



Hydrography TWG

March 12, 2020





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AGENDA

- ***NHDPlusHR Value Added Attributes Demo.***

- LevelPathID
- TerminalPath

- ***National Stream Internet Project***

- **Updates**

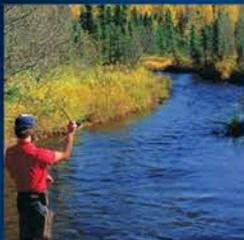
- WBD/NHD
- NHDPlusHR
- NHD/WBD Tool Status

- **Other Business**

- **Upcoming Events**

- **Next TWG**

Sept. 10, 2020



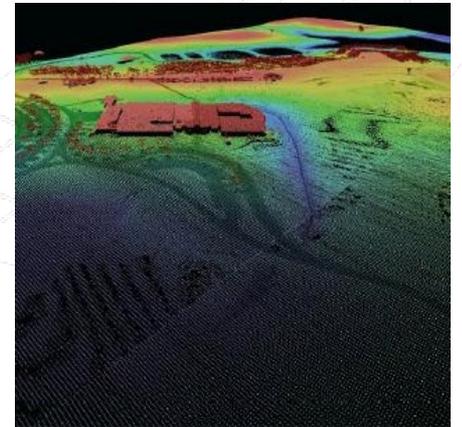
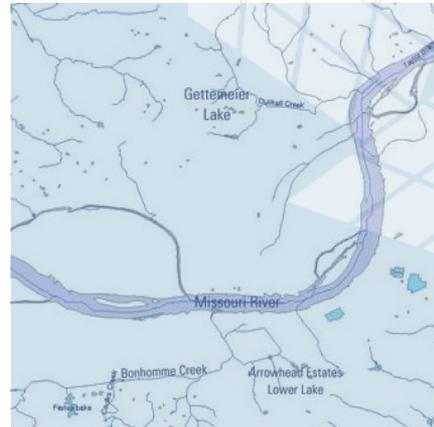
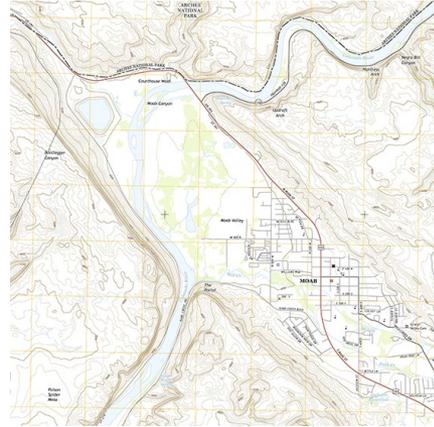
NHDPlusHR Value Added Attributes Demonstration



- Ariel Doumbouya, USGS



NHDPlus High Resolution Value Added Attributes: LevelPathID and TerminalPath





+ Presentation Overview

- NHDPlus High Resolution (NHDPlus HR)
- NHDPlus HR Flowline VAA Basics
- LevelPathID & Terminal Path
- Where to Find More Information

+ USGS National Hydrography Datasets

Hydrologic networks, units, catchments, and more...

Watershed Boundary Dataset (WBD)

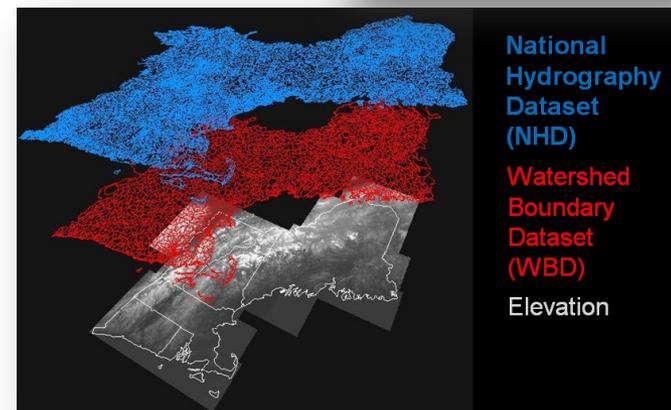
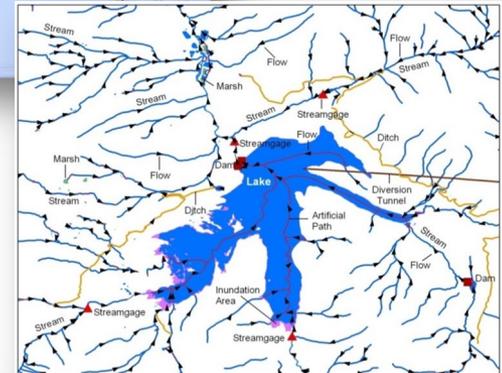
- The drainage basins at 8 scales of a nested hierarchy; defines the areal extent of surface water drainage to a point

National Hydrography Dataset (NHD)

- The drainage network with features such as rivers, streams, canals, lakes, ponds, and stream gages

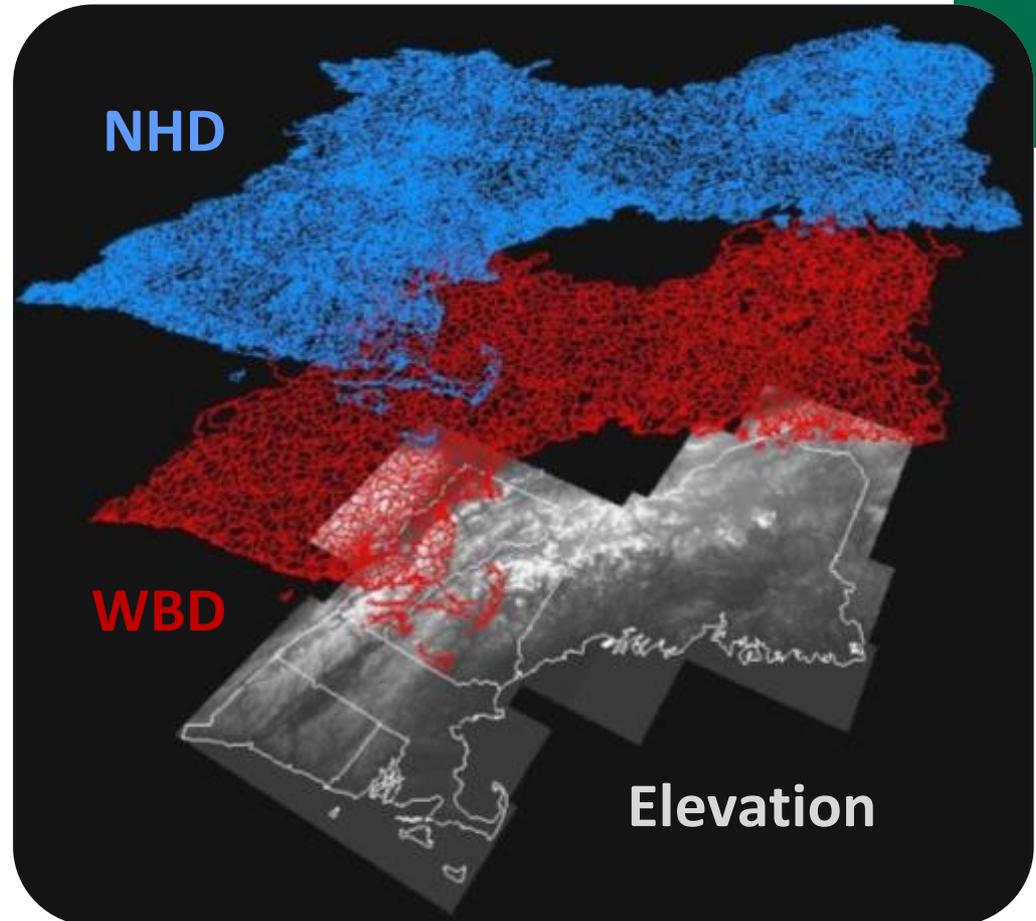
NHDPlus

- Incorporates features of the NHD, WBD and 3DEP elevation data to create a networked hydrography framework that incorporates the entire landscape



+ NHDPlus Completes the Framework

- Brings together NHD, WBD and elevation data to incorporate the landscape as a part of the stream network
- Creates a national framework for water-related information and enhance modeling capabilities
- Medium Resolution completed for CONUS (1:100,000), High Resolution in work (1:24,000)





+

NHDPlus 101

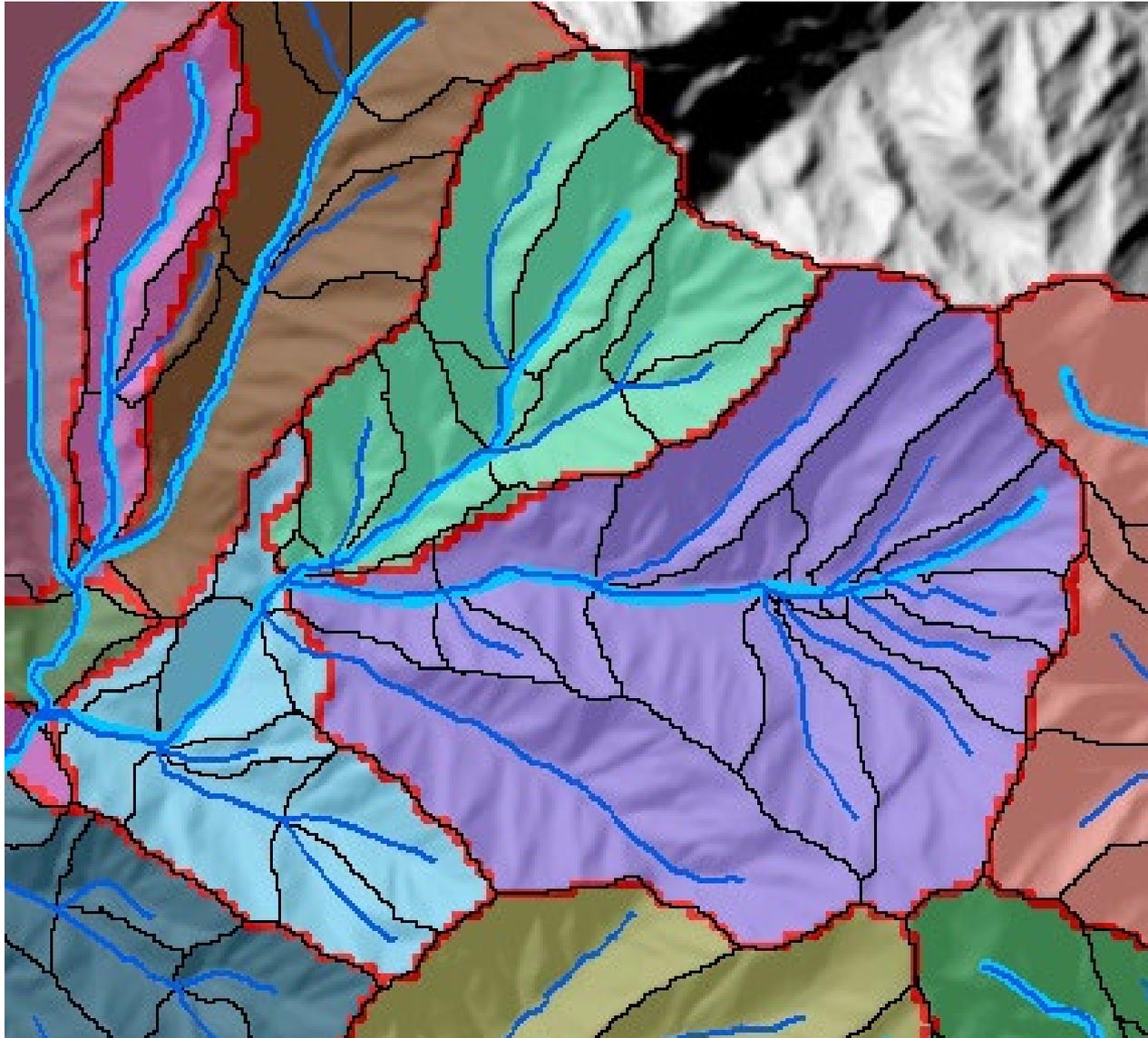
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NHDPlus is a digital stream network for hydrologic modeling with catchments and a suite of related geospatial data

- Includes:
 - Value Added Attributes that enhance stream network navigation, analysis and display
 - An elevation-based catchment area for each flowline in the stream network
 - Catchment characteristics, including mean annual precipitation, mean annual temperature, mean annual runoff, and mean latitude
 - Cumulative drainage area characteristics
 - Mean annual flow (1971-2000) and velocity estimates for each flowline with 10 years of continuous data for the above period
 - Flow direction, flow accumulation, elevation, and hydro-enforced elevation rasters
 - Headwater node areas
 - Flowline min/max elevations and slopes



+NHD*Plus* Develops More Detail



+ Accessing NHDPlus HR Data

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■ National Map Downloader

The screenshot displays the National Map Downloader interface. The browser address bar shows `viewer.nationalmap.gov/basic/`. The page header includes the USGS logo and navigation links like "How to", "Start Over", "Custom Views", and "Share Link".

On the left sidebar, the "Datasets" section is active. Under "Advanced Search Options", the "Find Products" button is highlighted with a red box and the number 4. Below this, the "Data" section has "Hydrography (NHDPlus HR, NHD, WBD)" selected, marked with a red box and the number 1. The "Product Search Filter" section has "NHDPlus High Resolution (NHDPlus HR)" selected, marked with a red box and the number 2. The "Data Extent" section has "HU-4 Subregion" selected, marked with a red box and the number 3. A "Description" button is visible next to a small map thumbnail.

The main map area shows a topographic map of the western United States, including Washington, Oregon, Idaho, Montana, and Wyoming. The map is overlaid with a grid of subregions, each labeled with a number (e.g., Subregion 1701, 1702, 1000, 1001). A search bar at the top of the map area contains the text "Search location." and "Go" and "Clear" buttons. The map also features a scale bar and a "Lat/Lng" display at the bottom showing coordinates 41.1356, -117.7163.

At the bottom of the page, there are links for "Accessibility", "FOIA", "Privacy", and "Policies and Notices".

+ Accessing NHDPlus HR Data

■ National Map Downloader

The screenshot shows the National Map Downloader website interface. On the left, a list of 'Available Products' is displayed under the 'Products' tab. The first product is highlighted with a red box. The product details for the highlighted item are:

- (NHDPlus HR) for 4-digit Hydrologic Unit - 1704 (published 20180827)
- Published Date: 2018-08-27
- Metadata Updated: 2019-07-18
- Format: NHDPlus HR Rasters (750.36 MB), Extent: HU-4 Subregion

Download options for this product are:

- Download 1 (Vector)
- Download 2 (Raster)

Red arrows point from the text 'Download 1: Vectors (gdb)' and 'Download 2: Rasters (folder)' to the respective download buttons. The right side of the interface shows a map of the region with subregion boundaries and various map controls.

+ Accessing NHDPlus HR Data

■ National Hydrography Website

The screenshot shows the homepage of the National Hydrography Website. The browser address bar displays 'usgs.gov/core-science-systems/ngp/national-hydrography'. The left sidebar contains a navigation menu with the following items: HOME, ABOUT NATIONAL HYDROGRAPHY PRODUCTS, ACCESS NATIONAL HYDROGRAPHY PRODUCTS (highlighted with a red box), DOCUMENTATION AND SPECIFICATIONS, RESOURCES, STEWARDSHIP AND COMMUNITY, GOVERNANCE, BENEFITS AND APPLICATIONS, NEWS, FAQs, and CONNECT. The main content area features a 'Home' section with a paragraph: 'The National Geospatial Program manages the [National Hydrography Dataset \(NHD\)](#), [Watershed Boundary Dataset \(WBD\)](#), and [NHDPlus High Resolution \(NHDPlus HR\)](#). These geospatial datasets represent the surface water of the United States for mapping and modeling applications.' Below this are three featured articles: 'Update National Hydrography with the Markup App' (with a 'Go There' button), 'NHDPlus HR - the Next Generation of National Hydrography' (with a 'Learn More' button), and 'Get the NHD Newsletter to keep up with the latest Hydrography info' (with a 'Read More' button). At the bottom, a paragraph states: 'The [National Hydrography Dataset \(NHD\)](#) and [Watershed Boundary Dataset \(WBD\)](#) form a rich geospatial data suite that map the Nation's surface water network and hydrologic drainage areas. The NHD, at 1:24,000-scale or larger, represents the Nation's rivers, streams, canals, lakes, ponds, glaciers, coastlines, dams, and streamgages, and related features. The WBD represents drainage areas of the country as eight nested levels of hydrologic units. The NHD and WBD are the most up-to-date and geographically inclusive hydrography datasets for the Nation.' A final paragraph explains: 'Together, the [NHD](#) and [WBD](#) act as an addressing system similar to streets ([NHD](#)) and ZIP Codes ([WBD](#)), creating an indexing and reporting system for water resources studies and information. Hydrographic addressing tools, such as the [Hydrography Event Management \(HEM\) Tool](#) and [HydroLink Tool](#), provide mechanisms to reference data to this surface water network. However, using the NHD and WBD alone, this addressing system does not have the ability to connect information about the surrounding landscape to the stream network.'

+ Accessing NHDPlus HR Data

■ National Hydrography Website

Download by Link

NHDPlus High Resolution (NHDPlus HR) Direct Download Links

Please note: The NHDPlus High Resolution is being released for download in Beta version (NHDPlus HR Beta) by 4-digit Hydrologic Unit (HU4) as it is built. Please see the [NHDPlus High Resolution](#) (NHDPlus HR) page for more information about this building process, to find out the current availability by 2-digit Hydrologic Unit (HU2), and to learn about participating in reviews of the Beta version data.

The NHDPlus HR data includes both vector and raster components for each geographic area mapped. NHDPlus HR Beta vector data is available in file geodatabase (GDB) format, zipped (.zip) to reduce the file size. NHDPlus HR raster data files are available for download as zipped (.7z) files.

- [Download the NHDPlus HR by 4-digit Hydrologic Unit \(HU4\)](#)
- [Download the NHDPlus HR by 8-digit Hydrologic Unit \(HU8\) - Alaska Only](#)

National Hydrography Dataset (NHD) Direct Download Links

The NHD High Resolution can be directly downloaded in shapefile or file geodatabase (GDB) format by [Hydrologic Unit \(HU\)](#), state, or the entire nation. Also, an extract containing only streamgages and dams is available.

- [Download the NHD by 4-digit Hydrologic Unit \(HU4\)](#)
- [Download the NHD by 8-digit Hydrologic Unit \(HU8\)](#)
- [Download the NHD by State](#)
- [Download the NHD by the Entire Nation](#)
- [Download streamgages and Dams only](#)

Watershed Boundary Dataset (WBD) Direct Download Links

The WBD can be directly downloaded in shapefile or file geodatabase format by 2-digit [Hydrologic Unit \(HU2\)](#) or as a file geodatabase for the entire nation.

- [Download the WBD by 2-digit Hydrologic Unit \(HU2\)](#)
 - [Download the WBD by the Entire Nation](#)
- National data are refreshed monthly.

- [Download the WBD from the NRCS Geospatial Data Gateway](#)

Watershed Boundaries can also be downloaded from the Natural Resources Conservation Service. Data on the Geospatial Data Gateway are refreshed every six months (March and September).

Map Services

Hydrography web-based map services are available from [The National Map Service Endpoints](#) page as cached



+ Accessing NHDPlus HR Data

- 4 downloads per unit (HU/VPU)

← → ↻ 🏠 🔒 prd-tnm.s3.amazonaws.com/index.html?prefix=StagedProducts/Hydrography/NHDPlus/HU4/HighResolution/GDB/

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2018-08-28T08:11:21.000Z	10.6 GB	NHDPLUS_H_1701_HU4_RASTER.7z
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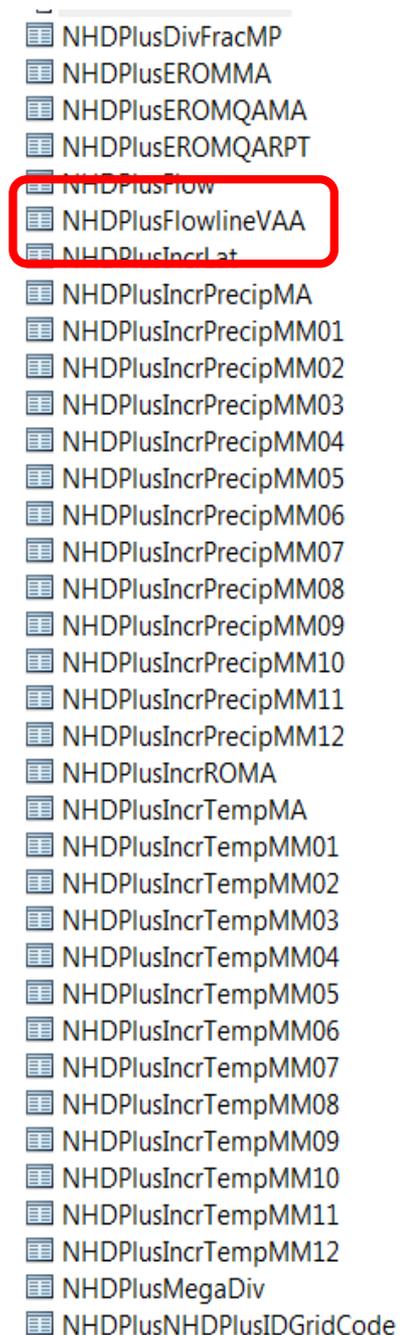
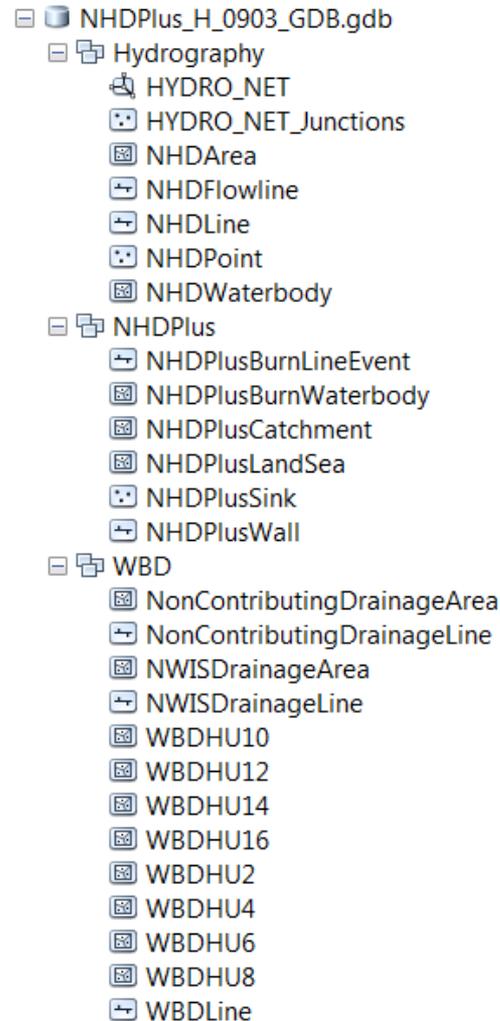


+NHDPlus Value Added Attributes (VAAs)

- The result of building NHDPlus HR is a set of value added geospatial layers and hundreds of attributes.
- Many of the attributes are computed from the analysis of the NHD network.
- These attributes are designed to make the NHD network more powerful and easier to use.

