

# Puget Sound Lead Entity Nomination Scoring Criteria Draft

4/23/2015:

Scoring Criteria is in draft form and is subject to revisions

1. HUC 10 provides considerable opportunity for Steelhead and Coho populations. Consider the intrinsic potential model for these rearing limited species.

- Steelhead I.P. Scoring Criteria:

- Less than 20% = 0 Points
- 20% - 25% = 5 Points
- 25.1% - 30% = 10 Points
- 30.1% - 35% = 15 Points
- 35.1% - 40% = 20 Points
- 40.1% - 45% = 25 Points
- 45.1% - 50% = 30 Points
- Above 50% = 40 Points

- Coho I.P. Scoring Criteria:

- Less than 30% = 0 Points
- 30% - 40% = 5 Points
- 40.1% - 45% = 10 Points
- 45.1% - 50% = 15 Points
- 50.1% - 55% = 20 Points
- 55.1% - 60% = 25 Points
- 60.1% - 65% = 30 Points
- Above 65% = 40 Points

2. HUC 10 nomination has been scoped (feasibility/readiness); projects identified and would be ready for implementation upon receiving funding.

- Multiple projects within the HUC 10 have been scoped and have 100% design = 10 points
- Multiple projects within the HUC 10 have been scoped and have been reviewed for feasibility = 5 Points
- No projects have been scoped within the HUC 10 = 0 points

3. HUC 10 has minimal water temperature concerns as identified on Washington Department of Ecology 305-B Designations.

Scoring Criteria:

- Greater than 25% = 0 Points
- 17.1% - 25% = 5 Points
- 14.1% - 17% = 10 Points
- 11.1% - 14% = 15 Points
- 8.1% - 11.0% = 20 Points
- 5.1% - 8.0% = 25 Points
- 3.1% - 5% = 30 Points
- 0% - 3% = 35 Points

4. Watershed's HUC 10 has limited impervious surfaces.

- Greater than or equal to 45% = 0 Points
- 25% - 44% = 5 Points
- 20% - 24% = 10 Points
- 15% - 19% = 15 Points
- 10% - 14% = 20 Points
- 5% - 9% = 25 Points
- 3% - 4% = 30 Points
- 0% - 2% = 40 Points

5. Watershed's HUC 10 has considerable amount of steelhead spawning habitat (high percentage of the total steelhead habitat is identified usable spawning habitat).

Scoring System to be determined

6. Watershed's HUC 10 has healthy riparian habitat. Consider total percentage of riparian coverage in a 150m buffer along anadromous streams.

Scoring System to be determined?

DRAFT



**Intrinsic Potential Analysis:  
Steelhead**

**Lower Nooksack HUC 10:**

Intrinsic Potential Category:	Total:	Coefficient (Multiplier):	New Total:
Steelhead IP 0.666667 - 1.000000	19627.7651	1.0	19627.7651
Steelhead IP 0.333334 - 0.666666	406032.0207	0.67	272041.4539
Steelhead IP 0.000001 - 0.333333	129358.5223	0.33	42688.31236
Steelhead IP 0.000000	347354.5259	0.0	0
Sum:			334357.5313
Total Modelled Stream Length:			902372.834
Habitat Quality IP Percentage:			<b>37.1%</b>

**Lower NF Nooksack HUC 10:**

Intrinsic Potential Category:	Total:	Coefficient (Multiplier):	New Total:
Steelhead IP 0.666667 - 1.000000	12013.2144	1.0	12013.2144
Steelhead IP 0.333334 - 0.666666	128592.8872	0.67	86157.23442
Steelhead IP 0.000001 - 0.333333	58025.1811	0.33	19148.30976
Steelhead IP 0.000000	212369.1908	0.0	0
Sum:			117318.7586
Total Modelled Stream Length:			411000.4735
Habitat Quality IP Percentage:			<b>28.5%</b>

**SF Nooksack HUC 10:**

Intrinsic Potential Category:	Total:	Coefficient (Multiplier):	New Total:
Steelhead IP 0.666667 - 1.000000	65952.5286	1.0	65952.5286
Steelhead IP 0.333334 - 0.666666	140424.4415	0.67	94084.3758
Steelhead IP 0.000001 - 0.333333	78920.1043	0.33	26043.63442
Steelhead IP 0.000000	241823.0929	0.0	0
Sum:			186080.5388
Total Modelled Stream Length:			527120.1673
Habitat Quality IP Percentage:			<b>35.3%</b>

Stillaguamish HUC 10:

Intrinsic Potential Category:	Total:	Coefficient (Multiplier):	New Total:
Steelhead IP 0.666667 - 1.000000	41994.4924	1.0	41994.4924
Steelhead IP 0.333334 - 0.666666	328611.9779	0.67	220170.0252
Steelhead IP 0.000001 - 0.333333	103113.326	0.33	34027.39758
Steelhead IP 0.000000	133241.0503	0.0	0
	Sum:		296191.9152
<b>Total Modelled Stream Length:</b>			606960.8466
<b>Habitat Quality IP Percentage:</b>			<b>48.8%</b>

Green/Duwamish HUC 10:

Intrinsic Potential Category:	Total:	Coefficient (Multiplier):	New Total:
Steelhead IP 0.666667 - 1.000000	36720.6783	1.0	36720.6783
Steelhead IP 0.333334 - 0.666666	372306.0771	0.67	249445.0717
Steelhead IP 0.000001 - 0.333333	122114.2647	0.33	40297.70735
Steelhead IP 0.000000	249326.2175	0.0	0
	Sum:		326463.4573
<b>Total Modelled Stream Length:</b>			780467.2376
<b>Habitat Quality IP Percentage:</b>			<b>41.8%</b>

Nisqually HUC 10

Intrinsic Potential Category:	Total:	Coefficient (Multiplier):	New Total:
Steelhead IP 0.666667 - 1.000000	21701.0431	1.0	21701.0431
Steelhead IP 0.333334 - 0.666666	489172.8257	0.67	327745.7932
Steelhead IP 0.000001 - 0.333333	137194.0432	0.33	45274.03426
Steelhead IP 0.000000	227388.9738	0.0	0
	Sum:		394720.8706
<b>Total Modelled Stream Length:</b>			875456.8858
<b>Habitat Quality IP Percentage:</b>			<b>45.1%</b>

# DRAFT

Steelhead IP Totals:	
Lower Nooksack HUC 10:	37.1%
Lower NF Nooksack HUC 10:	28.5%
SF Nooksack HUC 10:	35.3%
Stillaguamish HUC 10:	48.8%
Green/Duwamish HUC 10:	41.8%
Nisqually HUC 10:	45.1%

Average: 39.4%

Scoring Criteria:
Less than 20% = 0 Points
20%-25% = 5 Points
25.1% - 30% = 10 Points
30.1% - 35% = 15 Points
35.1% - 40% = 20 Points
40.1% - 45% = 25 Points
45.1% - 50% = 30 Points
Above 50% = 40 Points





## **FBRB Project Eligibility:**

### **Fish Passage Barrier Owners:**

#### **Eligible for FBRB Funding:**

- Private landowners
- Counties
- Cities
- Tribes

**Not Eligible for FBRB Funding: Although they are not eligible for FBRB funding, coordination with these entities will be essential to achieve fish passage goals.**

- State Agencies
- Large forest landowners (Rayonier, Weyco, Green Diamond, etc.)
- Small forest landowners (They are the focus of FFFPP)
- Federal Barriers – including railroad barriers

### **Fish Passage Project Types:**

#### **Eligible Barrier Corrections involving:**

- Road-associated Culverts
- Small dams (NOT FEDERAL)
- Road-associated-Tide Gates

#### **Remedies/Barriers replaced with:**

- New Culverts – Stream Simulation
- Abandonment
- Bridges
- Fishways?

#### **Not Eligible:**

- Natural Barriers (Beaver Dams, Waterfalls, etc.)
- Large Dams (Bureau of Reclamation)
- Large Bridges
- Levees and Dikes
- Pump Diversions
- Irrigation Channels and irrigation dams (small)??



# Fish Barrier Removal Board

## *Draft Work Plan*

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In 2014, the Washington State Legislature created the Fish Passage Barrier Removal Board to develop a coordinated barrier removal strategy and provide the framework for a fish barrier grant program. The board is established by Chapter 77.95 RCW.

### **Mission**

.The duty of the board is to identify and expedite the removal of human-made or caused impediments to anadromous fish passage in the most efficient manner practical through the development of a coordinated approach and schedule that identifies and prioritizes the projects necessary to eliminate fish passage barriers caused by state and local roads and highways and barriers owned by private parties.<sup>1</sup>

### **Values**

The board values all aspects of salmon recovery and the existing structure developed under the 1999 Salmon Recovery Act, and provides a statewide fish barrier removal strategy and program funding recommendations to the legislature. The board will ensure that the processes to identify, prioritize and fund projects are based on maximizing the opening of high quality habitat through a coordinated investment strategy that prioritizes projects necessary to eliminate fish barriers owned by state and local government, tribes, private parties, and others. This investment strategy values (1) opening high quality salmon habitat that can contribute to salmonid recovery, (2) coordinating with others doing barrier removals to achieve the greatest cost savings, and (3) correcting barriers located furthest downstream.

To achieve the mission, goals, and values the Board will:

- Improve coordination of existing fish passage programs to increase the benefits of barrier removal among multiple jurisdictions.
- Expedite the removal of barriers in the most efficient manner practical through economy of scale and streamline permitting processes.
- Facilitate collaboration, coordination, and communication among state, federal and local agencies, tribes, restoration contractors, landowners and other interested stakeholders on fish passage improvement programs and projects.
- Expedite implementation of on-the-ground projects by identifying and addressing institutional barriers.
- Educate and increase the public and agency awareness of fish passage issues to develop support for solving problems and preventing new ones.
- Seek funding sources for fish passage projects within Washington and administer a strategic funding program to further the Board's mission once funding is secured.

### **Goals & Strategies**

The board provides support to local fish passage programs based on its priorities, available resources, and emergent opportunities.

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<sup>1</sup> RCW 77.95.160 (2) (a)  
DRAFT April 17 2015

**Goal 1: The Washington Department of Fish & Wildlife shall maintain and chair a Fish Passage Barrier Removal Board (FBRB).**

- A. *Action:* The WDFW will organize, chair, and provide staff support for the Fish Barrier Removal Board.<sup>2</sup>

*Responsible Party/Timeline:* WDFW/Ongoing

- B. *Action:* Create clear communication to describe board role and duties. Some of this has already been accomplished, including Board by-laws and meeting notes. Additional items to develop include work plan, fact sheet, and webpage.

*Responsible Party/Timeline:* FBRB/By August 2015

- C. *Action:* The Board should review, on an annual basis, the current membership of the FBRB and consider adding members as appropriate.

*Responsible Party/Timeline:* Chair and FBRB/annually beginning June 2015

**Goal 2: The FBRB will develop a coordinated approach<sup>3</sup> to identifying and expediting the removal of fish passage barriers.**

- A. *Action:* WDFW will coordinate with WSDOT and other state agencies to ensure fish barrier passage removal programs are synchronized with each other. WSDOT routinely distributes planned projects for the biennium with forecasts of projects up to six years in advance (subject to change). WDFW will work with WSDOT to overlay the projects to maximize opportunities for coordinated projects and grant project pathways.

*Responsible Party/Timeline:* WDFW and WSDOT/September of each year

- B. *Action:* WDFW was not given any additional resources to support the Fish Barrier Removal Board. Although some existing resources are available, additional resources are needed to support the development of the Fish Barrier Removal Board statewide strategy, prioritization methodology, and development of grant program framework. Additional resources will be located and made available to support and provide guidance to the FBRB.

*Responsible Party/Timeline:* All FBRB members/Ongoing

- C. *Action:* Connect with the Washington Forest Protection Association for outreach and to clarify efforts to coordinate with the barrier removal projects of their members. Retrieve RMAP data from DNR

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<sup>2</sup> RCW 77.95.160 (1): "The board must be composed of a representative from the department, the department of transportation, cities, counties, the governor's salmon recovery office, tribal governments, and the department of natural resources. The representative of the department must serve as chair of the board and may expand the membership of the board to representatives of other governments, stakeholders, and interested entities."

<sup>3</sup> RCW 77.95.160 (2) (a) "The duty of the board is to identify and expedite the removal of human-made or caused impediments to anadromous fish passage in the most efficient manner practical through the development of a coordinated approach and schedule that identifies and prioritizes the projects necessary to eliminate fish passage barriers caused by state and local roads and highways and barriers owned by private parties."

annually to maximize opportunities for coordinated projects and grant project pathways

*Responsible Party/Timeline:* WDFW/Connect with WFPA by August 2015; retrieve RMAP annually (is there a logical time for this to occur - particular time when RMAP data has been refreshed?)

D. Action: Develop a statewide strategy for barrier removal. See following table for sub-actions.

Sub-action	By Whom	Timeline

E. *Action:* The FBRB should meet with on-the-ground implementers of barrier removal projects to gain an understanding of their perspectives on a strategy. This should include, at a minimum, Regional Fisheries Enhancement Groups (RFEs), Conservation Districts (CDs), and the Associated General Contractors organization. Meetings can occur either as part of the agenda for FBRB meetings or by attending meetings of implementers, as appropriate. One opportunity is the upcoming Salmon Recovery Conference in May, 2015.

*Responsible Party/Timeline:* FBRB/Start during spring/summer 2015

F. *Action:* Develop a strategy aimed at prioritizing which barrier focus areas should be addressed first.. Once those areas are chosen then conduct strategic barrier inventories and develop prioritized lists of barriers.

*Responsible Party/Timeline:* FBRB/2015 [Note: this is probably part of action D above, to develop a strategy]

G. *Action:* Follow-up with the regional salmon recovery board on their first efforts at responding to FBRB questions – e.g. meet with them in May 2015 during the May salmon recovery conference and develop next iteration of their prioritization efforts. This next iteration may include their focus areas; any inventories already done within their geographic area; and how they will identify existing barrier removal programs.

