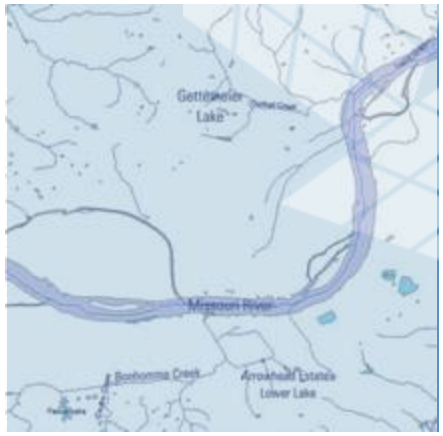
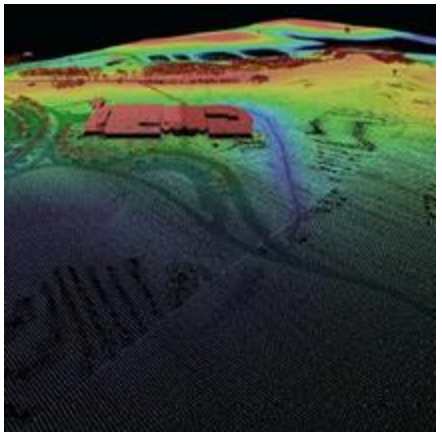
WBD Training









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The WBD Team
Kimberly Jones (kjones@usgs.gov)
Sheryl Boyack (sboyack@usgs.gov)
Brittany Gold (bgold@usgs.gov)
Lily Niknami (lniknami@usgs.gov)

Introduction

WBD National Team

- Kimberly Jones

kjones@usgs.gov
  - WBD National Technical Coordination Lead
  - WBD National Technical Coordinator
  - USGS Utah Water Science Center

- Lily Niknami

lniknami@usgs.gov
  - WBD National Technical Point of Contact
  - WBD National Technical Coordinator
  - USGS National Geospatial Technical Operations Center Denver