+ NHDPlus HR VAAs

- A set of value added attributes (VAAs) to enhance stream network navigation, analysis and display (inc. stream order)
- Catchment characteristics
- Cumulative drainage area characteristics
- Flowline min/max elevations and slopes (in meters)
- Flow volume (Q) & velocity (V) estimates for each flowline in the stream network

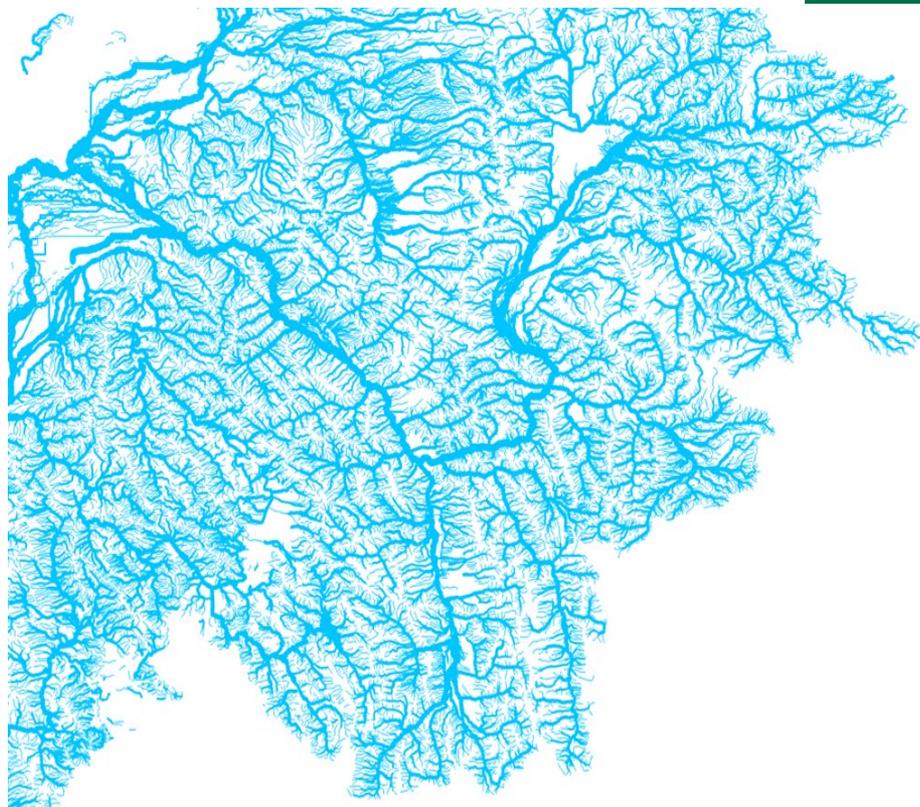




+ NHDPlus HR VAAs

Categories

1. NHDFlowline Attributes
2. Navigation Attributes
3. Analysis Attributes



NHDPlus HR Beta 1704
Weighted symbology based on NHDPlus
HR VAA: StreamOrder



+ NHDPlus HR VAAs

Analysis Attributes

Designed to support network analysis

StreamOrder	StreamCalculator (StreamCalc)
LevelPathIdentifier (LevelPathI)	UpstreamMainPathLevelPathID (UpLevelPat)
DownstreamMainPathLevelPathID (DnLevelPat)	PathLength
UpstreamCummulativeStreamKM (ArbolateSum)	TerminalPathIdentifier (TerminalPathI)

+ NHDPlus HR VAAs

Join NHDFlowline FC with NHDPlusFlowlineVAA table

- NHDPlusID is the join field
- These are the only 2 feature classes/tables required for this demonstration.

The screenshot displays the ArcGIS Desktop interface. The central map shows a watershed with blue flowlines and pink VAA boundaries. A specific VAA is labeled '1704'. The left pane shows the 'Contents' window with 'NHDFlowline' and 'WBDHU4' checked. The right pane shows the 'Geoprocessing' window with the 'Add Join' dialog box open. The dialog box is highlighted with a red border and contains the following settings:

- Layer Name or Table View: NHDFlowline
- Input Join Field: NHDPlusID
- Join Table: NHDPlusFlowlineVAA
- Output Join Field: NHDPlusID
- Keep All Target Features

The status bar at the bottom indicates a scale of 1:2,750,000 and coordinates 112.4643428°W 41.1466391°N.

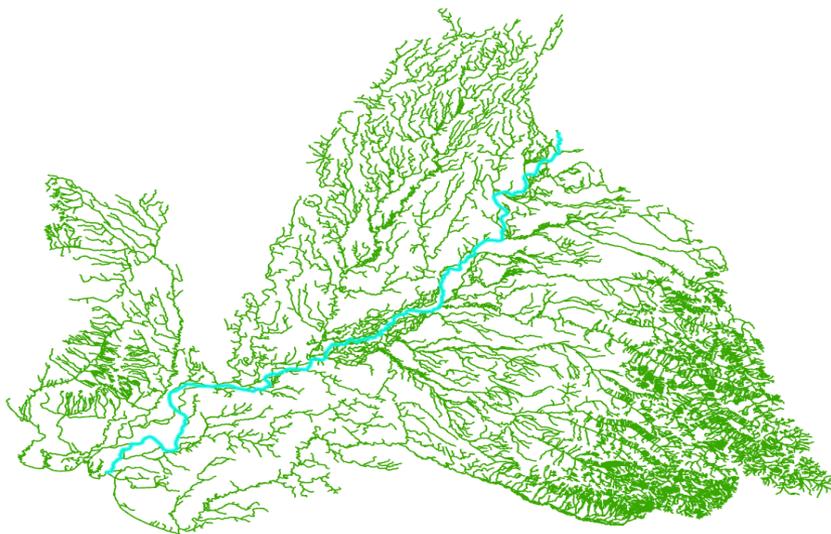


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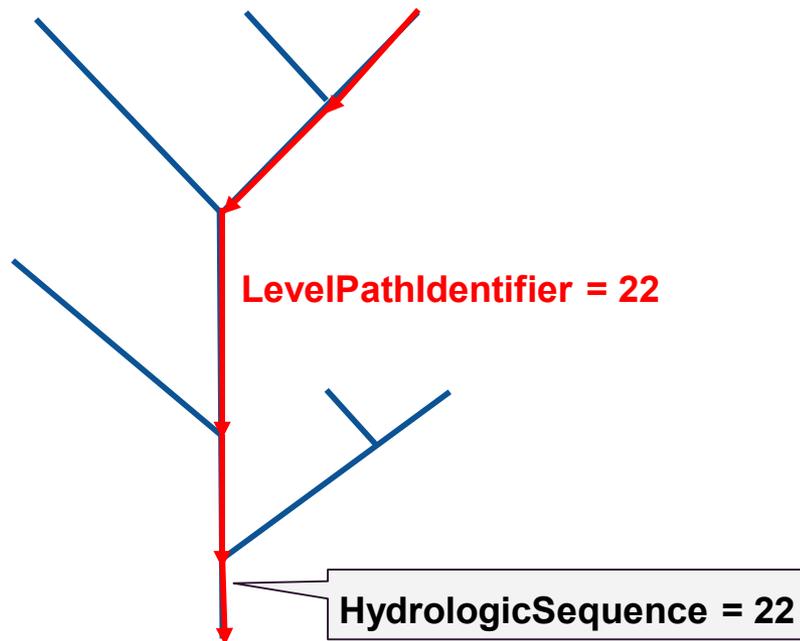
NHDPlus HR VAAs

Analysis Attributes: LevelPathIdentifier

- The identifier for all the flowlines on a level path from mouth to headwaters
- River Main Stem
- HydrologicSequence number of the most downstream flowline of a specific river



NHDPlus HR Beta 19020505



+ NHDPlus HR VAAs

Dissolve: LevelPathIdentifier

- Input: Joined NHDFlowline and NHDPlusFlowlineVAA
- Optional Step: Statistics Fields

The screenshot displays the ArcGIS Desktop interface during a Dissolve operation. The map shows a blue area with a red outline and a red '1703' label. The Geoprocessing pane on the right shows the Dissolve tool with 'LevelPathIdentifier' as the Dissolve Field(s) and 'NHDPlusID' (Count) and 'LengthKM' (Sum) as Statistics Fields. The Contents pane shows 'LevelPathID' and 'NHDFlowline_LevelPathID' layers. The Attribute Table shows a table with columns: OBJECTID_1, Shape, LevelPathIdentifier, COUNT_NHDPlusID, SUM_LengthKM, and Shape_Length.

OBJECTID_1	Shape	LevelPathIdentifier	COUNT_NHDPlusID	SUM_LengthKM	Shape_Length
1	Polyline ZM	<Null>	5803	6396.417557	69.298748
2	Polyline ZM	55000500182580	203	149.981287	1.657354
3	Polyline ZM	55001200000001	1	1.19	0.014103
4	Polyline ZM	55001200000002	1	1.557	0.018051
5	Polyline ZM	55001200000003	1	1.877	0.020374
6	Polyline ZM	55001200000004	1	1.001	0.011595
7	Polyline ZM	55001200000005	1	0.645	0.007841
8	Polyline ZM	55001200000006	1	0.828	0.010094
9	Polyline ZM	55001200000007	1	1.193	0.0134

+ NHDPlus HR VAAs

InNetwork = No

- Currently corresponds to FlowDir = Uninitialized
- No NHDPlus HR VAAs computed for these features

The screenshot displays the ArcGIS Desktop interface. The main map window shows a watershed boundary with a flow direction raster overlaid. A specific feature is highlighted with a red number '1704'. The 'Contents' pane on the left shows the layer 'NHDPlusFlowline' selected. The 'Geoprocessing' pane on the right shows the 'Select Layer By Attribute' tool with the expression `NHDPlusFlowline.InNetwork = No`. Below the map, a table of features is displayed, showing that all selected features have 'InNetwork' set to 'No'.

hCode	FlowDir	WBArea_Permanent_I	FType	FCode	MainPath	InNetwork
212000609	Uninitialized	<Null>	Pipeline	Pipeline: Pipeline Type = Siphon	Unspecified	No
212001506	Uninitialized	<Null>	Pipeline	Pipeline: Pipeline Type = Siphon	Unspecified	No
214172626	Uninitialized	<Null>	Pipeline	Pipeline: Pipeline Type = Siphon	Unspecified	No
212003747	Uninitialized	<Null>	Pipeline	Pipeline: Pipeline Type = Siphon	Unspecified	No
212000578	Uninitialized	<Null>	Pipeline	Pipeline: Pipeline Type = Siphon	Unspecified	No
203140696	Uninitialized	<Null>	Pipeline	Pipeline: Pipeline Type = Siphon	Unspecified	No
208145132	Uninitialized	<Null>	Pipeline	Pipeline: Pipeline Type = Siphon	Unspecified	No
208141601	Uninitialized	<Null>	Pipeline	Pipeline: Pipeline Type = Siphon	Unspecified	No

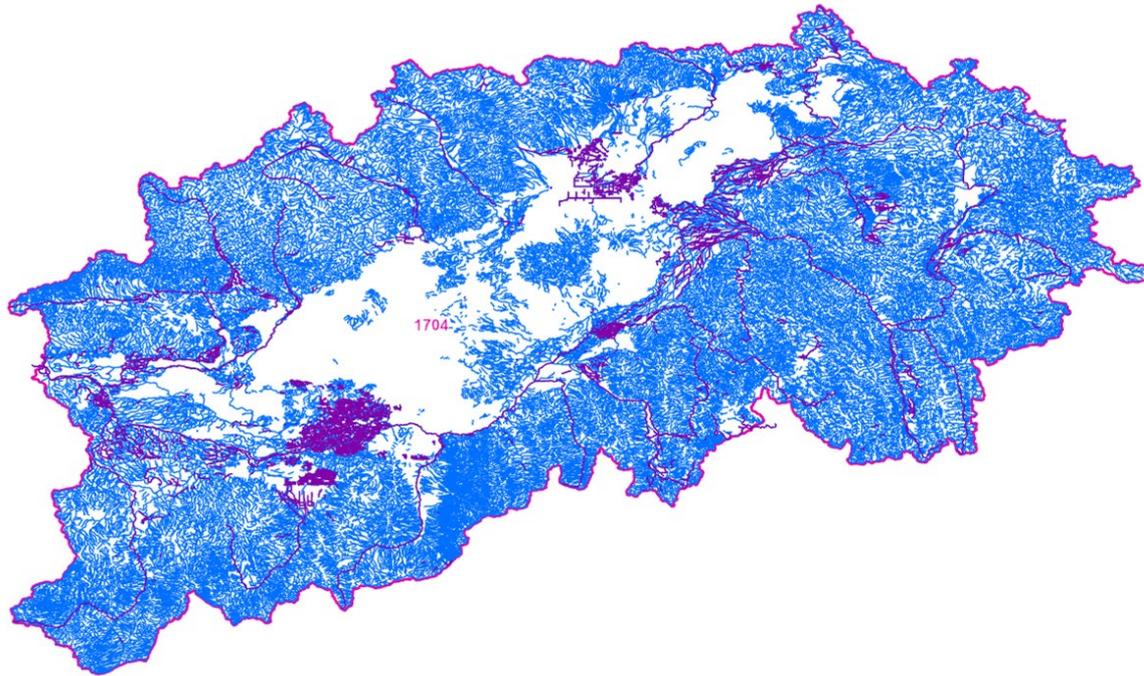
5,803 of *2,000 selected

Select Layer By Attribute completed. View Details Open History

+ NHDPlus HR VAAs

Analysis Attributes: LevelPathIdentifier

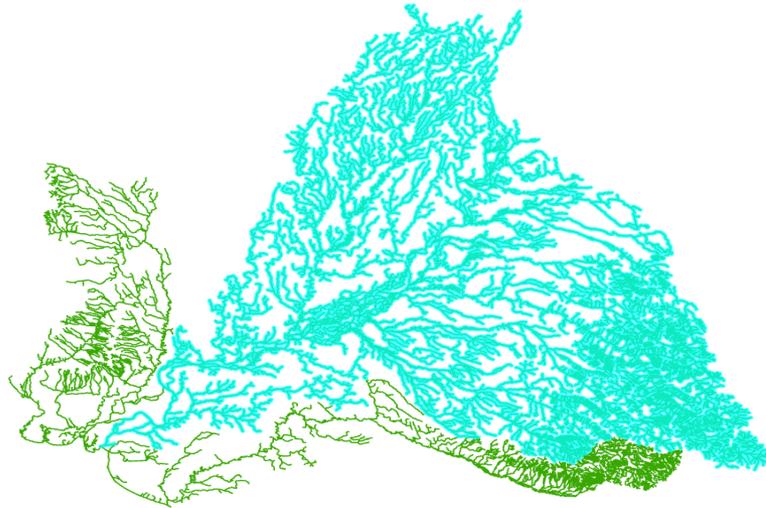
- LevelPathID in combination with LengthKM (from NHDFlowline)



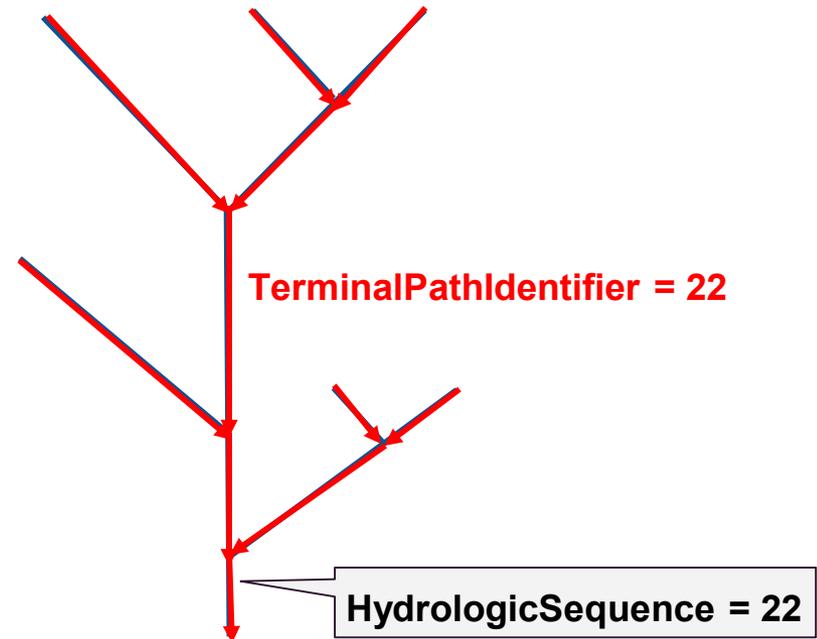
+ NHDPlus HR VAAs

Analysis Attributes: TerminalPathIdentifier

- The identifier for all connected and flowline flowlines from mouth to headwaters
- River Main Stem plus all tributaries
- HydrologicSequence number of the most downstream flowline of all connected flowlines



NHDPlus HR Beta 19020505



+ NHDPlus HR VAAs

Dissolve: TerminalPathIdentifier

- Input: Joined NHDFlowline and NHDPlusFlowlineVAA
- Optional Step: Statistics Fields

The screenshot shows the ArcGIS Desktop interface. The main map area displays a network of flowlines in blue and cyan. The Geoprocessing pane on the right shows the Dissolve tool configuration. The Statistics Field(s) section is highlighted with a red box, showing the following configuration:

Field	Statistic Type
NHDPlusID	Count
LengthKM	Sum

Below the map, a table shows the resulting feature class data:

OBJECTID_1	Shape	TerminalPathIdentifier	COUNT_NHDPlusID	SUM_LengthKM	Shape_Length
1	Polyline ZV	<Null>	5803	6396.417557	69.298748
2	Polyline ZV	55000300000252	86395	69634.82224	748.571823
3	Polyline ZV	55001200000001	1	1.19	0.014103
4	Polyline ZV	55001200000002	1	1.557	0.018051
5	Polyline ZV	55001200000003	1	1.877	0.020374
6	Polyline ZV	55001200000004	1	1.001	0.011595
7	Polyline ZV	55001200000005	1	0.645	0.007841
8	Polyline ZV	55001200000006	1	0.828	0.010094
9	Polyline ZV	55001200000007	1	1.193	0.0134

+ Putting it all together

VPUOut = 1/Yes

- One or more downstream VPU/HU

The screenshot displays the ArcGIS Desktop interface. The main map window shows a river network with a selection tool applied. The Geoprocessing pane on the right shows the 'Select Layer By Attribute' tool with the expression 'VPUOut = 1'. The table view at the bottom shows the following data:

ation	GNIS_ID	GNIS_Name	LevelPathIdentifier	VPUOut	LengthKM	ReachCode	FlowDir	WBArea_Permanent_I	FType	FCode	MainPath	InNetwork	VisibilityFilter	NHDPlusID
	01533479	Snake River	55000500182580	Yes	10.949955	17040212002210	WithDigitized	120008073	558	55800	Unspecified	Yes	Unspecified	55001200000017
	00376364	Clover Creek	55001200001961	Yes	0.067	17040212000366	WithDigitized	120008073	558	55800	Unspecified	Yes	Unspecified	550012000064544

+ Putting it all together

Examine LevelPathIdentifier at VPUOut

- Select from joined NHDFlowline/NHDPlusFlowlineVAA where LevelPathID = value at outflow (VPUOut)

The screenshot displays the ArcGIS Desktop interface. The main map area shows a watershed boundary in red and a flowline network in blue. A specific flowline is highlighted in red. The Geoprocessing pane on the right shows the 'Select Layer By Attribute' tool with the expression 'LevelPathI = 55000500182580'. The bottom pane shows a table of flowline data with columns for OBJECTID_1, Shape, Permanent_Identifier, FDate, Resolution, GNIS_ID, GNIS_Name, LengthKM, ReachCode, FlowDir, WBArea_Permanent_I, FType, FCode, MainPath, and InNetwork.