*Responsible Party/Timeline:* Chair and WDFW staff/Start in May 2015

H. *Action:* Continue to work with the Puget Sound Partnership to define a Puget Sound approach. **[What does this look like?]**

*Responsible Party/Timeline:* WDFW/By September 2015

I. *Action:* The FBRB will discuss technical assistance through the program and how it will be provided.

*Responsible Party/Timeline:* FBRB/ By December 2015

J. *Action:* Identify information and coordination needed by the Board.

*Responsible Party/Timeline:* By XXXX 2015

- K. *Action:* Develop a plan to coordinate information sharing and coordination between the FBRB and other entities involved in fish passage barrier removal projects.

*Responsible Party/Timeline:* FBRB/By December 2015

***[deleted because this is part of the coordinated approach in goal 2, not really a separate goal – specified items from the statute are addressed in other goals and actions].***

**Goal 4: WDFW Fish Passage Database**

- A. *Action:* The FBRB receives a database management update from WDFW. **[What is needed here beyond this?]**

*Responsible Party/Timeline* WDFW/September 2015

- B. *Action:* The FBRB receives a briefing on WDFW’s training program as described by the enabling legislation. The purpose of the training is to increase the awareness and consistency of fish passage barrier data collection, use of WDFW’s database, and modern techniques of fish passage barrier correction methods.

*Responsible Party/Timeline:* WDFW/By December 2015

- C. *Action:* Clarify the authorizing legislation<sup>4</sup> reference to this as a “database directory.” What does this mean?

*Responsible Party/Timeline:* WDFW/By XXXX 2015

**Goal 5: Develop a Communication Strategy**

- A. *Action:* The Board will identify communication strategy elements and timeframes for implementing them. Elements may include coordinating with other fish barrier removal programs; deciding how to share information developed by this Board; connecting with other entities including the federal government, tribes, and railroads; and deciding on an education and information strategy. The strategy should be reviewed annually by the Board **[What else is needed? How will this be done - will communications professionals be used to prepare this?]**

*Responsible Party/Timeline:* September 2015/WDFW, with assistance from other FBRB members

- B. *Action:* The Board will participate in the May 2015 Salmon Recovery Conference being held in Vancouver, Washington. There is a specific slot addressing fish passage, and a number of key players involved in fish passage barrier removal projects will be present. The work of the Board can be shared with others interested in the same issues, and opportunities to coordinate and share information can be pursued.

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<sup>4</sup> RCW 77.95.170 (5) (a): “The department shall establish a centralized database directory of all fish passage barrier information. The database directory must include, but is not limited to, existing fish passage inventories, fish passage projects, grant program applications, and other databases. These data must be used to coordinate and assist in habitat recovery and project mitigation projects.”

*Timeline/Responsible Party:* May 2015/Chair, other members of the FBRB

- C. *Action:* WDFW will prepare a report to the legislature by October 31, 2016 (as required by enabling legislation).

*Responsible Party/Timeline:* October 31, 2016/WDFW

**Goal 6: Grant Program**

- A. *Action:* Identify new and available funding that could be used for the program and a proposed funding mechanism.

*Responsible Party/Timeline:* By December 2015/WDFW (with assistance from other FBRB members)

- B. *Action:* Develop a grant program that will allocate available funding, and address elements including match requirements, whether and how funding might be allocated between regions, and other factors. Continue developing the “hybrid option #3” discussed at the February 2015 meeting of the FBRB.

*Responsible Party/Timeline:* By XXXX 2015

**Goal 7: Project Permitting and Streamlining**

- A. *Action:* Seek permitting efficiencies and streamlining regarding federal permits. Coordinating with the Governor’s office, initiates contact with USACE, NOAA, and USFWS to explore and develop the feasibility of bundling of projects under any available nationwide permits for the purpose of achieving streamlined federal permitting.

*Responsible Party/Timeline:* By XXXX 2015/WDFW

- B. *Action:* Seek permitting efficiencies and streamlining regarding local and state permits. Work with local government planners to seek efficiencies and streamlining regarding shoreline permits, critical areas permits, and HPAs; and other actions as needed.

*Responsible Party/Timeline:* By XXXX 2015

**TIMELINE**

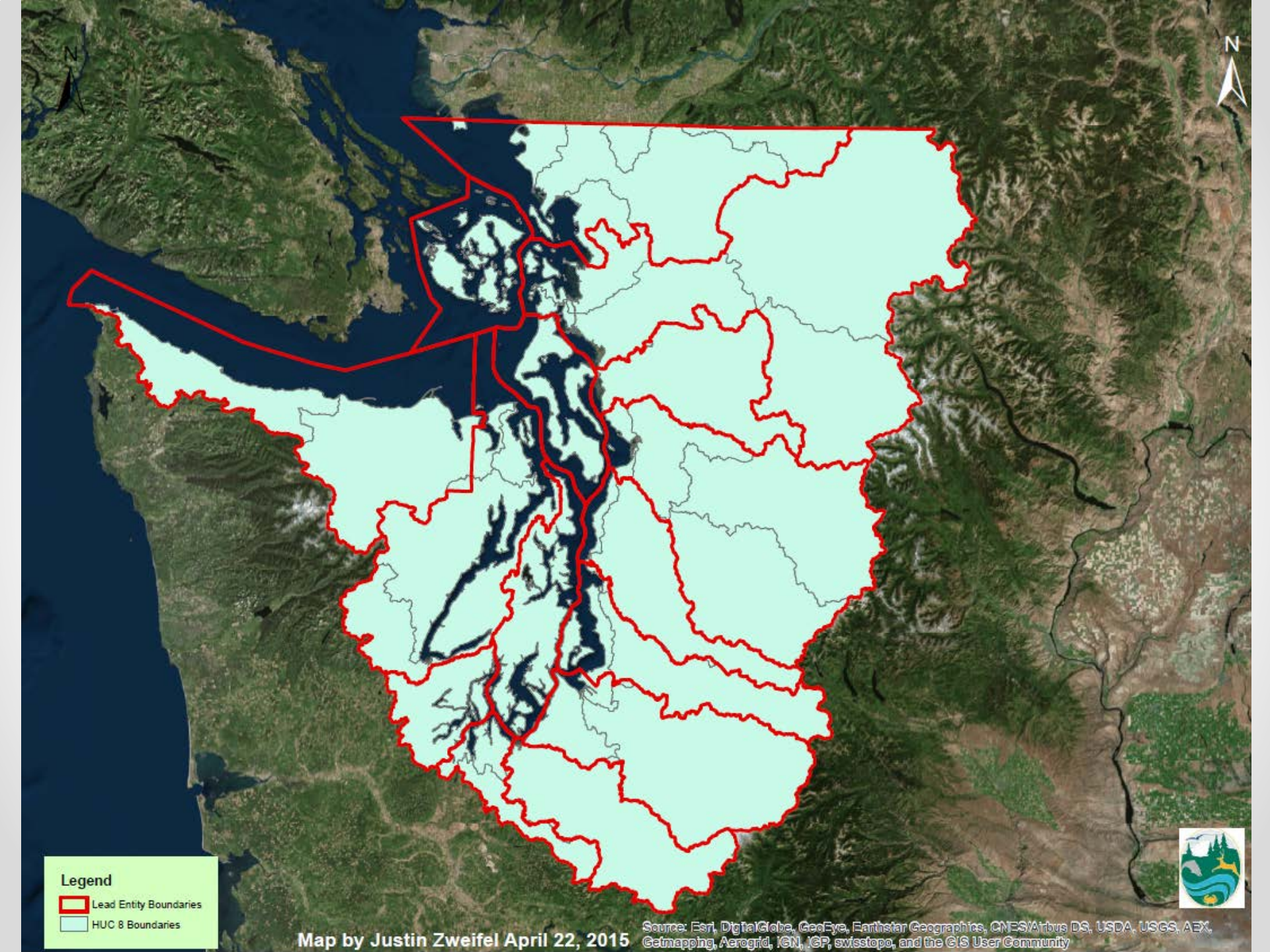
[List action items in chronological order for easy reference]

<b>ACTION</b>	<b>TIMELINE</b>	<b>RESPONSIBILITY</b>
Establish Fish Passage Barrier Removal Board	6/2014	WDFW