- Sheryl Boyack

sboyack@usgs.gov
  - WBD National Edit Team
  - USGS Utah Water Science Center

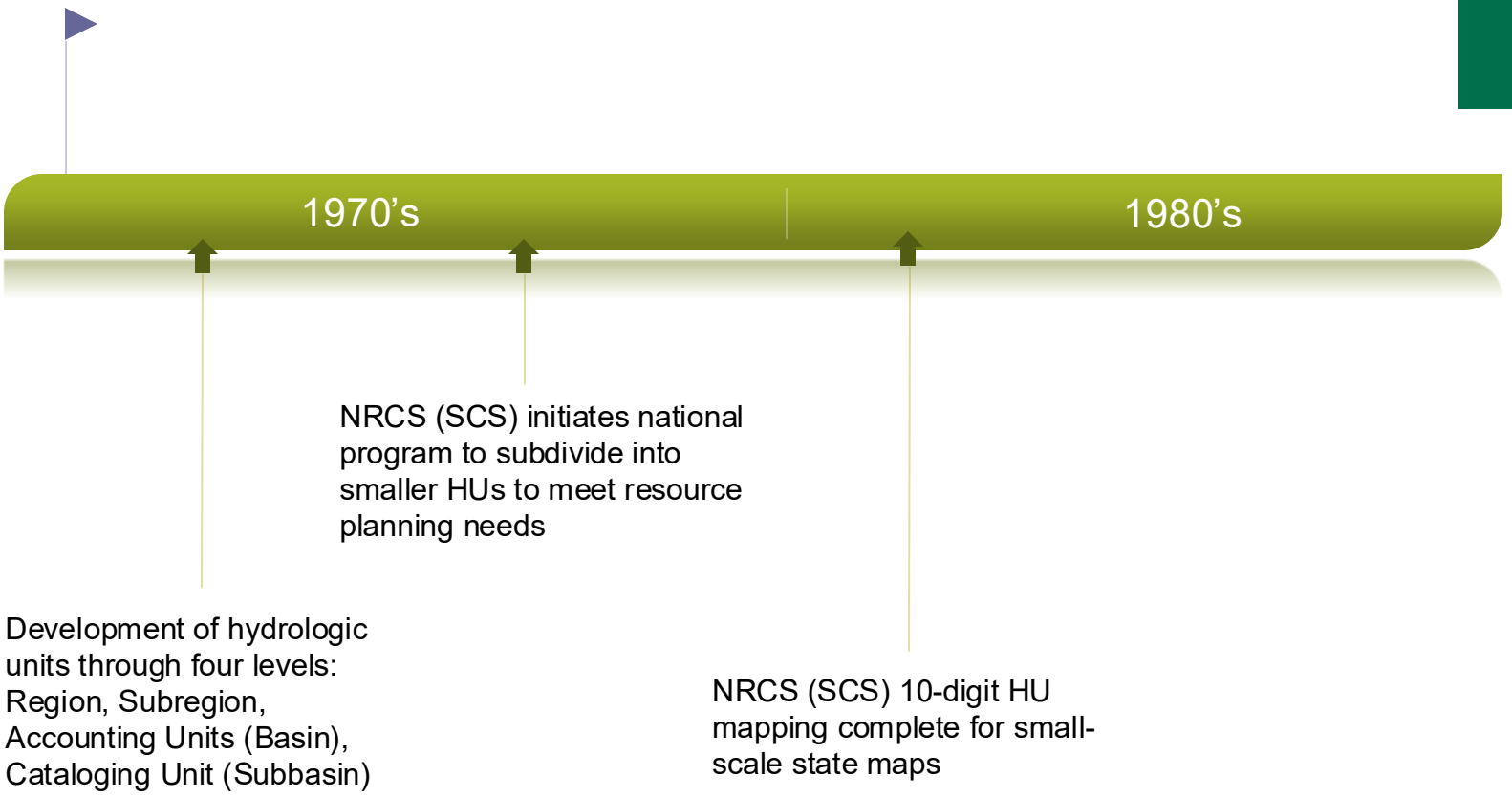
- Brittany Gold

bgold@usgs.gov
  - WBD National Edit Team
  - USGS Utah Water Science Center

Agenda

1. Overview and History
2. Metadata
3. Geometry Changes and Guidance
4. Attribution Changes and Guidance
5. QA/QC

History of WBD : 1970's - Present



History of WBD : 1970's - Present



1992
NRCS develops National Instruction for standardized delineation criteria for 10 and 12-digit HUs

National initiative to delineate and digitize 10 and 12-digit HUs in compliance with The National Map accuracy standards

1995-2010
State partners, USDA-FS, BLM, EPA continue to delineate 10- and 12-digit Hus; coordination at state and federal levels

Stakeholders conduct regional workshops to develop and certify nationally consistent HU digital framework

June 2008
Formal agreement between USGS and NRCS; cooperative enhancement, integration and distribution of WBD with NHD; WBD becomes a component of The National Map

2012-Present
USGS becomes host of WBD, NRCS copartners

Ongoing coordination to improve WBD

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WBD Overview

Watershed Boundary Dataset (WBD)

- Consistent national composition of hydrologic units (HUs) defined by hydrologic and topographic features (such as ridges and valleys)
  - No political/administrative boundaries
- HUs are hierarchical (nested) – they describe surface water drainage areas at different geographic scales
- Largely created from heads-up digitizing of – at a minimum – 1:24k DRGs