OBJECTID_1	Shape	Permanent_Identifier	FDate	Resolution	GNIS_ID	GNIS_Name	LengthKM	ReachCode	FlowDir	WBArea_Permanent_I	FType	FCode	MainPath	InNetwork
997	Polyline ZM	89296836	2/19/2012 12:11:07 PM	High	01533479	Snake River	0.446	1704021200087	WithDigitized	120008088	558	55800	Unspecified	Yes
998	Polyline ZM	89296812	8/22/2014	High	01533479	Snake River	0.324328	1704021200082	WithDigitized	120008088	558	55800	Unspecified	Yes
1003	Polyline ZM	89296786	2/19/2012 12:09:23 PM	High	01533479	Snake River	0.135	1704021200078	WithDigitized	120008081	558	55800	Unspecified	Yes
1004	Polyline ZM	89296798	8/22/2014	High	01533479	Snake River	1.415969	1704021200079	WithDigitized	120008081	558	55800	Unspecified	Yes
1596	Polyline ZM	89296806	2/19/2012 12:11:04 PM	High	01533479	Snake River	0.215	1704021200081	WithDigitized	120008081	558	55800	Unspecified	Yes
1625	Polyline ZM	89309440	2/19/2012 12:12:23 PM	High	01533479	Snake River	0.53	17040212004798	WithDigitized	120008088	558	55800	Unspecified	Yes
1629	Polyline ZM	89309352	2/19/2012 12:11:45 PM	High	01533479	Snake River	0.685	17040212000108	WithDigitized	120008088	558	55800	Unspecified	Yes
1681	Polyline ZM	89293538	2/19/2012 12:11:49 PM	High	01533479	Snake River	6.225	17040212008759	WithDigitized	89312664	558	55800	Unspecified	Yes
9576	Polyline ZM	80304370	2/10/2012 12:00:12 PM	High	01533479	Snake River	0.042	17040212000180	WithDigitized	120008088	558	55800	Unspecified	Yes

+ Putting it all together

LevelPathIdentifier and GNIS

- Select from joined NHDFlowline/NHDPlusFlowlineVAA where GNIS_Name = 'Snake River'

The screenshot displays the ArcGIS Desktop interface. The main map area shows a river network with a selection tool applied, highlighting a specific path. The Contents pane on the left lists the layers: NHDFlowline_LevPatID_55000500182580, NHDFlowline_PlusFlowVAA, NHDFlowline, WBDHU4, and NHDPlusFlowlineVAA. The Geoprocessing pane on the right shows the 'Select Layer By Attribute' tool with the expression 'GNIS_Name = \'Snake River\''.

Field:	Add	Delete	Calculate	Selection:	Zoom To	Switch	Clear	Delete	Copy	Highlighted:	Unselect	Reselect	Zoom To	Switch	Clear	Delete
usiID	StreamLevel	StreamOrder	StreamCalculator	FromNode	ToNode	HydrologicSequence	LevelPathIdentifier	PathLength	TerminalPathIdentifier	UpstreamCumulativeStreamKm	DivergenceCode	Isl				
lull>	5	8	8	55001200014902	55001200025244	55001200005570	55001200004253	1759.208741	55000300000252	37257.028969	Feature is not part of a divergence	Nc				
lull>	5	8	8	55001200014905	55001200076561	55001200005590	55001200004253	1759.761039	55000300000252	37251.839002	Feature is not part of a divergence	Nc				
lull>	5	8	8	55001200013768	55001200044613	55001200005284	55001200004253	1647.518778	55000300000252	48725.99539	Feature is not part of a divergence	Nc				
lull>	5	8	8	55001200013769	55001200054731	55001200005334	55001200004253	1648.516415	55000300000252	48722.500905	Feature is the main path of a diver	Nc				
lull>	5	7	7	55001200018106	55001200007800	55001200008496	55001200004253	2013.832766	55000300000252	18242.236255	Feature is not part of a divergence	Nc				
lull>	5	8	8	55001200015821	55001200026170	55001200006925	55001200004253	1862.618881	55000300000252	30259.514825	Feature is not part of a divergence	Nc				
lull>	5	8	8	55001200005529	55001200077437	55001200006950	55001200004253	1867.703857	55000300000252	30247.031411	Feature is the main path of a diver	Nc				
lull>	5	8	8	55001200015825	55001200067126	55001200007060	55001200004253	1870.753319	55000300000252	30192.865079	Feature is the main path of a diver	Nc				
lull>	5	8	8	55001200015827	55001200066576	55001200007060	55001200004253	1868.745148	55000300000252	30232.108721	Feature is not part of a divergence	Nc				

1,480 of 128,209 selected

Filters: 100%

Geoprocessing: Select Layer By Attribute completed. View Details Open History

+ Putting it all together

Examine LevelPathIdentifier in relation to GNIS

- Missing GNIS_ID caused LevelPathID to change

The screenshot displays the ArcGIS Desktop interface. The main map area shows a network of flowlines. A specific flowline segment is highlighted in yellow and labeled with the number '1704'. The interface includes a 'Contents' panel on the left, a 'Symbology' panel on the right, and a data table at the bottom.

OBJECTID_1	Shape	Permanent_Identifier	FDate	Resolution	GNIS_ID	GNIS_Name	LengthKM	ReachCode	FlowDir	WBArea_Permanent_J	FType	FCode	MainPath	InNetwork
4287	Polyline ZM	90477778	5/30/2013	High	<Null>	<Null>	0.125705	17040209250518	WithDigitized	89302042	558	55800	Unspecified	Yes
25168	Polyline ZM	167432977	1/19/2012 3:08:16 AM	High	01533479	Snake River	0.449	17040209245269	WithDigitized	120008096	558	55800	Unspecified	Yes
27975	Polyline ZM	89302842	2/19/2012 12:10:18 PM	High	01533479	Snake River	0.015	17040212000292	WithDigitized	89312674	558	55800	Unspecified	Yes
104808	Polyline ZM	89302846	2/19/2012 12:10:18 PM	High	01533479	Snake River	0.219	17040212000292	WithDigitized	89312674	558	55800	Unspecified	Yes
104809	Polyline ZM	90477782	1/19/2012 3:08:14 AM	High	01533479	Snake River	0.448	17040209250496	WithDigitized	89302042	558	55800	Unspecified	Yes
104810	Polyline ZM	90477788	5/30/2013	High	01533479	Snake River	0.485469	17040209250469	WithDigitized	89302042	558	55800	Unspecified	Yes
108712	Polyline ZM	89302848	2/19/2012 12:10:18 PM	High	01533479	Snake River	4.886	17040212000292	WithDigitized	89312674	558	55800	Unspecified	Yes
117370	Polyline ZM	90477774	2/19/2012 12:10:18 PM	High	01533479	Snake River	0.089	17040212000292	WithDigitized	<Null>	334	33400	Unspecified	Yes

+ Putting it all together

Examine TerminalPathIdentifier at VPUOut

- Select from joined NHDFlowline/NHDPlusFlowlineVAA where LevelPathID = value at outflow (VPUOut)

The screenshot displays the ArcGIS Desktop interface. The main map window shows a watershed area with flowlines. The Contents pane on the left lists several layers, including 'NHDFlowline_TermPatID_55000300000252'. The Geoprocessing pane on the right shows the 'Feature Class to Feature Class' tool with the following parameters:

- Input Features: NHDFlowline_PlusFlowVAA
- Output Location: Idaho_HydroTWG_Sept122019.gdb
- Output Feature Class: NHDFlowline_TermPatID_55000300000252
- Expression: (None defined)

The Field Map pane shows the output fields and their sources:

Output Fields	Source	Properties
Permanent_Id...	Merge Rule First	
FDate	NHDFlowline_PlusF	
Resolution	> Permanent_Identifier	
GNIS_ID		
GNIS_Name		
LengthKM		
ReachCode		
FlowDir		
WBArea_Perm...		
FType		
FCode		
MainPath		

The data table at the bottom shows the following columns and values for the selected features:

VPUOut	TerminalPathIdentifier	LevelPathIdentifier	HydrologicSequence	LengthKM	ReachCode	FlowDir	WBArea_Perma...	FType	FCode	MainPath	InNetwork	VisibilityFilter	NI
No	55000300000252	55000500182580	55001200002042	0.446	17040212000087	WithDigitized	120008088	558	55800	Unspecified	Yes	Unspecified	55K
No	55000300000252	55000500182580	55001200002022	0.324328	17040212000082	WithDigitized	120008088	558	55800	Unspecified	Yes	Unspecified	55K
No	55000300000252	55000500182580	55001200002005	0.135	17040212000078	WithDigitized	120008081	558	55800	Unspecified	Yes	Unspecified	55K
No	55000300000252	55000500182580	55001200002010	1.415969	17040212000079	WithDigitized	120008081	558	55800	Unspecified	Yes	Unspecified	55K
No	55000300000252	55000500182580	55001200002013	0.215	17040212000081	WithDigitized	120008081	558	55800	Unspecified	Yes	Unspecified	55K
No	55000300000252	55000500182580	55001200002344	0.53	17040212004798	WithDigitized	120008088	558	55800	Unspecified	Yes	Unspecified	55K
No	55000300000252	55000500182580	55001200002327	0.685	17040212000108	WithDigitized	120008088	558	55800	Unspecified	Yes	Unspecified	55K
No	55000300000252	55000500182580	55001200004430	6.225	17040212008759	WithDigitized	89312664	558	55800	Unspecified	Yes	Unspecified	55K
No	55000300000252	55000500182580	55001200004430	0.042	17040212000108	WithDigitized	120008088	558	55800	Unspecified	Yes	Unspecified	55K

+ Putting it all together

How is the data connected?

- VPUOut will correspond to VPUIn in next downstream VPU/HU
- **LevelPathIdentifier** continues through hydrologically connected VPUs

The screenshot displays the ArcGIS Desktop interface. The main map shows a watershed divided into three sub-basins: an orange basin at the top, a green basin at the bottom left, and a blue basin at the bottom right. A cyan flowline network is overlaid on the map. The Geoprocessing pane on the right shows a 'Select Layer By Attribute' tool with a 'Where' clause: `LevelPa is < 550005`. Below the map, two attribute tables are visible, showing data for VPU 1705 and VPU 1704.

Table 1: NHDFlowline_PlusFlowVAA_1705

Field	GNIS_ID	GNIS_Name	VPUIn	TerminalPathIdentifier	LevelPathIdentifier	HydrologicSequence	LengthKM	ReachCode	FlowDir	WBArea_Permanent_I	FType	FCode	MainPath	In
01533479	Snake River	No	55000300000252	55000500182580	55000700001153	0.366	17050201004134	WithDigitized	127034637	558	55800	Unspecified	Yes	
01533479	Snake River	No	55000300000252	55000500182580	55000700001152	0.356	17050201004132	WithDigitized	127034637	558	55800	Unspecified	Yes	
01533470	Snake River	No	55000300000252	55000500182580	55000700001148	1.036	1705011500000047	WithDigitized	127034637	558	55800	Unspecified	Yes	

Table 2: NHDFlowline_PlusFlowVAA_1704

Field	GNIS_ID	GNIS_Name	VPUOut	TerminalPathIdentifier	LevelPathIdentifier	HydrologicSequence	LengthKM	ReachCode	FlowDir	WBArea_Permanent_I	FType	FCode	MainPath	In
11533479	Snake River	No	55000300000252	55000500182580	55001200002042	0.446	17040212000087	WithDigitized	120008088	558	55800	Unspecified	Yes	
11533479	Snake River	No	55000300000252	55000500182580	55001200002022	0.324328	17040212000082	WithDigitized	120008088	558	55800	Unspecified	Yes	
11533479	Snake River	No	55000300000252	55000500182580	55001200002005	0.135	17040212000078	WithDigitized	120008081	558	55800	Unspecified	Yes	
11533479	Snake River	No	55000300000252	55000500182580	55001200002010	1.415969	17040212000079	WithDigitized	120008081	558	55800	Unspecified	Yes	

+ Putting it all together

How is the data connected?

- VPUOut will correspond to VPUIn in next downstream VPU/HU
- **TerminalPathIdentifier** continues through hydrologically connected VPUs

The screenshot displays the ArcGIS Desktop interface. The main map shows a watershed with flow accumulation values. Three specific values are highlighted in red: 1706, 1708, and 1714. The interface includes a Contents pane on the left, a Geoprocessing pane on the right, and two attribute tables at the bottom showing data for 'NHDFlowline_PlusFlowVAA_1705' and 'NHDFlowline_PlusFlowVAA_1704'.

Table 1: NHDFlowline_PlusFlowVAA_1705

GNIS_ID	GNIS_Name	VPUIn	TerminalPathIdentifier	LevelPathIdentifier	HydrologicSequence	LengthKM	ReachCode	FlowDir	WBArea_Permanent_I	FType	FCode	MainPath	In
<Null>	<Null>	No	55000300000252	55000700016074	55000700092073	0.02	17050108002231	WithDigitized	<Null>	460	46003	Unspecified	Ye
<Null>	<Null>	No	55000300000252	55000700016123	55000700016184	0.104	17050108002232	WithDigitized	137314114	558	55800	Unspecified	Va

Table 2: NHDFlowline_PlusFlowVAA_1704

GNIS_ID	GNIS_Name	VPUOut	TerminalPathIdentifier	LevelPathIdentifier	HydrologicSequence	LengthKM	ReachCode	FlowDir	WBArea_Permanent_I	FType	FCode	MainPath	Inf
11533479	Snake River	No	55000300000252	55000500182580	55001200002042	0.446	17040212000087	WithDigitized	120008088	558	55800	Unspecified	Yes
11533479	Snake River	No	55000300000252	55000500182580	55001200002022	0.324328	17040212000082	WithDigitized	120008088	558	55800	Unspecified	Yes
11533479	Snake River	No	55000300000252	55000500182580	55001200002005	0.135	17040212000078	WithDigitized	120008081	558	55800	Unspecified	Yes
11533479	Snake River	No	55000300000252	55000500182580	55001200002010	1.415969	17040212000079	WithDigitized	120008081	558	55800	Unspecified	Yes



+ NHDPlus HR VAAs

- A set of value added attributes (VAAs) to enhance stream network navigation, analysis and display (inc. stream order)
- Catchment characteristics
- Cumulative drainage area characteristics
- Flowline min/max elevations and slopes (in meters)
- Flow volume (Q) & velocity (V) estimates for each flowline in the stream network

- NHDPlus_H_0903_GDB.gdb
 - Hydrography
 - HYDRO_NET
 - HYDRO_NET_Junctions
 - NHDArea
 - NHDFlowline
 - NHDLine
 - NHDPoint
 - NHDWaterbody
 - NHDPlus
 - NHDPlusBurnLineEvent
 - NHDPlusBurnWaterbody
 - NHDPlusCatchment
 - NHDPlusLandSea
 - NHDPlusSink
 - NHDPlusWall
 - WBD
 - NonContributingDrainageArea
 - NonContributingDrainageLine
 - NWISDrainageArea
 - NWISDrainageLine
 - WBDHU10
 - WBDHU12
 - WBDHU14
 - WBDHU16
 - WBDHU2
 - WBDHU4
 - WBDHU6
 - WBDHU8
 - WBDLine

- NHDPlusDivFracMP
- NHDPlusEROMMA
- NHDPlusEROMQAMA
- NHDPlusEROMQARPT
- NHDPlusFlow
- NHDPlusFlowlineVAA
- NHDPlusIncrLat
- NHDPlusIncrPrecipMA
- NHDPlusIncrPrecipMM01
- NHDPlusIncrPrecipMM02
- NHDPlusIncrPrecipMM03
- NHDPlusIncrPrecipMM04
- NHDPlusIncrPrecipMM05
- NHDPlusIncrPrecipMM06
- NHDPlusIncrPrecipMM07
- NHDPlusIncrPrecipMM08
- NHDPlusIncrPrecipMM09
- NHDPlusIncrPrecipMM10
- NHDPlusIncrPrecipMM11
- NHDPlusIncrPrecipMM12
- NHDPlusIncrROMA
- NHDPlusIncrTempMA
- NHDPlusIncrTempMM01
- NHDPlusIncrTempMM02
- NHDPlusIncrTempMM03
- NHDPlusIncrTempMM04
- NHDPlusIncrTempMM05
- NHDPlusIncrTempMM06
- NHDPlusIncrTempMM07
- NHDPlusIncrTempMM08
- NHDPlusIncrTempMM09
- NHDPlusIncrTempMM10
- NHDPlusIncrTempMM11
- NHDPlusIncrTempMM12
- NHDPlusMegaDiv
- NHDPlusNHDPlusIDGridCode



More Information: NHDPlus HR

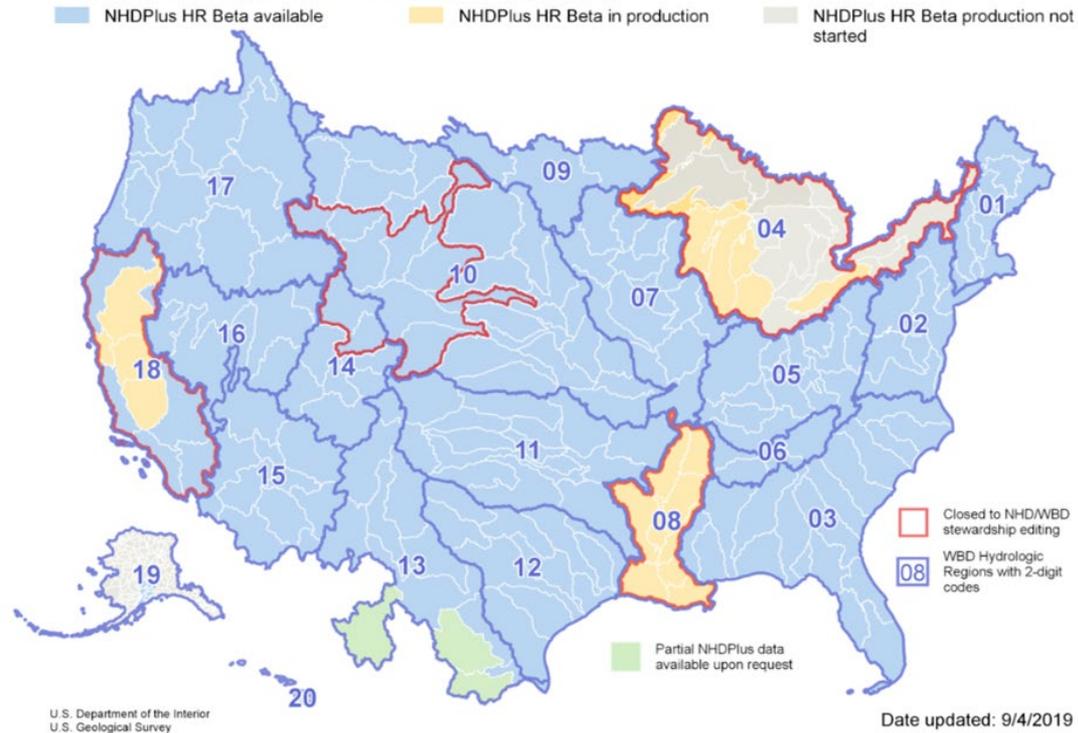
National Hydrography Website

- HOME
- ABOUT NATIONAL HYDROGRAPHY PRODUCTS
- NHDPlus High Resolution (NHDPlus HR)
- National Hydrography Dataset (NHD)
- Watershed Boundary Dataset (WBD)
- ACCESS NATIONAL HYDROGRAPHY PRODUCTS
- DOCUMENTATION AND SPECIFICATIONS
- RESOURCES
- STEWARDSHIP AND COMMUNITY
- GOVERNANCE
- BENEFITS AND APPLICATIONS
- NEWS
- FAQS
- CONNECT

NHDPlus High Resolution



NHDPlus High Resolution Availability





Questions/Comments

- Ariel Doumbouya (atdoumbouya@usgs.gov)

- National Hydrography Website: usgs.gov/NatHydro

National Stream Internet Project



- **David Nagel, USFS**



U.S. Forest Service Aquatic Resources Data for the Western U.S.