# Presentation on Draft Puget Sound Lead Entity Nomination Scoring Criteria

By: Cade Roler - WDFW  
and Justin Zweifel - WDFW





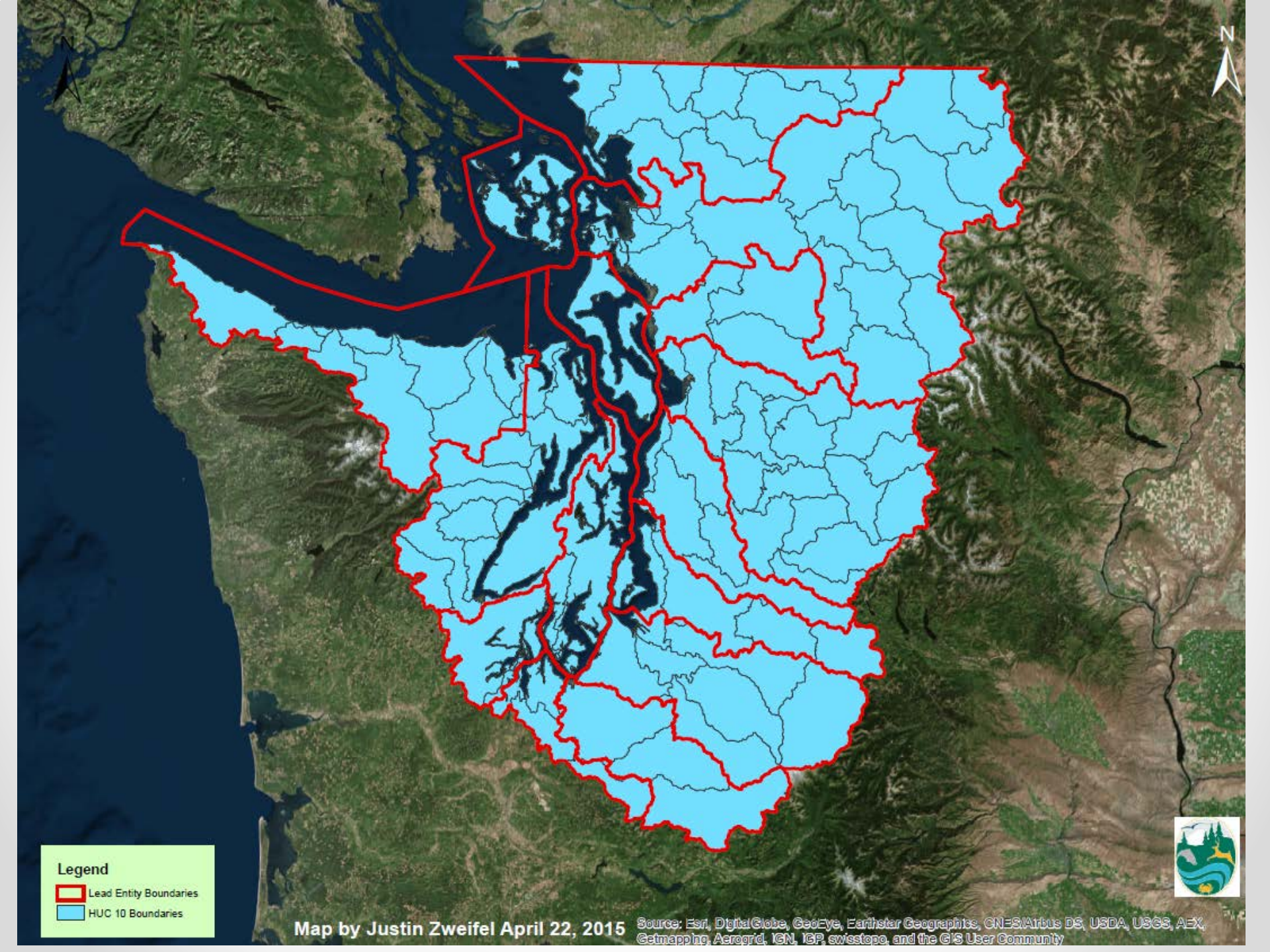
**Legend**

-  Lead Entity Boundaries
-  HUC 8 Boundaries

Map by Justin Zweifel April 22, 2015

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community





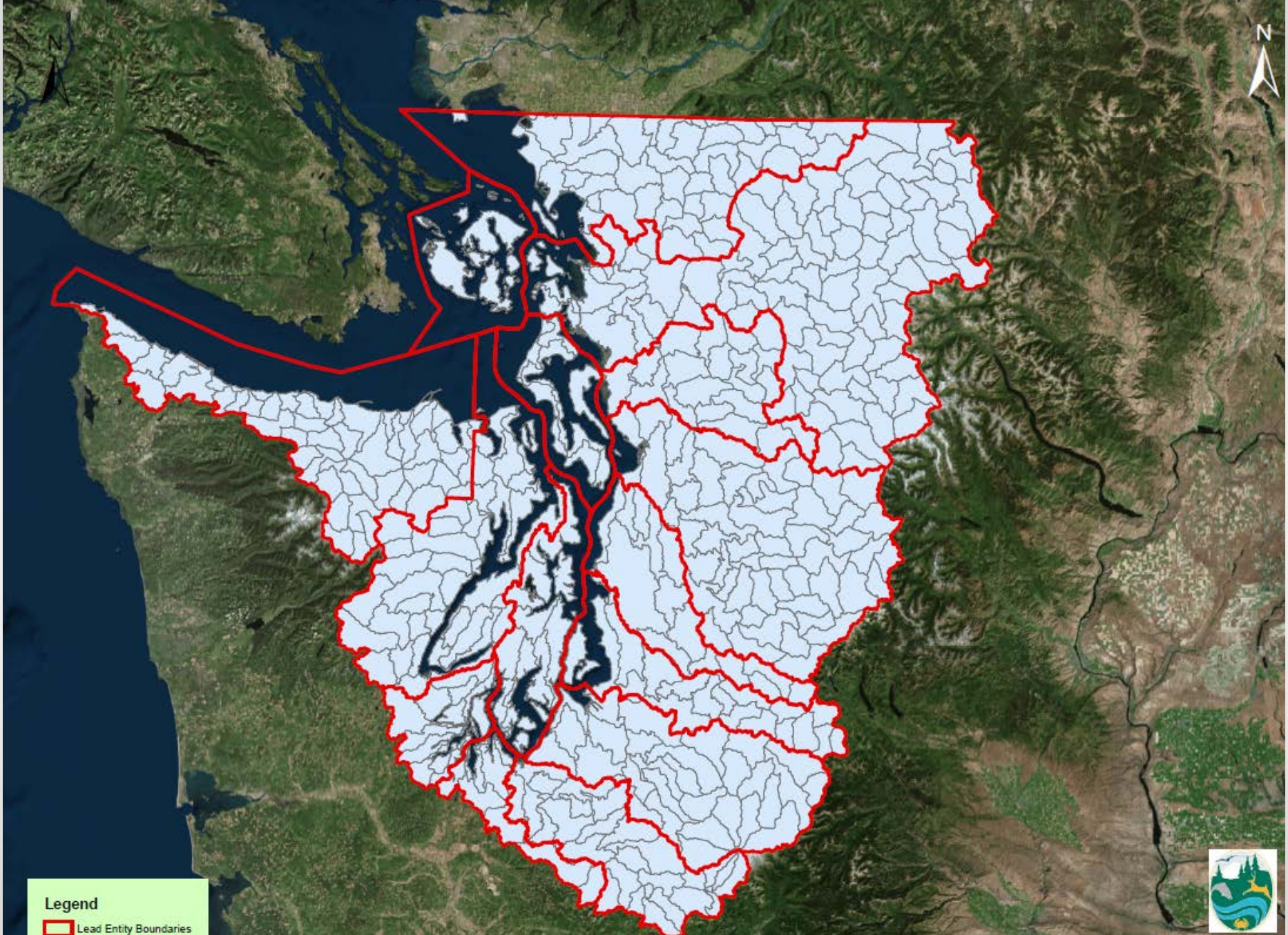
**Legend**

-  Lead Entity Boundaries
-  HUC 10 Boundaries



Map by Justin Zweifel April 22, 2015

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the G'S User Community





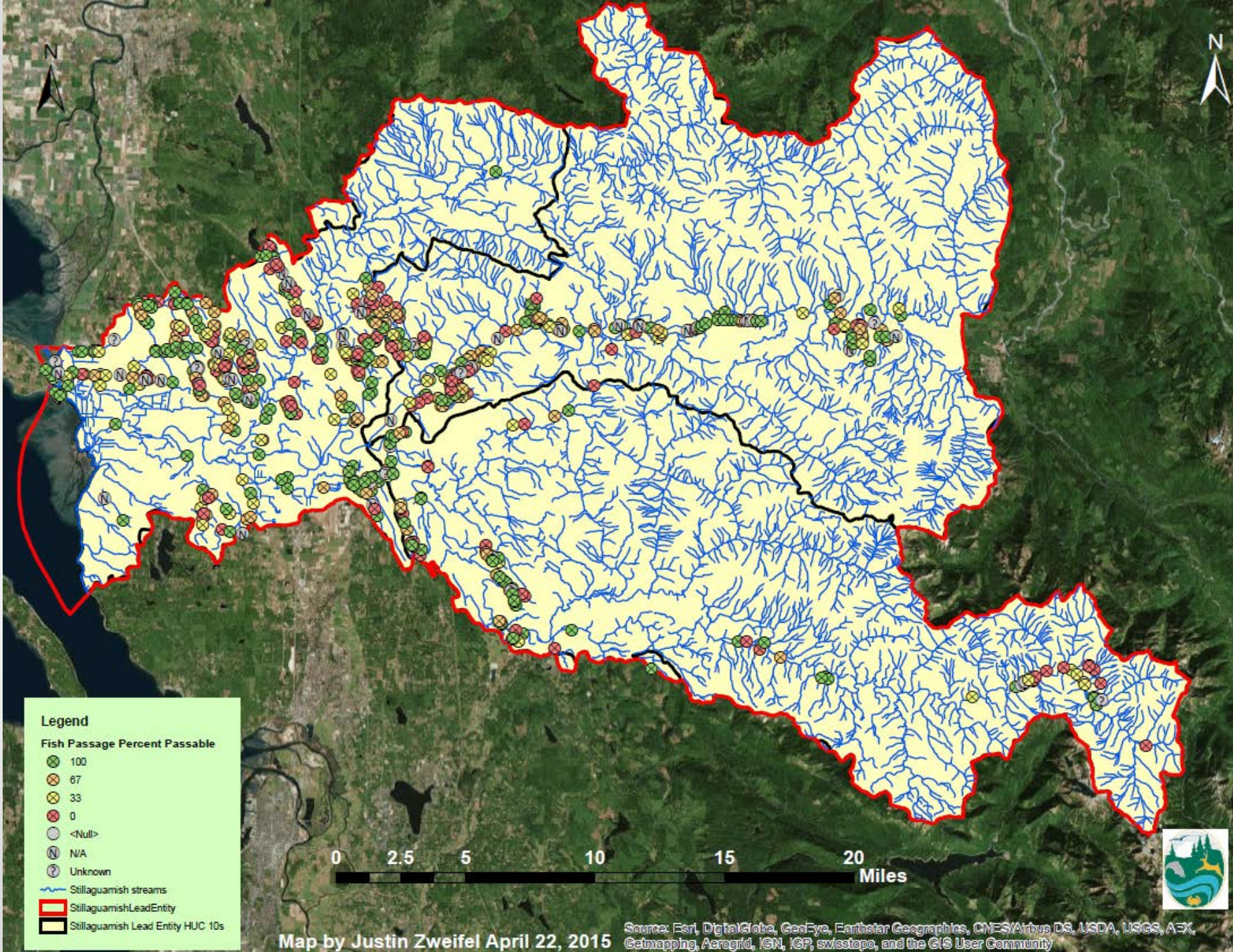
**Legend**

-  Lead Entity Boundaries
-  HUC 12 Boundaries

Map by Justin Zweifel April 22, 2015








Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community








**Legend**

**Fish Passage Percent Passable**

-  100
-  67
-  33
-  0
-  <Null>
-  N/A
-  Unknown

-  Stillaguamish streams
-  StillaguamishLeadEntity
-  Stillaguamish Lead Entity HUC 10s

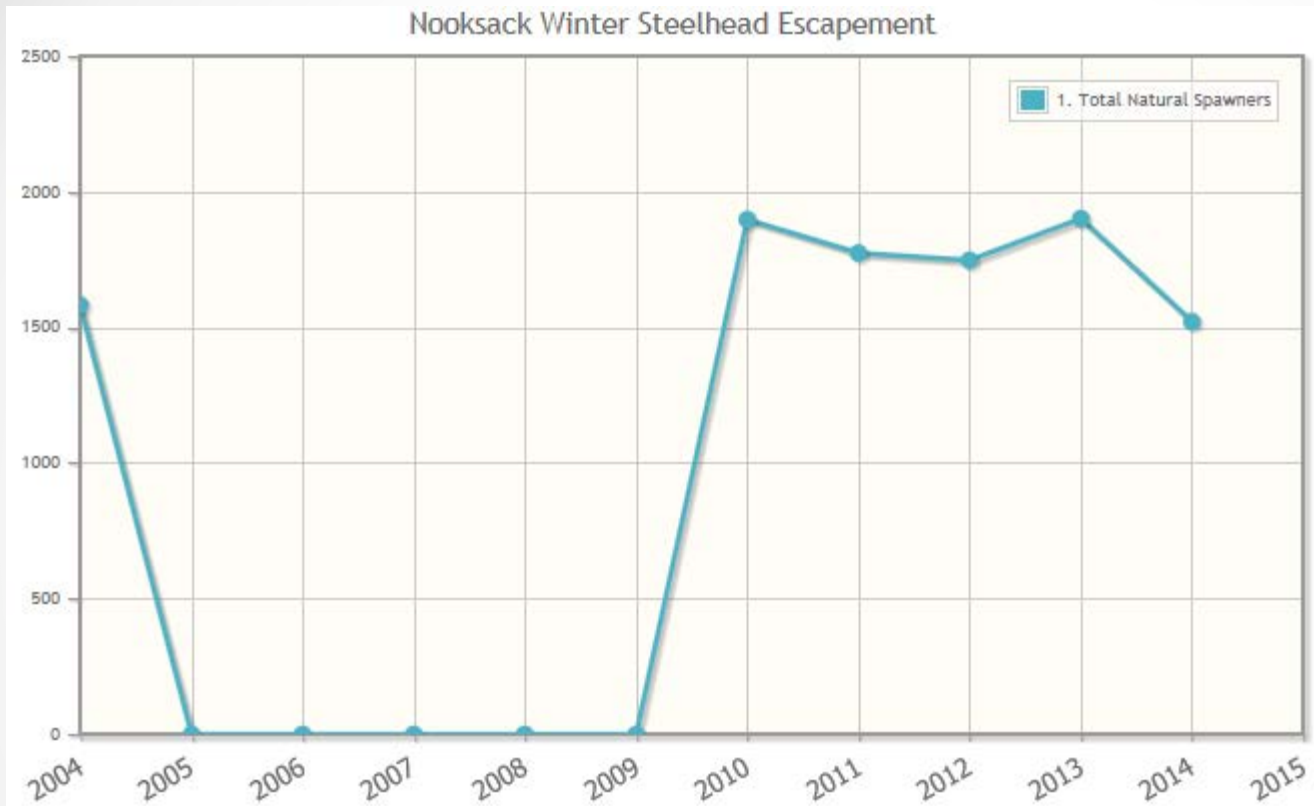


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## WRIA 1 (Nooksack) Winter Steelhead Escapement

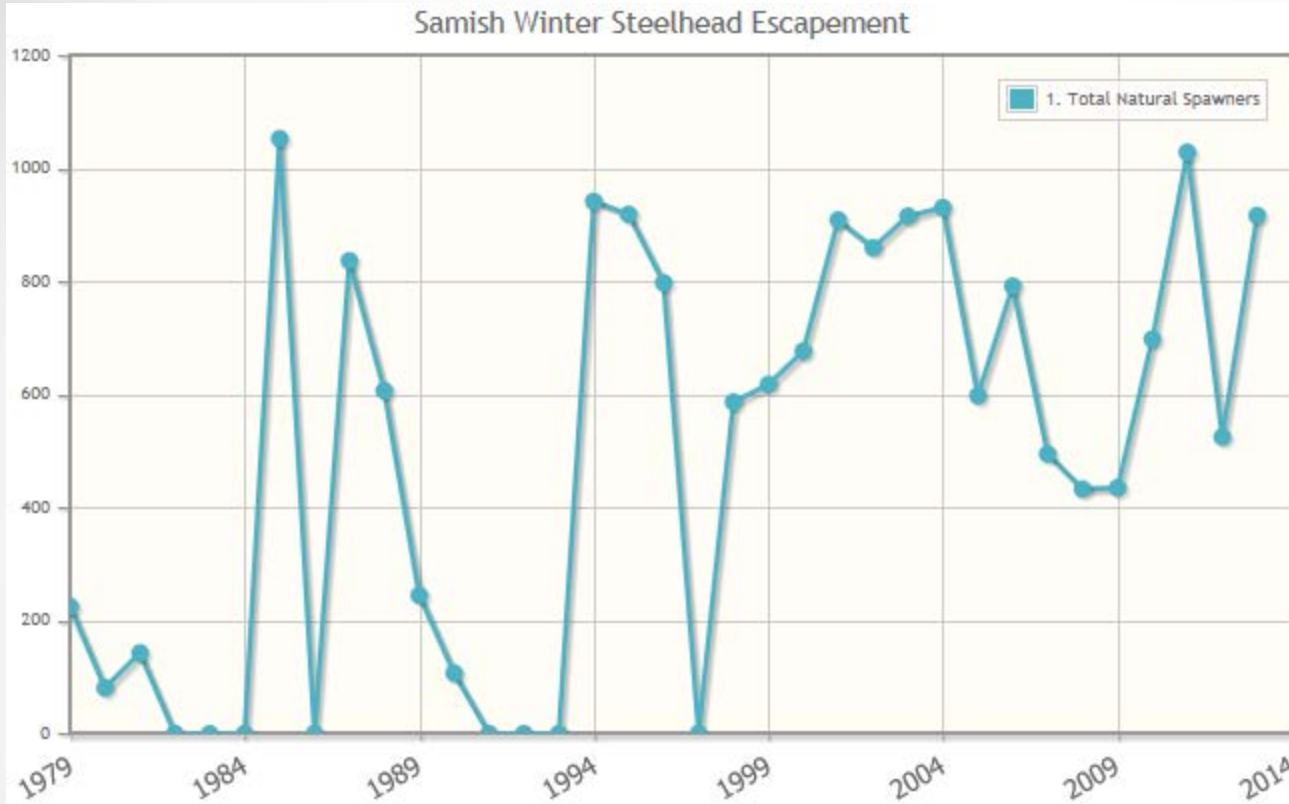


Year	Total Natural Spawners
2004	1,582
2005	
2006	
2007	
2008	
2009	
2010	1,897
2011	1,774
2012	1,747
2013	1,901
2014	1,521

*Total Natural Spawners:* Data are estimates from aerial surveys of the North, Middle, and South Fork. Spawning ground data have been collected from select tributary indexes.

