the average. Diversion data used for this evaluation exceed the Mean Annual Flow. Flow scores are presented on Table G-10.

4922 - Chewiliken Creek

Fish	Habitat	Flow
1	1	1

Fish Status/Utilization

Chewiliken Creek is a relatively small creek that is dewatered in fall and winter creating a complete fish passage barrier; it is only passable during May through July. As with Whitestone Creek, fish status/utilization in this reach is limited to Okanogan summer Chinook and Okanogan summer steelhead juvenile rearing ,hence the ‘low’ fish status/utilization rating. Additional fish biodiversity scoring information is provided on Table G-8.

Habitat

A natural falls exists at approximately RM 1.75, and intermittent flows are also considered as a passage barrier. The creeks overall habitat score is of ‘poor’ function and values for salmonid life or production potential. Habitat scoring detail can be found on Table G-9.

Flow

Gauge:No Rule:No An NHD+ estimated 1.3 cfs Mean Annual Flow was used to score this reach. Diversions evaluated for this project represent 2 percent of the Mean Annual Flow. Flow scores are presented on Table G-10.

4923 - Similkameen River (Reach 1)

Fish	Habitat	Flow
3	3	3

Fish Status/Utilization

Similkameen River Reach 1 has one of the higher fish status/utilization ratings. The high rating is attributed to all three life stages of Okanogan summer Chinook and Okanogan summer steelhead being carried out in this reach. Additional fish biodiversity scoring information is provided on Table G-8.

Habitat

The Similkameen River Basin is primarily comprised of forested lands and rangelands. Just as in the Okanogan River Basin, ownership of the Similkameen encompasses public and private lands. There are few-to-no passage problems upstream to Enloe dam, and this reach contains 'good' spawning and rearing suitability. Off-channel, floodplain, and riparian conditions are 'fair' as documented by personal observations and consultations within WDFW. Habitat scoring detail can be found on Table G-9.

Flow

Gauge:Yes Rule:No The minimum of monthly mean flows in this reach is 443 cfs in September and the peak is 7,521 cfs in May. Minimum flow is 21 percent of the average. Diversions evaluated for this project represent 1 percent of the Mean Annual Flow; reaches with diversions less than 5% of Mean Annual Flow scored 'good' for this scoring component. Flow scores are presented on Table G-10.

4924 - Similkameen River (Reach 2)

Fish	Habitat	Flow
1	3	3

Fish Status/Utilization

Similkameen River Reach 1 and Reach 2 are separated by Enloe dam, which completely blocks anadromous fish access to Similkameen River Reach2 and upstream tributaries. This reach was included in the evaluation because addition water savings above the dam may be found and would benefit downstream reaches. Additional fish biodiversity scoring information is provided on Table G-8.

Habitat

Passage for the upper Similkameen River is the only habitat score rated as ‘poor,’ due to the lack of anadromous passage over Enloe Dam. Other than that low score, the five other habitat conditions are ranked as ‘fair’ to ‘good’ based on discussions and personal on-site observations. Habitat scoring detail can be found on Table G-9.

Flow

Gauge:Yes Rule:Yes The minimum of monthly mean flows in this reach is 586 cfs in September and the peak is 8,515 cfs in June. Minimum flow is 26 percent of the average. Diversions evaluated for this project represent 3 percent of the Mean Annual Flow; reaches with diversions less than 5% of Mean Annual Flow scored ‘good’ for this scoring component. Flows remain above the minimum instream flow rule every month, on average. Flow scores are presented on Table G-10.

4925 - Toats Coulee Creek

Fish	Habitat	Flow
1	3	2

Fish Status/Utilization

Toats Coulee Creek is also above Enloe dam and has no anadromous usage, but there is a potential of water savings on this reach that may benefit downstream reaches. Additional fish biodiversity scoring information is provided on Table G-8.

Habitat

The creek is fully diverted at approximately RM 2.5 upstream from the confluence of Sinlahekin Creek at certain times of the year and therefore rates a ‘poor’ passage condition score. There is very limited information on this reach in the literature reviewed, and scoring was based on direct observations from past WDFW inventory surveys. The portion upstream of the diversion is less populous and habitat scores are ‘fair’ to ‘good’ with more natural surroundings. Habitat scoring detail can be found on Table G-9.

Flow

Gauge:Yes Rule:No The minimum of monthly mean flows in this reach is 11 cfs in September and the peak is 262 cfs in May. Minimum flow is 17 percent of the average. Gauge data are missing in winter months for this reach. Diversions evaluated for this project represent 43 percent of the Mean Annual Flow; reaches with diversions more than 15% of Mean Annual Flow scored ‘poor’ for this scoring component. High flow volume in comparison to other WRIA reaches boosts the score to ‘fair.’ Flow scores are presented on Table G-10.

4926 - Sinlahekin Creek

Fish	Habitat	Flow
1	3	2

Fish Status/Utilization

Sinlahekin Creek is another reach above Enloe dam and does not support anadromous fish. Additional fish biodiversity scoring information is provided on Table G-8.

Habitat

There is limited habitat information available through literature for Sinlahekin Creek. Scoring was determined primarily through observations and assumptions based on location of the creek within a less populous area of the Okanogan watershed. While there are no anadromous fish, passage can be scored based on resident fish needs; passage for resident salmonids in this creek is considered 'good.' All other habitat parameters were scored as 'fair' as there are agriculture uses, lower gradient reaches, and a road nearby that somewhat degrade the habitat. Habitat scoring detail can be found on Table G-9.

