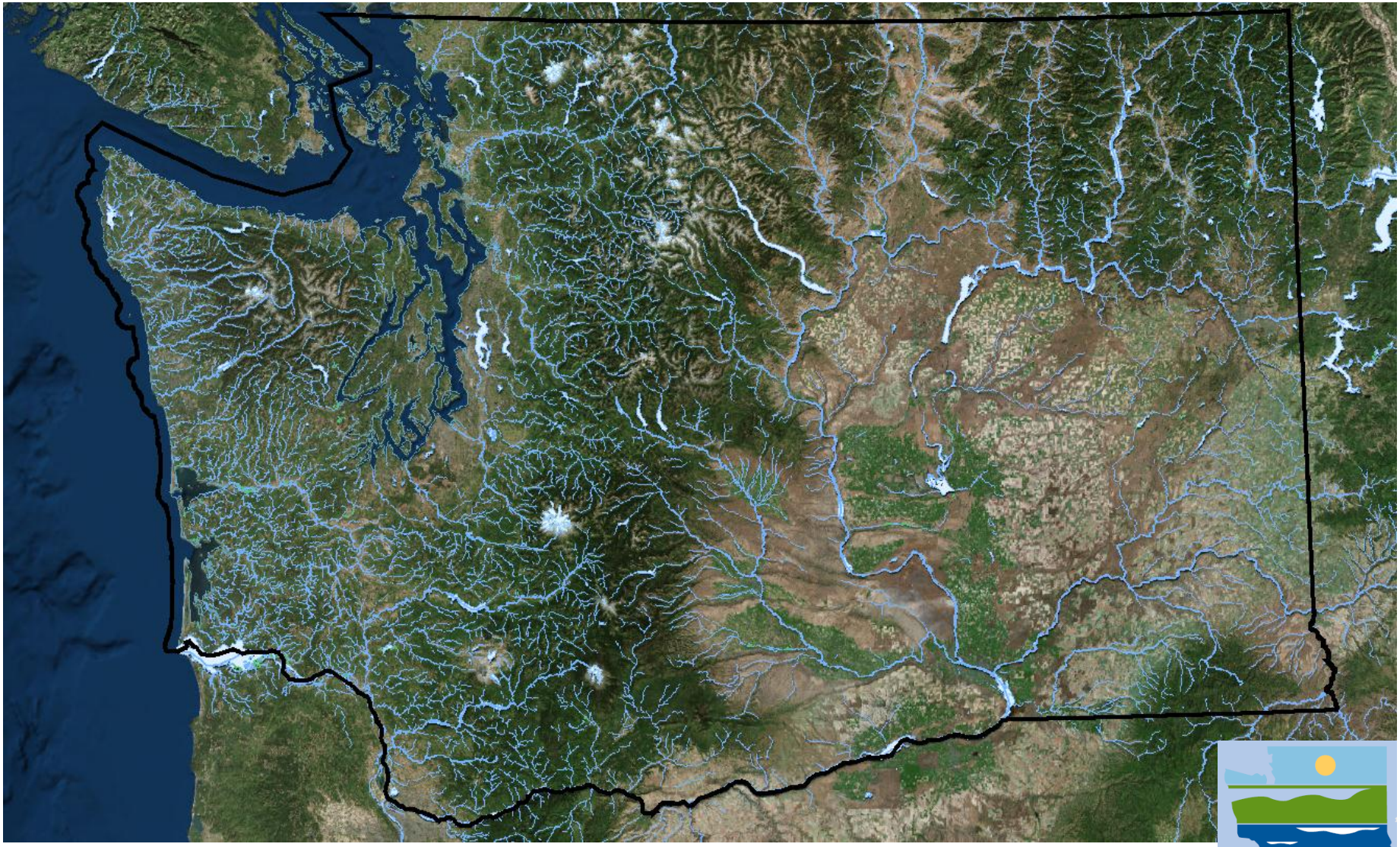
Putting the NHD to work in the State of Washington



Anita Stohr - Washington State NHD Hydrography Data Steward - Washington Department of Ecology

DEPARTMENT OF ECOLOGY State of Washington

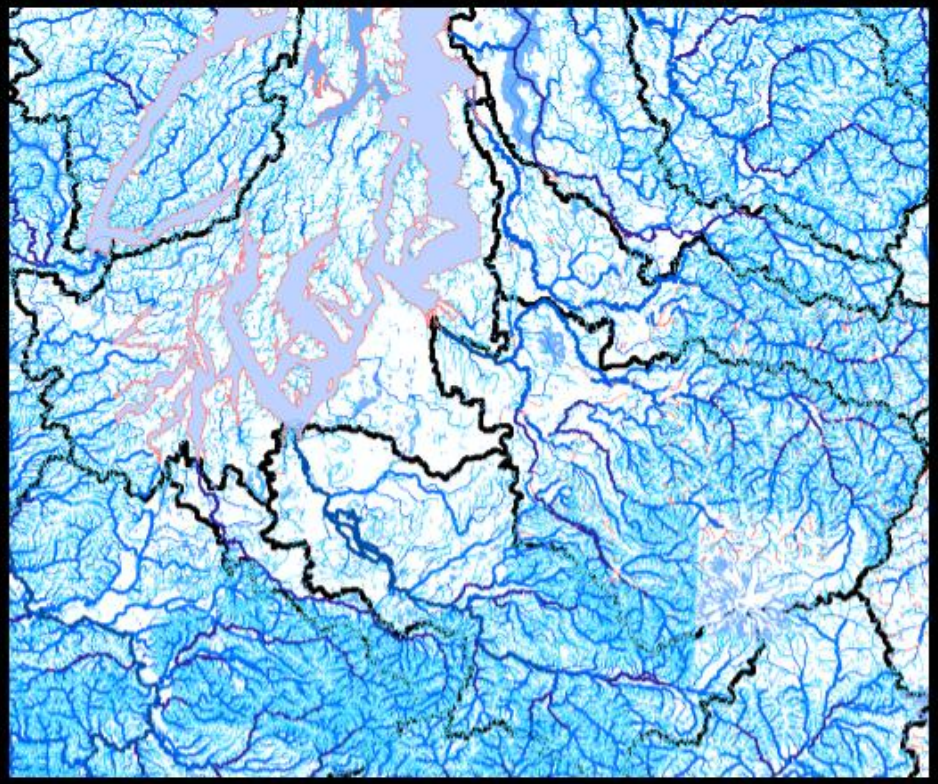
Putting the NHD to on

Anita Stohr - Washington State NHD Hydrography Data Steward - Washington Department of Ecology

DEPARTMENT OF ECOLOGY State of Washington

The Washington State Standard National Hydrography Dataset (NHD)

In January 2011, Washington adopted the National Hydrography Dataset (NHD) as the state standard for surface water hydrography.



Participants in decision:

- WA Dept of Ecology,
- WA Dept. Natural Resources,
- WA Dept. Fish and Wildlife,
- WA Dept. Health,
- Information Services, and the
- Northwest Indian Fish Commission

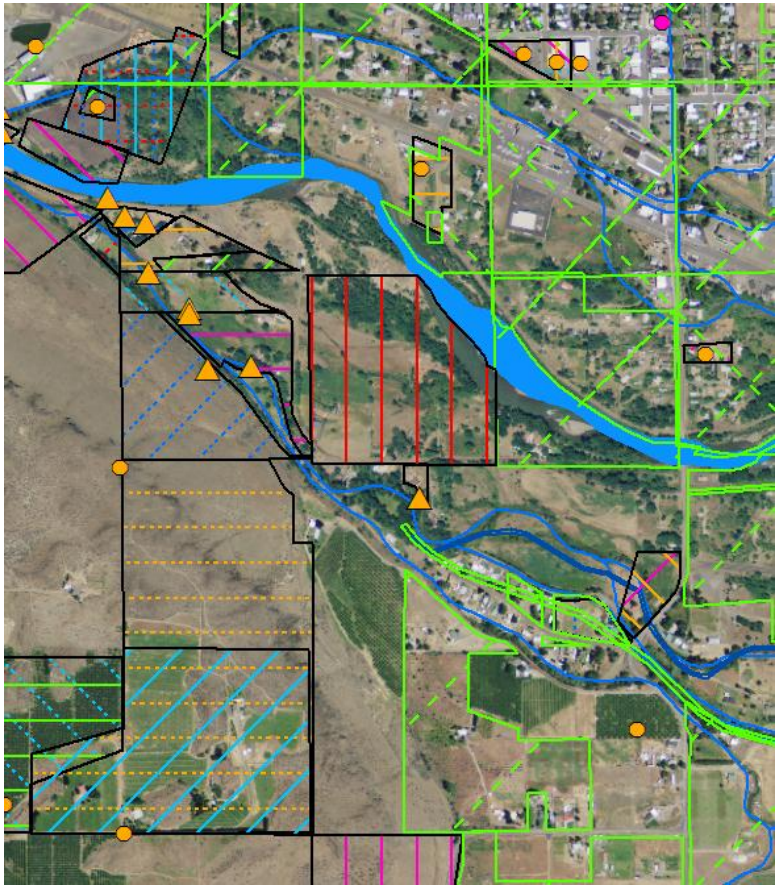
Goals:

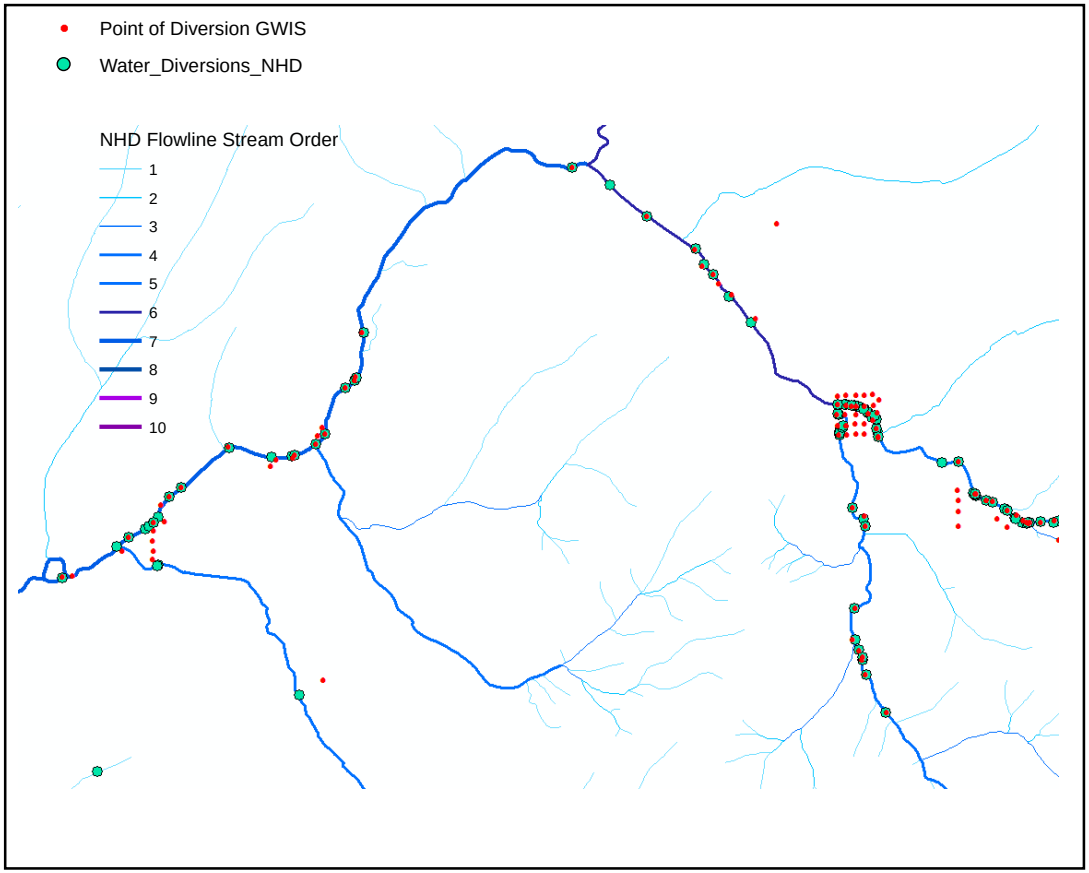
- Maintain just one copy of GIS map layers for rivers, lakes estuaries (and supported by USGS)

- Attach individual agency data/business needs through linear referencing (events)

Water Rights- Problem/Procedure/Solution

- In January 2015 we completed a three year USGS funded project to map Washington's Surface Water Diversions and State managed Dams.
- The Water Resources Program and the Information Technology Services Office worked together to map 37,000 Water Right's Points of Diversion as events on the National Hydrography Dataset (NHD).
- The largest of these diversions are currently being uploaded as point events to the NHDPointEventFC in The National Map.



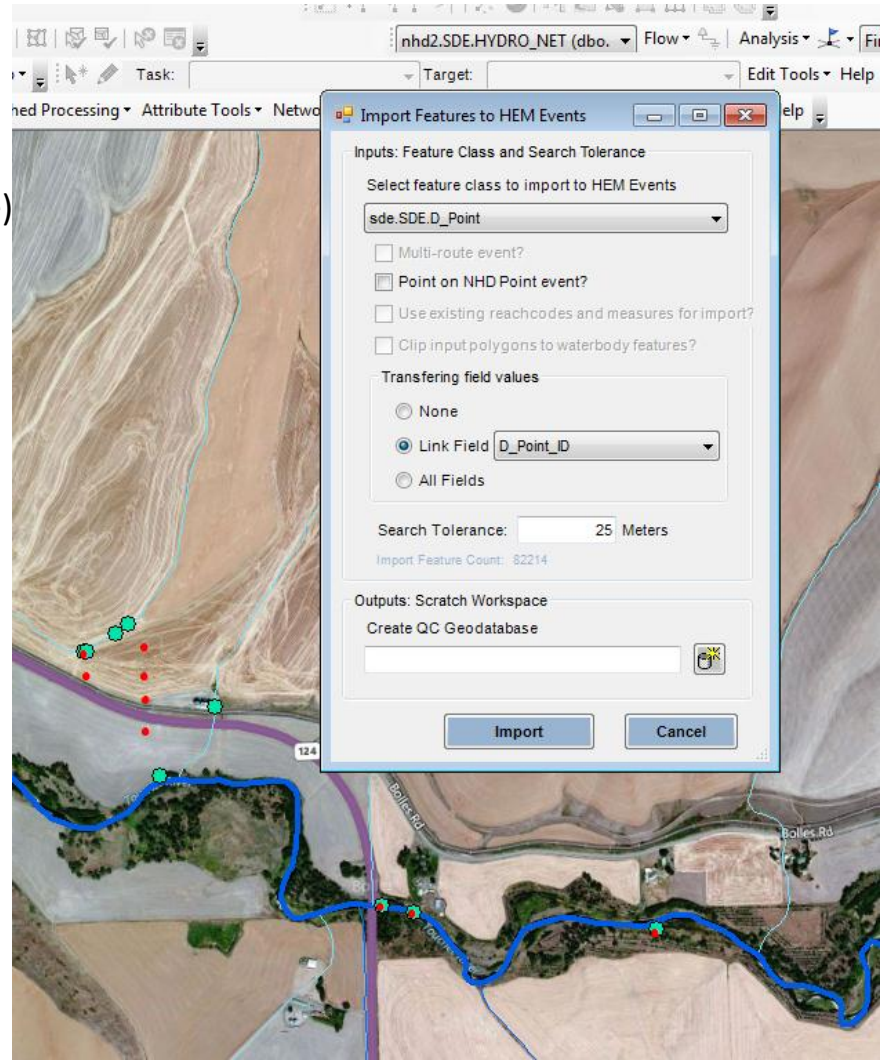


Water Rights- Procedure

- USGS HEM (Hydro Event Management) Software
- Extract source point data from GWIS
- Point to NHDFlowline State data
-
- Snap in 25 foot increments (keep dist as attribute)
- Join new snapped POD table by reachcode
- Compare GNIS name with source name

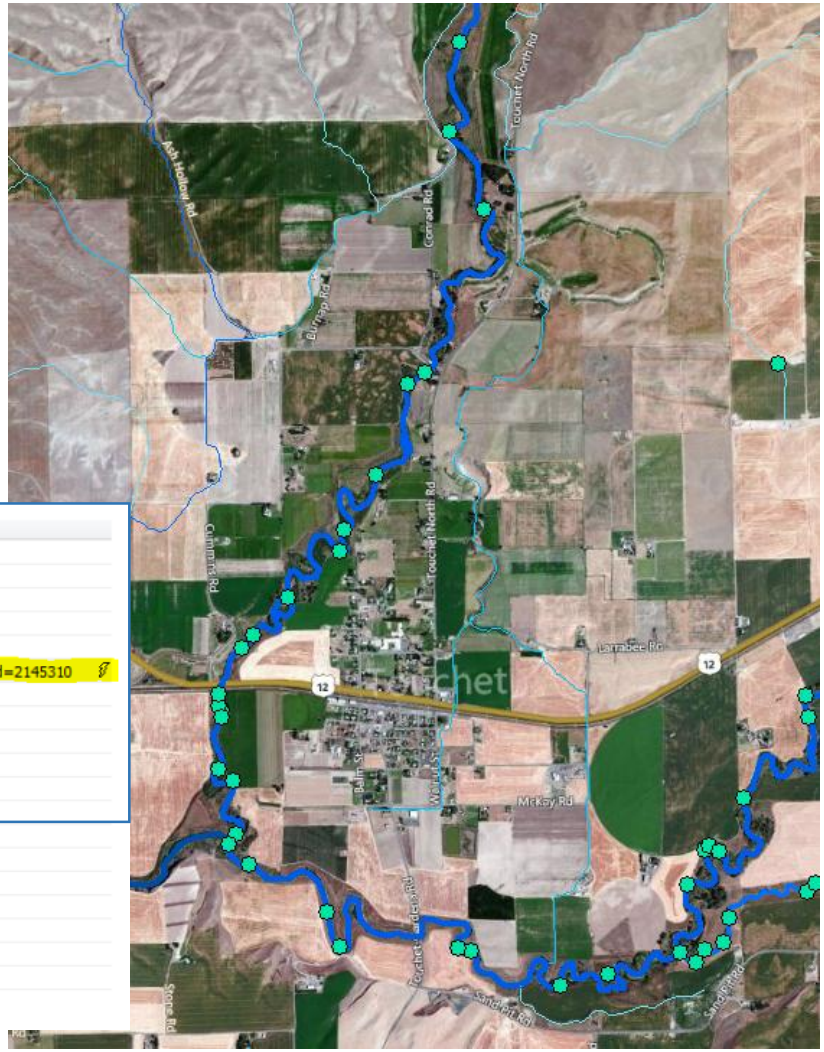
- Manually check
  - Diversions with no name match
  - Diversions > 1000 feet away
  - All lake diversions (artificial path issues)