**David E. Nagel, Daniel J. Isaak, John M. Buffington,
Charles H. Luce, and Michael K. Young**

**U.S. Forest Service, Rocky Mountain Research Station;
Air, Water and Aquatic Environments Program**

IDWR Hydrography Technical Working Group Meeting
March 12, 2020



Boise Aquatic Sciences Lab



Air, Water, and Aquatic Environments Program



Idaho Water Center



Fish and watershed research

Principal Investigator

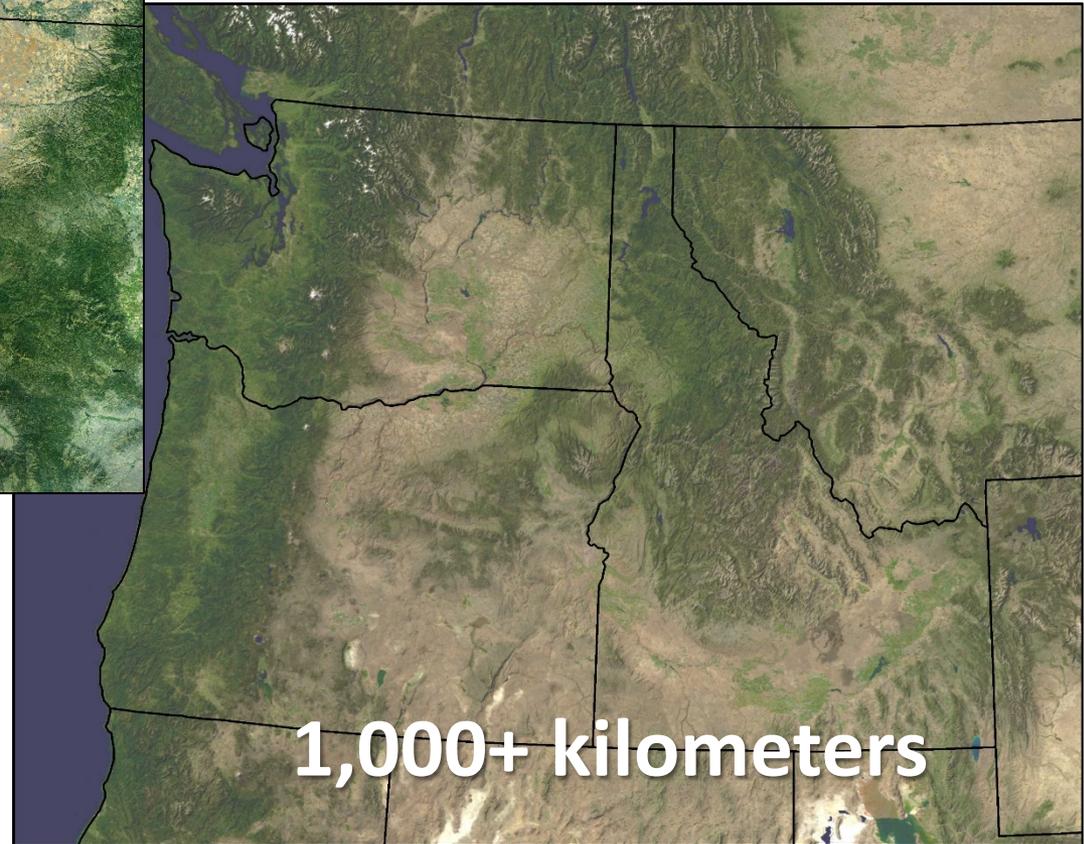
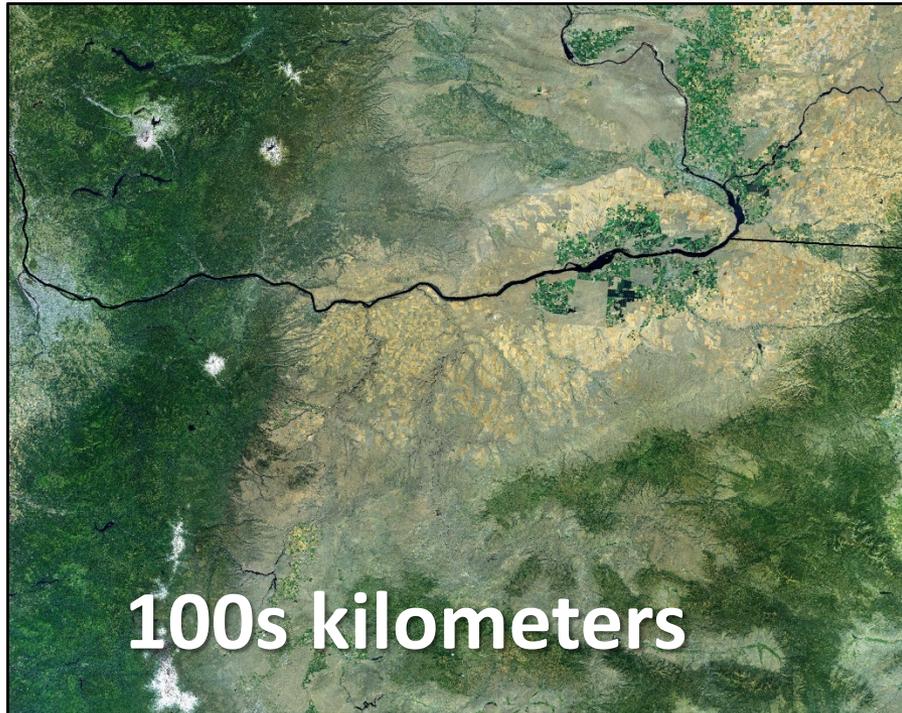
Dr. Daniel Isaak

Boise Spatial Streams Group

- **Gwynne Chandler – Database**
- **Dona Horan – SAS and GIS**
- **David Nagel – GIS**
- **Sharon Payne – Web and GIS**
- **Sherry Wollrab – Database and GIS**



Research conducted at landscape or regional scales



Built on a Common Framework

100K Medium Scale NHDPlus

*NHDPlus
Version 2*

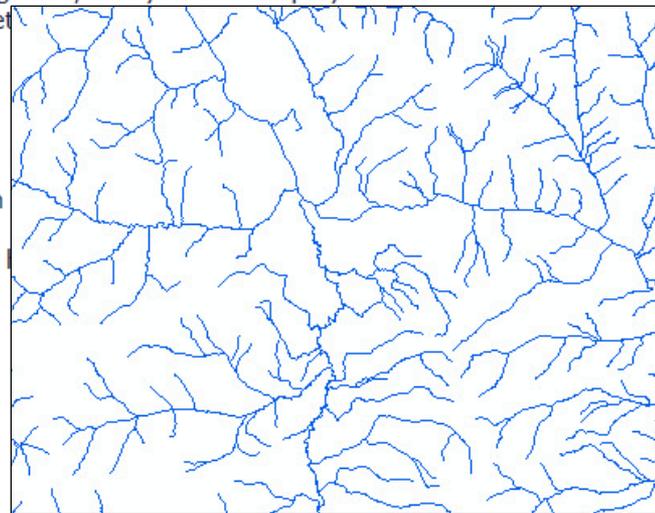
Horizon
Systems
Corporation

Horizon Systems → NHDPlus Version 2

« NHDPlus Version 2 »

NHDPlusV2 consists of the following components:

- Greatly improved 1:100K National Hydrography Dataset (NHD)
- Greatly improved 1 arc-second (approximately 30 meter ground spacing) National Elevation Dataset (NED)
- Nationally complete Watershed Boundary Dataset (WBD)
- A set of value added attributes to enhance stream network navigation, analysis and display
- An elevation-based catchment for each flowline in the stream network
- Catchment characteristics
- Headwater node areas
- Cumulative drainage area characteristics
- Flow direction, flow accumulation and elevation grids
- Flowline min/max elevations and slopes
- Flow volume & velocity estimates for each flowline in the stream network
- Catchment attributes and network accumulated attributes
- Various grids from the hydro-enforcement process including the



NHDPlus Home

NHDPlus Version 2

Documentation

Data

Data Extensions

Tools

Events

Applications ★

Contacts

NHDPlus Version 1
(Archive)



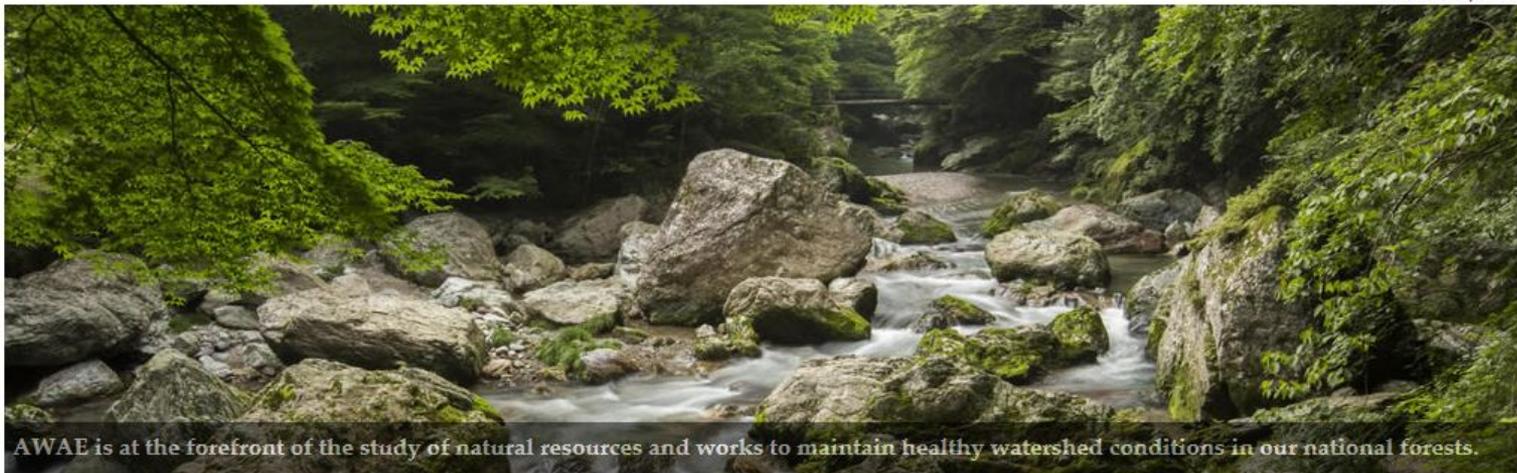
Rocky Mountain Research Station

Air, Water, & Aquatic Environments Program



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- RESEARCH ▾
- PROJECTS, TOOLS, & DATA ▾
- PUBLICATIONS ▾
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AWAE is at the forefront of the study of natural resources and works to maintain healthy watershed conditions in our national forests.

PUBLICATIONS

AWAE provides impartial information on the health of our ecosystems and environments, the natural resources we rely on, the impacts of climate and land-use change, and the core science systems that help us provide timely, relevant, and useable information. To learn more, access [publications](#) written by our scientists in a variety of formats.



JOURNAL ARTICLES
(TREESEARCH)

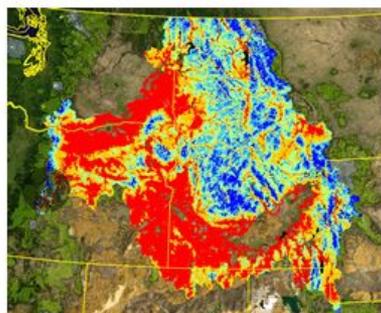


SCIENCE BRIEFINGS



TECHNICAL
REPORTS

PROJECTS, TOOLS, & DATA



NorWeST Stream Temperature
The NorWeST webpage hosts stream temperature data and geospatial map outputs from a regional temperature model for the Northwest U.S.



RESEARCH TOPICS

RMRS AWAE scientists cover a wealth of different subject areas, with much collaboration between specialties. Scientists have extensive experience and expertise within the [Rocky Mountain Research Station's Strategic Research Priorities](#) and associated Sub-Elements, including:



DISTURBANCE
ECOLOGY

HUMAN-
LANDSCAPE
INTERACTIONS

RESILIENT
LANDSCAPES

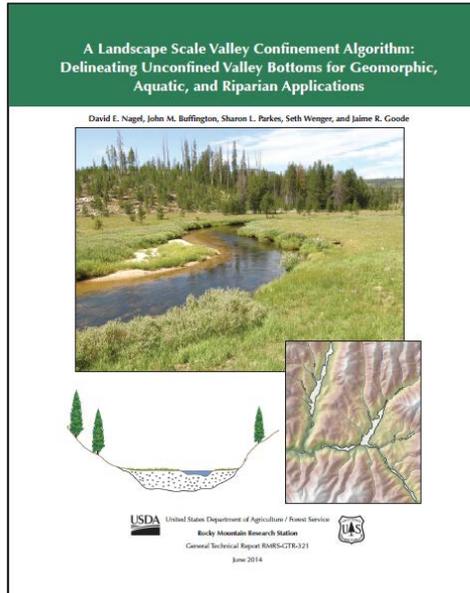
FIRE SCIENCES

INVENTORY &
MONITORING

SPECIES
ENDANGERMENT

WATER &
WATERSHEDS

Data are peer reviewed, quality assured, and documented



ArcGIS Metadata ▶

Topics and Keywords ▶

* CONTENT TYPE Downloadable Data

THEME KEYWORDS model, water, stream, temperature, stream temperature, hydrography *Hide Topics and Keywords ▲*

Citation ▶

Stream Internet Quality Assurance Protocol

D. Nagel, January 31, 2015

Before Merging QA Procedure

Display the reconditioned stream lines in blue 1.5 width. Display the original stream lines (NHDFlowline.shp) underneath in in red 1.0 width in the same viewer. Look at the streams that were deleted. See if they meet the criteria of being uninitialized flow, or braids or diversions.

Datasets

Stream temperature

Fish habitat patches

Stream flow metrics

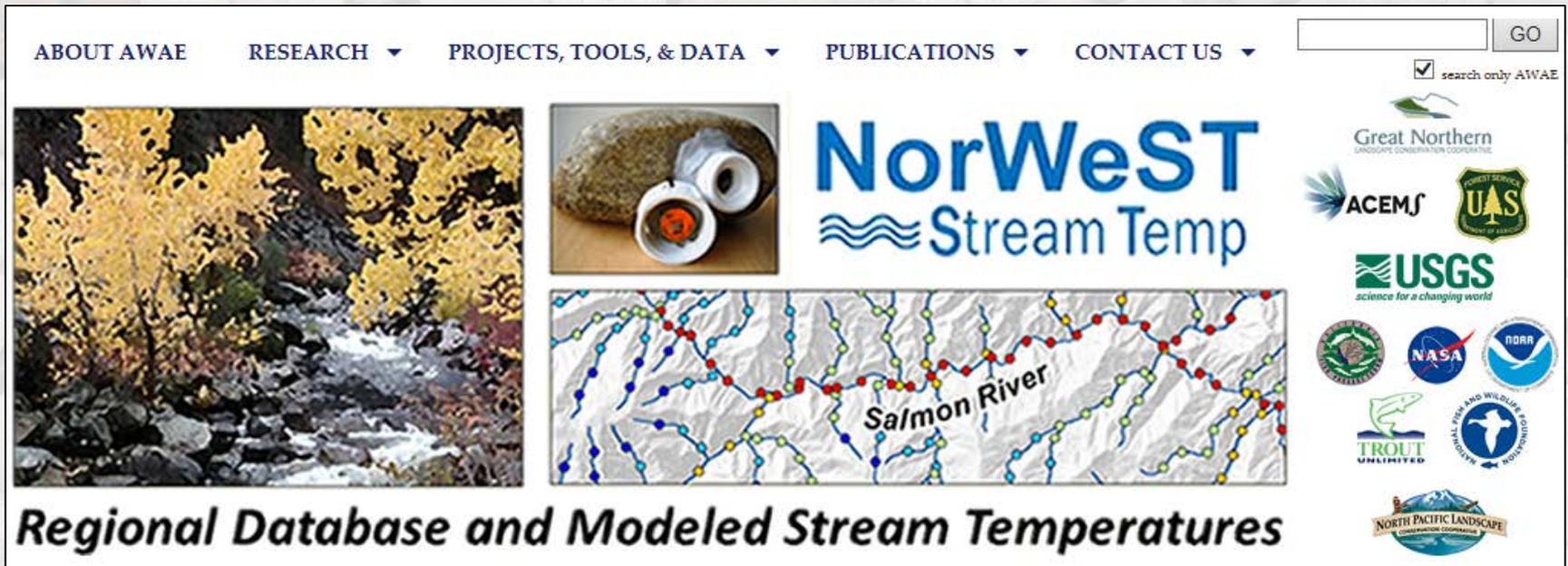
Valley confinement

Edited NHDPlus flowlines (NSI)

Environmental DNA (eDNA)

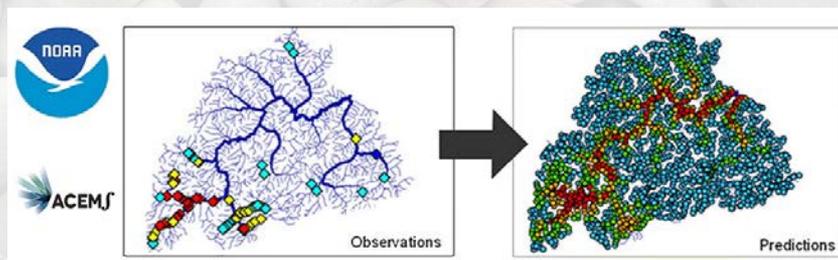
Stream gradient

1) NorWeST Stream Temperature



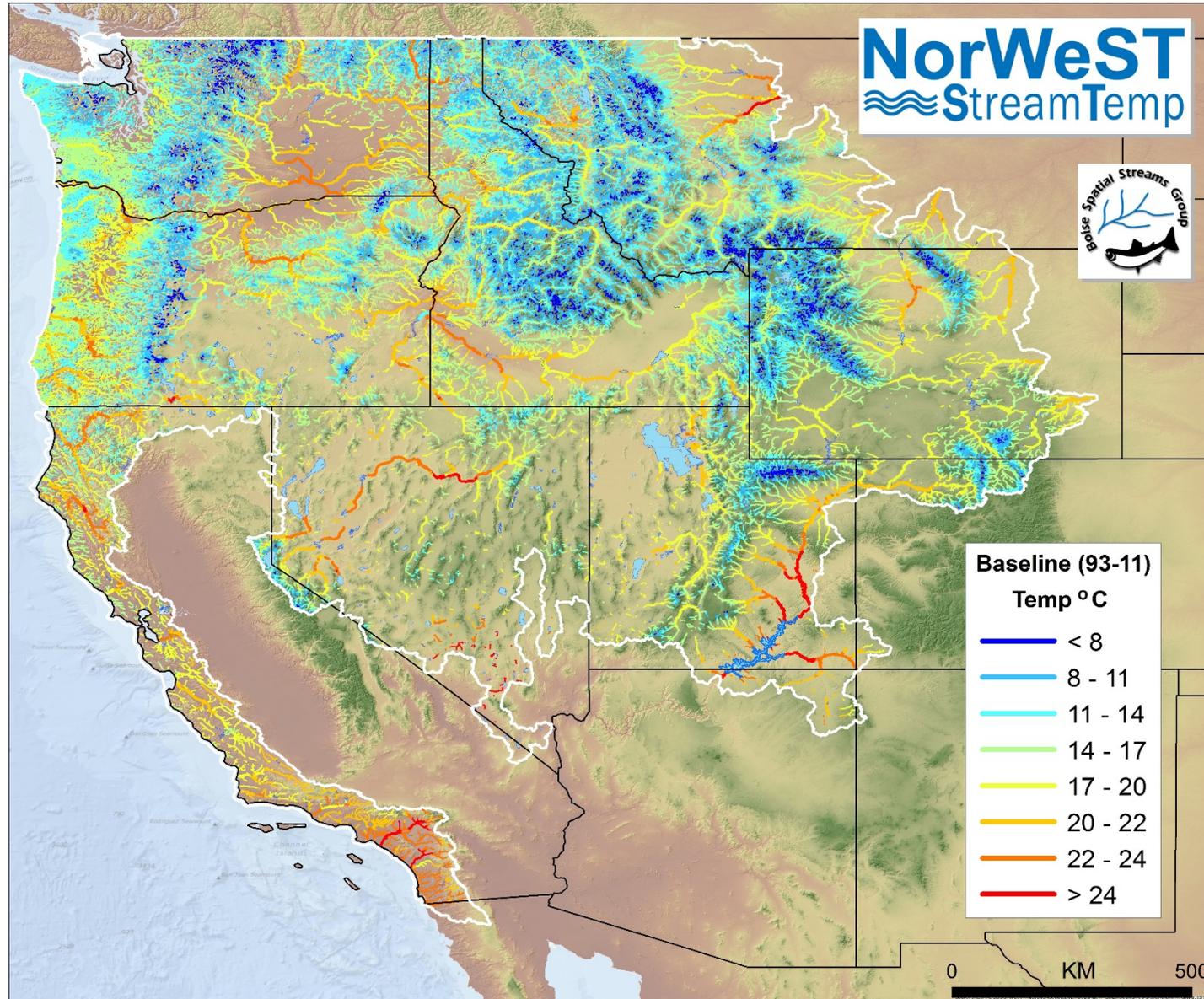
The screenshot shows the homepage of the NorWeST Stream Temp website. At the top, there is a navigation menu with links for 'ABOUT AWAE', 'RESEARCH', 'PROJECTS, TOOLS, & DATA', 'PUBLICATIONS', and 'CONTACT US'. A search bar is located on the right with a 'GO' button and a checked box for 'search only AWAE'. Below the navigation, there are three main images: a photograph of a stream with yellow autumn foliage, a close-up of a stream temperature sensor, and a map of the Salmon River watershed with stream temperature data points. The text 'NorWeST Stream Temp' is prominently displayed in the center. Below the images, the text reads 'Regional Database and Modeled Stream Temperatures'. On the right side, there is a vertical column of logos for various partner organizations, including Great Northern Landscape Conservation Cooperative, ACEMJS, US Forest Service, USGS, NASA, NOAA, Trout Unlimited, and North Pacific Landscape Conservation Cooperative.

Modeled stream temperature at 1 km resolution for the Western U.S.