Flow

Gauge:Yes Rule:No The minimum of monthly mean flows in this reach is 4 cfs in January and the peak is 15 cfs in May. Minimum flow is 49 percent of the average. Diversion data used for this evaluation exceed the Mean Annual Flow. Flow scores are presented on Table G-10.

5. Scoring Sheets

Color / Bin Score

3 = High/Good
2 = Average / Fair
1 = Low / Poor

Table G-8 Fish Scoring Sheet

Code	Reach Name	Reach Score & Bin	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4901	Okanogan River (Reach 1)	106	4	5	11	13	12	12	10	9	10	7	7	6
4902	Okanogan River (Reach 2)	106	4	5	11	13	12	12	10	9	10	7	7	6
4903	Okanogan River (Reach 3)	106	4	5	11	13	12	12	10	9	10	7	7	6
4904	Tonasket Creek	57	0	1	10	10	10	10	7	6	3	0	0	0
4905	Bonaparte Creek	75	3	4	10	10	10	10	7	6	6	3	3	3
4906	Loup Loup Creek	75	3	4	10	10	10	10	7	6	6	3	3	3
4907	Ninemile Creek	75	3	4	10	10	10	10	7	6	6	3	3	3
4908	Aeneas Creek	12	0	0	0	0	4	4	4	0	0	0	0	0
4909	Omak Creek	75	3	4	10	10	10	10	7	6	6	3	3	3
4910	Palmer Creek	0	0	0	0	0	0	0	0	0	0	0	0	0
4912	Antoine Creek	75	3	4	10	10	10	10	7	6	6	3	3	3
4913	Siwash Creek	12	0	0	0	0	4	4	4	0	0	0	0	0
4914	Tunk Creek (Reach 1)	54	0	1	10	10	10	10	7	3	3	0	0	0
4915	Tunk Creek (Reach 2)	48	0	0	9	9	9	9	6	3	3	0	0	0
4916	Salmon Creek (Reach 1)	75	3	4	10	10	10	10	7	6	6	3	3	3
4917	Salmon Creek (Reach 2)	69	3	3	9	9	9	9	6	6	6	3	3	3
4918	Chiliwist Creek	42	3	4	4	4	4	4	4	3	3	3	3	3
4919	Tallant Creek	42	3	4	4	4	4	4	4	3	3	3	3	3
4920	Reed Creek	42	3	4	4	4	4	4	4	3	3	3	3	3
4921	Whitestone Creek	15	0	1	1	1	4	4	4	0	0	0	0	0
4922	Chewiliken Creek	12	0	0	0	0	4	4	4	0	0	0	0	0

4923	Similkameen River (Reach 1)	88	4	5	11	11	10	10	8	7	8	5	5	4
4924	Similkameen River (Reach 2)	0	0	0	0	0	0	0	0	0	0	0	0	0
4925	Toats Coulee Creek	0	0	0	0	0	0	0	0	0	0	0	0	0
4926	Sinlahekin Creek	0	0	0	0	0	0	0	0	0	0	0	0	0
Monthly Totals			46	62	155	161	172	172	134	97	98	56	56	52

Note: Reach names link to workbook tabs

SaSI Stocks in the Yakima Basin	SaSI Stock Rating	Weight Factor**
Okanogan Summer Chinook - 1864	Healthy	1
Okanogan Summer Steelhead - 6920	Unknown	2
Okanogan Sockeye - 5900	Depressed	2

** Weighting Factor Values by SaSI Stock Status:	Weight
Healthy	1
Depressed	2
Unknown	2
Critical	3

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

Color / Bin Score

3 = High/Good

2 = Average / Fair

1 = Low / Poor

Table G-9 Habitat Scoring Sheet

Reach Code	Reach Name	Reach Score & Bin	Off Channel Habitat (OCHs)	Flood-plain Connectivity	Riparian Condition	Spawning Suitability	Rearing Suitability	Passage Condition
4901	Okanogan River (Reach 1)	9	1	1	1	1	2	3
4902	Okanogan River (Reach 2)	11	1	1	2	2	2	3
4903	Okanogan River (Reach 3)	13	1	1	2	3	3	3
4904	Tonasket Creek	10	1	2	2	2	2	1
4905	Bonaparte Creek	9	1	1	2	2	2	1
4906	Loup Loup Creek	11	1	2	2	2	3	1
4907	Ninemile Creek	11	1	1	2	3	3	1
4908	Aeneas Creek	11	1	3	2	2	2	1
4909	Omak Creek	12	1	2	2	2	3	2
4910	Palmer Creek	13	2	2	2	2	3	2
4912	Antoine Creek	10	1	2	2	2	2	1
4913	Siwash Creek	10	1	1	2	2	2	2
4914	Tunk Creek (Reach 1)	13	1	2	1	3	3	3
4915	Tunk Creek (Reach 2)	8	1	2	1	1	2	1
4916	Salmon Creek (Reach 1)	8	1	1	1	2	2	1
4917	Salmon Creek (Reach 2)	14	1	2	2	3	3	3
4918	Chiliwist Creek	8	1	1	2	1	2	1
4919	Tallant Creek	12	2	2	2	2	2	2
4920	Reed Creek	12	2	2	3	1	2	2
4921	Whitestone Creek	8	1	1	2	1	2	1
4922	Chewiliken Creek	6	1	1	1	1	1	1
4923	Similkameen River (Reach 1)	15	2	2	2	3	3	3
4924	Similkameen River (Reach 2)	13	2	2	2	3	3	1
4925	Toats Coulee Creek	14	3	2	3	2	3	1
4926	Sinlahekin Creek	13	2	2	2	2	2	3
			33	41	47	50	59	44