No data for Drayton Harbor tributaries that support winter steelhead

# WRIA 5 (Lower Skagit/Samish) Winter Steelhead Escapement

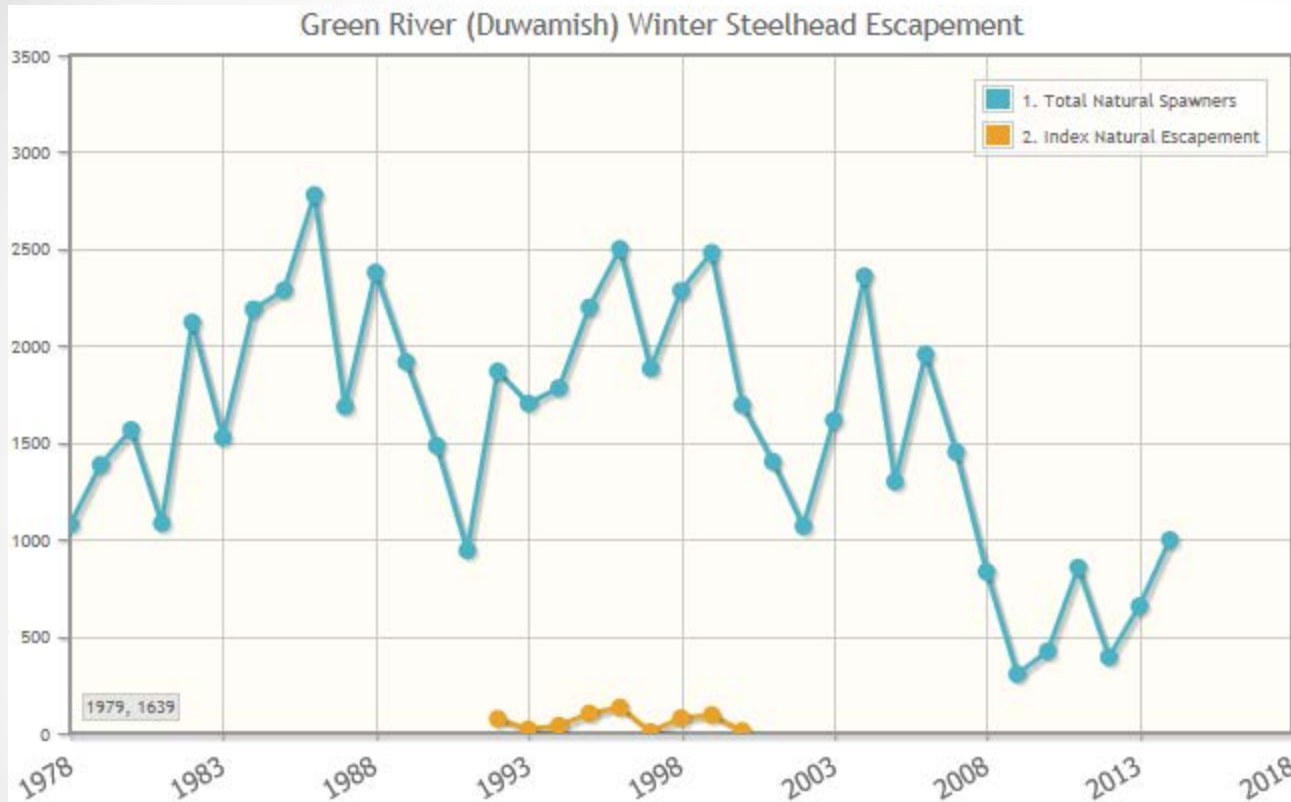


Year	Total Natural Spawners
1979	224
1980	80
1981	142
1982	
1983	
1984	
1985	1,052
1986	
1987	836
1988	606
1989	244
1990	106
1991	
1992	
1993	
1994	941
1995	918
1996	797
1997	
1998	586
1999	617
2000	676
2001	908
2002	859
2003	915
2004	930
2005	597
2006	791
2007	494
2008	432
2009	434
2010	697
2011	1,028
2012	524
2013	916

No data for Nookachamps Creek which supports winter steelhead



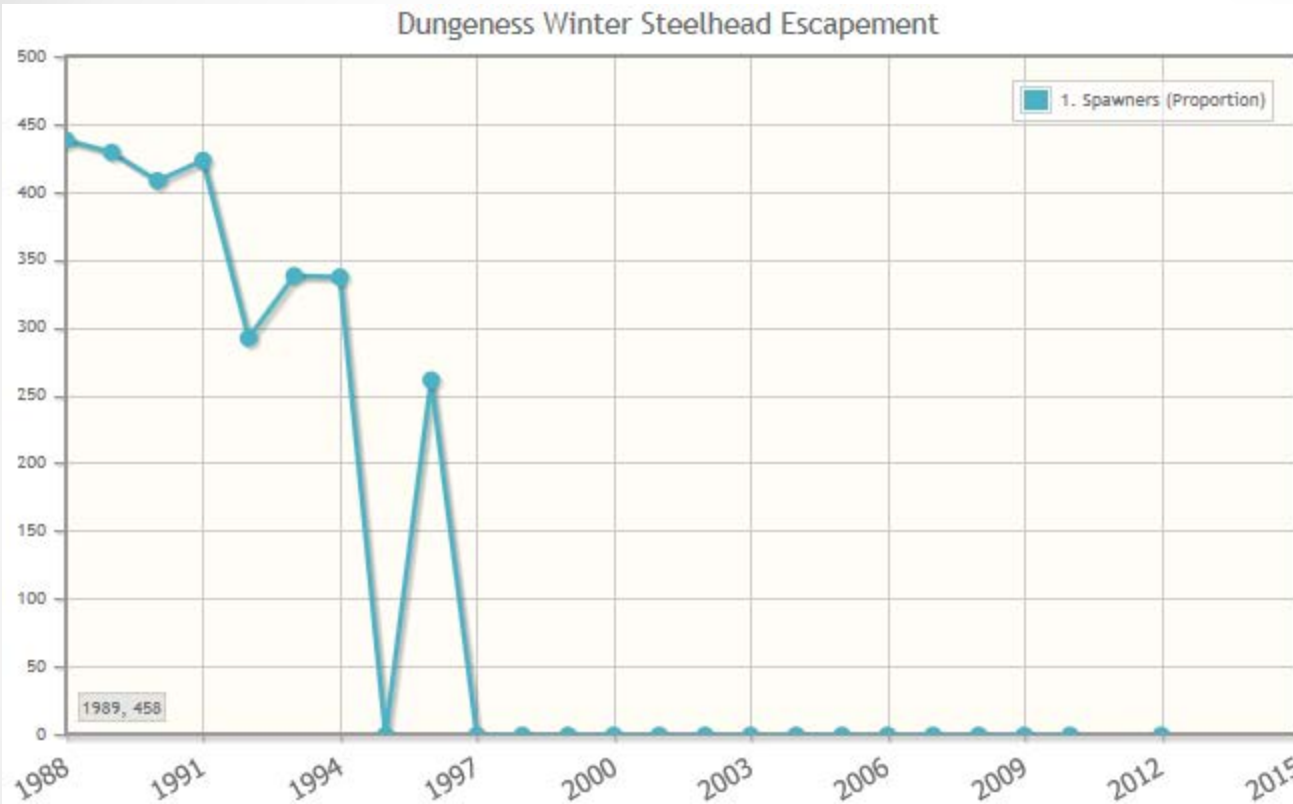
# WRIA 9 (Duwamish/Green) Winter Steelhead Escapemen



Year	Total Natural Spawners	Index Natural Escapement
1978	1,077	
1979	1,385	
1980	1,566	
1981	1,083	
1982	2,121	
1983	1,526	
1984	2,188	
1985	2,286	
1986	2,778	
1987	1,685	
1988	2,378	
1989	1,916	
1990	1,484	
1991	944	
1992	1,868	74
1993	1,702	20
1994	1,782	39
1995	2,198	102
1996	2,500	133
1997	1,882	7
1998	2,284	78
1999	2,480	94
2000	1,694	11
2001	1,402	
2002	1,068	
2003	1,615	
2004	2,359	
2005	1,298	
2006	1,955	
2007	1,452	
2008	833	
2009	304	
2010	423	
2011	855	
2012	392	
2013	656	
2014	997	

- *Total Natural Spawners:* Data are total escapement estimates based on cumulative redd counts in all mainstem spawning areas (RM 26.7 to RM 61.0) and in various reaches in Newaukum, Soos, Covington, and Jenkins Creeks
- *Index Natural Escapement:* Data are counts of fish transported above Howard Hanson Dam.

# WRIA 18 (Elwha/Dungeness) Winter Steelhead Escapement

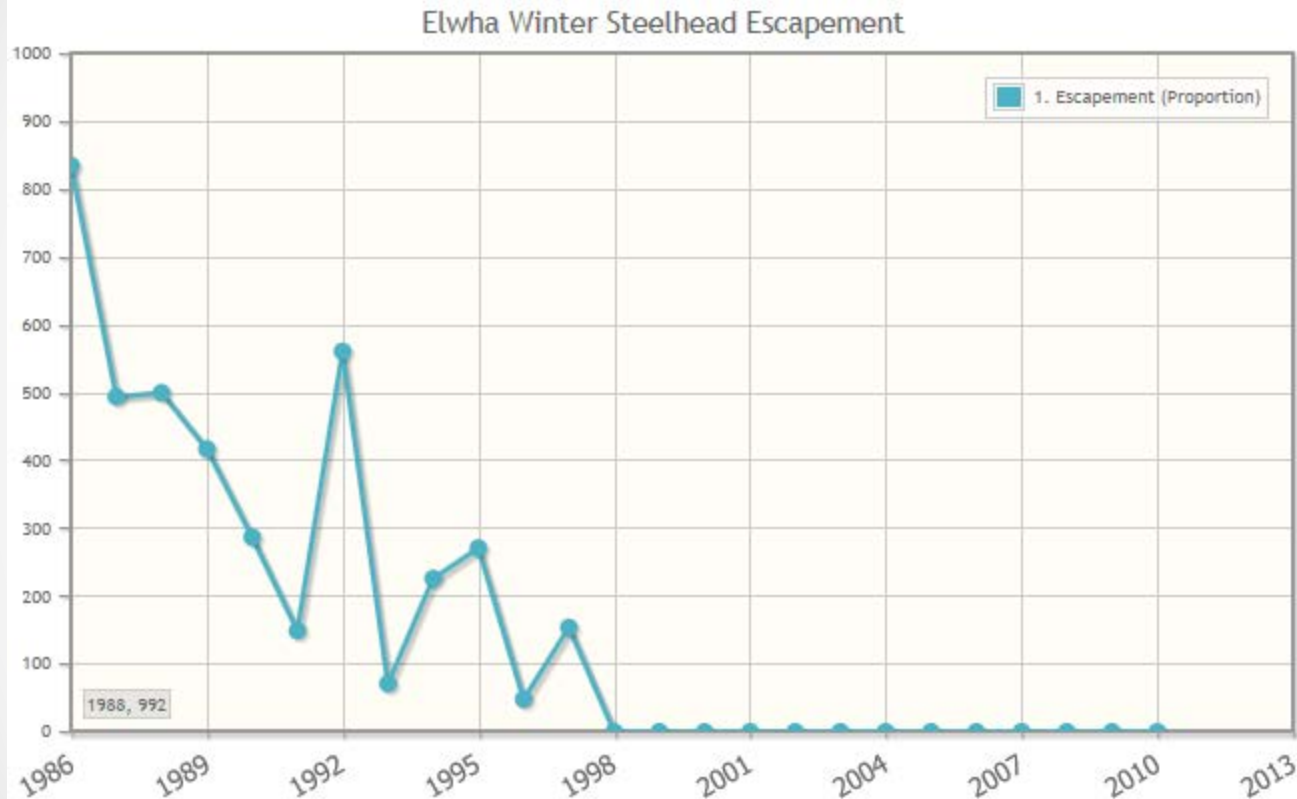


Year	Spawners (Proportion)
1988	438
1989	429
1990	408
1991	423
1992	292
1993	338
1994	337
1995	
1996	261
1997	
1998	
1999	
2000	
2001	
2002	
2003	
2004	
2005	
2006	
2007	
2008	
2009	
2010	
2012	

*Spawners (Proportion)*: Data are index escapements based on redd counts in index areas. Escapement estimates have not been made on an annual basis since 1995. The Dungeness River can be difficult to survey for steelhead because of high flows, especially in May.



## ...cont...WRIA 18 (Elwha/Dungeness) Winter Steelhead Escapement



Year	Escapement (Proportion)
1986	834
1987	493
1988	499
1989	416
1990	286
1991	148
1992	560
1993	70
1994	225
1995	270
1996	47
1997	153
1998	
1999	
2000	
2001	
2002	
2003	
2004	
2005	
2006	
2007	
2008	
2009	
2010	

*Escapement (Proportion)*: Data are total run size estimates based on hatchery/wild ratios in the commercial harvest and the return to the Elwha Hatchery.

# Advantages to using Escapement

- Compare population numbers
- Compare trends

# Limitations to using Escapement

- Missing data
  - From entire year(s)
  - From entire streams (or HUC 10s)
- Inconsistent data collection methods

# Criteria #1

- HUC 10 provides considerable opportunity for Steelhead and Coho populations. Consider the intrinsic potential model for these rearing limited species.

# Intrinsic Potential (IP) Model Background

- Used to identify and quantify fish habitat quality.
  - High quality rearing habitat for Steelhead, Coho, and Chinook Salmon
- Takes into account multiple landscape parameters that influence fish habitat.
  - Gradient
  - Mean Annual Stream Flow
  - Calibrated Valley Width
  - Additional parameters can be added
- Values are assigned to stream reaches and based on historic watershed conditions.
- Has been used to identify habitat hotspots for restoration work.