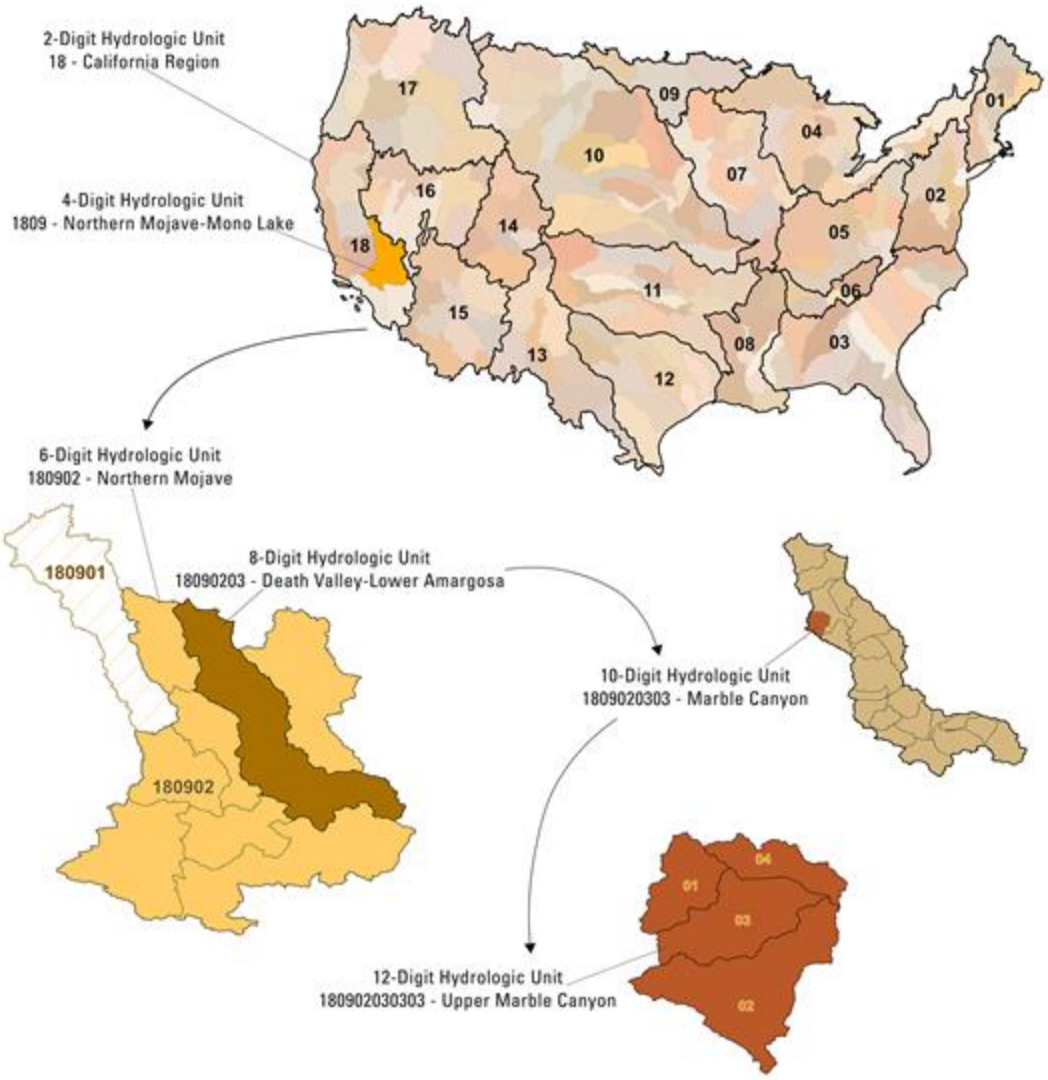




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WBD Overview

- HUs are uniquely identified by a code with a particular number of digits depending on which nested level they represent
  - 2, 4, 6, 8, 10, 12, 14, and 16-digits
  - # and value of the digits specifies how far nested a HU is in its parent and which parent HU it belongs to
  - The larger the # of digits, the smaller the HU size
  - WBD is complete for the nation to the 12-digit HU level. 14- and 16-digit HU levels are optional and developed based on state/local need and are not complete for the nation.



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WBD Overview

WBD Model Overview

Feature Classes

- WBD
  - WBDLine
  - WBDHU2
  - WBDHU4
  - WBDHU6
  - WBDHU8
  - WBDHU10
  - WBDHU12
  - WBDHU14
  - WBDHU16
- NWIS
  - NonContributingDrainageArea
  - NonContributingDrainageLine
  - NWISDrainageArea
  - NWISDrainageLine