Color / Bin Score

3 = High/Good

2 = Average / Fair

1 = Low / Poor

Table G-10 Flow Scoring Sheet

Code	Reach Name	GOOD IS HIGH	POOR IS HIGH; GOOD IS LOW >>>>>>>>					
		BIN	Sum scores (A:D) * E	A % of Mo Avg Below Rule	B Qi Deviation	C No. Claims	D August Deviation from Mean Annual Flow	E Flow Volume Factor
4901	Okanogan River Reach 1	3	4	1	1	3	2	0.5
4902	Okanogan River Reach 2	3	4	1	2	3	2	0.5
4903	Okanogan River Reach 3	3	10	3	3	3	1	1.0
4904	Tonasket Creek	1	32		3	2	3	4.0
4905	Bonaparte Creek	1	36		3	3	3	4.0
4906	Loup Loup Creek	1	27		3	3	3	3.0
4907	Ninemile Creek	2	20		0	3	2	4.0
4908	Aeneas Creek	2	20		0	2	3	4.0
4909	Omak Creek	2	21		1	3	3	3.0
4910	Palmer Creek	3	6				3	2.0
4912	Antoine Creek	1	32		3	3	2	4.0
4913	Siwash Creek	2	20		0	2	3	4.0
4914	Tunk Creek Reach 1	3	12				3	4.0
4915	Tunk Creek Reach 2	1	32		3	2	3	4.0
4916	Salmon River Reach 1	3	15		0	2	3	3.0
4917	Salmon River Reach 2	1	24		2	3	3	3.0
4918	Chiliwist Creek	1	36		3	3	3	4.0
4919	Tallant Creek	1	24		2	1	3	4.0
4920	Reed Creek	1	32		3	2	3	4.0
4921	Whitestone Creek	1	24		3	2	1	4.0
4922	Chewiliken Creek	1	24		1	2	3	4.0
4923	Similkameen River Reach 1	3	3		1	2	3	0.5
4924	Similkameen River Reach 2	3	4	1	1	3	2	0.5
4925	Toats Coulee	2	18		3	1	2	3.0
4926	Sinlahekin	2	21		3	3	1	3.0