- Problems (springs)
- Lots of research (50% needed manual check)
  - Water Rights Legal Documentation
  - Aerial Imagery



Water Rights- Solution

Field	Value
EventDate	7/31/2014 3:19:22 PM
ReachCode	17070102009565
ReachSMDate	2/22/2012
Feature_Permanent_Identifier	300140
FeatureClassRef	NHDFlowline
FeatureDetailURL	https://fortress.wa.gov/ecy/waterresources/map/WaterResourcesExplorer.aspx?wr_doc_id=2145310
Measure	92.38325
D_Point_ID	300140
Source_FeatureID	CCVOL2P507
WR_REPORT_STATUS	No Reporting
WR_Doc_NR	CCVOL2P507
WR_DOC_ID	2145310
Fill_CD	1
WR_Doc_Typ	CC
Quality_CD	G
wr_doc_j_2	2145310
region_cd	ERO
wr_doc_fil	S3-CV2P507
doc_type_c	CertChg
doc_cfs_qt	1.46



Water Rights- Solution

State of Washington [US] https://fortress.wa.gov/ecy/waterresources/map/WaterResourcesExplorer.aspx?wr_doc_id=2145310

Apps | HR Information Portal | USGS Real-Time Wa... | Suggested Sites | Imported From IE

DEPARTMENT OF ECOLOGY State of Washington

Water Resources Explorer

Water Resources | Quantity R... | ...er | Privacy Policy

Map Navigation Menu

Search Options | Layers | Selecte...

Record No. : S3-CV2P507

Quantities:
1.4600 CFS
0.000 Acre Feet

Purposes:
Irrigation

Source Names:
TOUCHET RIVER

Source Types:
Source Type Not Found

Submit Record

No diversion information available

Images:
Progress Sheet
Black and White 150 dpi
Certificate
Black and White 150 dpi

CERTIFICATE OF CHANGE OF POINT OF DIVERSION OF WATER

In accordance with the provisions of Chapter 117, Laws of Washington, for 1917, and amendments thereto, and rules thereunder of the State Supervisor of the Division of Water Resources.

THIS IS TO CERTIFY that [redacted]
has complied with all of the require
Code of Washington, and is hereby gr
of diversion of 1.125 second-foot A
second-foot September 15 to April 1
as granted in Certificate #203 of C
vs. West End Irrigation District et
NE¼SE¼ sec.10, T. 7 N., R. 33 E.W.M., to a point
NE¼SE¼ sec. 15, T. 7 N., R. 33 E.W.M.; such point being approximately
1¼ miles below the former point of diversion all within Walla Walla
County, Washington.

WITNESS THE SEAL and SIGNATURE of the Supervisor of the Division of Water Resources of the State of Washington, affixed this 3rd day of May, 1957.

W. G. WALKER, State Supervisor
DIVISION OF WATER RESOURCES

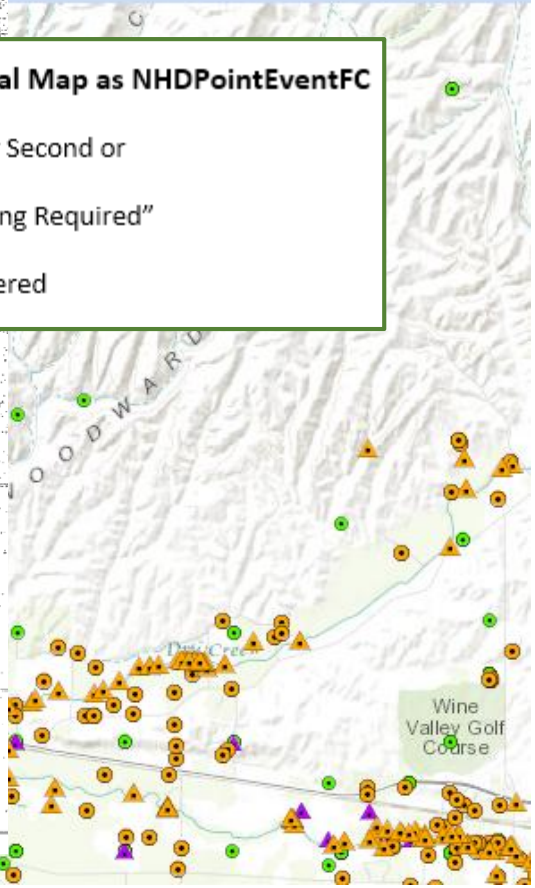
RECORDED:
Vol. 2, Page 507
Records of Change of
Point of Diversion
of Water.

Subset to upload to The National Map as NHDPointEventFC

Water quantity > 10 Cubic Feet per Second or

Water quantity > 5 cfs and "Metering Required"

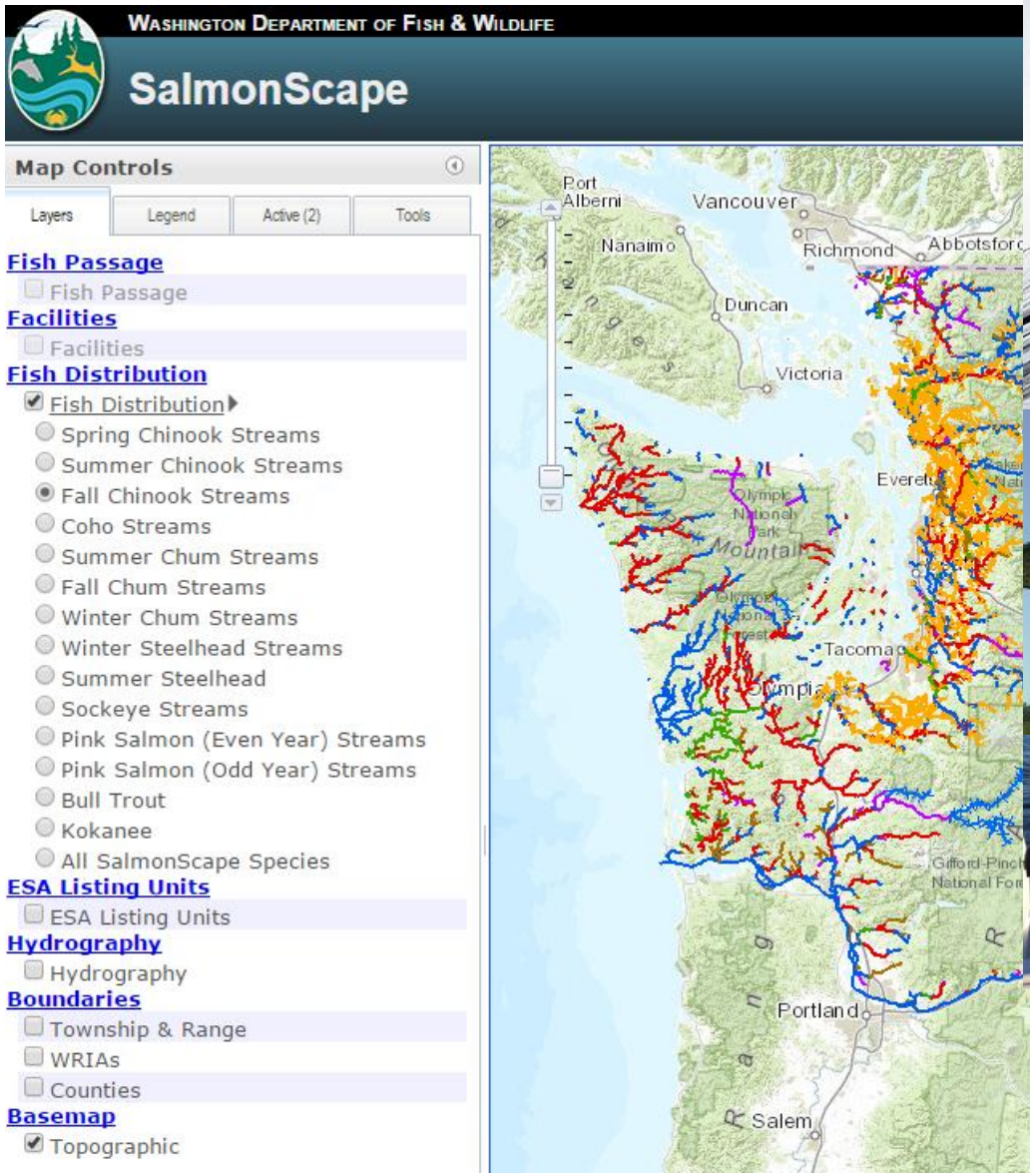
Remove "Claims" that are not metered



Fish Distribution

Washington Department of FISH and WILDLIFE

Northwest Indian Fisheries Commission
Serving the Treaty Tribes of Western Washington