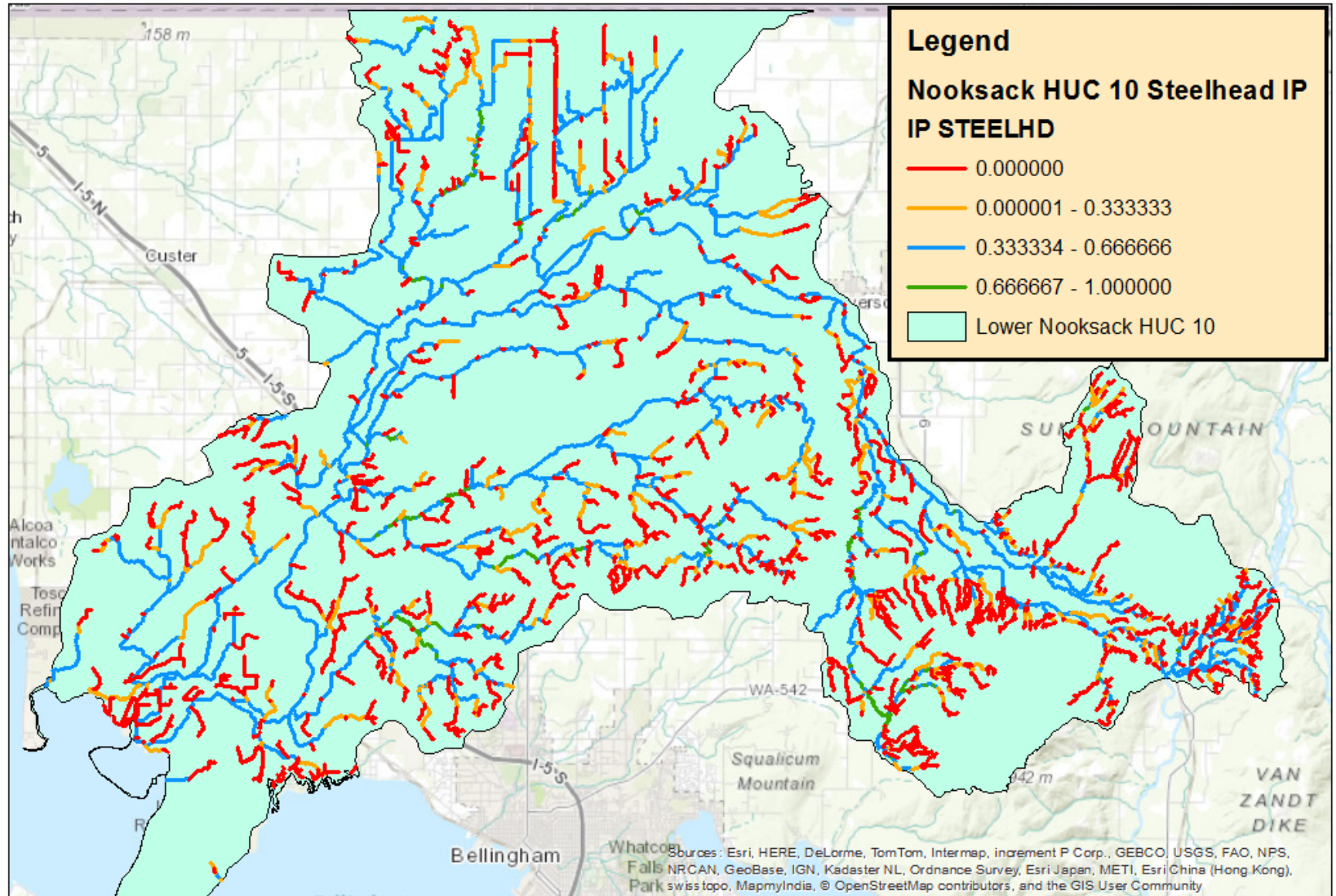
# How We Used the IP Model

- Compared relative percentages of quality habitat in HUC 10s
  - Steelhead
  - Coho
- Ran model on small subsample
  - Nooksack HUC 10s
  - Stillaguamish
  - Nisqually
  - Green/Duwamish
- Removed modeled habitat upstream of the species - specific gradient breaks
  - Steelhead: 20%
  - Coho: 16%

## Limitations:

- Conditions don't take into account anthropogenic factors
- Waterfalls and other natural barriers (other than gradient) were not excluded
- Streams are modeled based on topography and don't always match on-the-ground conditions

# Lower Nooksack HUC 10 Steelhead IP

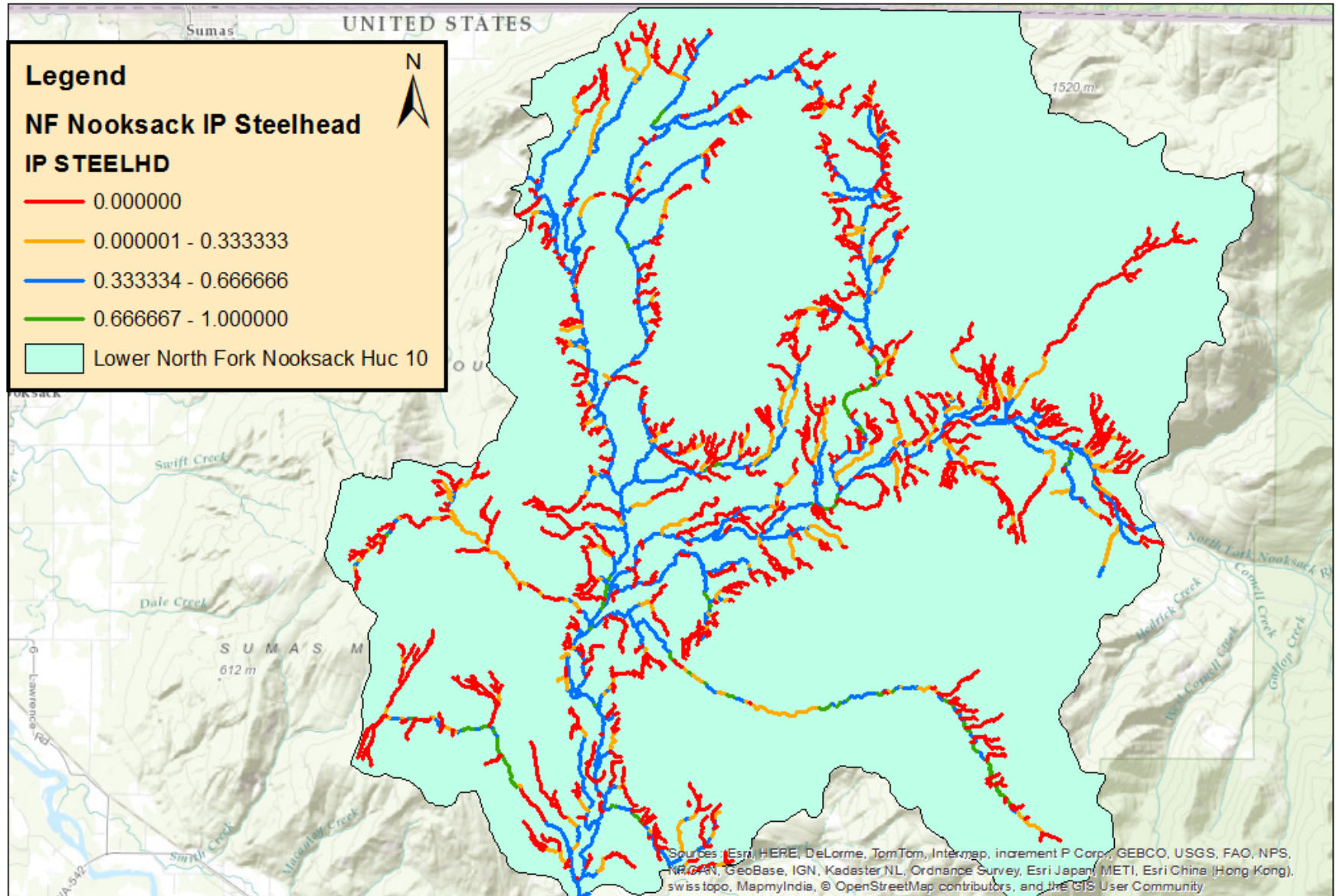


Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), Swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

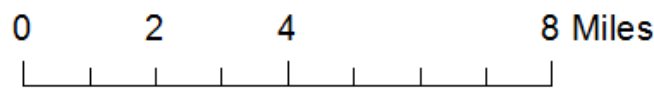
Author: Cade Roler - WDFW



# Lower N.F. Nooksack HUC 10 Steelhead IP



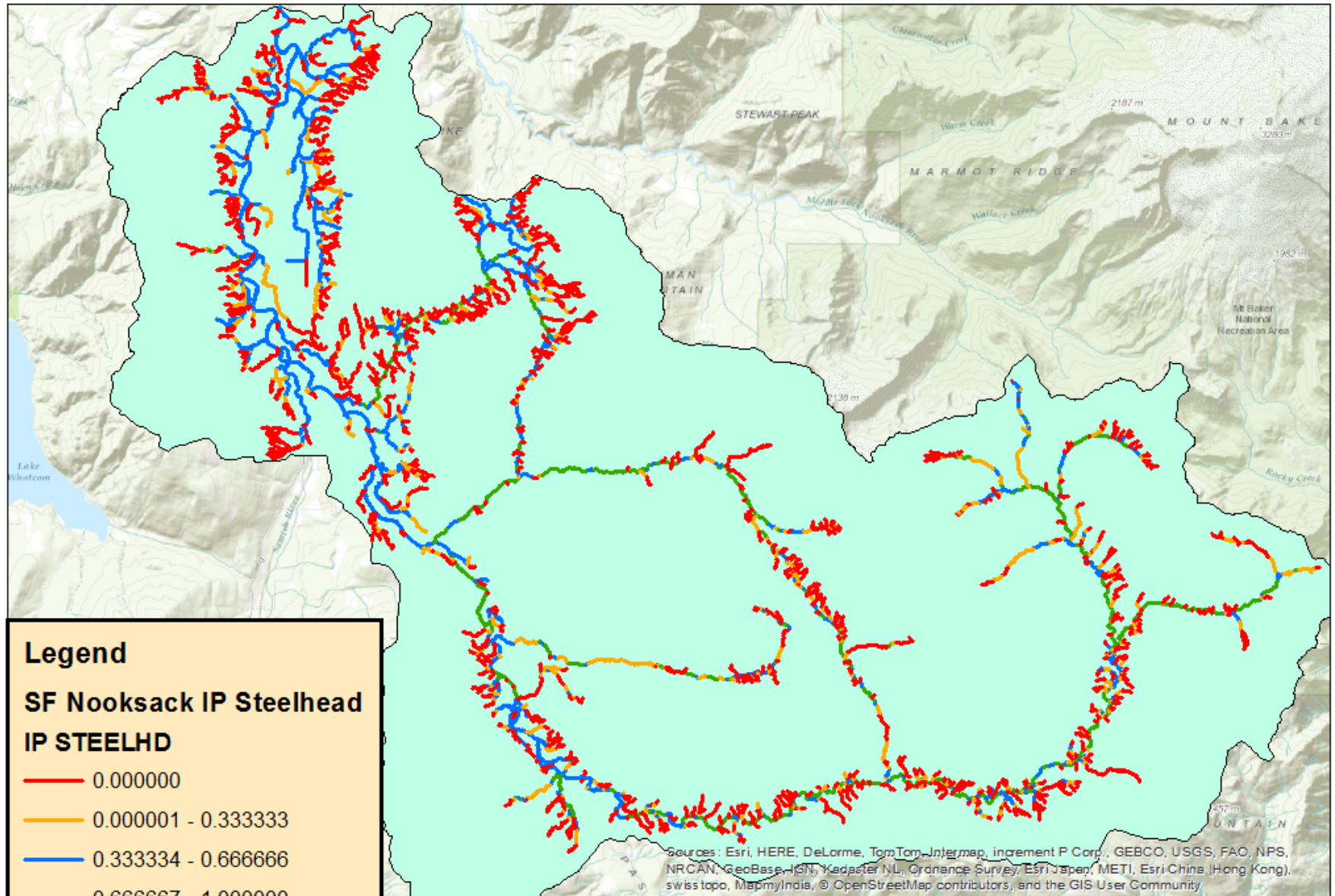
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRC, GNS, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan (METI), Esri China (Hong Kong), swiss topo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community