6. Maps

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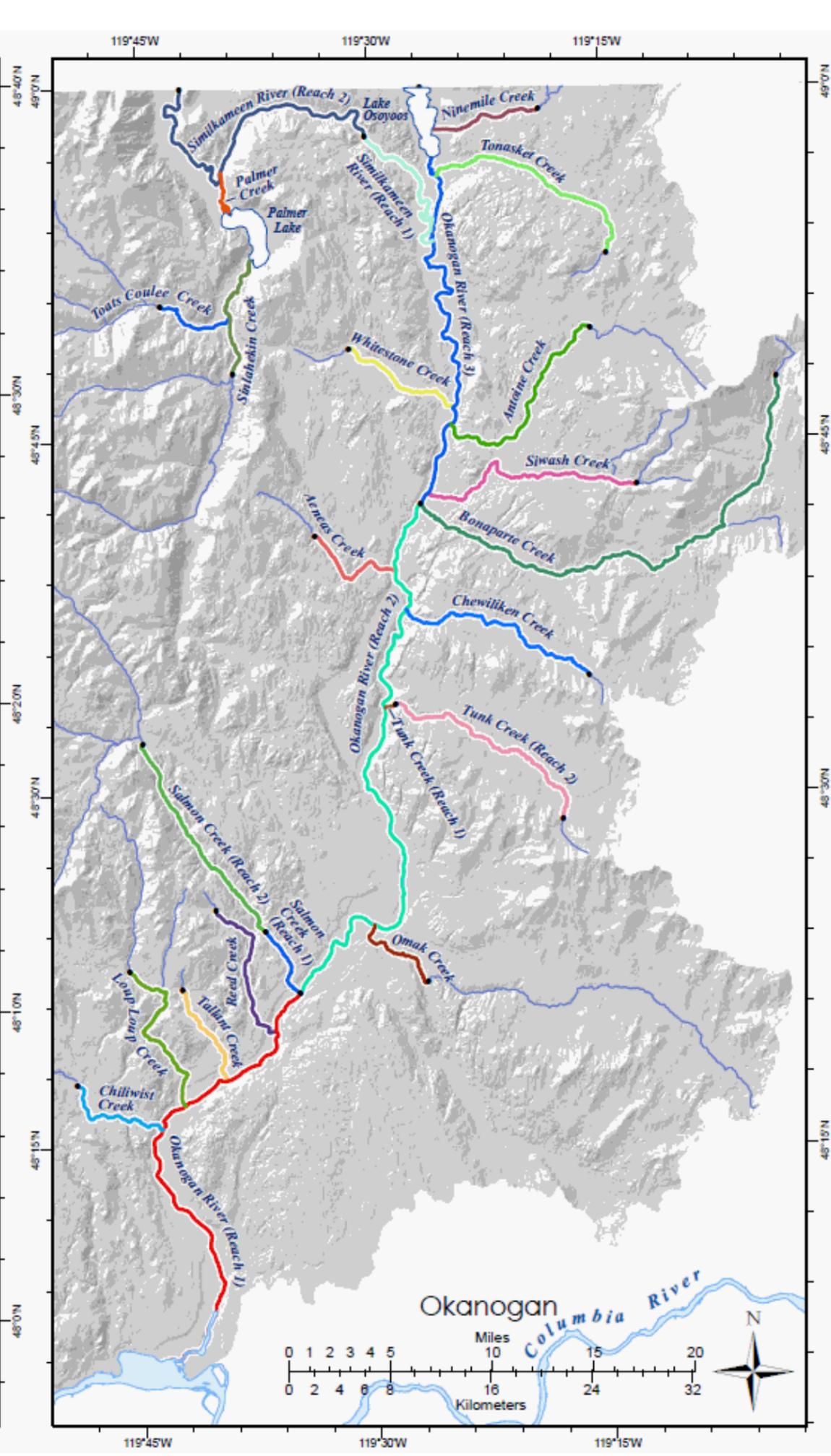