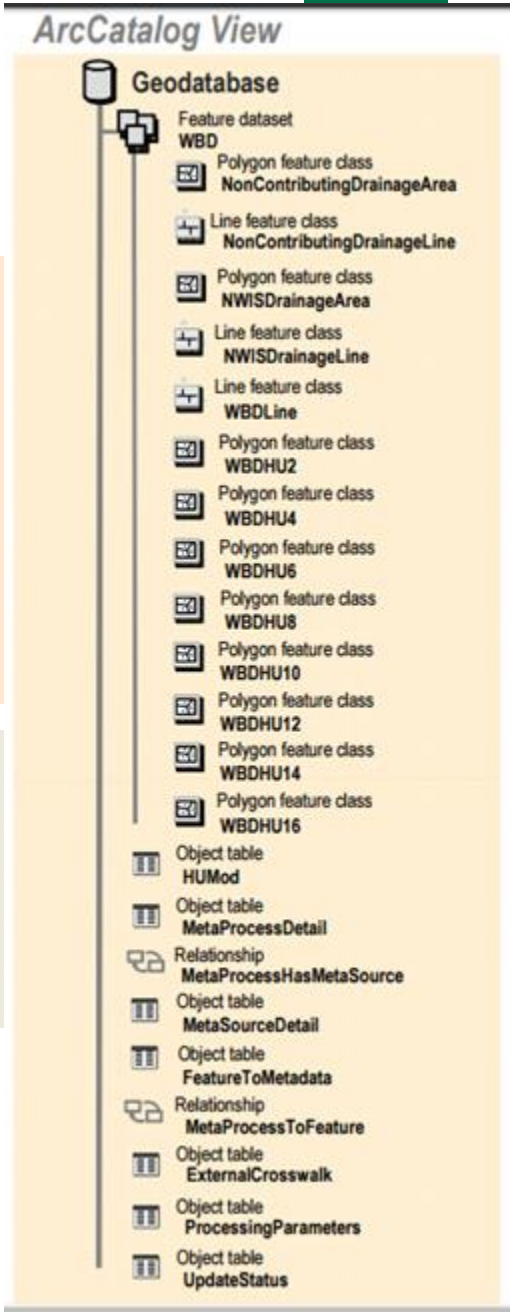
Tables

- FeaturetoMetadata
- MetaProcessDetail
- MetaSourceDetail
- ExternalCrosswalk
- ProcessingParameters
- UpdateStatus
- HUMod

Relationship Classes

- MetaProcessHasMetaSource
- MetaProcessToFeature

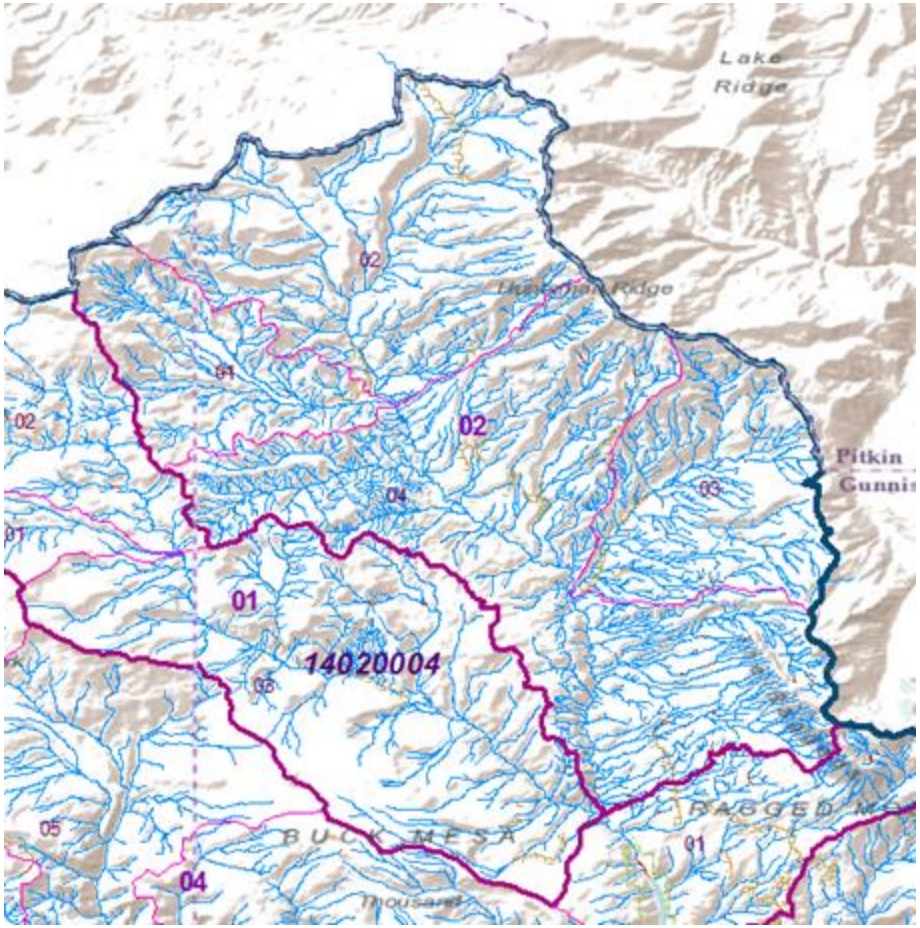
Link to Model Poster:
Watershed Boundary Dataset (WBD) Data Model (v2.3.1) Poster | U.S. Geological Survey (usgs.gov)