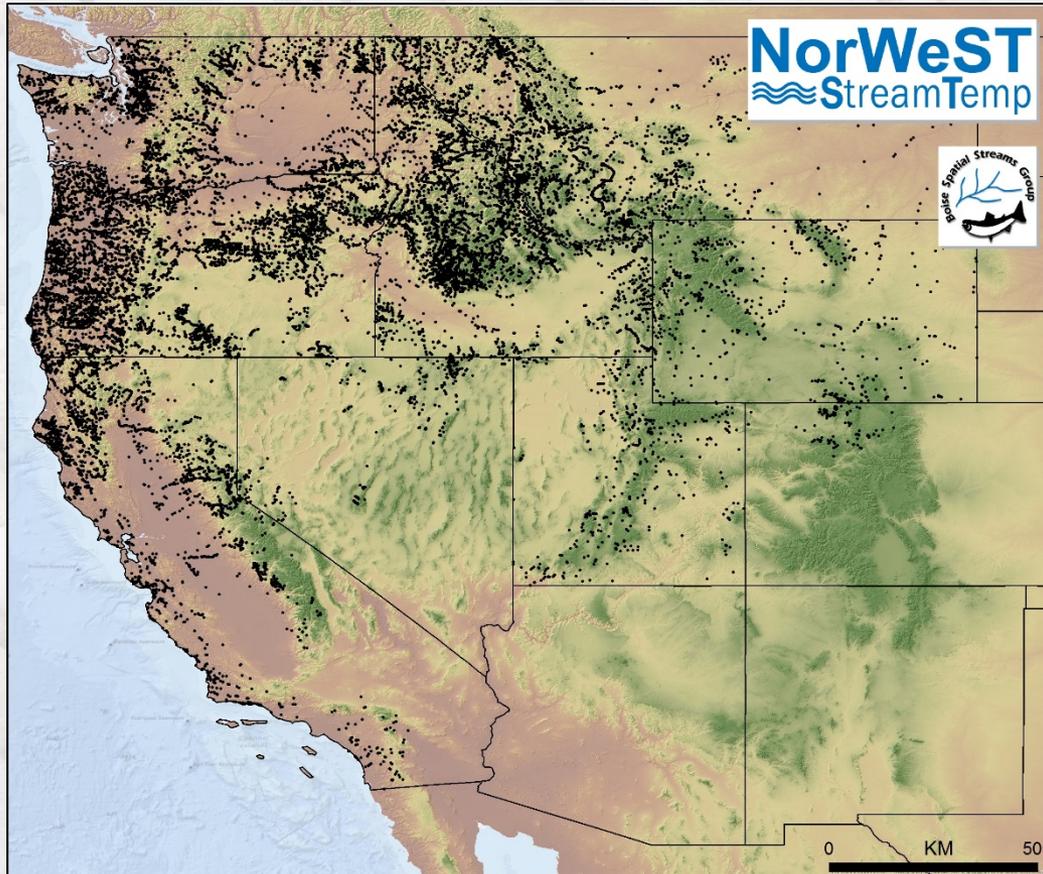
STARS and SSN

NorWeST Footprint



NorWeST Model Inputs

Observed Temperatures

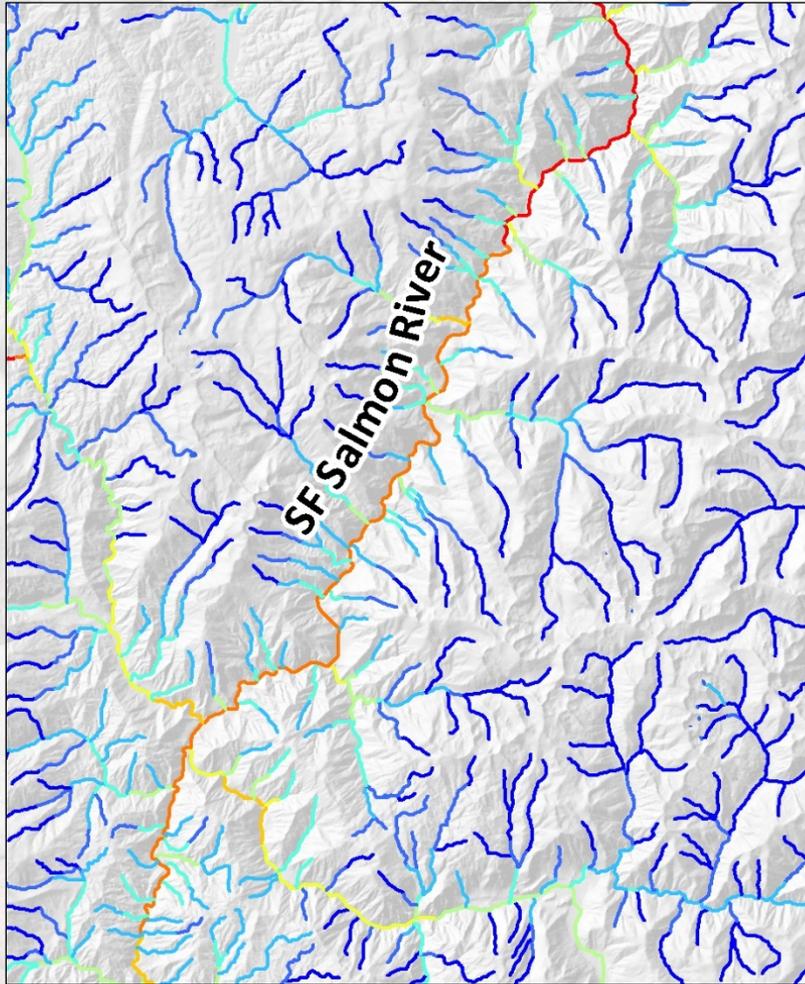


Predictors

- Elevation
- Canopy percent
- Stream gradient
- Precipitation
- Catchment area
- Latitude
- Lake influence
- Base flow index
- Tailwater flag
- Air temperature
- Flow

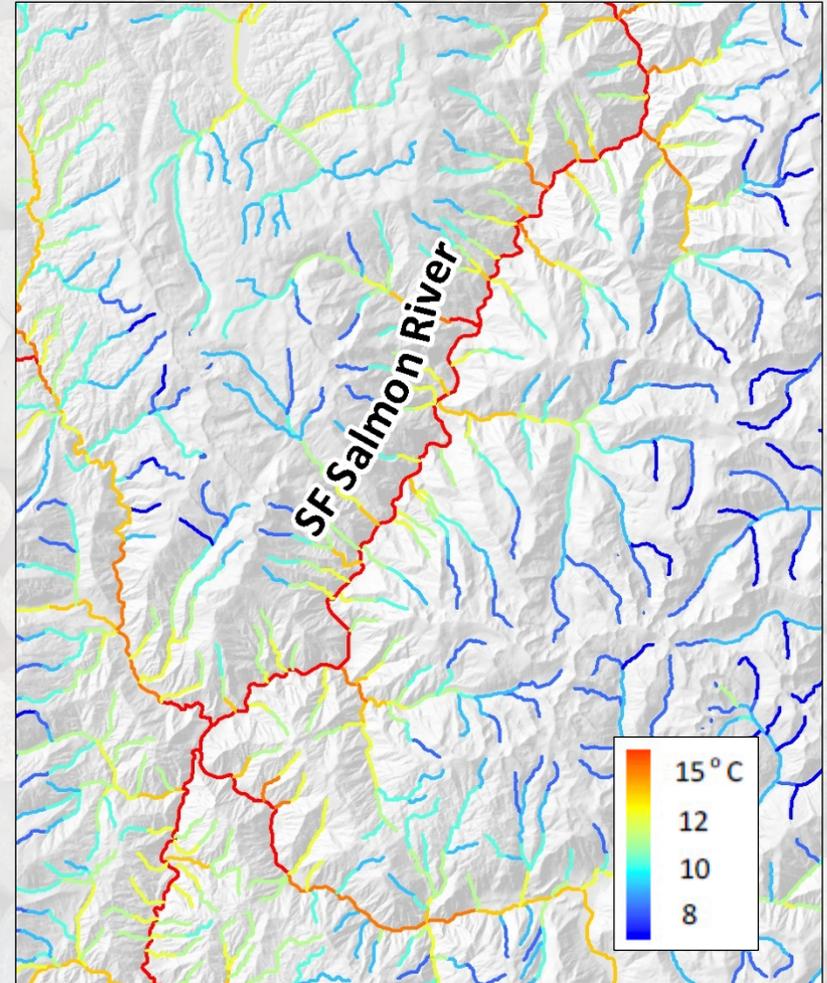
Example Data

1993



Air = 11.9 °C Flow = 50.1 cms

2003

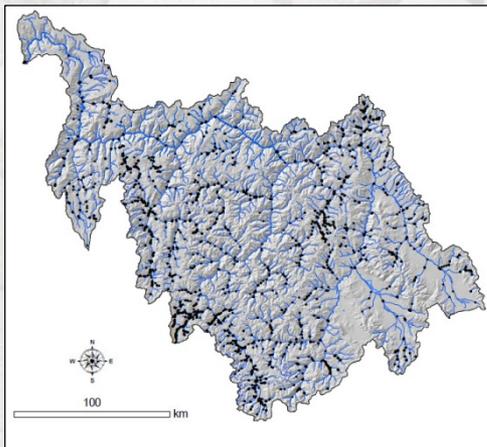


Air = 15.8 °C Flow = 26.7 cms

NorWeST Products

1) Summarized stream temperature observation data (database)

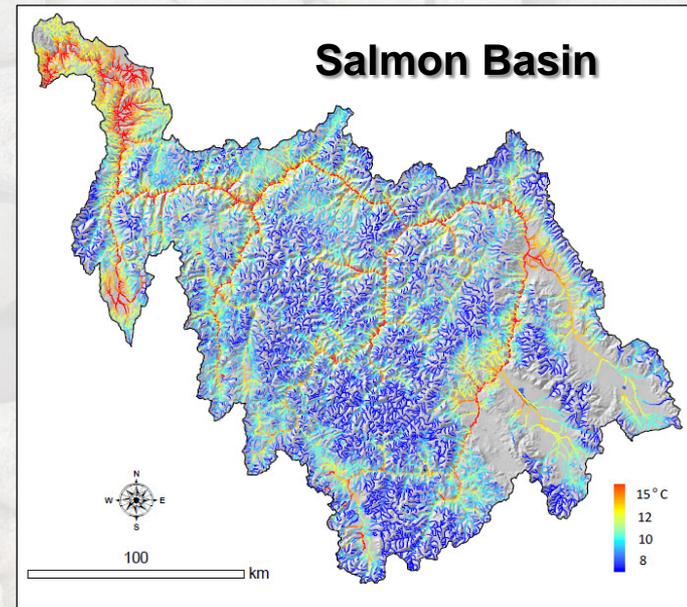
	A	B	C	D	E	F	G
1	OBSPRED_ID	Date	DailyMinimum	DailyMean	DailyMaximum	Nobs	Status
2	1	8/1/2008	10.60	12.11	14.10	10	P
3	1	8/2/2008	10.90	12.26	13.70	10	P
4	1	8/3/2008	10.60	11.84	12.90	10	P
5	1	8/4/2008	10.60	11.91	12.90	10	P
6	1	8/5/2008	10.60	12.00	13.70	10	P
7	1	8/6/2008	10.90	12.61	14.40	10	P
8	1	8/7/2008	12.10	13.18	14.10	10	P
9	1	8/8/2008	12.50	13.17	14.40	10	P
10	1	8/9/2008	12.10	12.94	14.10	10	P
11	1	8/10/2008	10.60	12.07	13.30	10	P



Excel and Esri shapefile format

Daily metrics

2) Modeled stream temperature scenarios



Esri shapefile format

Annual August means

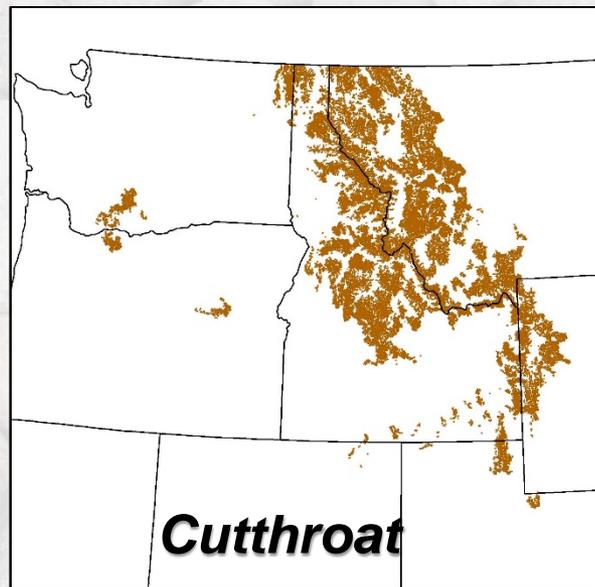


Google:
Norwest stream temperature

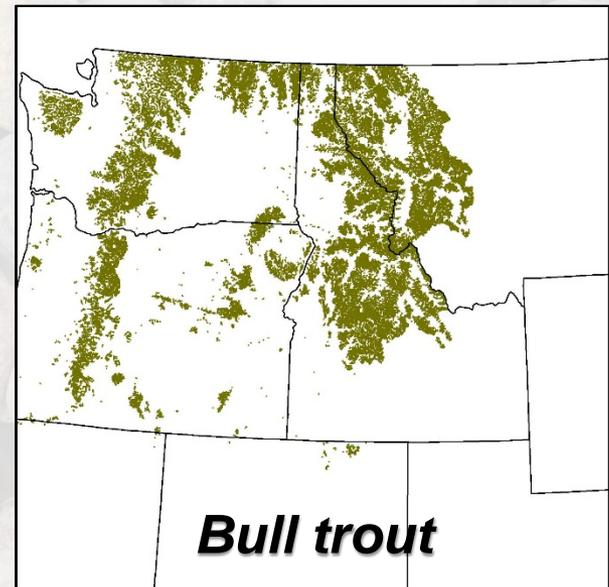
2) Cold-Water Climate Shield



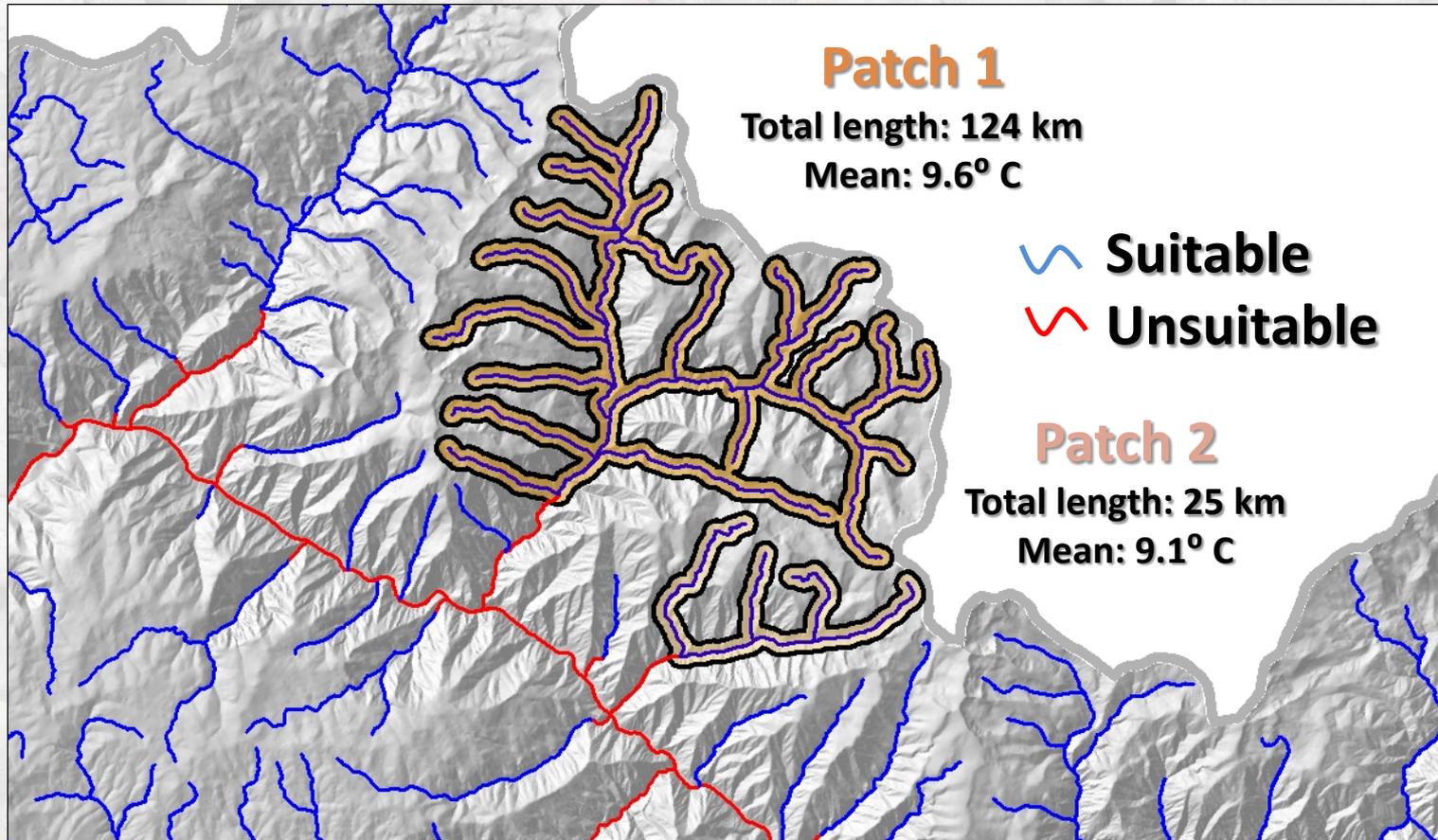
Mapped, thermally suitable habitat patches for juvenile cutthroat and bull trout



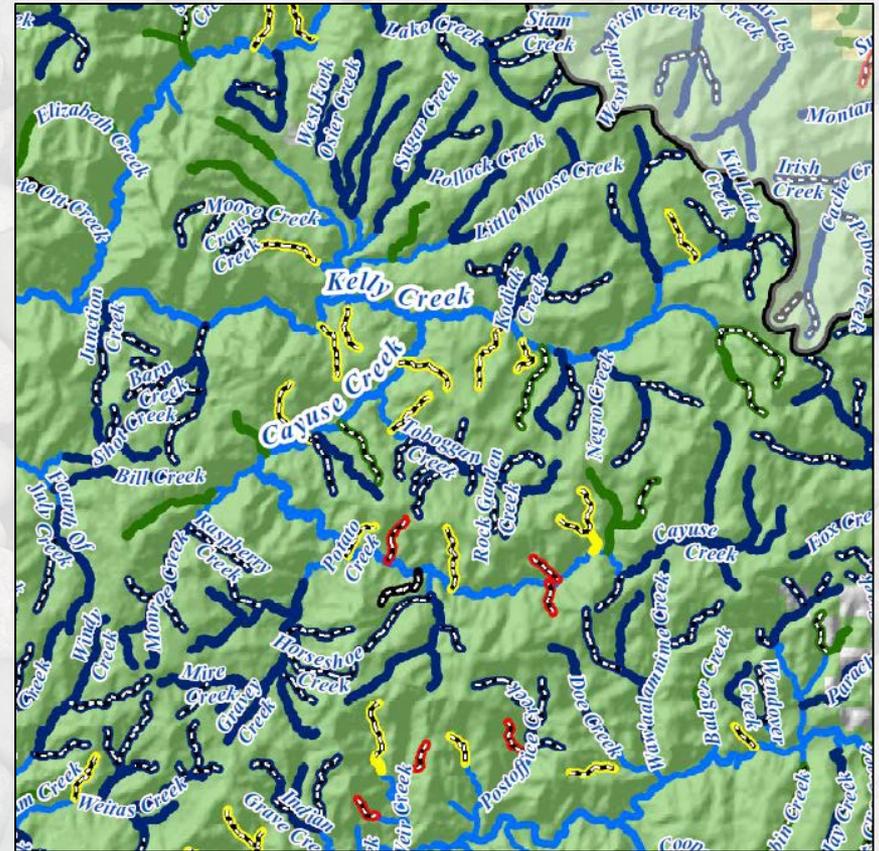
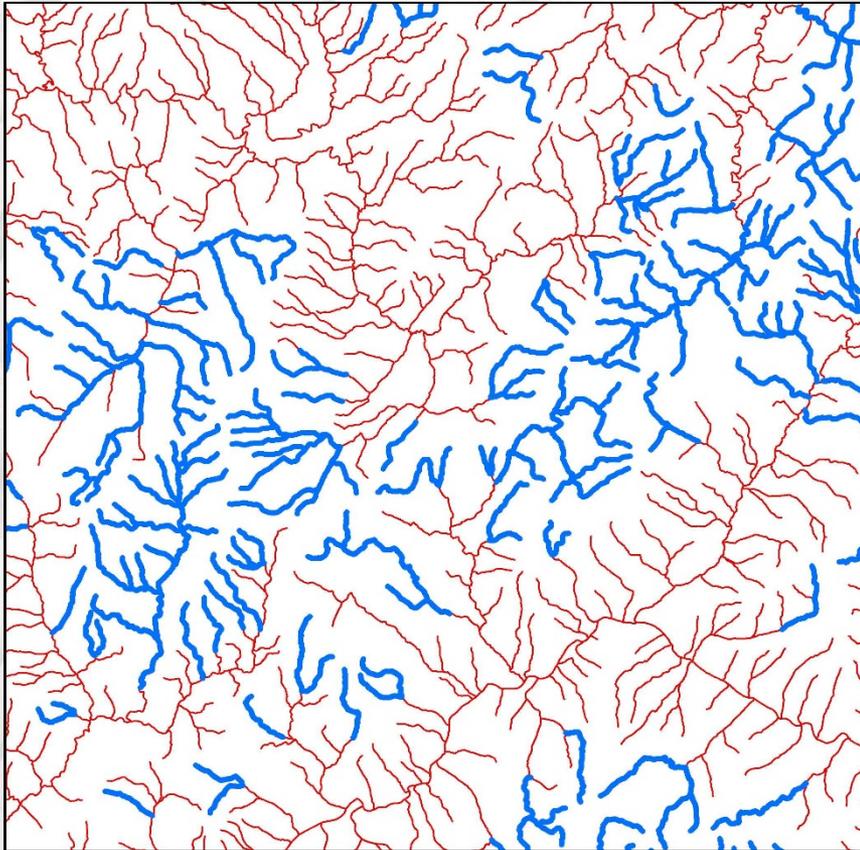
Thermally suitable