Fish Distribution

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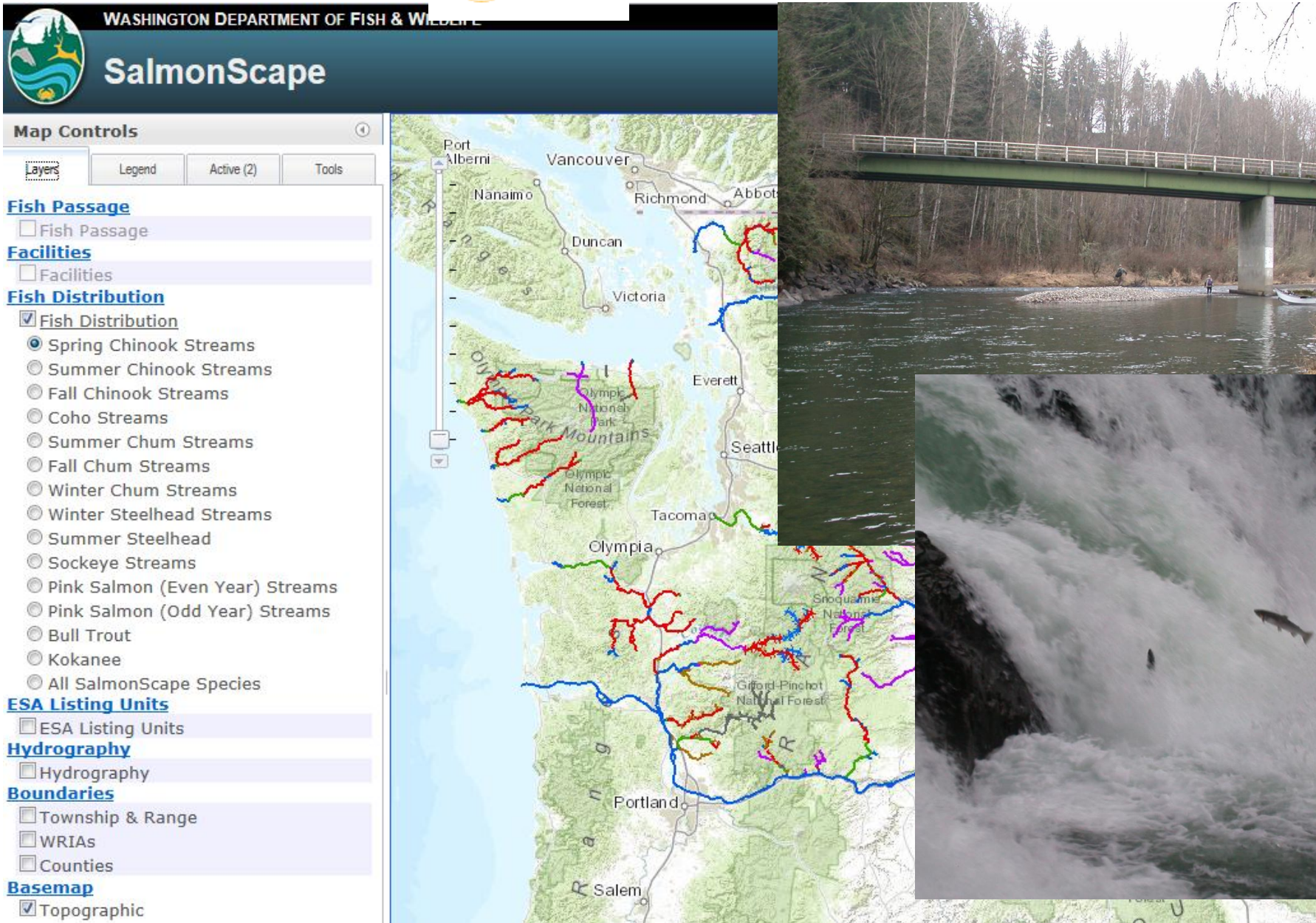


Fish Distribution

Washington Department of FISH and WILDLIFE

Northwest Indian Fisheries Commission
Serving the Treaty Tribes of Western Washington

WASHINGTON DEPARTMENT OF FISH & WILDLIFE

SalmonScape

Map Controls

Layers | Legend | Active (2) | Tools

- **Fish Passage**
  - Fish Passage
- **Facilities**
  - Facilities
- **Fish Distribution**
  - [x] Fish Distribution
    - (•) Spring Chinook Streams
    - ( ) Summer Chinook Streams
    - ( ) Fall Chinook Streams
    - ( ) Coho Streams
    - ( ) Summer Chum Streams
    - ( ) Fall Chum Streams
    - ( ) Winter Chum Streams
    - ( ) Winter Steelhead Streams
    - ( ) Summer Steelhead
    - ( ) Sockeye Streams
    - ( ) Pink Salmon (Even Year) Streams
    - ( ) Pink Salmon (Odd Year) Streams
    - ( ) Bull Trout
    - ( ) Kokanee
    - ( ) All SalmonScape Species
- **ESA Listing Units**
  - ESA Listing Units
- **Hydrography**
  - Hydrography
- **Boundaries**
  - Township & Range
  - WRIAs
  - Counties
- **Basemap**
  - [x] Topographic

Result 1 of 1
NHD Water Courses

Permanent_Identifier	165062797
FDate	2/26/2012 6:35:08 AM
GNIS_ID	<Null>
GNIS_Name	<Null>
ReachCode	17110009001680
FlowDir	WithDigitized
WBArea_Permanent_Identifier	<Null>
FType	StreamRiver
FCode	46006
StreamOrder	2

Result 1 of 2
Fall Chinook Streams

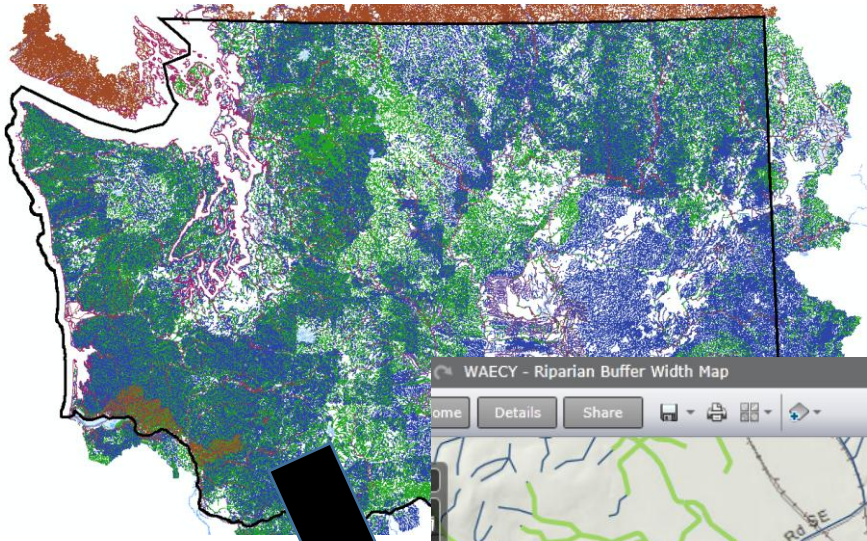
LLID	1217128478487
Stream Name	
Species / Run	Fall Chinook
Distribution Type	Modeled
Use Type	Presence
Life History	Anadromous
Length (miles)	1.92

Fish Distribution
Spring Chinook Streams
- Documented Presence
- Documented Spawning
- Documented Rearing
- Modeled Presence
- Presumed Presence
- Potential: Blocked
- Documented Historic Pres
- Transported Presence
- Transported Spawning
- Transported Rearing
- Documented-Artificial, Pre
- Documented-Artificial, Sp
- Documented-Artificial, Re

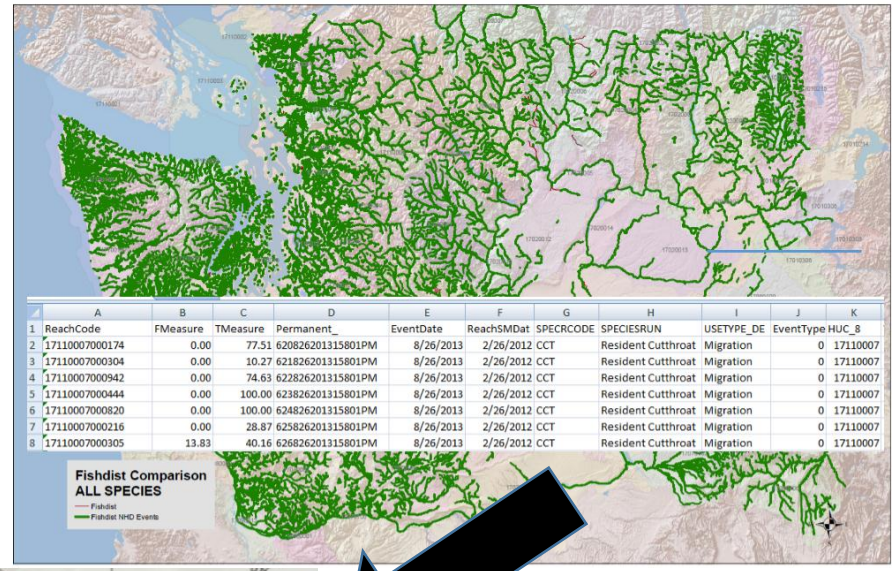
Port Alberni
Nanaimo
Kennewick
Salem
Whitman National Forest