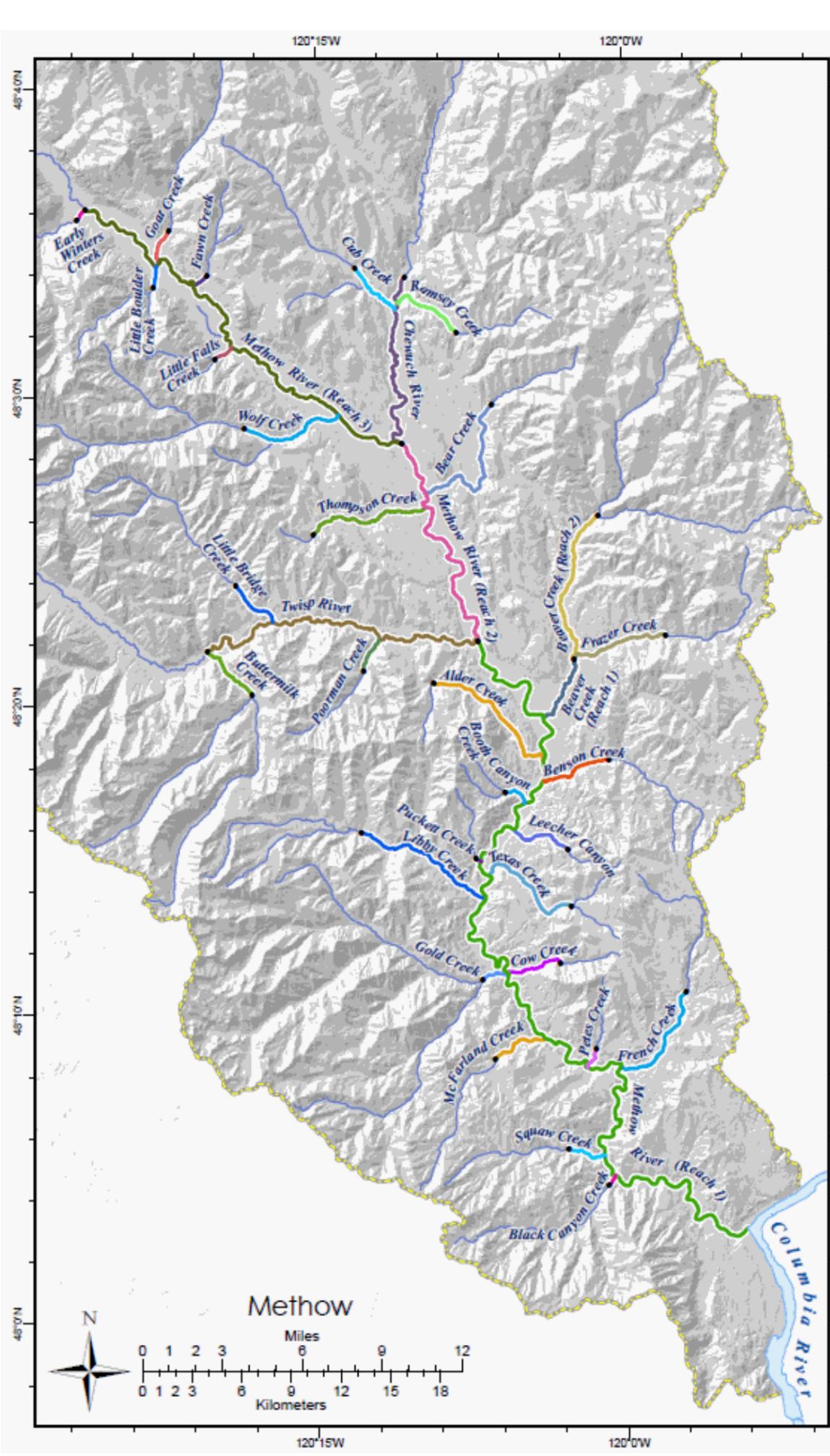
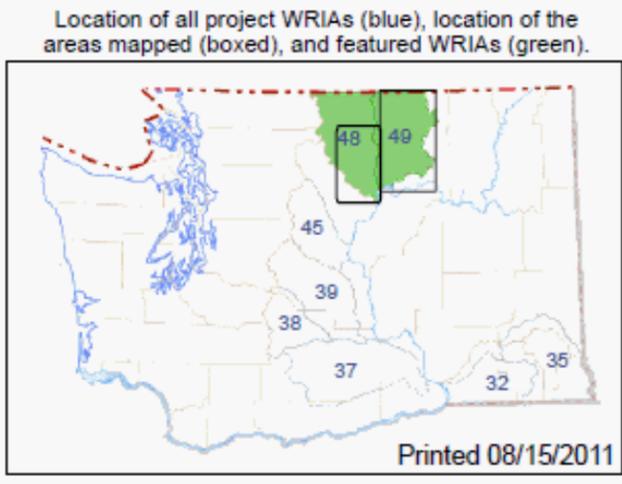