Author: Cade Roler - WDFW



# S.F. Nooksack HUC 10 Steelhead IP



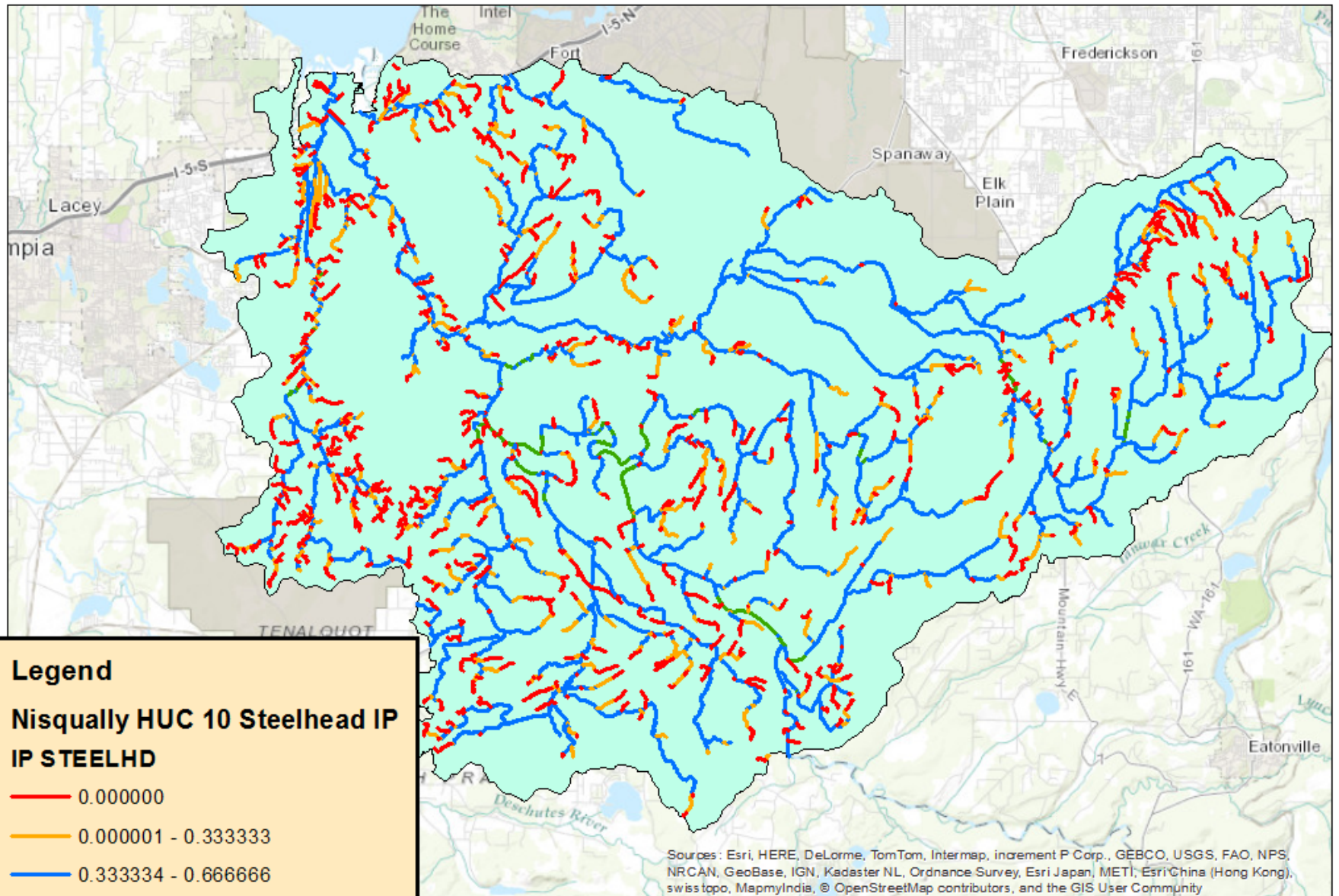
0 2.75 5.5 11 Miles

Author: Cade Roler - WDFW





# Lower Nisqually HUC 10 Steelhead IP



## Legend

### Nisqually HUC 10 Steelhead IP IP STEELHD

- 0.000000
- 0.000001 - 0.333333
- 0.333334 - 0.666666
- 0.666667 - 1.000000
- Lower Nisqually HUC 10

Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swiss topo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

0 3.5 7 14 Miles

Author: Cade Roler - WDFW



# Intrinsic Potential Analysis: Steelhead

Lower Nooksack HUC 10:

Intrinsic Potential Category:	Total:	Coefficient (Multiplier):	New Total:
Steelhead IP 0.666667 - 1.000000	19627.7651	1.0	19627.7651
Steelhead IP 0.333334 - 0.666666	406032.0207	0.67	272041.4539
Steelhead IP 0.000001 - 0.333333	129358.5223	0.33	42688.31236
Steelhead IP 0.000000	347354.5259	0.0	0
		Sum:	334357.5313
	<b>Total Modelled Stream Length:</b>		902372.834
	<b>Habitat Quality IP Percentage:</b>		<b>37.1%</b>