Putting it together- a Riparian Web Map Example

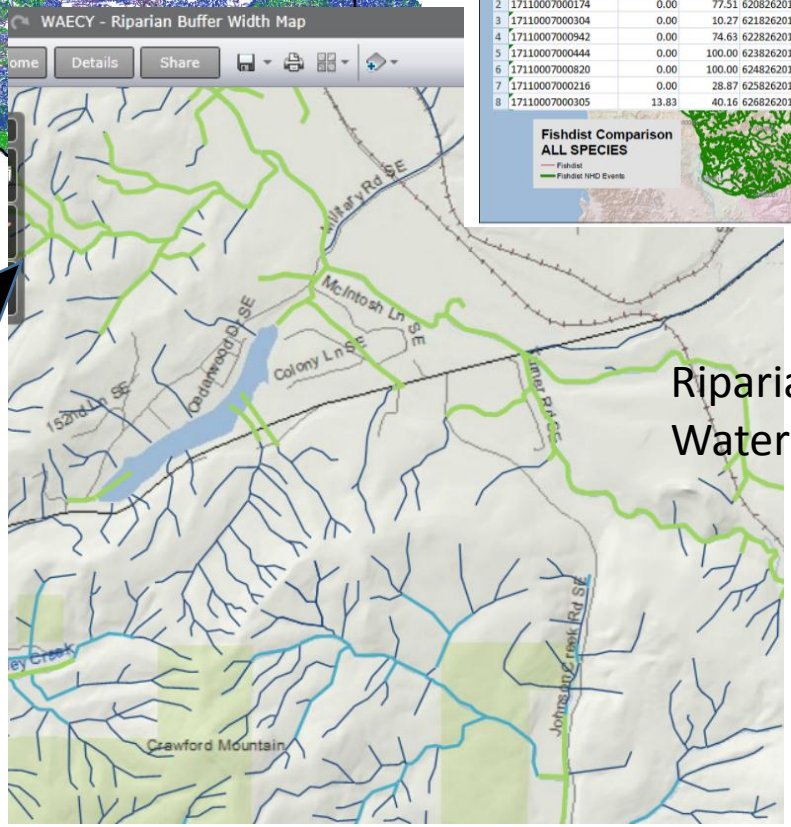
NHD "FCODE"



NWIFC/WDFW Combined Fish Distribution



	A	B	C	D	E	F	G	H	I	J	K
1	ReachCode	FMeasure	TMeasure	Permanent_	EventDate	ReachSMDat	SPECRCODE	SPECIESRUN	USETYPE_DE	EventType	HUC_8
2	17110007000174	0.00	77.51	620826201315801PM	8/26/2013	2/26/2012	CCT	Resident Cutthroat	Migration	0	17110007
3	17110007000304	0.00	10.27	621826201315801PM	8/26/2013	2/26/2012	CCT	Resident Cutthroat	Migration	0	17110007
4	17110007000942	0.00	74.63	622826201315801PM	8/26/2013	2/26/2012	CCT	Resident Cutthroat	Migration	0	17110007
5	17110007000444	0.00	100.00	623826201315801PM	8/26/2013	2/26/2012	CCT	Resident Cutthroat	Migration	0	17110007
6	17110007000820	0.00	100.00	624826201315801PM	8/26/2013	2/26/2012	CCT	Resident Cutthroat	Migration	0	17110007
7	17110007000216	0.00	28.87	625826201315801PM	8/26/2013	2/26/2012	CCT	Resident Cutthroat	Migration	0	17110007
8	17110007000305	13.83	40.16	626826201315801PM	8/26/2013	2/26/2012	CCT	Resident Cutthroat	Migration	0	17110007



Riparian Buffer Guidelines for Water Quality Grant Applicants

Riparian Buffer Width Web Map

- Business Need:
  - To clearly and easily derive the minimum riparian buffer width for applicants of Ecology's Water Quality grant funding of riparian BMPs.
  - To provide Ecology, EPA, and NWIFC with a consistent way to determine if a project meets minimum funding guidelines.

- ArcGIS Online was chosen to meet the critical requirement to quickly and easily develop a web map for public consumption of the information.

FY 2015 Funding Guidelines for Water Quality Grant Program

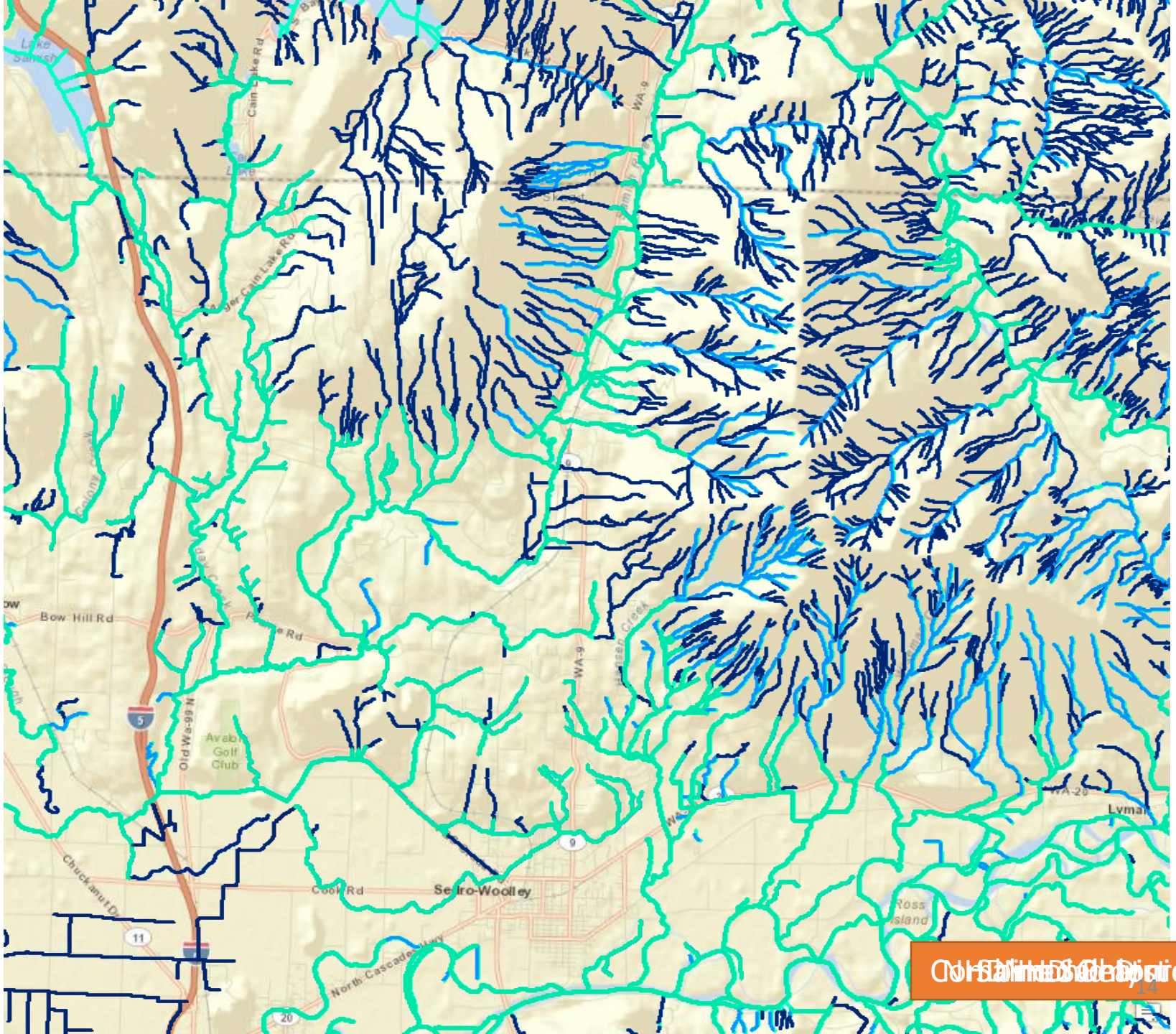
Table L- 1: Minimum Buffer Requirements for Surface Waters