WBD Overview

Value Added

- Spatially
  - HUs indicate where surface water is contained and where it is flowing
    - Scientists use HUs to define study areas related to water resources and conservation
    - HUs naturally group surface water features



WBD - Stewardship

Throughout WBD's history, it has been recognized that the scope of a national dataset is more than a one-agency effort.

- Stewardship is the key component to building a seamless hydrographic framework at local, regional and national scales. The stewardship program was a foundational part of building the WBD into what it is today.
  - Geospatial accuracy
  - Informed decision making
  - Promoting adaptive management and resilience of our nation's surface water systems

The Alaska WBD Principal Steward is Sheryl Boyack (sboyack@usgs.gov)

USGS National Geospatial Program (NGP)
USGS Water Mission Area (WMA)

- **NGP National Geospatial Technical Operations Center (NGTOC)**
  - ***WBD National Technical Coordinator***
  - Data management and delivery
  - Stewardship and tool support
  - Tool development
  - National-level data maintenance and improvement

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- **USGS Utah Water Science Center (WSC)**
  - ***WBD National Technical Coordinator (Lead)***
  - National-level data maintenance and improvement
  - Stewardship and tool support
  - ***NGP-WMA WBD Team Lead***
  - Programmatic direction and decisions
  - NGP Hydrography leadership team

USDA Natural Resources Conservation Service (NRCS)

- **National Geospatial Center of Excellence**
  - ***WBD National Technical Coordinator***
  - Principal Federal stakeholder
  - Many stewards