Figure G-1 Assessed Stream Reaches



**Methow and Okanogan River Basins
WRIAs 48 and 49
Assessed Stream Reaches
colored for visual reference**

- — Assessed Stream Reach upper extents
- Continuation of Assessed Streams to Headwaters



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Figure G-2 Combined Prioritization Scores Fish, Habitat, & Flow



**Methow and Okanogan River Basins
WRIs 48 and 49
Combined Prioritization Scores
for Fish, Habitat, and Flow**

Scores for Fish Status and Utilization and Current Habitat Condition are visually represented using the following color scheme:

Fish Score			Habitat Score
Low	Med	High	
Light Green	Yellow	Dark Green	

Line thicknesses represent Flow Condition

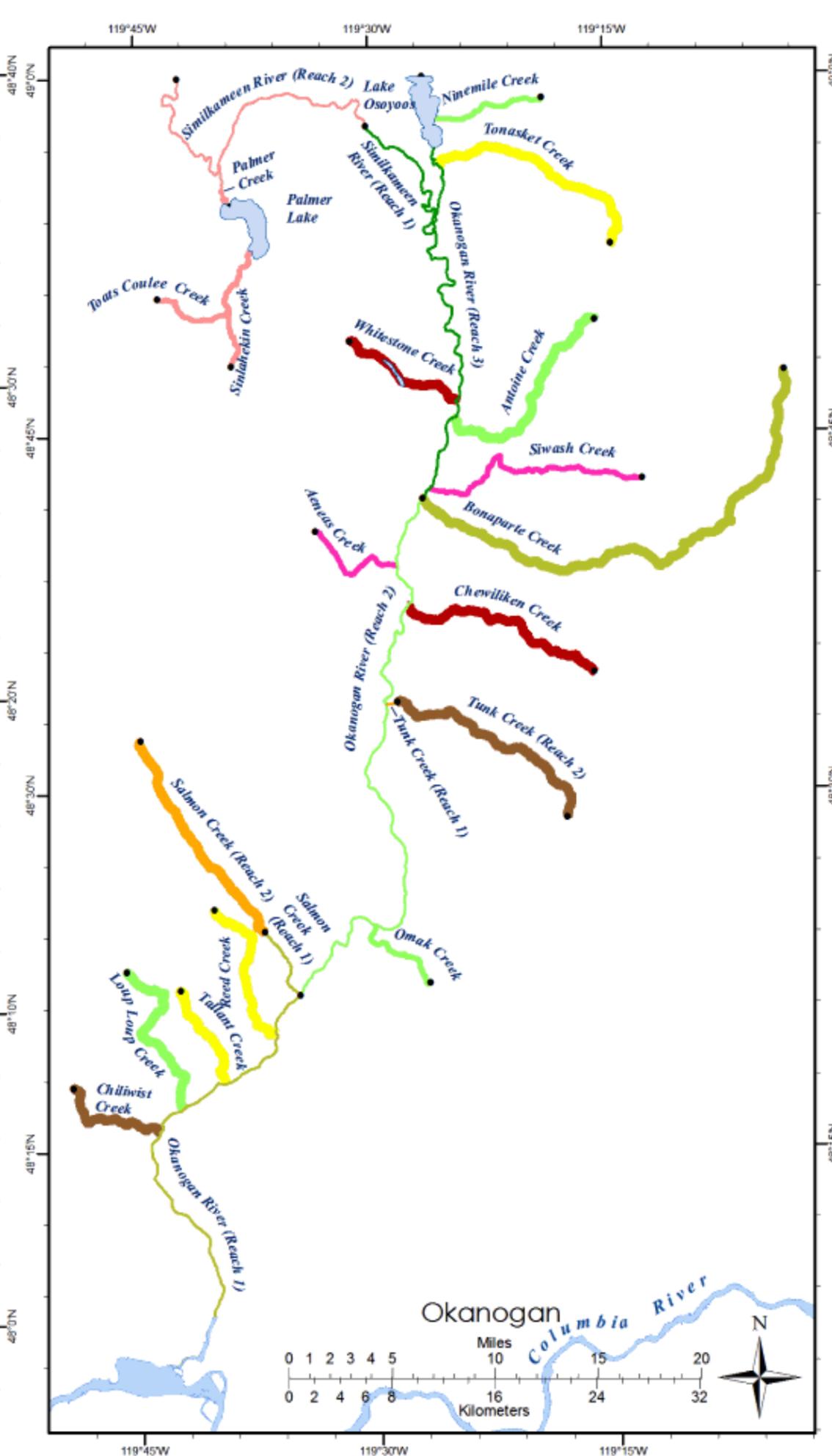
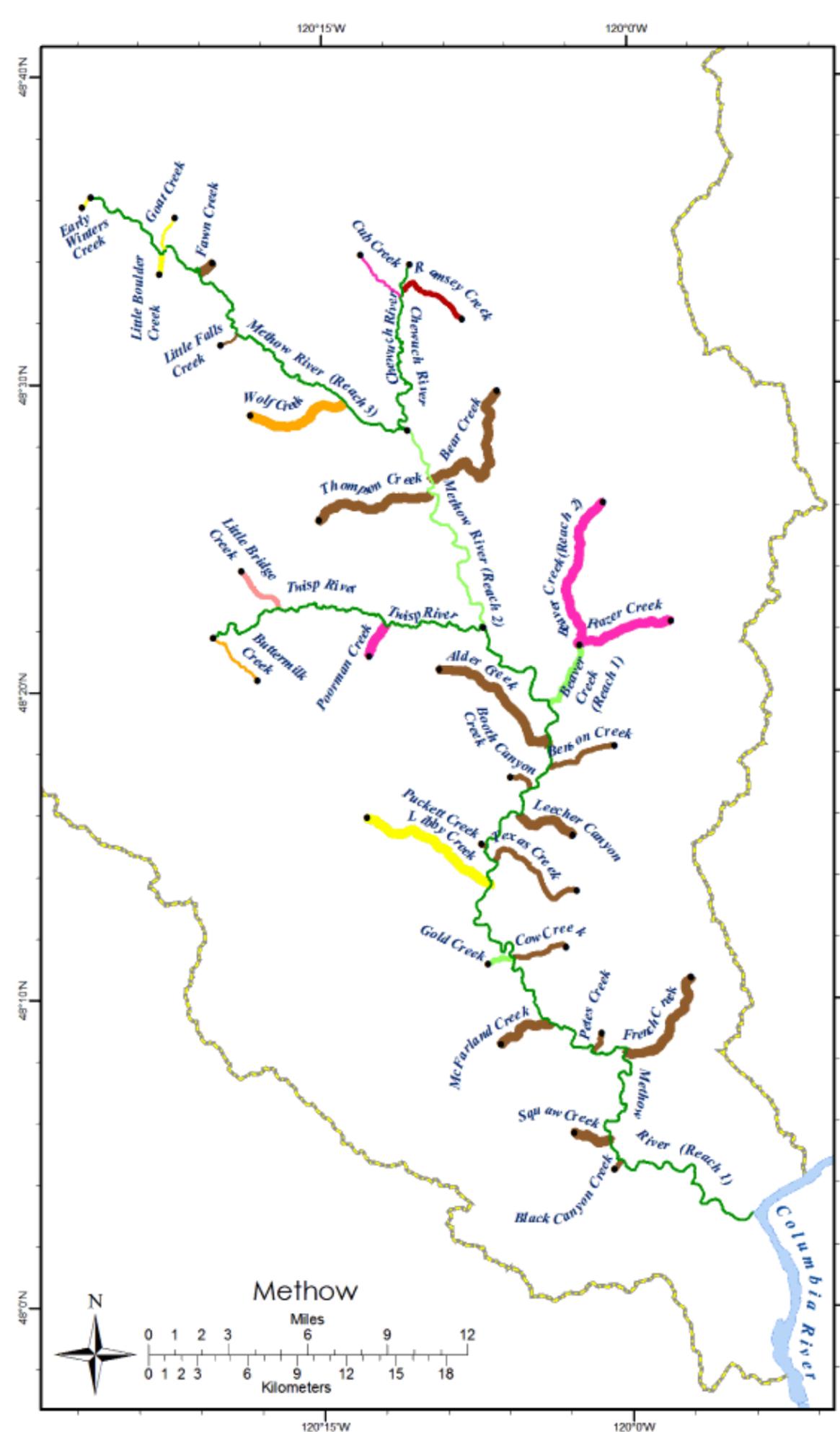
- Thin line: Good
- Medium line: Fair
- Thick line: Poor