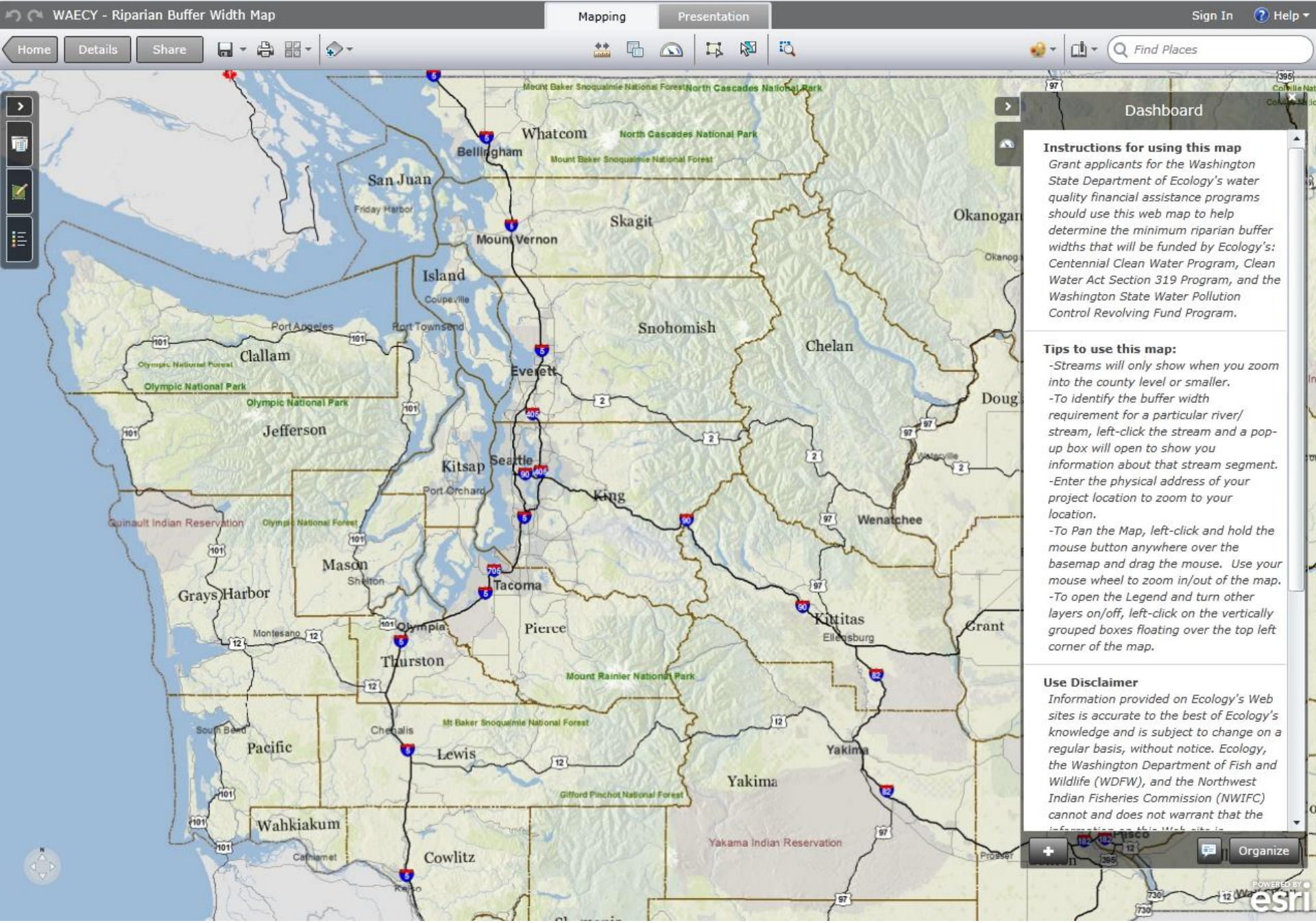
Category	Functions	Minimum Buffer Width West of Cascades	Minimum Buffer Width East of Cascades
A. Constructed Ditches, Intermittent Streams and Ephemeral Streams that are not identified as being accessed and were historically not accessed by anadromous or Endangered Species Act (ESA) listed fish species	Water quality, shade, source control and delivery reduction.	35' minimum	35' minimum
B. Perennial waters that are not identified as being accessed and were historically not accessed by anadromous or ESA listed fish species	Water quality, shade, source control and delivery reduction.	50' minimum	50' minimum
C. Perennial, intermittent and ephemeral waters that are identified as being accessed or were historically accessed by anadromous or ESA listed fish species	Water quality, large wood debris (LWD) for cover, complexity and shade and microclimate cooling, source control and delivery reduction.	100' minimum	75' minimum
D. Intertidal and estuarine streams and channels that are identified as being accessed or were historically accessed by anadromous or ESA listed fish species	Water quality, habitat complexity	35'-75'minimum, or more as necessary to meet water quality standards	N/A

Type of stream and seasonality
Uses **FCode** and **FType** attributes

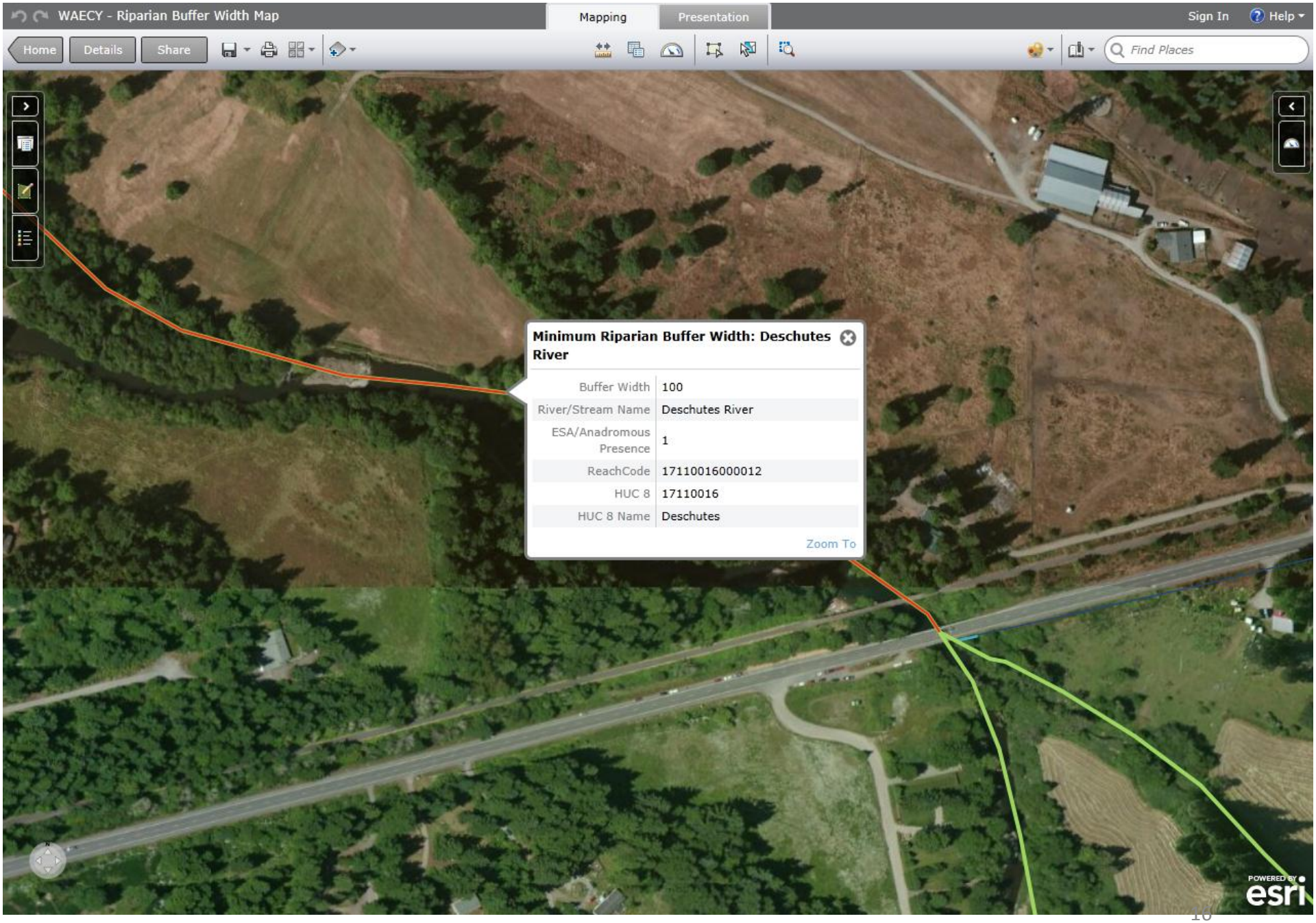
Salmonid/ESA
Distribution on NHD

The final buffer width category can be found in the funding guidelines at this link:
https://fortress.wa.gov/ecy/publications/SummaryPages/1310041.html


Lake Samish
Cain Lake Rd
Bow Hill Rd
Old Wa-99 N
Avalon Golf Club
Chuckanut Dr
Cook Rd
Sedro-Woolley
North Cascade Hwy
WA-9
WA-20
Lyman
Ross Island
5
9
11
20