NRCS
Natural Resources Conservation Service

Stewards

Users

Contractors



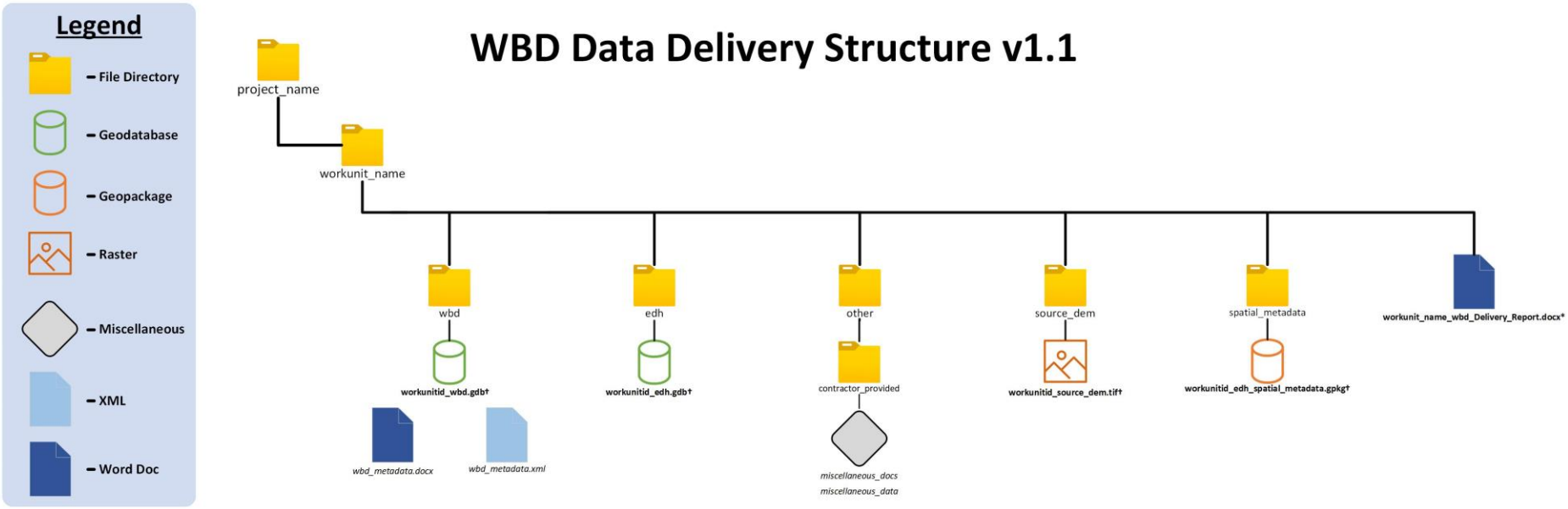
STATES

UNIVERSITY

USGS
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NRCS
Natural Resources Conservation Service

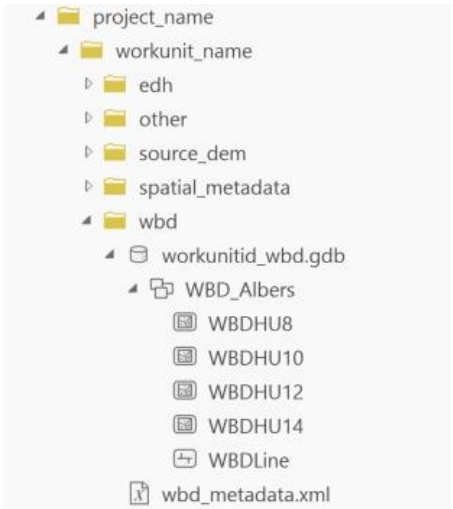
WBD Data Delivery Structure



All File Directory Naming Conventions Should Be Followed Exactly

* recommended file format
** CONUS only requirement
† required file format

Required File Name - Bold
Suggested File Name - Italic



NOTES:

- edh folder should contain the edh data used while developing/updating the WBD
- Source dem is only required with first delivery of the data unless the outer boundary changes enough that the original source dem does not adequately cover the extent anymore.
- DEM limitation dataset is needed if it exists for the work unit

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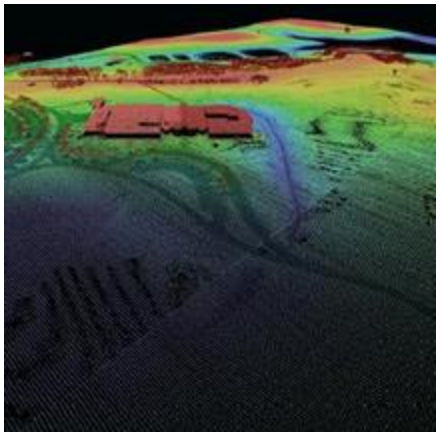
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Metadata









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WBD Metadata

Feature-Dataset vs Feature-Level Metadata

- FGDC Feature Dataset Metadata
  - Relevant to a dataset as a whole
  - For the national WBD, States are required to keep their own state-level WBD FGDC metadata up-to-date with major edits
  - Historical WBD state metadata archive
- FGDC Feature Level Metadata
  - Relevant to a specific feature in a dataset. Discoverable on WBD features in the national dataset.

For your deliverables, you will be required to provide FGDC complaint metadata. A template will be provided to you for this process.

*Metadata template is reviewed in the QC process, and will be appended to the data when it is submitted back to the national WBD

```
                    <origin>U.S. Geological Survey (USGS)</origin>
                        <origin>### Agency/Office that produced the
data</origin>
                    <pubdate>###Date that the data is provided to
USGS</pubdate>
                    <title>National Watershed Boundary Dataset (WBD), ###
Add the hydrologic unit code to the title</title>
                    <geoform>Vector Digital Data Set</geoform>
                    <onlink>https://usgs.gov/WBD</onlink>
                </citeinfo>
            </citation>
            <descript>
                <abstract>The Watershed Boundary Dataset (WBD) is a
comprehensive aggregated collection of hydrologic unit data consistent with
the national criteria for delineation and resolution. It defines the areal
extent of surface water drainage to a point except in coastal or lake front
areas where there could be multiple outlets as stated by the Federal
Standards and Procedures for the National Watershed Boundary Dataset (WBD),
herein after referred to as the "Standard" (http://pubs.usgs.gov/tm/11/a3).
Watershed boundaries are determined solely upon science-based hydrologic
principles, not favoring any administrative boundaries. This dataset
represents the hydrologic unit boundaries to the 12-digit (6th level) for ###
(Enter HUC information and state. For example; 8-digit hydrologic unit
19080402 in Alaska).  Some areas may also include additional subdivisions
```

Elements of Metadata

What are we looking for in the metadata?