• — Assessed Stream Reach upper extents
 WRIA Boundary

Location of all project WRIs (blue), location of the areas mapped (boxed), and featured WRIs (green).



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WRIs 48 and 49 - Methow and Okanogan River Basins - Fish, Habitat, and Flow

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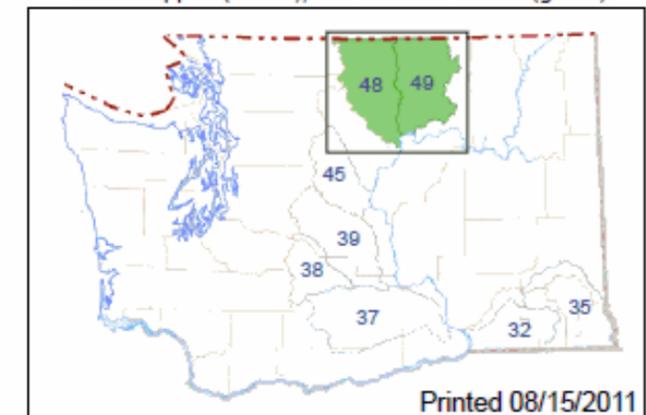
Figure G-3 2001 Statewide 1m Orthophoto



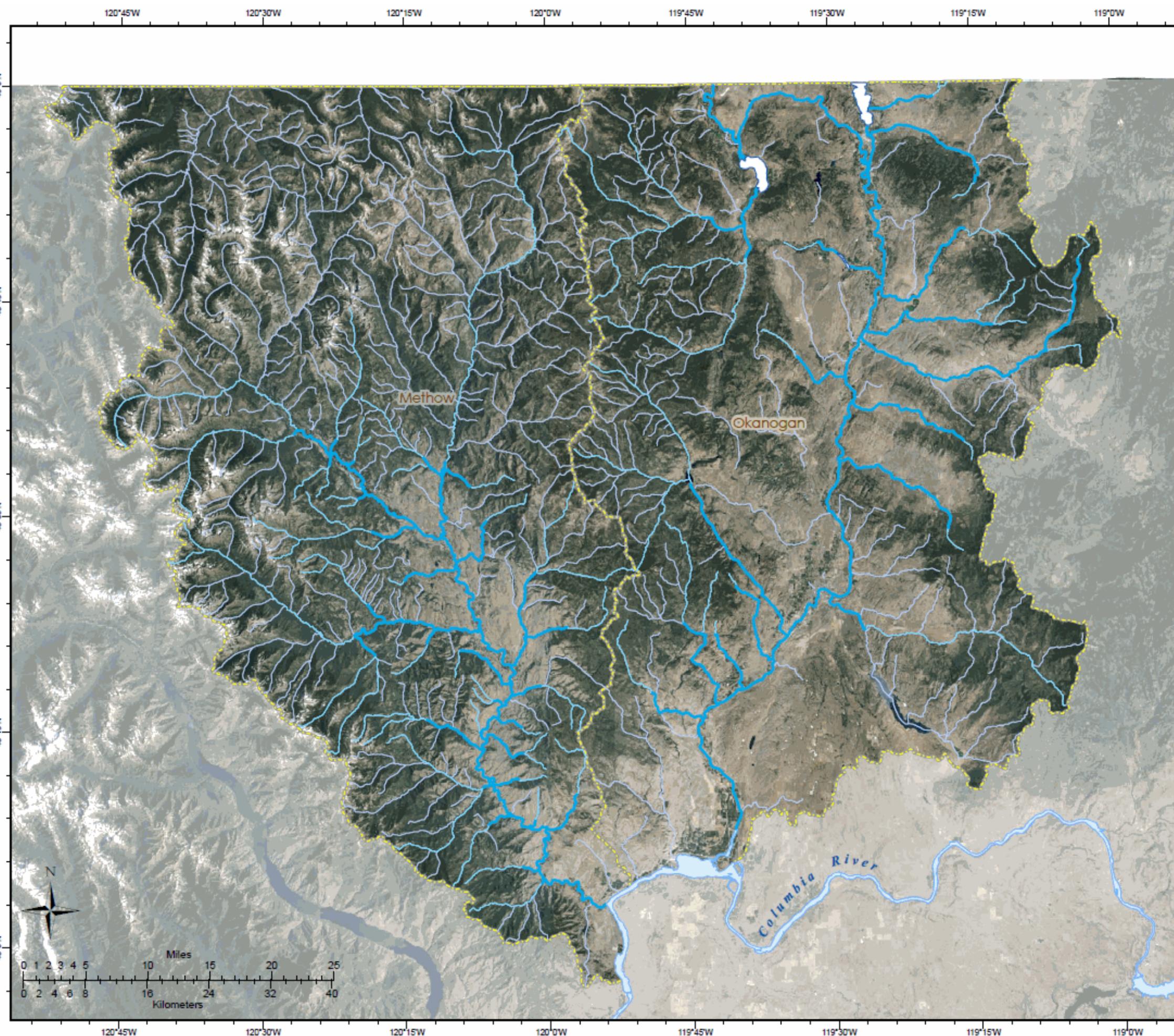
Methow and Okanogan River Basins
WRIAs 48 and 49
2009 Statewide 1m Orthophoto

- Stream Distinctions
- Assessed Reaches
 - Headwaters of Assessed Reaches
 - Other Named Streams
- WRIA Boundary

Location of all project WRIAs (blue), location of the area mapped (boxed), and featured WRIAs (green).



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WRIAs 48 and 49 - Methow and Okanogan River Basins - Orthophoto

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Figure G-4 2001 National Land Cover Database



**Methow and Okanogan
River Basins
WRIAs 48 and 49
2001 National
Land Cover Database**

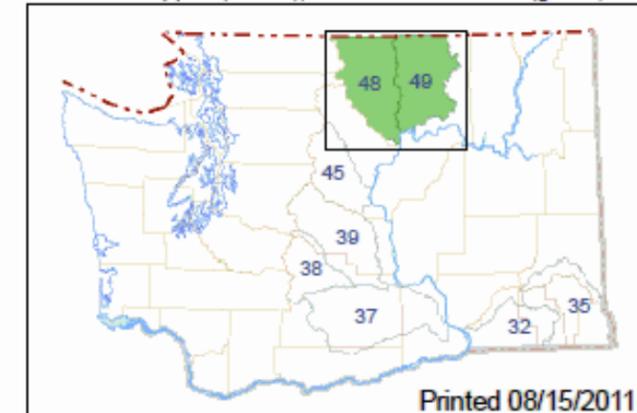
Land Cover and Use

-  Snow and Ice
-  Developed
-  Barren
-  Forest
-  Scrub
-  Grasslands
-  Agriculture
-  Riparian