## Steelhead IP Totals:

**Lower Nooksack HUC 10:**

**37.1%**

**Lower NF Nooksack HUC 10:**

**28.5%**

**SF Nooksack HUC 10:**

**35.3%**

**Stillaguamish HUC 10:**

**48.8%**

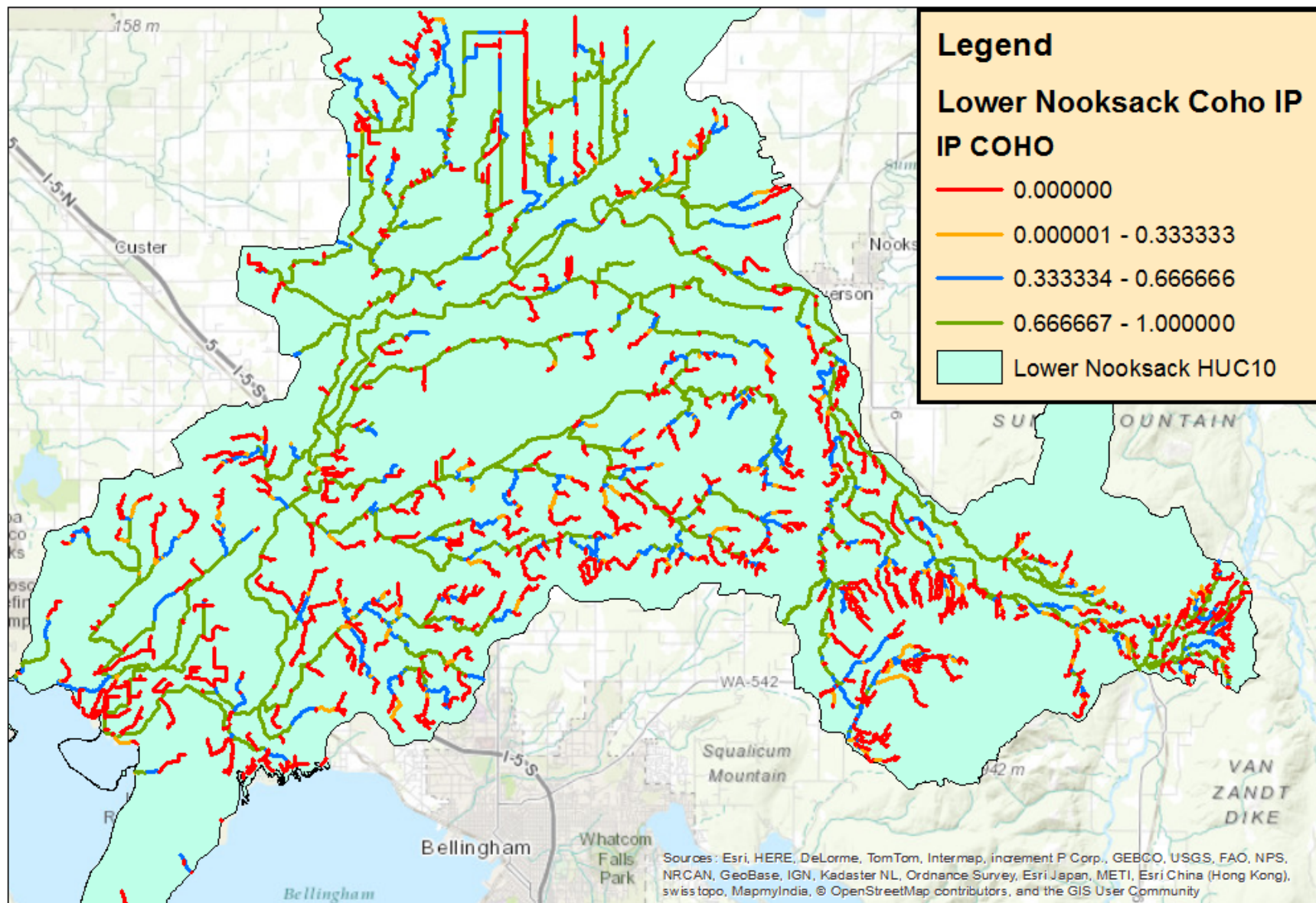
**Green/Duwamish HUC 10:**

**41.8%**

**Nisqually HUC 10:**

**45.1%**

# Lower Nooksack HUC 10 Coho IP

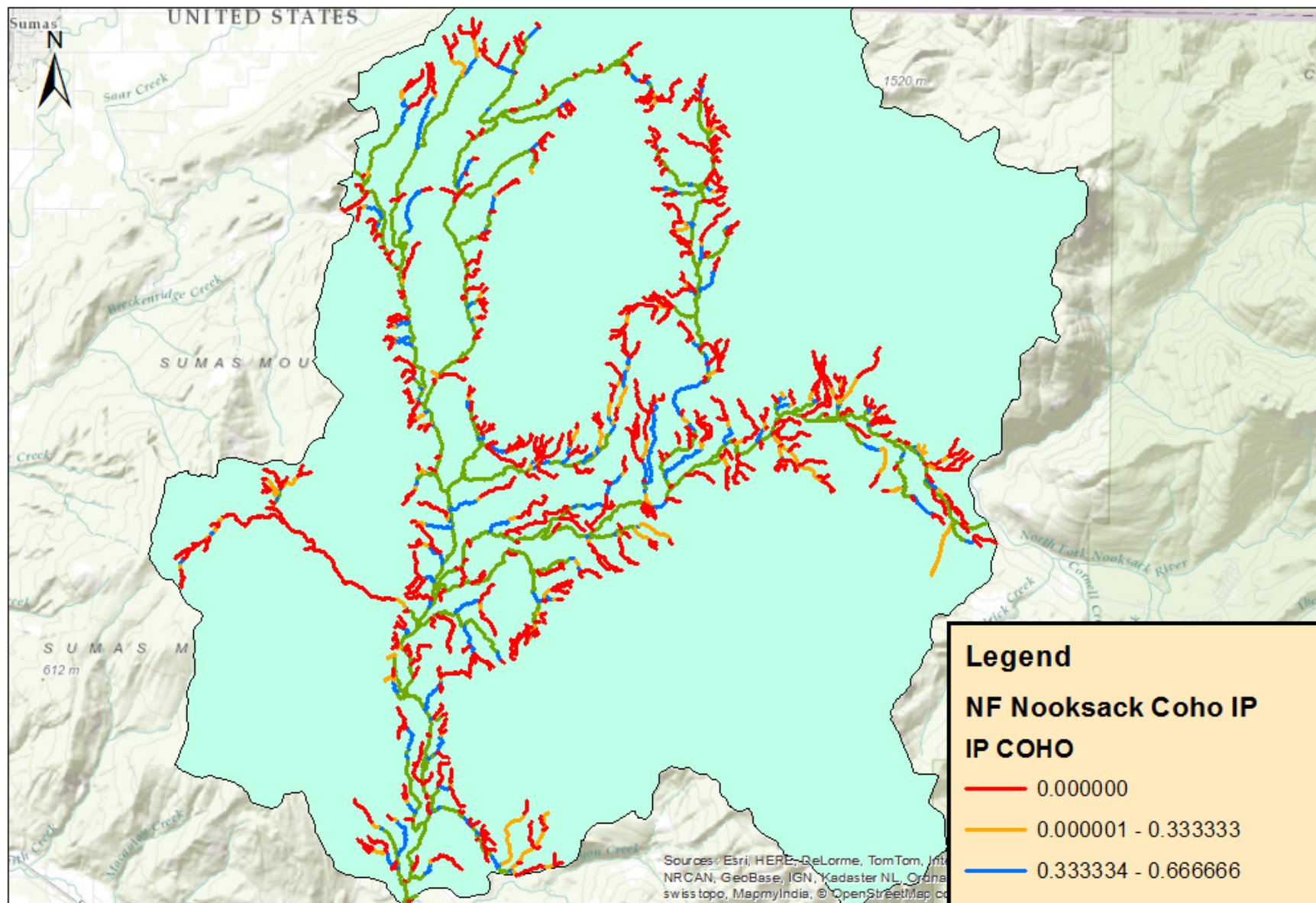


Author: Cade Roler

0 3 6 12 Miles



# Lower N.F. Nooksack HUC 10 Coho IP



## Legend

### NF Nooksack Coho IP

#### IP COHO

0.000000

0.000001 - 0.333333

0.333334 - 0.666666

0.666667 - 1.000000

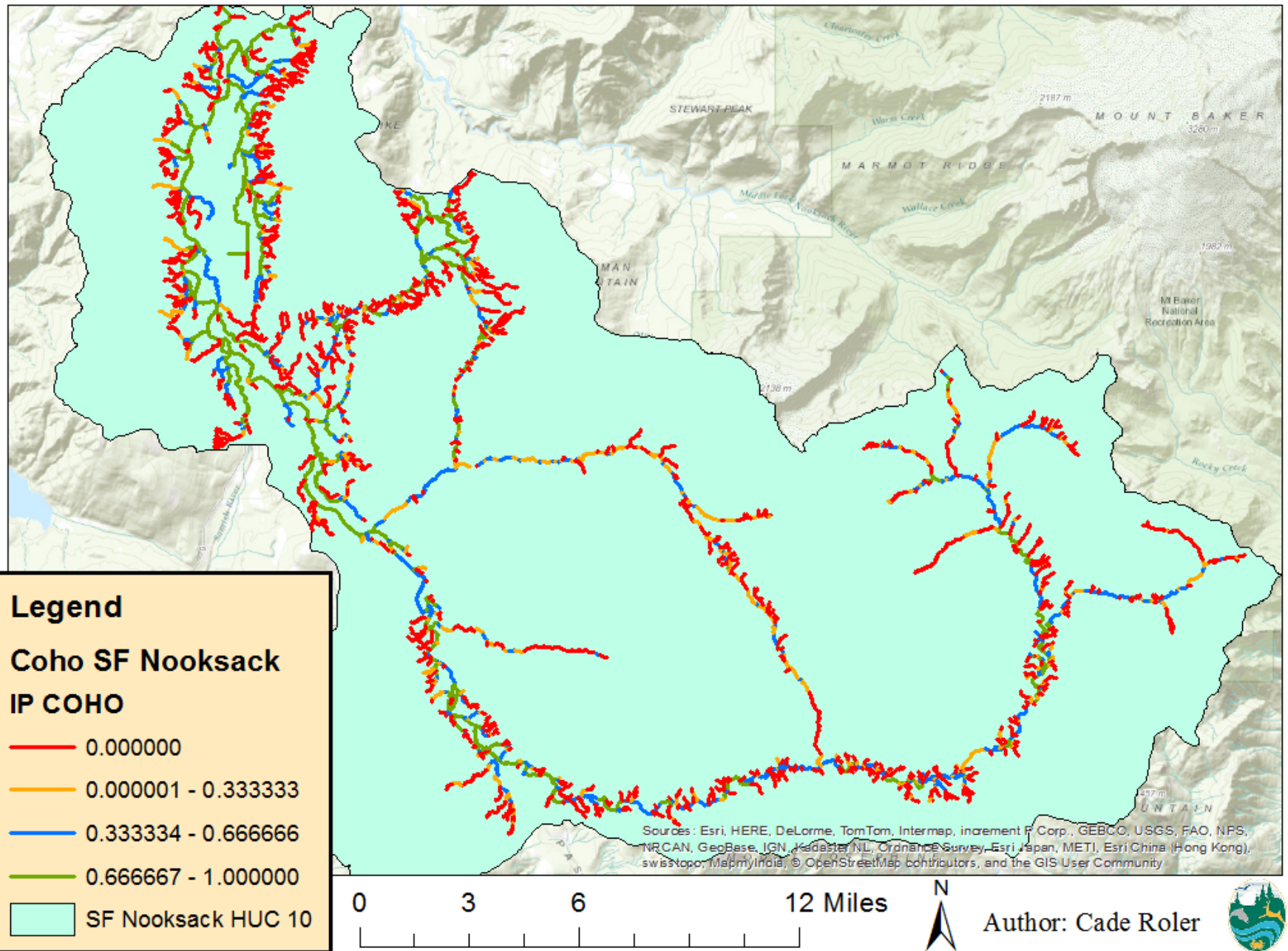
Lower NF Nooksack HUC 10



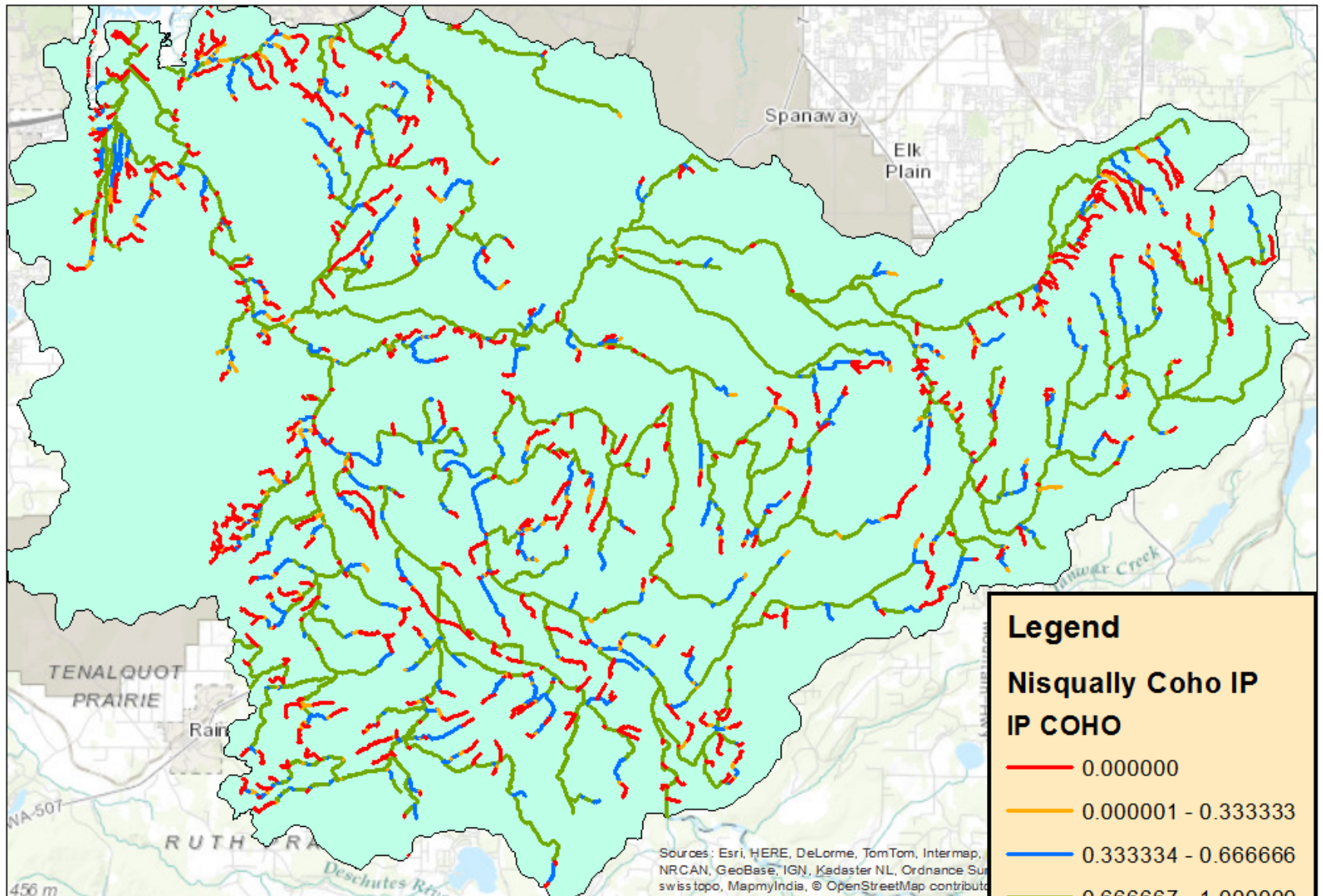
Author: Cade Roler

0 2 4 8 Miles

# S.F. Nooksack HUC 10 Coho IP



# Nisqually HUC 10 Coho IP



## Legend

### Nisqually Coho IP IP COHO

- 0.000000
- 0.000001 - 0.333333
- 0.333334 - 0.666666
- 0.666667 - 1.000000
- Nisqually HUC 10

Sources: Esri, HERE, DeLorme, TomTom, Intermap, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, swis topo, MapmyIndia, © OpenStreetMap contributors



Author: Cade Roler

0 3 6 12 Miles



# Intrinsic Potential Analysis: COHO

Lower Nooksack HUC 10:

Intrinsic Potential Category:	Total:	Coefficient (Multiplier):	New Total:
Coho IP 0.666667 - 1.000000	370740.0606	1.0	370740.0606
Coho IP 0.333334 - 0.666666	118064.5406	0.67	79103.2422
Coho IP 0.000001 - 0.333333	42454.4064	0.33	14009.95411
Coho IP 0.000000	306155.9076	0.0	0
		Sum:	463853.2569
	<b>Total Modelled Stream Length:</b>		837414.9152
	<b>Habitat Quality IP Percentage:</b>		<b>55.4%</b>



# Coho IP HUC 10 Totals

<b>Coho IP Totals:</b>	
<b>Lower Nooksack HUC 10:</b>	<b>55.4%</b>
<b>Lower NF Nooksack HUC 10:</b>	<b>43.4%</b>
<b>SF Nooksack HUC 10:</b>	<b>40.5%</b>
<b>Stillaguamish HUC 10:</b>	<b>64.5%</b>
<b>Green/Duwamish HUC 10:</b>	<b>57.0%</b>
<b>Nisqually HUC 10:</b>	<b>67.1%</b>

# Criteria #2: Shovel Ready

- HUC 10 nomination has been scoped (feasibility/readiness); projects identified and would be ready for implementation upon receiving funding
  - Criteria could be used if money became available this year
    - Would help identify HUC 10s and project areas that are ready to go quickly
  - This would require lead entities to reach out to local groups to determine shovel ready projects

# Criteria #3 Temperature

- HUC 10 has minimal water temperature concerns as identified on Washington Department of Ecology 305-B Designations.

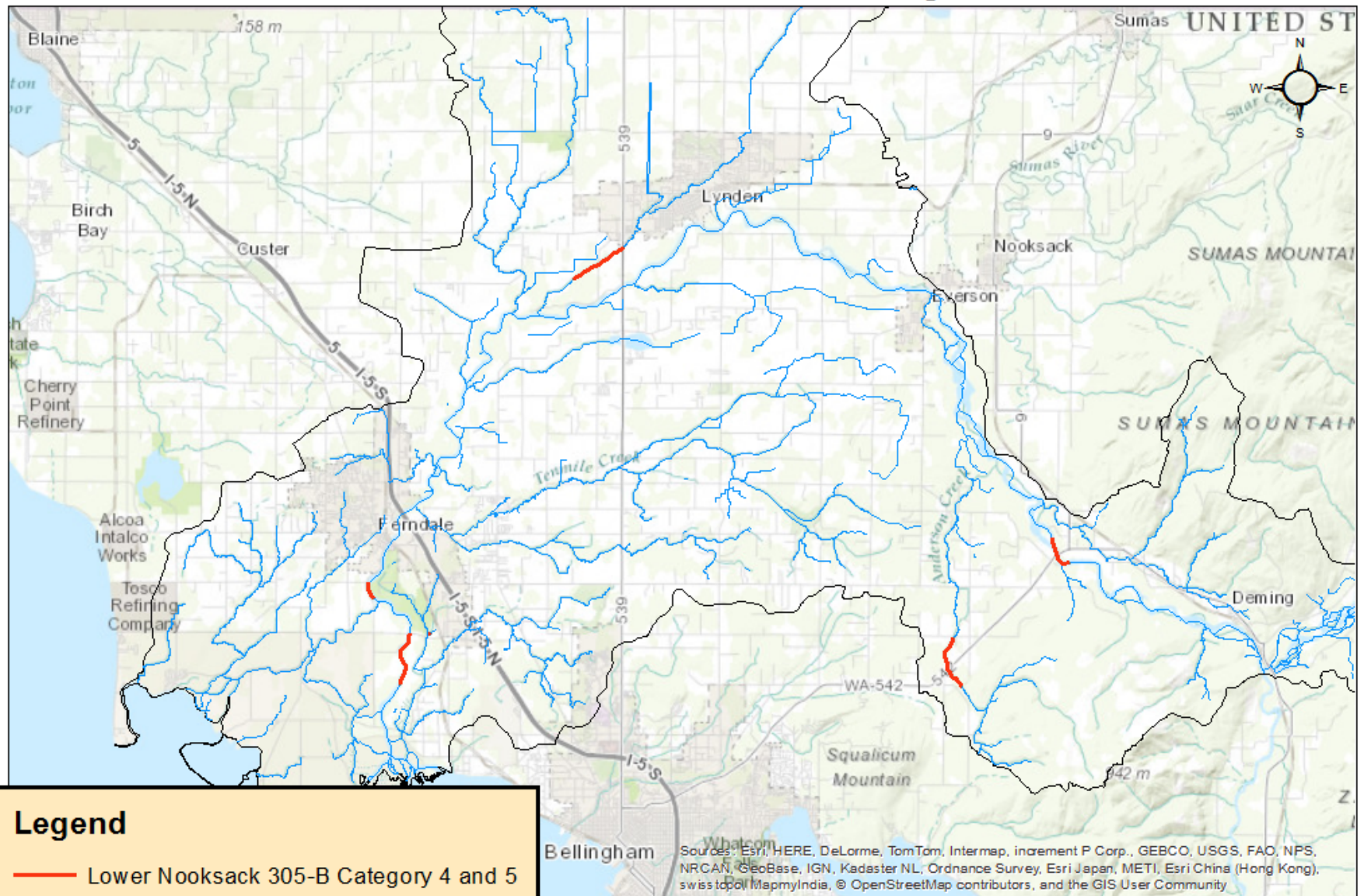
# 305-B

- Requires that each state prepare a water quality assessment report every 2 years
  - Demanded by the Federal Clean Water Act
  - Report prepared by Department of Ecology
- Ecology uses a sample survey approach that enables the estimation of the condition of 98% of streams and 100% of estuaries in Washington State.




# How We Used 305-B

- We focused only on 305-B temperature designations Categories 4 and 5
- Determined the linear percent of fish bearing water that falls within 305-B Categories 4 and 5 temperature designations
- **Limitations:**
  - Used DNR Stream Typing Layer – Not 100% accurate with fish use and on-the-ground stream location
  - Ecology cannot sample every waterway in the state, making estimation necessary.