- Some of the required information includes, but is not limited to:
  - Title (which area is being delivered)
  - Who produced the data
  - Location Information
  - Source information and publication information
  - Source citation information
  - Description of process used to develop the data
  - Positional accuracy information
  - Metadata date

```
                    <srccite>
                        <citeinfo>
                            <origin>### Name of the organization or
individual that developed the source data</origin>
                            <pubdate>### The date when the source
dataset was published or otherwise made available.</pubdate>
                            <title>### The name by which the source
dataset is known</title>
                            <geoform>### The mode in which the
geospatial data is presented</geoform>
                            <othercit>###Provide citation information
to the source if available. If not remove the othercit section</othercit>
                            <onlink>### The online address of where
the source data was acquired</onlink>
                        </citeinfo>
                    </srccite>
                    <srcscale>### Source scale denominator</srcscale>
                    <typesrc>### Type of source media</typesrc>
                    <srctime>
                        <timeinfo>
                            <rngdates>### can change to <sngdate>
tags if that is more appropriate.
                                <begdate>###</begdate>
                                <enddate>###</enddate>
                            </rngdates>
                        </timeinfo>
                        <srccurr>### The basis on which the source time
period of content information of the source data set is determined</srccurr>
                    </srctime>
                    <srccitea>### The short form alias for the source
citation. Example 3DEP, IfSAR DEM</srccitea>
                    <srccontr>### A brief statement identifying the
information contributed by the source dataset to the final dataset</srccontr>
                </srcinfo>
                <procstep>
                    <procdesc>### An explanation of the processes used to
develop the data. Can be split into multiple entries if needed.</procdesc>
                    <srcused>### List of source citations (shore name)
used for the process.</srcused>
                    <procdate>### Timeline that process description was
carried out.</procdate>
                </procstep>
```

Elements of Metadata

Location Information

- Location information (placekey): Information that provides location information about the hydrologic unit
  - Include State information
  - Include major hydrographic features (can use the names of hydrography features used to name the Hydrologic units)

```
<place>
      <placekt>Geographic Names Information
      System</placekt>
      <placekey>US</placekey>
      <placekey>United States</placekey>
      <placekey>Alaska</placekey>
      <placekey>Adam Lake</placekey>
      <placekey>Alfred Creek</placekey>
      <placekey>Beaver Slough</placekey>
      <placekey>Big Lake</placekey>
      <placekey>Bull Creek</placekey>
      <placekey>Butte Creek</placekey>
      <placekey>Candle Creek</placekey>
      <placekey>Coal Creek</placekey>
      <placekey>Crazy Slough</placekey>
      <placekey>Dall River</placekey>
      <placekey>Dall River Headwaters</placekey>
      <placekey>East Fork The Forks</placekey>
      <placekey>Flat Lake</placekey>
      <placekey>Forty and One</placekey>
      <placekey>Fortymile Creek</placekey>
      <placekey>Fortytwo Mile Creek</placekey>
```


```
<place>
      <placekt>Geographic Names Information
System</placekt>
      <placekey>US</placekey>
      <placekey>United States</placekey>
      <placekey>### The name of the place(s) that include
the dataset such as state. Enter multiple places as separate entries. Include
keywords for major geographic names that are used in the watershed boundary
names here. Example Yukon River</placekey>
</place>
```