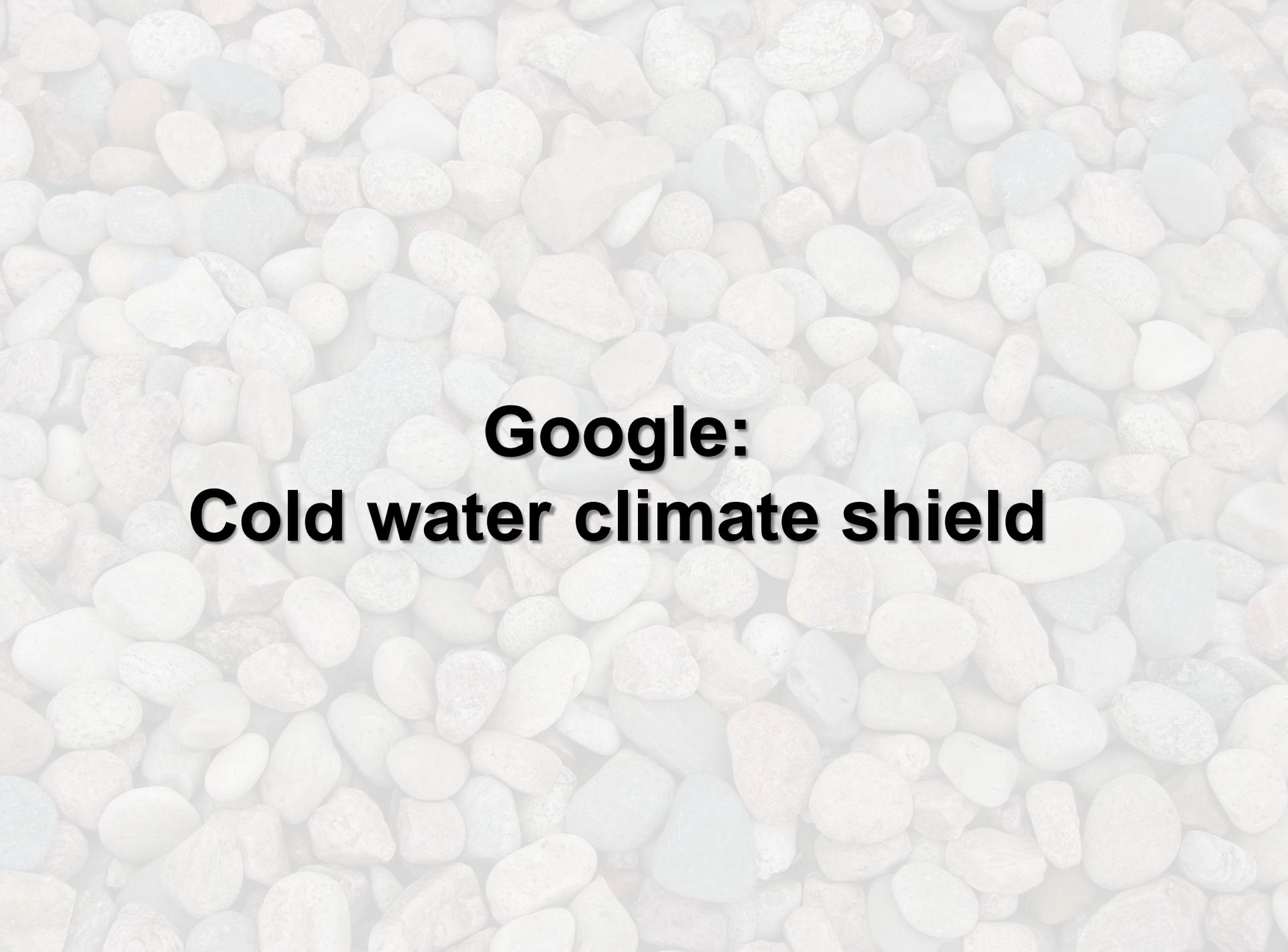


Thermally Suitable Habitat Patches



Distributing shapefiles and PDF maps





Google:
Cold water climate shield

3) Western U.S. Stream Flow Metrics



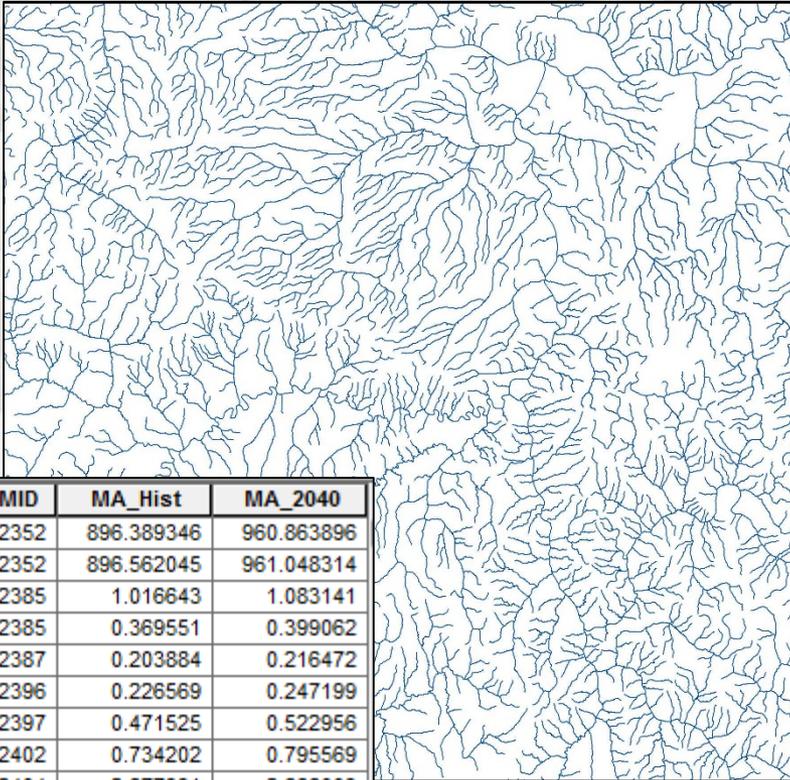
Western U.S. Stream Flow Metrics - A dataset of modeled flow metrics for streams in major river basins of the Western US for historical and future climate change scenarios.

Dr. Charles Luce and Abby Lute

- **Derived from Variable Infiltration Capacity (VIC) model**
 - **Distributing tables linked to NHDPlusV2 COMID**
 - **Historic and future flows**
- Metrics**
- **Mean annual flow**
 - **Mean August flow**
 - **Winter 95th percentile**
 - **Winter 99th percentile**
 - **1.5 year flood**
 - **Center of flow mass**

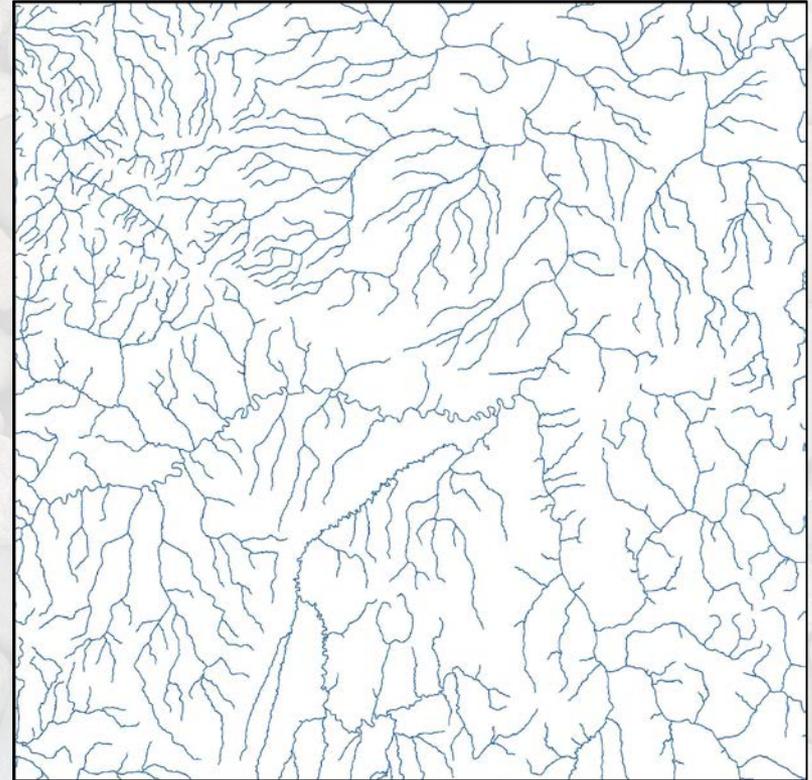
Network Thinning

**Full NHDPlus
network**

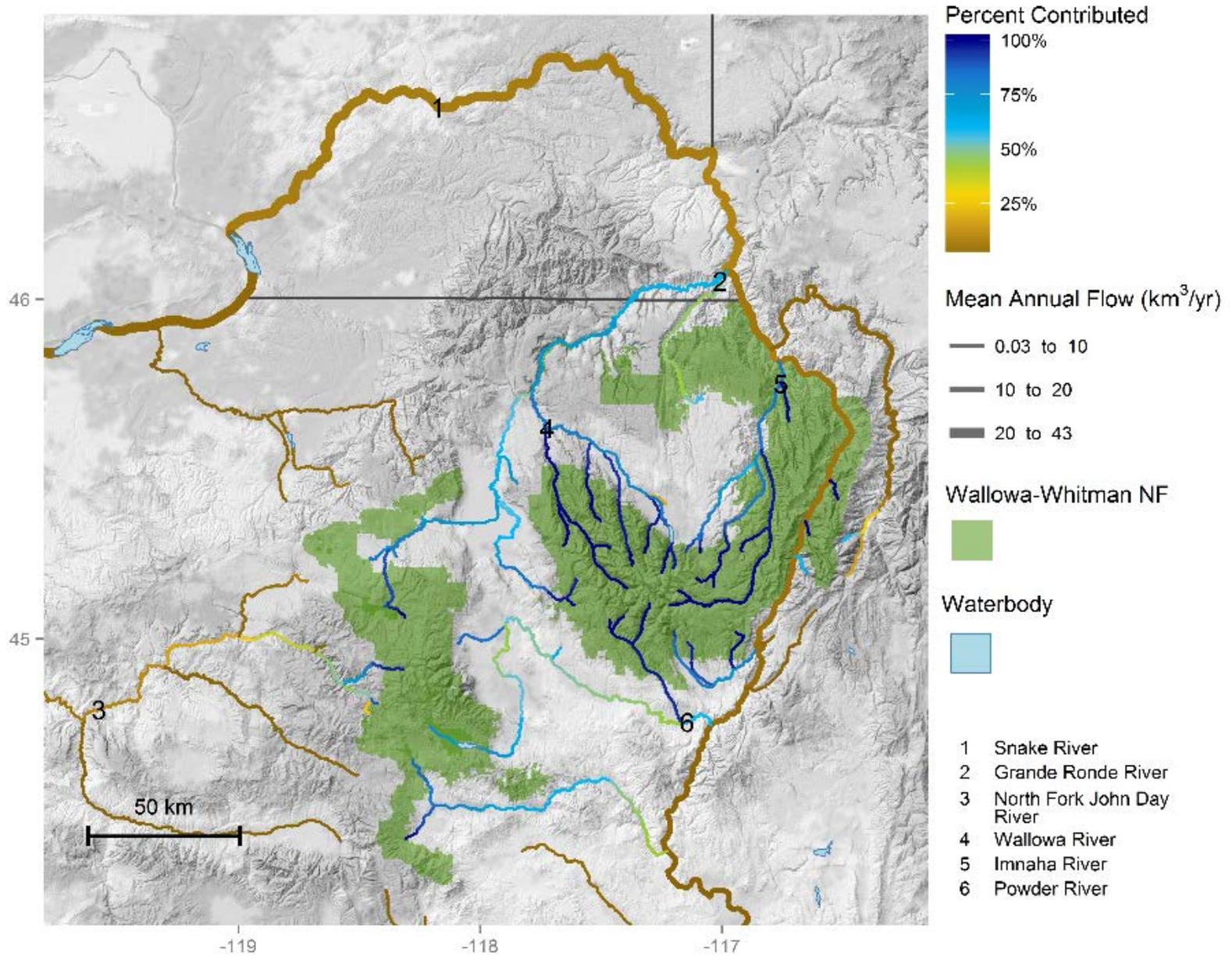


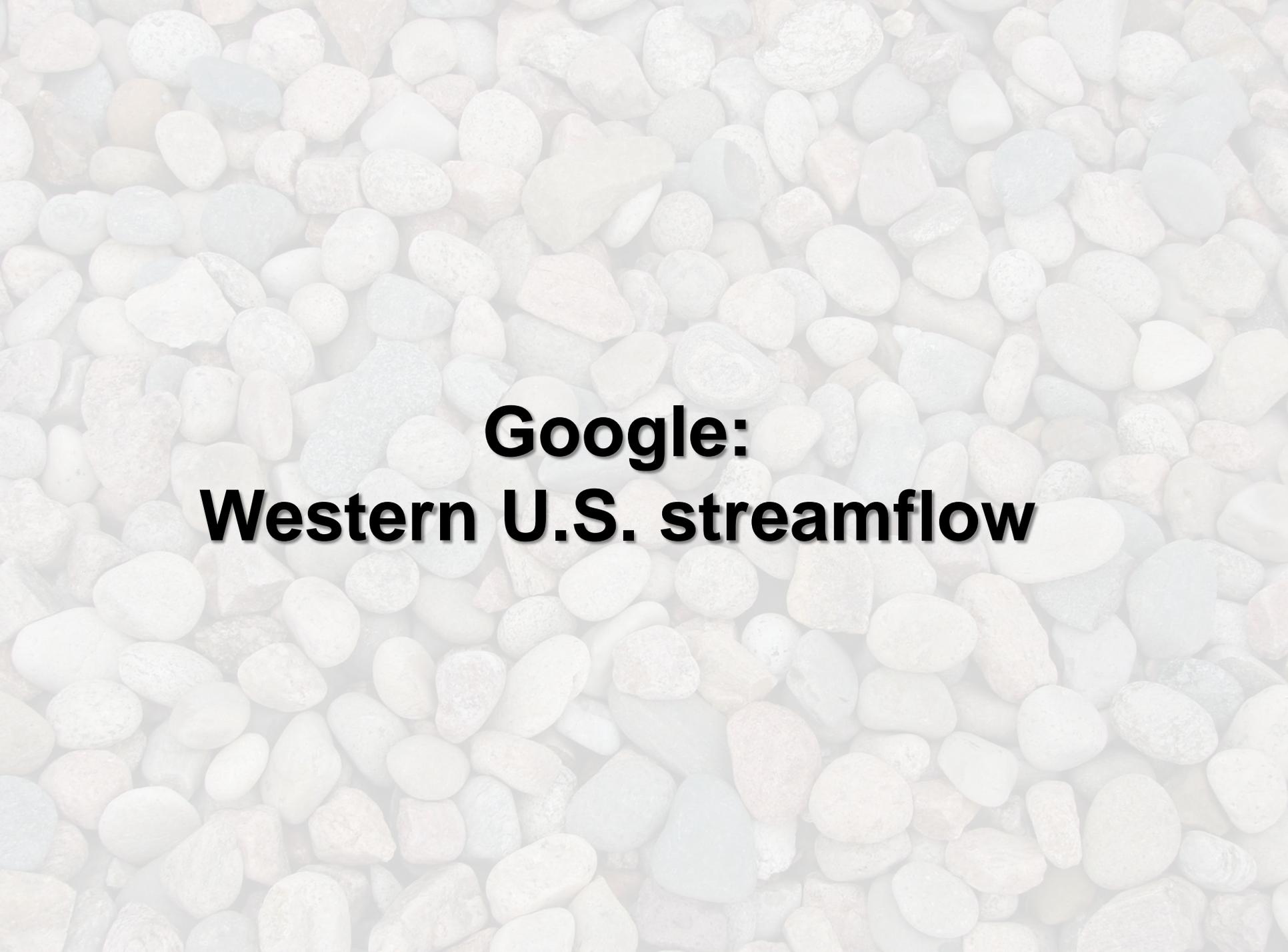
COMID	MA_Hist	MA_2040
2312352	896.389346	960.863896
2312352	896.562045	961.048314
2312385	1.016643	1.083141
2312385	0.369551	0.399062
2312387	0.203884	0.216472
2312396	0.226569	0.247199
2312397	0.471525	0.522956
2312402	0.734202	0.795569
2312404	2.677391	2.886009
2312409	0.929208	0.979848
2312412	1.682356	1.804876
2312352	895.969726	960.415803

**Mean annual
flow > 0.5 cfs**



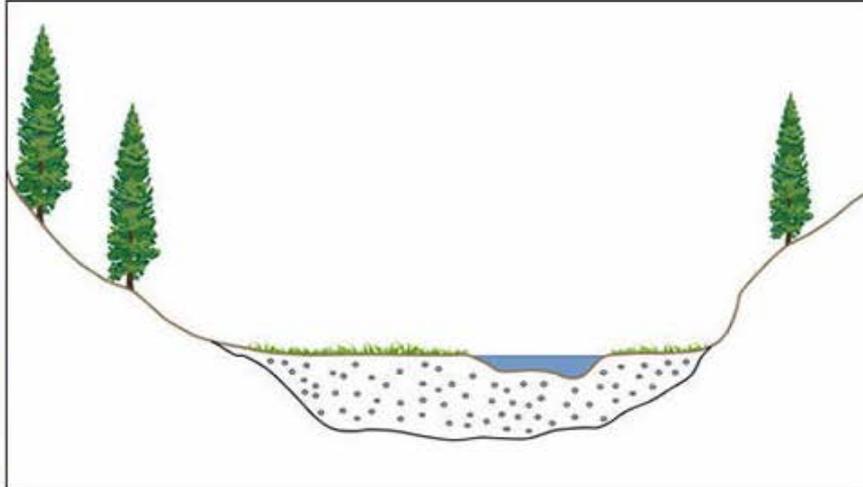
Wallowa-Whitman NF





**Google:
Western U.S. streamflow**

4) Valley Bottom Confinement



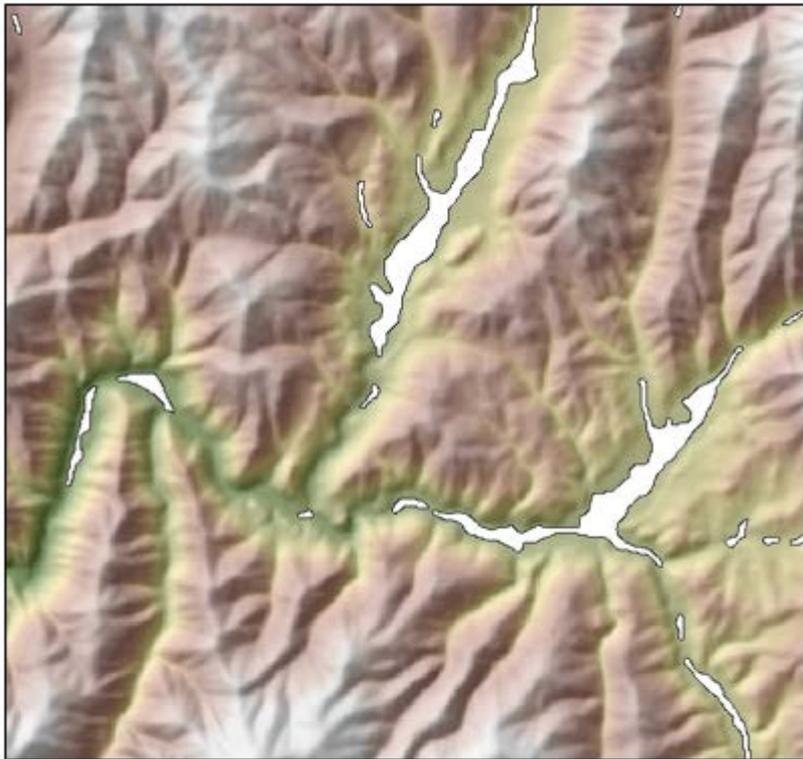
Valley Confinement Alogrithm

**GIS algorithm uses
NHDPlus and elevation
data to identify unconfined
valley bottoms**

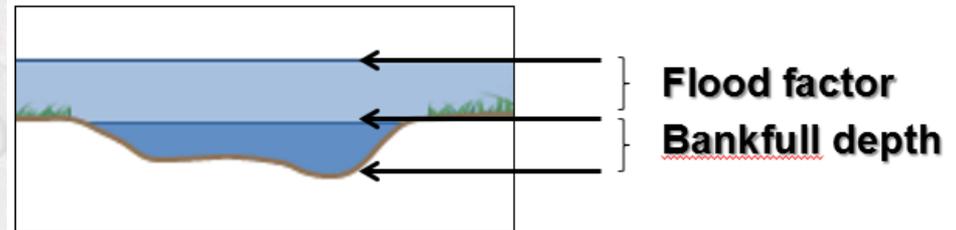
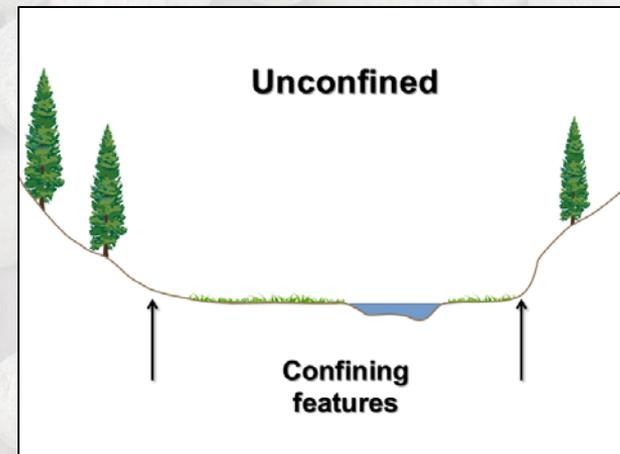
**Brook trout, Chinook,
steelhead**



Algorithm uses a flooding approach based on bankfull depth



10 km



Valley Bottom Data Distribution

Portions of NHDPlus regions 17 and 10

[Download Shapefiles](#)



Forest Service lands of the [Interior Columbia Basin in Region 17](#)



Forest Service lands in the [northwestern portion of Region 10](#)

[View Metadata \(PDF\)](#)