# Lower Nooksack HUC 10 - Areas with Temperature Issues



## Legend

-  Lower Nooksack 305-B Category 4 and 5
-  DNR Stream Layer-Fish Use Only
-  Lower Nooksack HUC 10

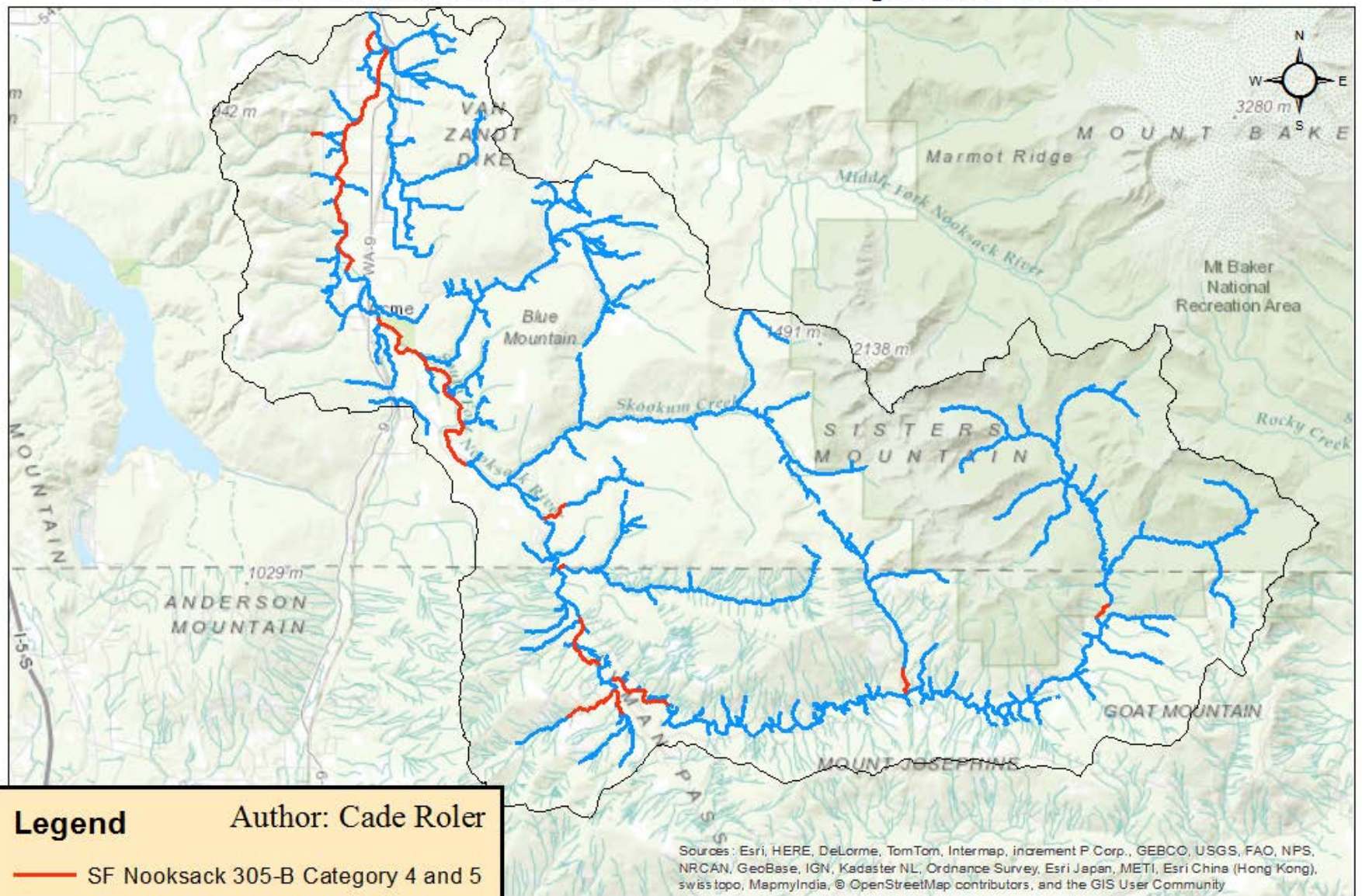
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community



Author: Cade Roler






# SF Nooksack HUC 10 - Areas with Temperature Issues



## Legend

Author: Cade Roler

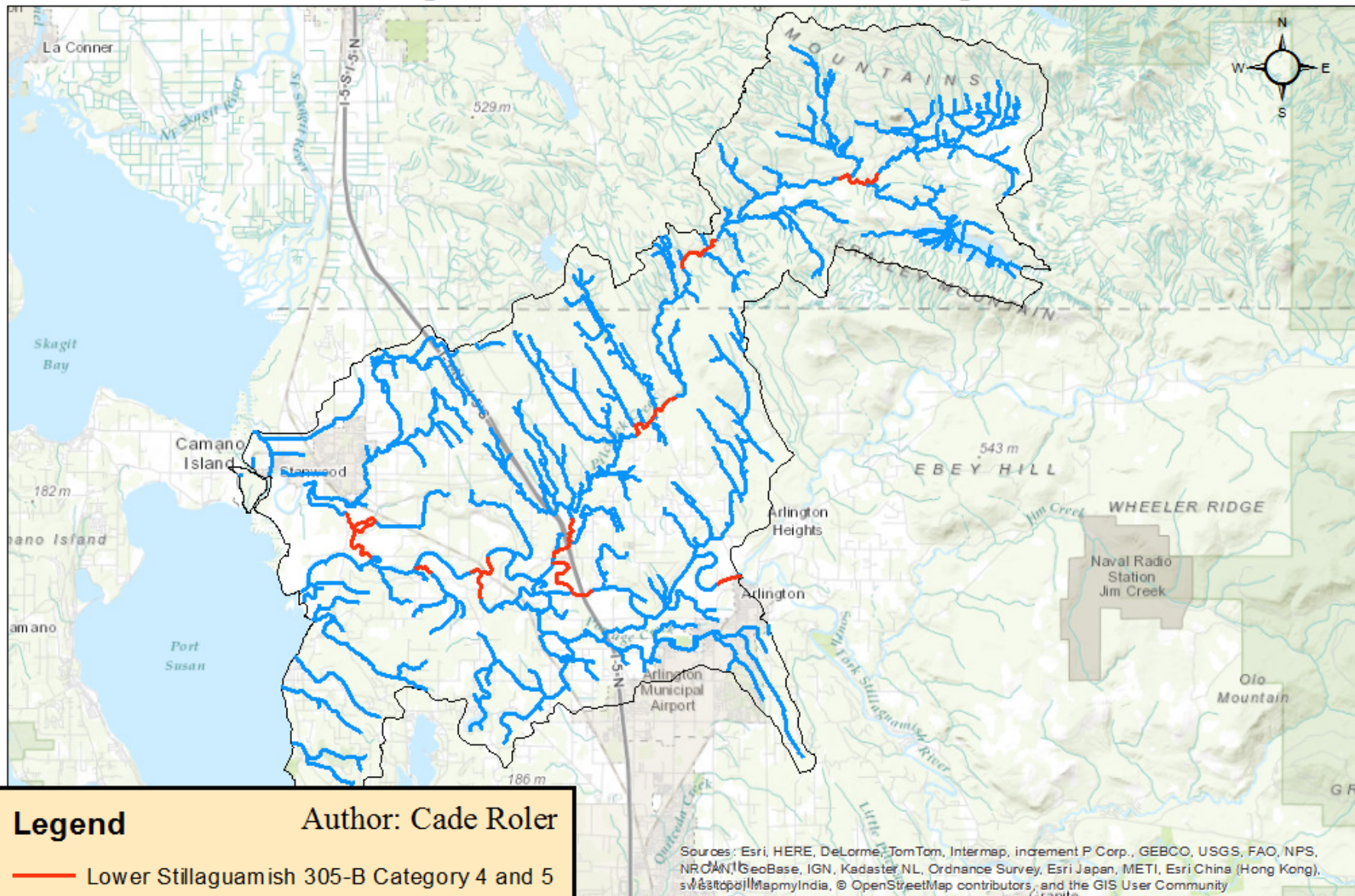
-  SF Nooksack 305-B Category 4 and 5
-  DNR Stream Layer-Fish Use Only
-  SF Nooksack HUC 10

Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

0 3.75 7.5 15 Miles






# Lower Stillaguamish HUC 10 - Areas with Temperature Issues



## Legend

Author: Cade Roler

-  Lower Stillaguamish 305-B Category 4 and 5
-  DNR Stream Layer-Fish Use Only
-  Lower Stillaguamish HUC 10

Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), Swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community





## 305-B Temperature Category 4 and 5 Totals:

305-B Category 4 and 5 only  
Length in Meters!

### Lower Nooksack HUC 10:

**Totals:**

**Temperature Length:**

7539.1379

**Stream Length:**

468844.7621

**Percentage 305B Category 4 and 5:**

1.61%

# Sample HUC 10 305-B Totals

<b>Lower Nooksack HUC 10:</b>				<b>Totals:</b>
Percentage 305B Category 4 and 5				<b>1.61%</b>
<b>N.F. Nooksack HUC 10:</b>				<b>Totals:</b>
Percentage 305B Category 4 and 5:				<b>4.31%</b>
<b>S.F. Nooksack HUC 10:</b>				<b>Totals:</b>
Percentage 305B Category 4 and 5:				<b>8.69%</b>
<b>Lower Stillaguamish HUC 10:</b>				<b>Totals:</b>
Percentage 305B Category 4 and 5:				<b>4.74%</b>
<b>Green/Duwamish HUC 10:</b>				<b>Totals:</b>
Percentage 305B Category 4 and 5:				<b>9.13%</b>
<b>Lower Nisqually HUC 10:</b>				<b>Totals:</b>
Percentage 305B Category 4 and 5:				<b>0.00%</b>

# Criteria #4

- Watershed's HUC 10 has limited Impervious Surfaces
  - Artificial structures: Parking Lots, Buildings, Roads, Sidewalks, etc.
  - High amounts of impervious surfaces reduce groundwater recharge, lead to decreased dissolved oxygen in streams, and cause degraded streams
  - Studies show that watersheds with impervious surfaces greater than 45% have a loss of ecological function and cannot sustain populations of most species of salmon (May, 1996)
- **Limitations:**
  - Small inaccuracies in the GIS algorithm





# Statewide Washington Integrated Fish Distribution (SWIFD)

- Data from WDFW and the Northwest Indian Fish Commission
- Uses categories for fish use
  - Documented
  - Presumed
  - Potential
  - Modeled

0 2.5 5 10 15 20 Miles



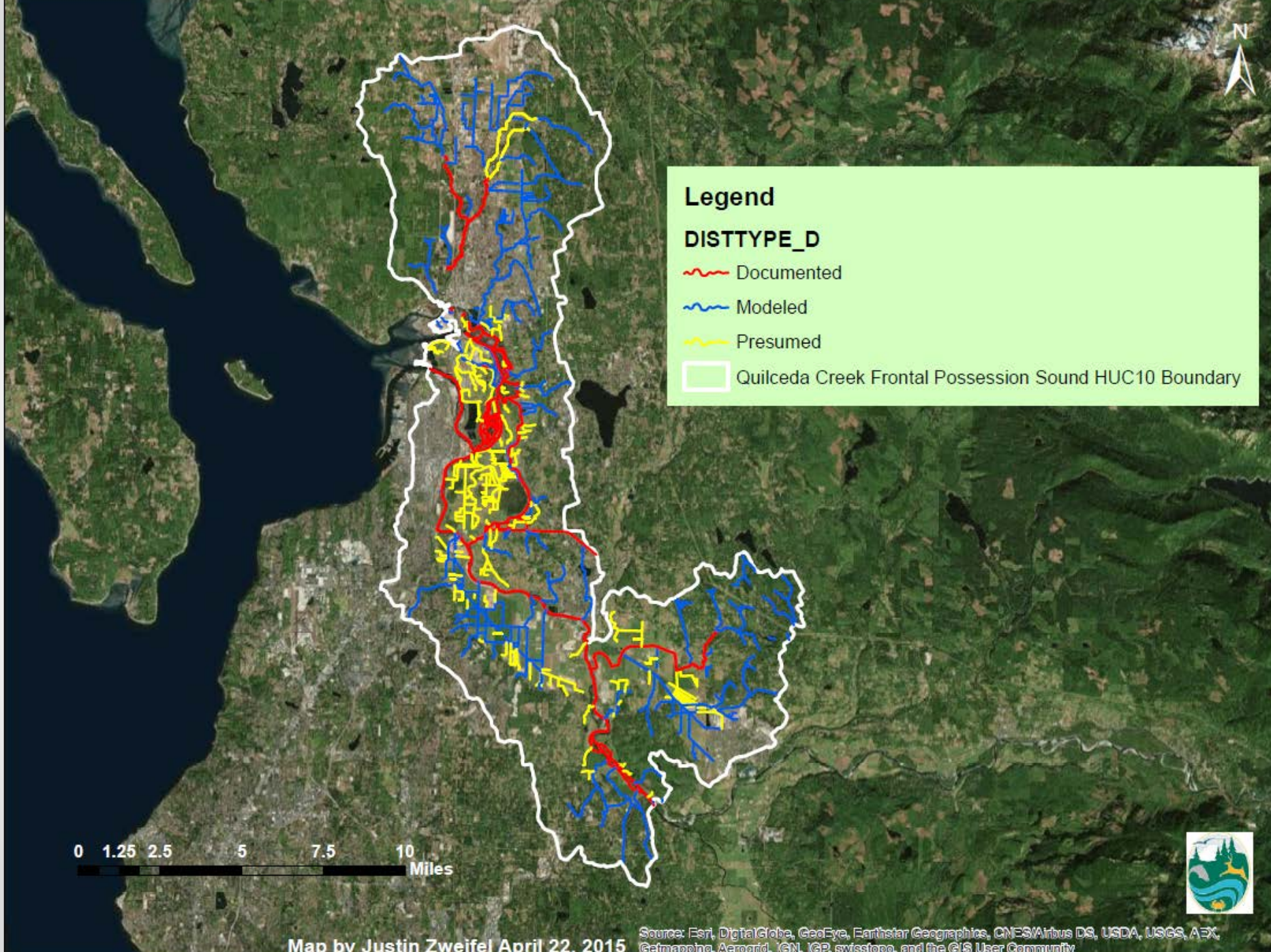
**Legend**

-  SWIFD layer for steelhead
-  stream layer
-  Cedar Sammamish Lead Entity boundary
-  Cedar Sammamish HUC 10 boundaries

Map by Justin Zweifel April 22, 2015


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community








**Legend**

**DISTTYPE\_D**

 Documented

 Modeled

 Presumed

 Quilceda Creek Frontal Possession Sound HUC10 Boundary

0 1.25 2.5 5 7.5 10 Miles

Map by Justin Zweifel April 22, 2015

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



# Advantages

- Includes all of WDFW and NWIFC's fish distribution data: known, presumed, historic, and modeled
- Good source for steelhead presence/absence

# Limitations

- Data collected using different methods
  - Cannot be compared statistically

# Criteria #6

- Watershed's HUC 10 has healthy riparian habitat. Consider total percentage of riparian coverage in a 150 meter buffer along anadromous streams
  - Use land coverage layer to identify the percentage of trees and shrubs within riparian buffers
  - HUC 10 riparian percentages would be compared throughout the Puget Sound
- **Limitations:**
  - Process is very time consuming
  - This criterion would give higher weight to HUC 10s higher in the watersheds
  - Small inaccuracies in GIS algorithm



# Other additional criteria and thoughts?

- County and city barriers as criterion?
  - Position in watershed
- Additional species?
- Any additional thoughts on criteria?