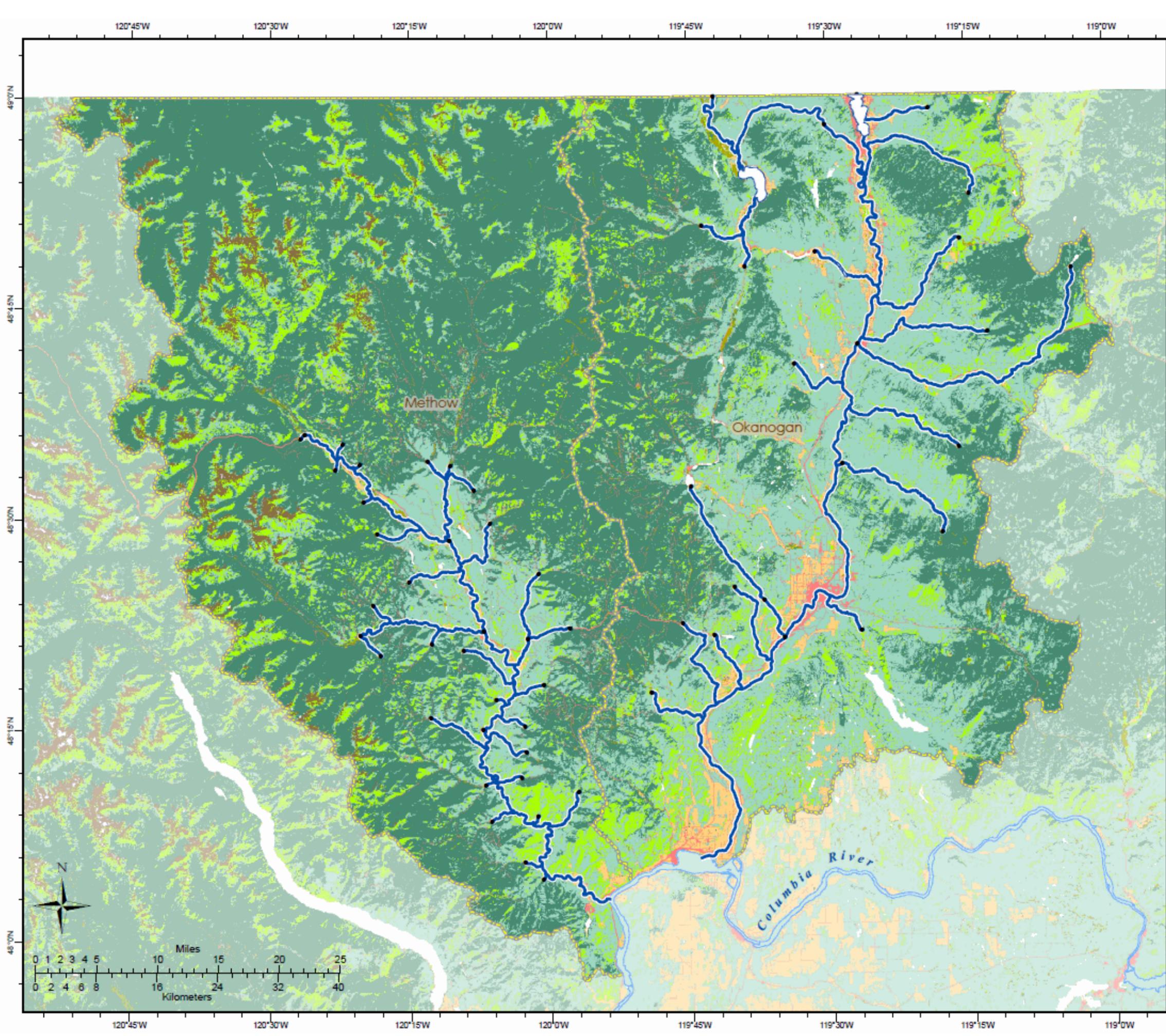
Assessed Stream Reaches with
upper extents marked



Location of all project WRIAs (blue), location of the
area mapped (boxed), and featured WRIAs (green).



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WRIAs 48 and 49 - Methow and Okanogan River Basins - NLCD

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Figure G-5 Stream Gauge Identification and Land Management



**Methow and Okanogan River Basins
WRIAs 48 and 49
Stream Gauge Identification
and Land Management**

Stream Gauges by Agency

- WA DOE
- WA DOE (limited data)
- USBR
- USGS
- USGS (limited data)

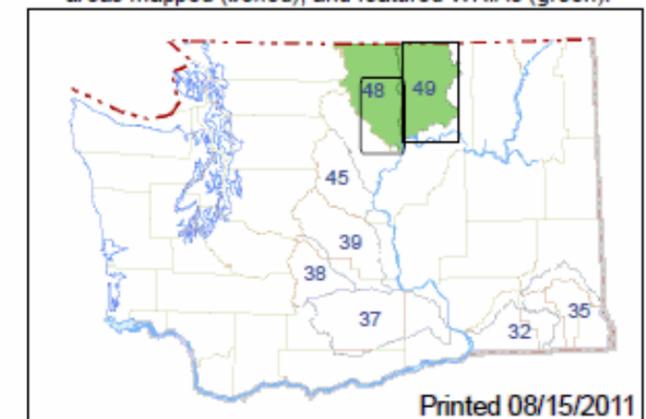
Generalized Land Management

- Tribal
- US Bureau of Land Mgmt.
- US Bureau of Reclamation
- US Forest Service
- WA Dept. Fish & Wildlife
- WA Dept. Natural Resources

Assessed Stream Reaches with upper extents marked

WRIA Boundary

Location of all project WRIAs (blue), location of the areas mapped (boxed), and featured WRIAs (green).



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