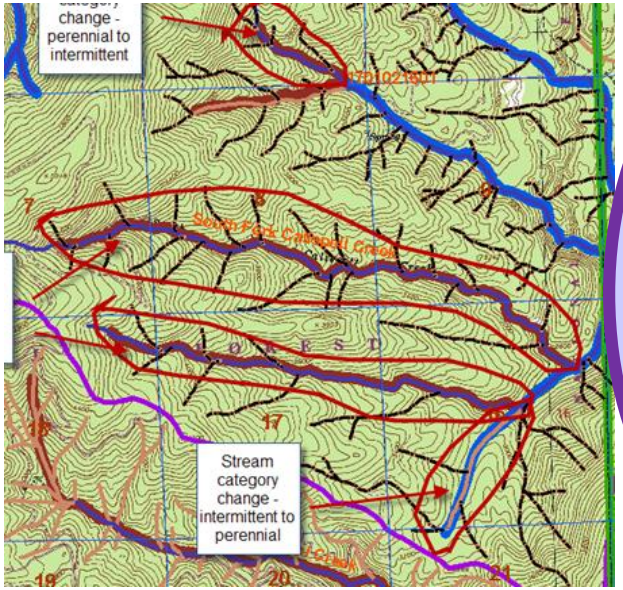


[ArcGIS Explorer Online](#) Link


WAECY - Riparian Buffer Width Map
Mapping
Presentation
Sign In
Help
Home
Details
Share
Find Places
Minimum Riparian Buffer Width: Deschutes River
Buffer Width 100
River/Stream Name Deschutes River
ESA/Anadromous Presence 1
ReachCode 17110016000012
HUC 8 17110016
HUC 8 Name Deschutes
Zoom To
POWERED BY esri

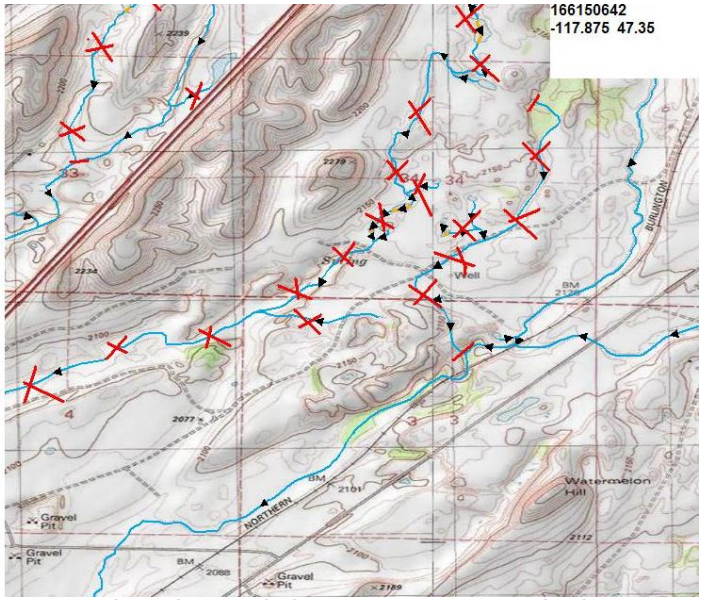
Stream Order- Strahler

Can I delete the black lines?

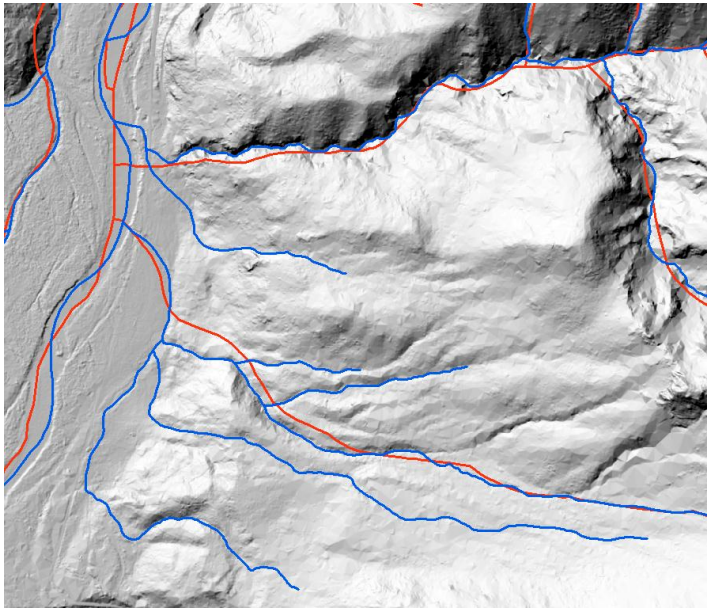


How do we code NHDFlowline to accommodate user's needs to see different density levels? incorporate lidar?

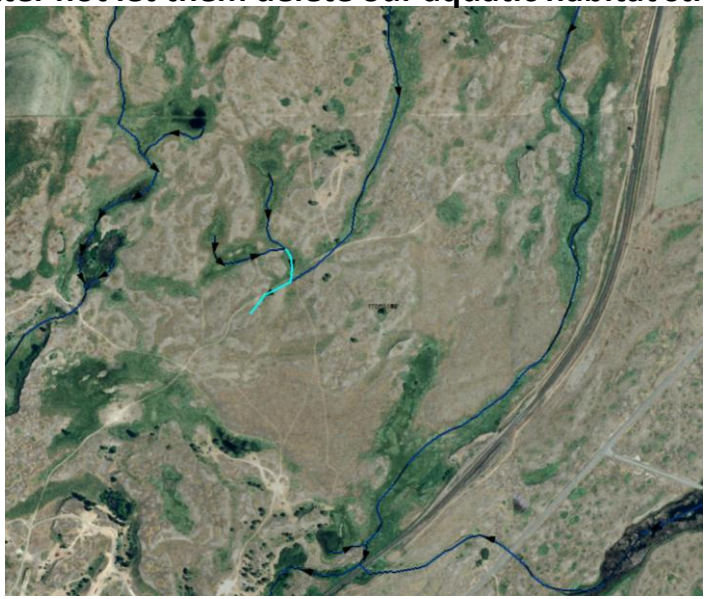
Can I delete the red x lines?



Can I add the blue lidar generated lines?



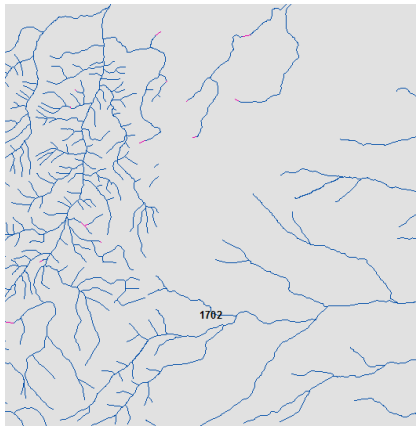
You better not let them delete our aquatic habitat streams.



Stream Order- Strahler

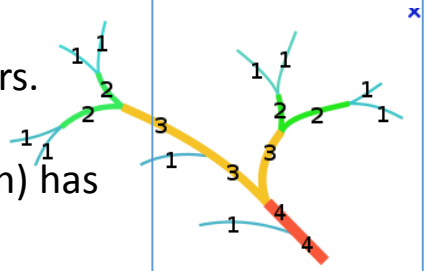
Stream Density: Pacific NW Hydro Framework Needs and Strategies *(Fall 2012 Meeting Topic)*

How do we code NHDflowlines to accommodate user's needs to see different density levels/incorporate lidar?



Density Dependent

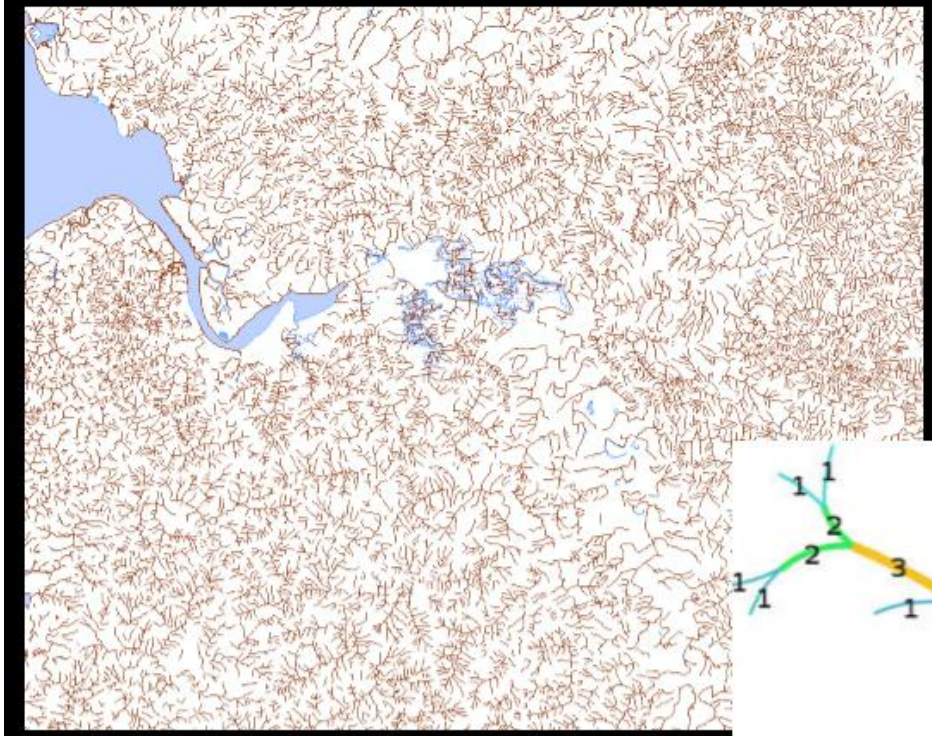
- **Stream Order**
  - Requested by many users.
  - VAA Field
  - Jay Stevens (BLM-Oregon) has process in place
- **Stream Level**
  - Lower numbers at mouth of stream
  - Set up for NHDplus processing
  - Most people recommend not using
  - Field populated until a few years ago?