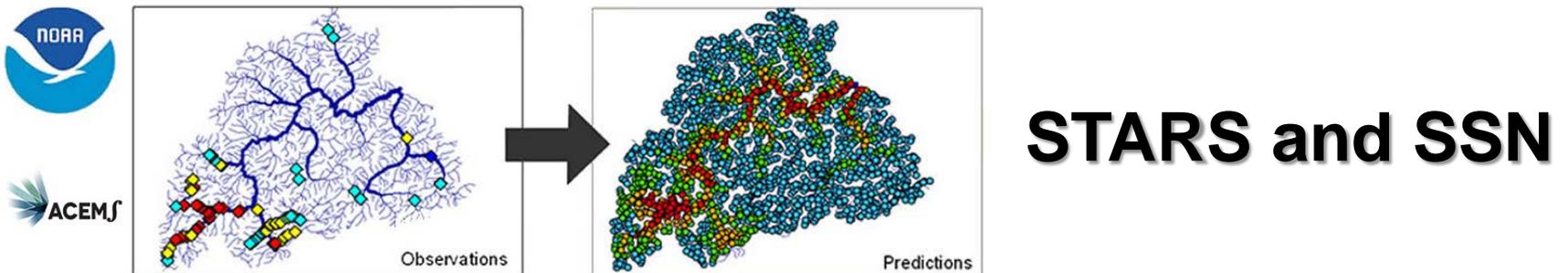


**Google:
Valley confinement algorithm**

5) National Stream Internet

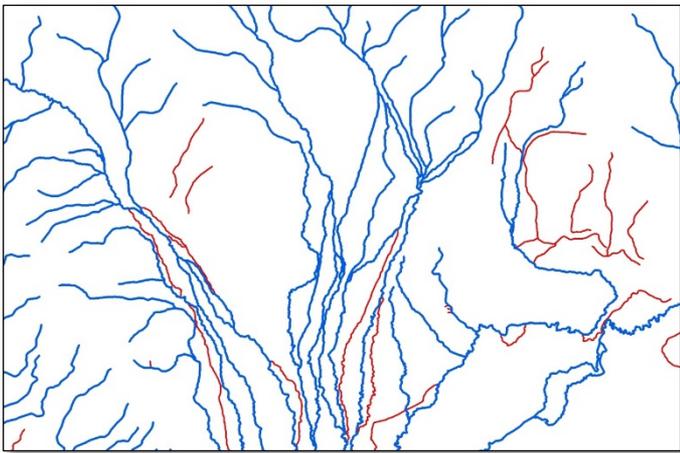


National edited NHDPlus flow lines for use with Spatial Stream-network Models

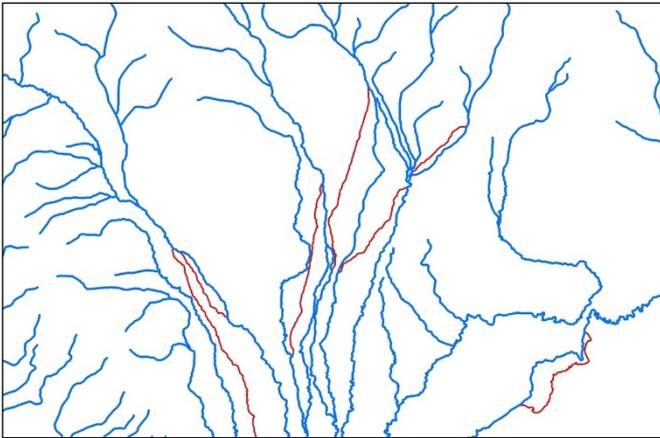


Edits

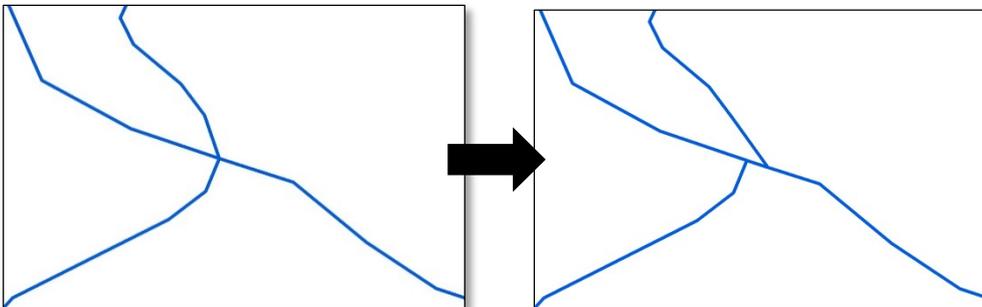
Uninitialized flow



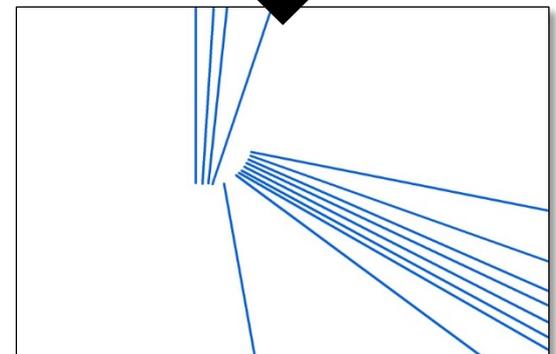
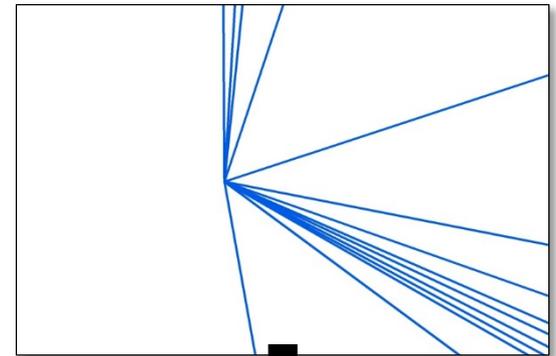
Braids



Multi-confluence



Convergence



Redistributing edited NHDPlus flow lines with a User Guide

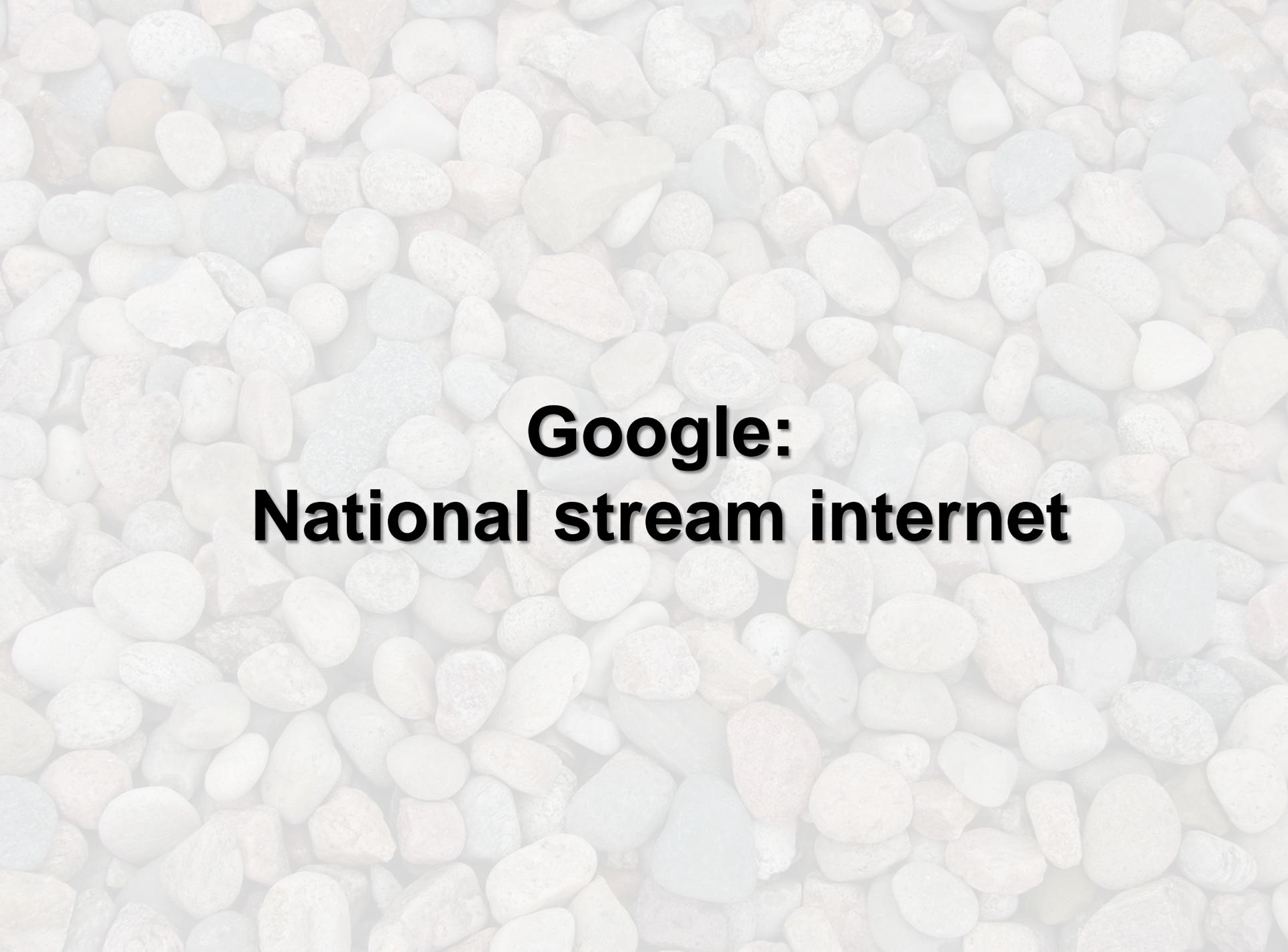
National Stream Internet Protocol and User Guide

David Nage¹, Erin Peterson², Daniel Isaak¹, Jay Ver Hoef³, and Dona Horan⁴

U.S. Forest Service, Rocky Mountain Research Station
Air, Water, and Aquatic Environments Program
322 E. Front St., Boise, ID

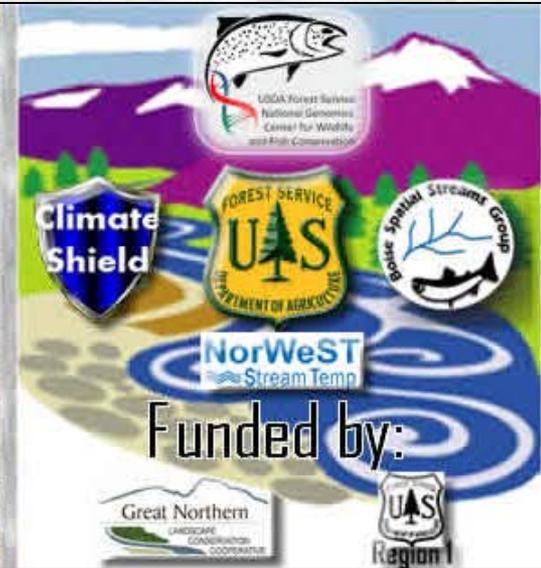


Processing Unit (NHD Plus V2)	Stream Line and Prediction Point Shapefiles (zip format)	
01 Northeast	Flowline_NE01_NSI.shp PredictionPoints_NE01_NSI.shp	
02 Mid Atlantic	Flowline_MA02_NSI.shp PredictionPoints_MA02_NSI.shp	
03N South Atlantic North	Flowline_SA03N_NSI.shp PredictionPoints_SA03N_NSI.shp	
03S South Atlantic South	Flowline_SA03S_NSI.shp PredictionPoints_SA03S_NSI.shp	



**Google:
National stream internet**

6) eDNA Bull Trout Status Assessment

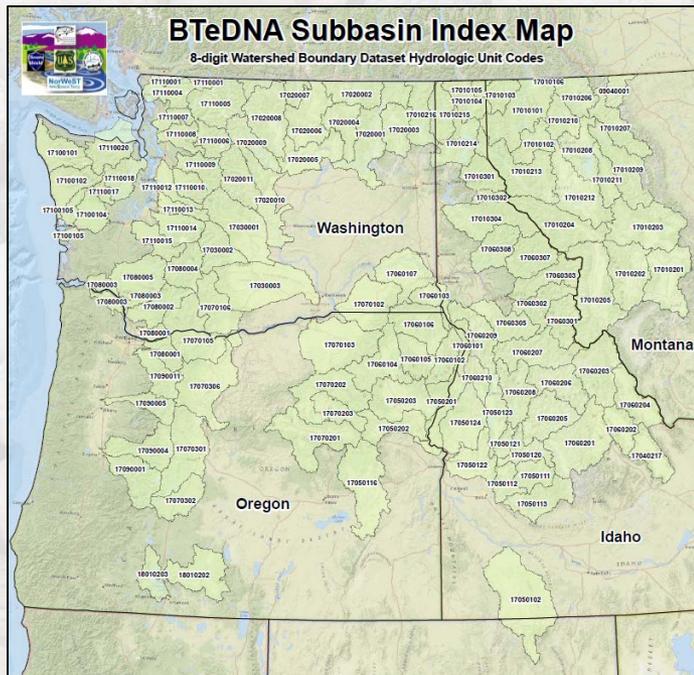


The Rangelwide Bull Trout eDNA Project

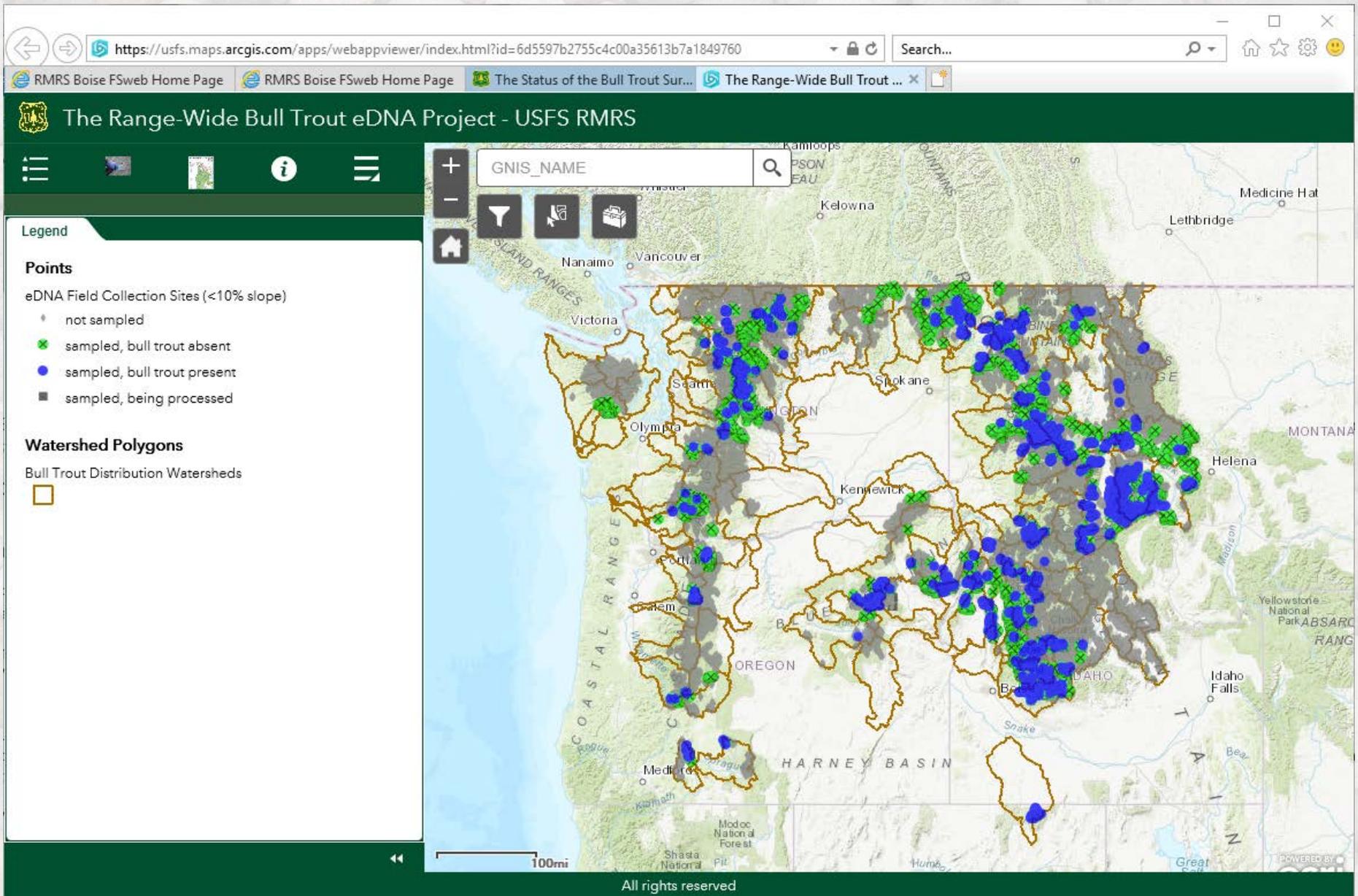
A spatial framework for water sampling, to detect free DNA and assess bull trout distribution

eDNA Bull Trout Project Scope

- 117 8-digit HUCs in historical range of BT
- 41,000+ sample sites at 1 km interval
- 6,600 samples contributed to date
- Collected by FS field crews and numerous cooperators
- Three year timeframe
- Sample results posted as available



Bull Trout AGOL Tool





Google:
Bull trout edna

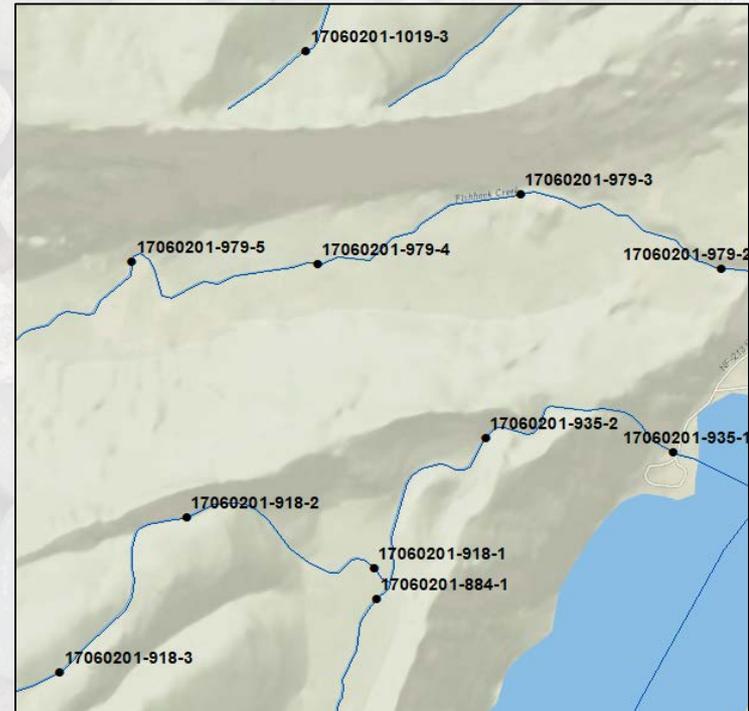
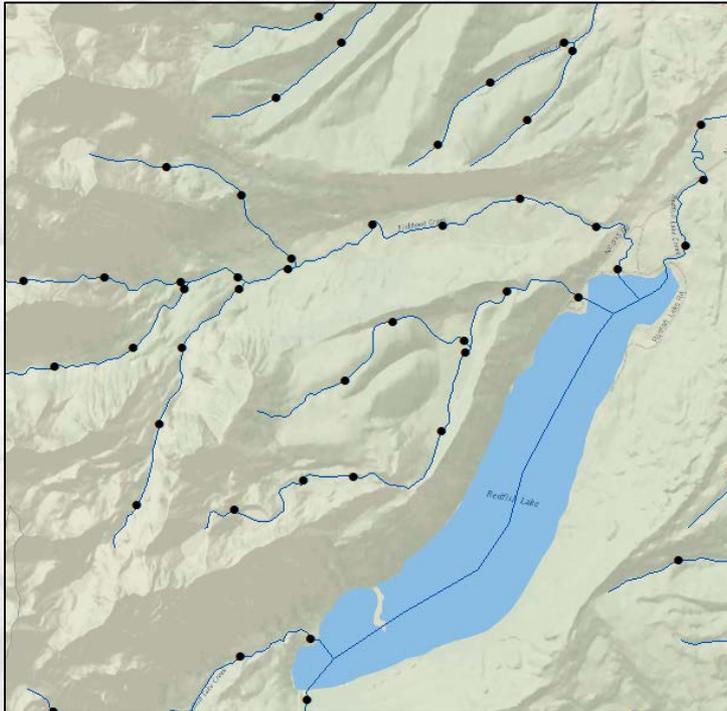
7) eDNAAtlas



**A spatial framework for water sampling,
to detect free DNA and assess
distribution of most cold-water**

eDNAAtlas Project Scope

- **1km sampling grid along all streams in the Western and Eastern U.S.**
- **Unique site IDs**
- **Sampling kits available on loan**
- **Results posted when available**
- **11,000+ samples contributed to date**



eDNAAtlas AGOL Tool

The screenshot displays the eDNAAtlas AGOL Tool web application. The browser window shows the URL <https://usfs.maps.arcgis.com/apps/webappviewer/index.html?id=b496812d1>. The application title is "The Aquatic eDNAAtlas Project: Lab Results Map - USFS RMRS".

The interface includes a search bar at the top with the text "GNIS_NAME" and a search icon. Below the search bar are navigation controls: a home button, a filter button, a print button, and a full-screen button. The main map area shows a topographic view of a mountainous region with various elevation points (e.g., 2101 m, 2862 m, 2694 m, 2453 m, 584 m). The map features several layers of data points, represented by green crosses and blue dots, indicating sampling locations and species presence/absence. The map also shows geographical features like "HELLS CANYON", "DEAD HORSE MOUNTAINS", "BLUE BUNCH RIDGE", and "DRILLER MOUNTAINS".

On the left side, there is a "Layer List" panel with the following items:

- sampled, species absent
- sampled, species present
- Arctic Grayling Samples (ARGR) ...
- sampled, species absent
- sampled, species present
- Boreal Toad / Western Toad Complex Samples (BOTO) ...
- sampled, species absent
- sampled, species present
- Brook Trout Samples (BRKT) ...
- sampled, species absent
- sampled, species present
- Brown Trout Samples (BRNT) ...
- sampled, species absent
- sampled, species present
- Bull Trout Samples (BULL) ...
- sampled, species absent
- sampled, species present
- Burbot Samples (BURB) - being processed ...
- sampled, species absent

At the bottom of the map, there is a scale bar (0 to 6 miles) and the text "All rights reserved". A notification at the bottom of the browser window reads: "It looks like you haven't started Firefox in a while. Do you want to clean it up for a fresh, like-new experience? And by the way, welcome back!" with a "Refresh Firefox..." button.