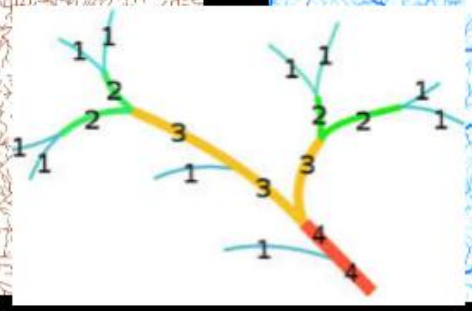


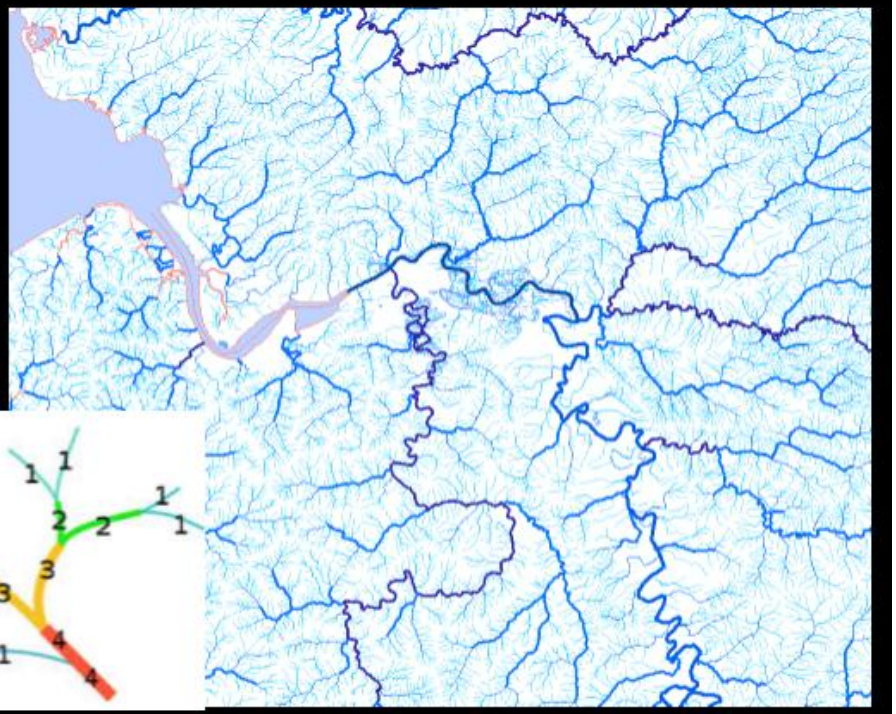
Density Independent

- **Mean Annual Flow (NHDPlus)-**
  - Flow = weighted area, precipitation, air temperature, regional correction factor
  - Horizon Systems using regression against gage data to improve estimates.
- **Periodicity**-perennial, intermittent, ephemeral (rules for?)
- **National Map generalization project**
  - Larry S. (will a flag be returned to the VAA table to show which Flowlines are selected for inclusion into the 1:24K national map?)

Stream Order project- January-April 2013







NHDFlowlineVAA

OBJECTID *	Permanent_Identifier *	FDate	StreamLevel	StreamOrder	FromNode	ToNode
312	129645531	6/17/2008 7:53:05 PM	6	2	<Null>	<Null>
313	129645532	6/17/2008 7:53:05 PM	7	1	<Null>	<Null>
314	129645538	6/17/2008 7:52:41 PM	7	2	<Null>	<Null>
315	129645540	6/17/2008 7:52:21 PM	6	3	<Null>	<Null>
316	129645544	6/17/2008 7:52:41 PM	6	1	<Null>	<Null>
317	129645545	6/17/2008 7:53:09 PM	7	1	<Null>	<Null>
318	129645546	6/17/2008 7:53:06 PM	6	1	<Null>	<Null>
319	129645550	6/17/2008 7:53:04 PM	5	1	<Null>	<Null>
320	129645552	6/17/2008 7:53:00 PM	5	1	<Null>	<Null>
321	129645554	6/17/2008 7:49:05 PM	5	1	<Null>	<Null>
322	129645555	6/17/2008 7:47:29 PM	5	1	<Null>	<Null>
323	129645565	6/17/2008 7:51:31 PM	5	2	<Null>	<Null>
324	129645566	6/17/2008 7:47:53 PM	5	2	<Null>	<Null>
325	129645567	6/17/2008 7:54:09 PM	5	1	<Null>	<Null>

Stream Order- Strahler

Procedure: By HUC4 Subregion

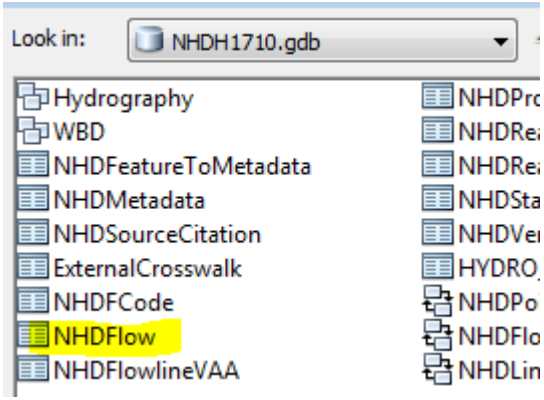
1. Copy NHDFlow table to server
2. Run QAQC python script to make sure network ends and pour points are valid
3. Run StreamOrder python script
4. In ArcMap Join the output table to Flowline with Permanent Identifier
5. Draw NHDflowline using st_order symbols

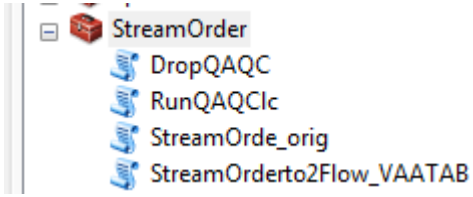
QC-

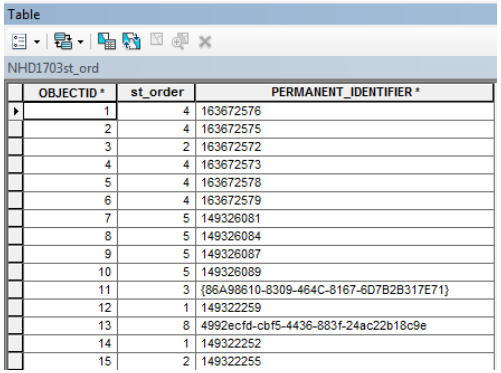
1. In some irrigated basins, canals crossing each other can artificially make the stream order too large. These are obvious
2. Make a copy of the NHD .gdb. And delete Flowlines that cause manmade features to create incorrect stream orders. *(keep a list deleted permanent IDs so that you don't need to do this process over the next time you run stream order)*
3. Run the BuildFlow NHDUtility from USGS.
4. REPEAT Procedure from 1 above.

Finalize-

1. When stream order is complete, Run python script to transfer orders to NHDFlowline and the VAA Table
2. Share with Oregon and USGS



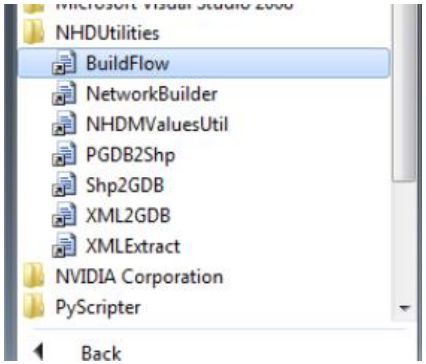




Table

NHD1703st_ord

OBJECTID *	st_order	PERMANENT_IDENTIFIER *
1	4	163672576
2	4	163672575
3	2	163672572
4	4	163672573
5	4	163672578
6	4	163672579
7	5	149326081
8	5	149326084
9	5	149326087
10	5	149326089
11	3	{86A98610-8309-464C-8167-6D7B2B317E71}
12	1	149322259
13	8	4992ecfd-cbf5-4436-883f-24ac22b18c9e
14	1	149322252
15	2	149322255



Questions?

Putting the NHD to work in the State of Washington

Acknowledgements
Brad Carlson (Water Diversions, Ecology)
Arleta Agun (Fisheries-WDFW)
Andy Weiss (Fisheries WDFW)
Tyson Waldo (Fisheries-NWIFC)
Dustin Bilhimer (Water Quality, Ecology)
Jay Stevens (Stream Order, Oregon BLM)
Darby Veeck (Stream Order, Ecology)
Brad McMillian (NHD, Ecology)

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