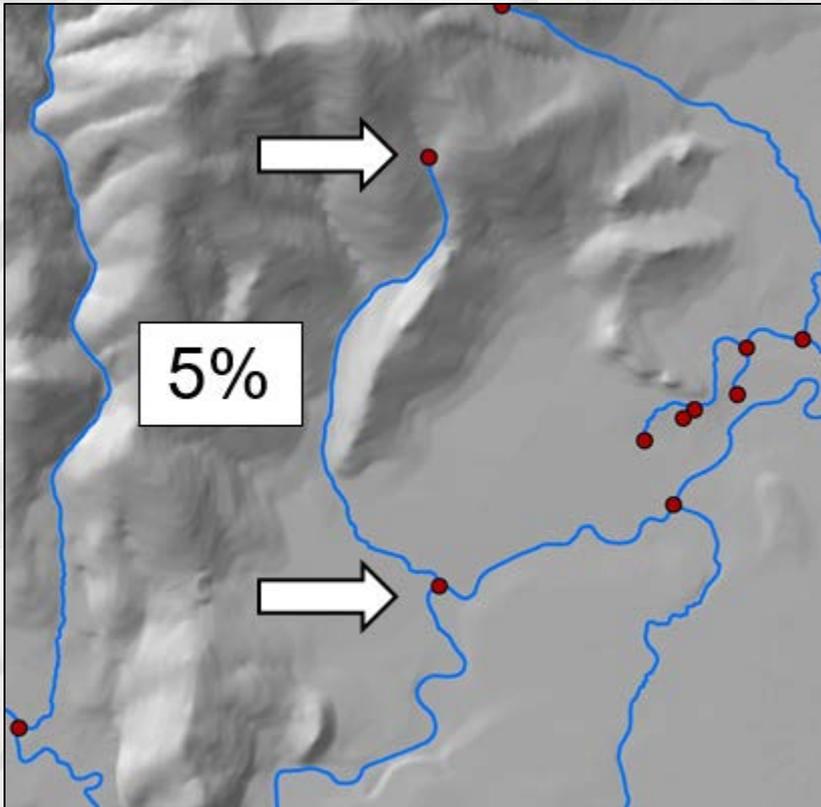
**Google:
edna atlas**

8) West-wide Stream Gradient Coming Soon

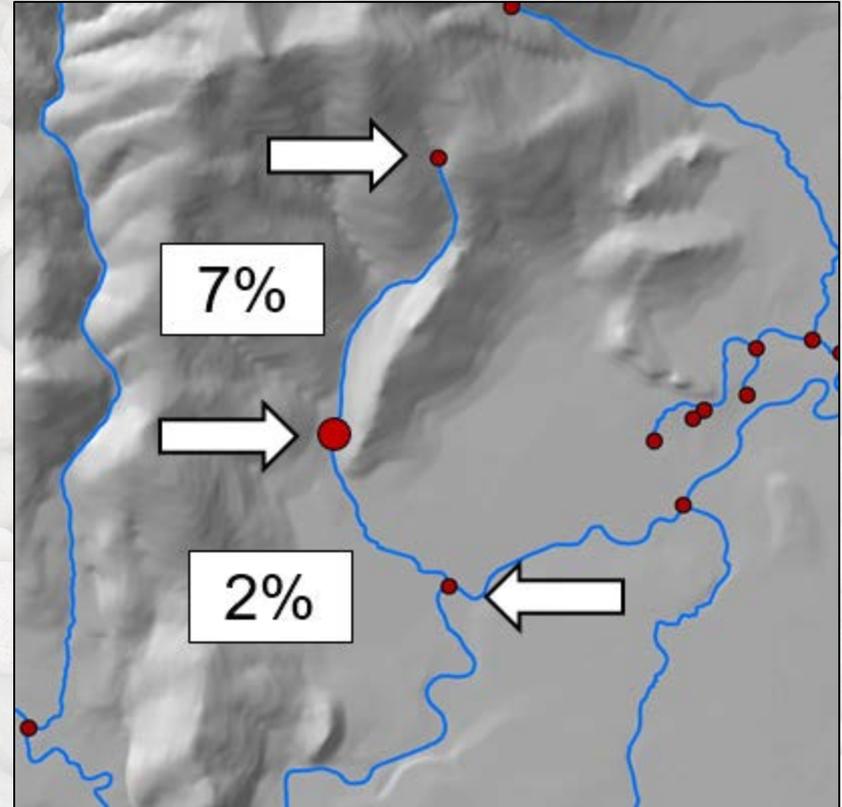


Gradient Calculations

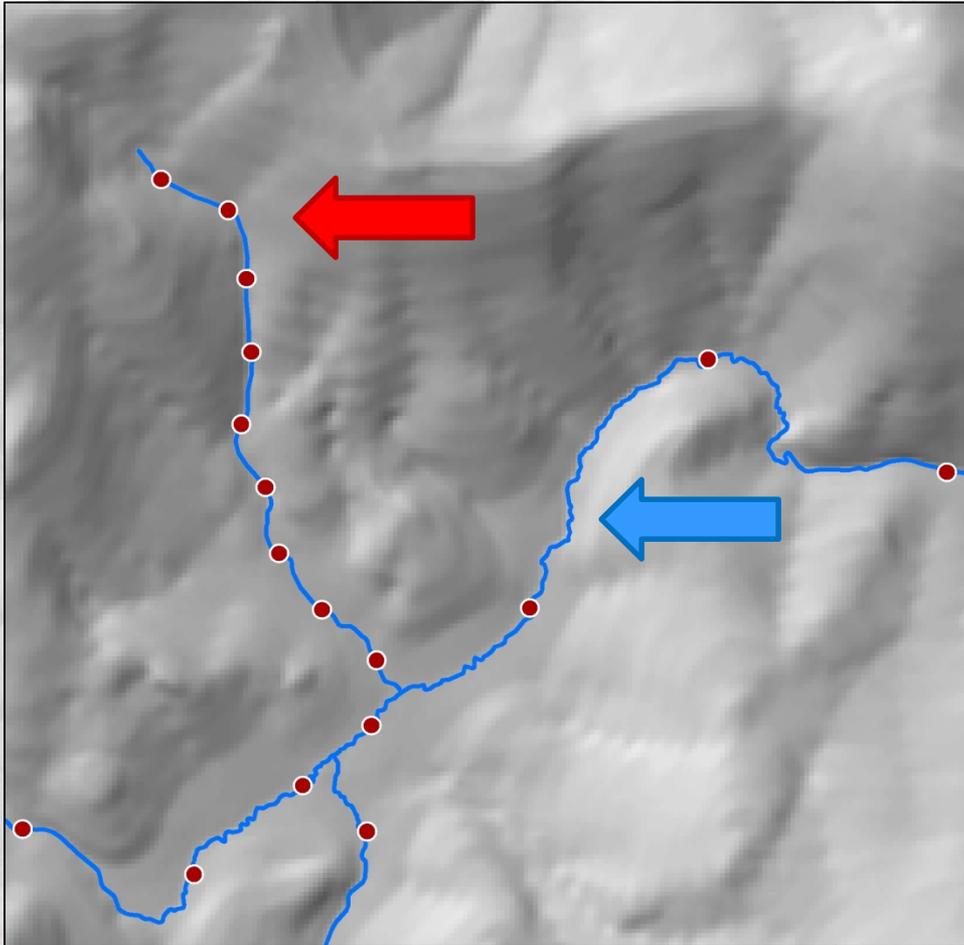
NHD gradient



Ideal gradient



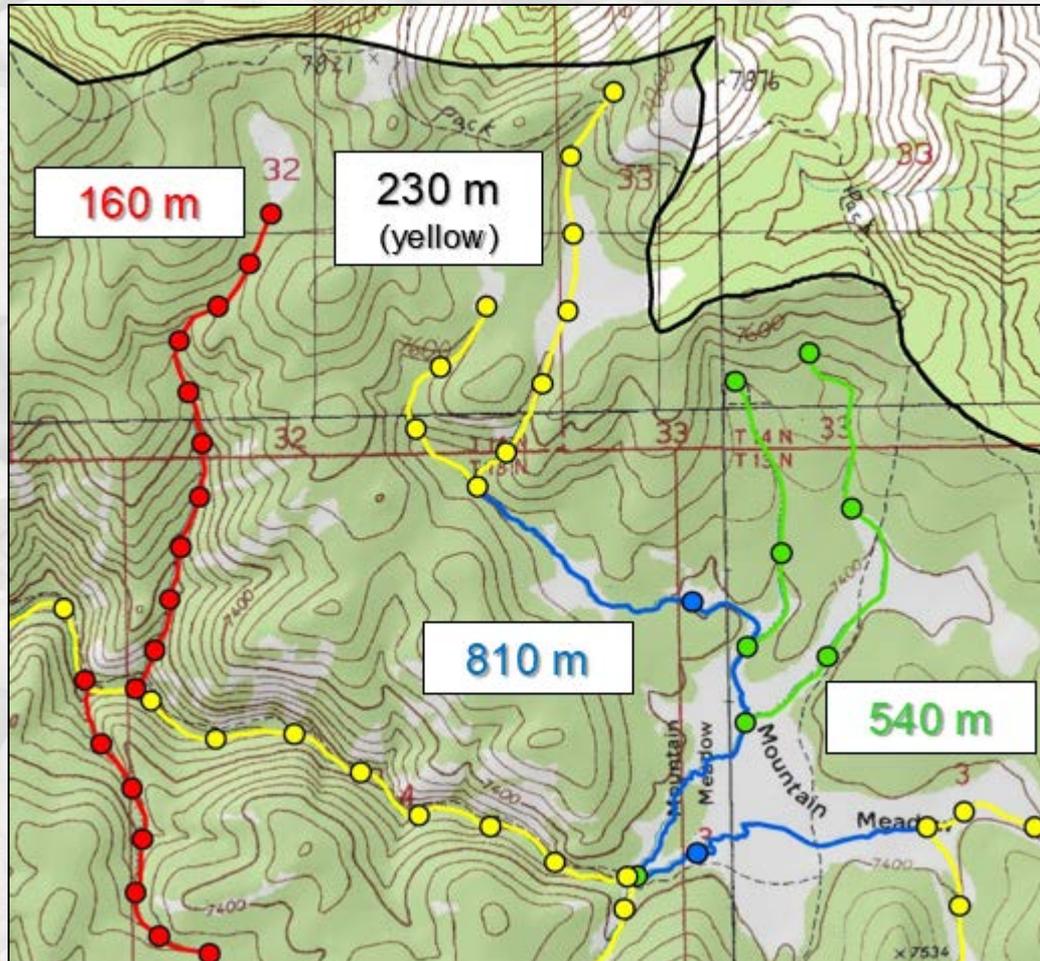
Our solution is a variable interval spacing, which varies by slope class and approximates the original quad map contour spacing



High gradient = short intervals

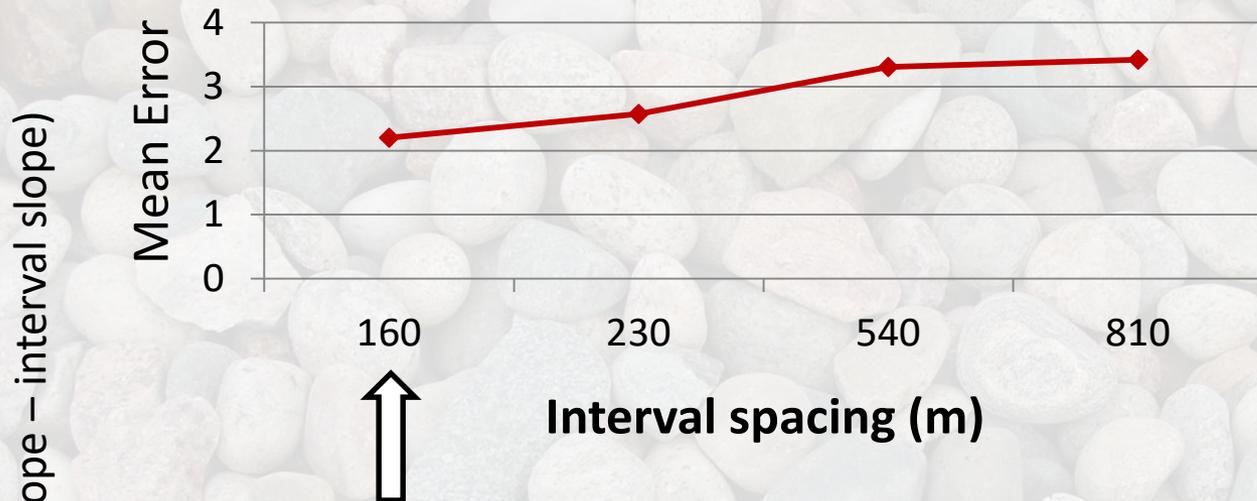
Low gradient = longer intervals

Variable intervals approximating original contours



High Slope Streams (Cascade - Slope > 7.5%)

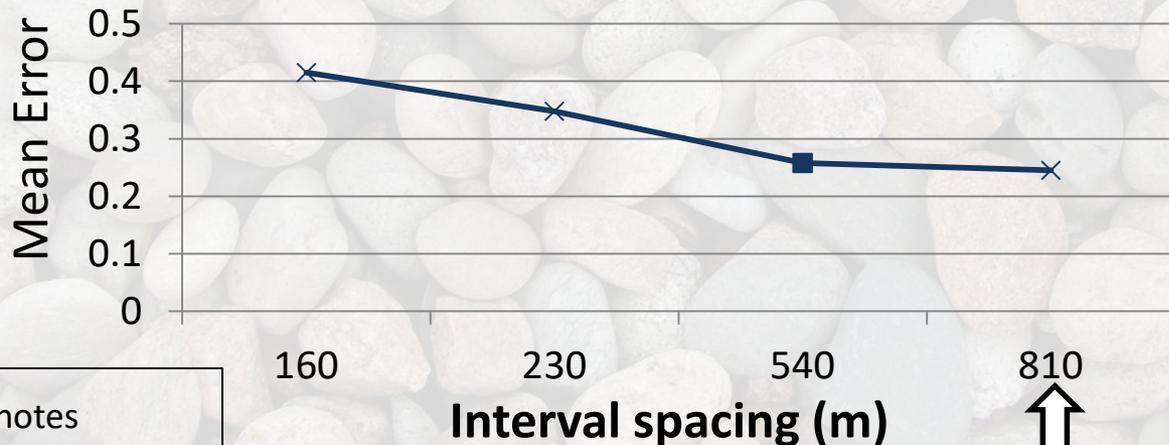
36%
improvement
over 810 m



Mean error = ABS(contour slope - interval slope)

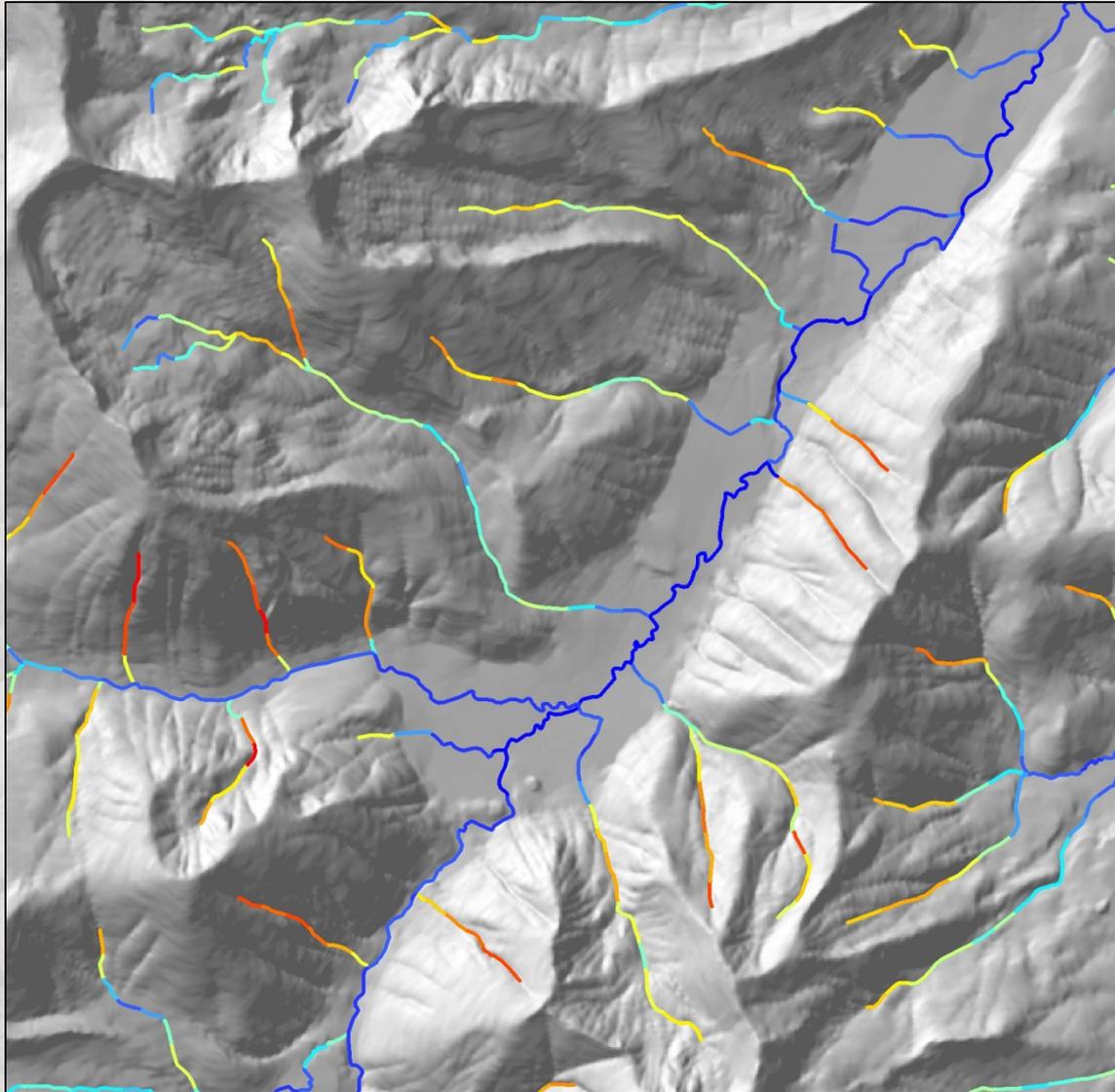
Low Slope Streams (Pool-riffle - Slope < 1.5%)

40%
improvement
over 160 m



↑ Denotes minimum error

Final Channel Gradient



Google: AWAE Forest Service

david.nagel@usda.gov



UNITED STATES DEPARTMENT OF AGRICULTURE - U.S. FOREST SERVICE



Rocky Mountain Research Station

Air, Water, & Aquatic Environments Program



ABOUT AWAE RESEARCH ▾ PROJECTS, TOOLS, & DATA ▾ PUBLICATIONS ▾ CONTACT US ▾

 search only AWAE



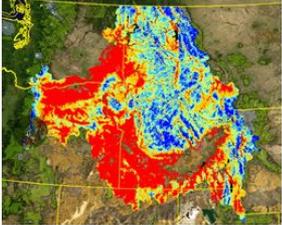
AWAE is at the forefront of the study of natural resources and works to maintain healthy watershed conditions in our national forests.

PUBLICATIONS

AWAE provides impartial information on the health of our ecosystems and environments, the natural resources we rely on, the impacts of climate and land-use change, and the core science systems that help us provide timely, relevant, and useable information. To learn more, access [publications](#) written by our scientists in a variety of formats.

-  JOURNAL ARTICLES (TREESearch)
-  SCIENCE BRIEFINGS
-  TECHNICAL REPORTS

PROJECTS, TOOLS, & DATA



NorWeST Stream Temperature
The NorWeST webpage hosts stream temperature data and geospatial map outputs from a regional temperature model for the Northwest U.S.

Ge GR

RESEARCH TOPICS

RMRS AWAE scientists cover a wealth of different subject areas, with much collaboration between specialties. Scientists have extensive experience and expertise within the [Rocky Mountain Research Station's Strategic Research Priorities](#) and associated Sub-Elements, including:

- DISTURBANCE ECOLOGY
- HUMAN-LANDSCAPE INTERACTIONS
- RESILIENT LANDSCAPES
- FIRE SCIENCES
- INVENTORY & MONITORING
- SPECIES ENDANGERMENT
- WATER & WATERSHEDS

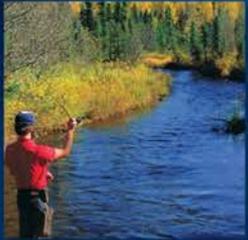
Updates

- NHD
 - VisFilter Attribute is complete. Please update your NHD to take advantage of it.
 - New feature – Drainageway: Will be added soon. Will have more at next TWG.
- WBD
 - Some model changes coming. More to come at the Sept. TWG.
- NHDPlus HR
 - Region 16 & 17 in beta. Working on refresh of 1601.
 - If you want to submit QC edits, see IDWR website.
 - Refresh cycle starting with Regions 6,1, & 2.
 - [VAA Webpage](#)
- Markup Reviewer
 - For submitting small edits to all 3 datasets.



- IDWR





Updates

NHD/WBD Tools Status

Editor Tools: All require ArcGIS 10.5.1

- NHD: version 6.7.1.0
- WBD: version 2.9.1.31
- GeoConflation: 3.4.1.0

Tools available from nhd.usgs.gov

- HEM: version 2.10.0.1
- Utilities: version 3.1.1.0
 - Network Builder Requires ArcGIS Standard or Advanced License

Training: Will begin again in May.
Email NHD.WBD@idwr.idaho.gov if interested.



Other Business?





Upcoming Events

- **IWUA Water Law & Resource Issues Seminar**
 - June 8-9, 2020 Sun Valley, ID
- **URISA GIS-Pro**
 - Sept. 27 – Oct. 1, 2020 Baltimore, MD
- **Northwest GIS Conference**
 - Sept. 27-Oct. 2, 2020 Boise, ID



Contact Information:

Danielle Favreau, Idaho WBD & NHD Technical Point of Contact Danielle.Favreau@idwr.idaho.gov

Linda Davis, Idaho Principal Data Steward Linda.Davis@idwr.idaho.gov

NHD.WBD@idwr.Idaho.gov

Website Information: <http://idwr.idaho.gov/GIS/NHD/>

NEXT TWG MEETING: Sept. 10, 2020