Elements of Metadata

Souce Information

- **Source Information** (srcinfo): Information about the sources used to update the WBD
  - Include a record for each source used

```
                    <srccite>
                        <citeinfo>
                            <origin>### Name of the organization or
individual that developed the source data</origin>
                            <pubdate>### The date when the source
dataset was published or otherwise made available.</pubdate>
                            <title>### The name by which the source
dataset is known</title>
                            <geoform>### The mode in which the
geospatial data is presented</geoform>
                            <othercit>###Provide citation information
to the source if available. If not remove the othercit section</othercit>
                            <onlink>### The online address of where
the source data was acquired</onlink>
                        </citeinfo>
                    </srccite>
                    <srcscale>### Source scale denominator</srcscale>
                    <typesrc>### Type of source media</typesrc>
                    <srctime>
                        <timeinfo>
                            <rngdates>### can change to <sngdate>
tags if that is more appropriate.
                                <begdate>###</begdate>
                                <enddate>###</enddate>
                            </rngdates>
                        </timeinfo>
                        <srccurr>### The basis on which the source time
period of content information of the source data set is determined</srccurr>
                    </srctime>
                    <srccitea>### The short form alias for the source
citation. Example 3DEP, IfSAR DEM</srccitea>
                    <srccontr>### A brief statement identifying the
information contributed by the source dataset to the final dataset</srccontr>
                </srcinfo>
                <procstep>
                    <procdesc>### An explanation of the processes used to
develop the data. Can be split into multiple entries if needed.</procdesc>
                    <srcused>### List of source citations (shore name)
used for the process.</srcused>
                    <procdate>### Timeline that process description was
carried out.</procdate>
                </procstep>
```

Elements of Metadata

Process Description

- **Process Information** (procdesc): Information about the processes used to develop the data
  - Include all pertinent information about the process and tools used to update the data
  - Can be split into multiple steps or entries if needed

```
                <procstep>
                        <procdesc>### An explanation of the processes used to
develop the data. Can be split into multiple entries if needed.</procdesc>
                        <srcused>### List of source citations (shore name)
used for the process.</srcused>
                        <procdate>### Timeline that process description was
carried out.</procdate>
                </procstep>
```

Elements of Metadata

Process Description Section

- Include information about:
    1. Source data used (all sources)
    2. Any pre-processing of IfSAR data
    3. How the EDH was used/referenced
    4. Delineation and editing workflows
    5. Attribution review and update process
    6. DEM limitations and how WBD delineations were handled in these areas
    7. HU codes that were retired or added. Merged units or split units
    8. QA/QC procedures
    9. Finalization of data

Elements of Metadata

Process Detail: Example of Poor vs Good descriptions

Poor Description

The WBD was updated based on IfSAR DEMs and EDH data. Boundaries were updated based on the dems and attributes were refined. The final WBD was created after reviewing all data.

Good Description

The WBD for HU xxxx was updated using 5-m IfSAR DEM data and the EDH dataset dated xx/xx/xxxx.
The DEM was conditioned to remove artifacts and generate hydrologic derivatives including flow direction, accumulation, and preliminary ridgeline features.

EDH hydrography was used as the authoritative drainage network for aligning WBD boundaries. Boundaries were snapped to EDH adjusted at confluences to ensure proper hydrologic connectivity. Waterbody edges and 2D flow features were reviewed to prevent inappropriate intersections, consistent with WBD validation guidance.

Delineation edits were performed using hydrology-derived divides and manual adjustment where DEM flow patterns suggested improved drainage representation. Major hydrologic unit changes were coordinated with USGS staff.
Due to changes in the hydrography as defined by the EDH data it was determined that unit xxxx was outside the WBD size specifications and would need to be sub-divided. Unit xxxx was retired and two new units were generated and assigned new codes xxxx and xxxxx

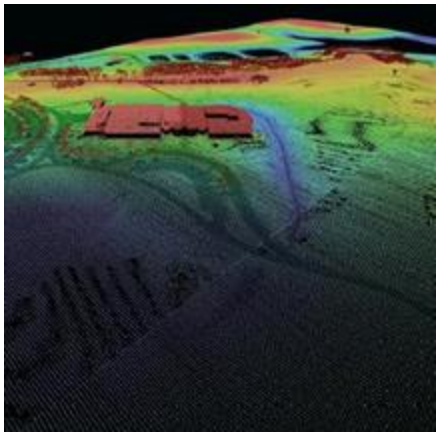
QA/QC included topology checks (ensuring no overlaps or gaps), comparison against EDH/NHD alignment requirements, and confirmation that all units adhered to WBD schema 2.3. Boundaries were smoothed and simplified following WBD guidelines and inspected for adherence to ridgelines. Final datasets were reviewed for schema consistency, metadata completeness, and packaged per the updated WBD/EDH delivery structure

Geometry Changes and Guidance







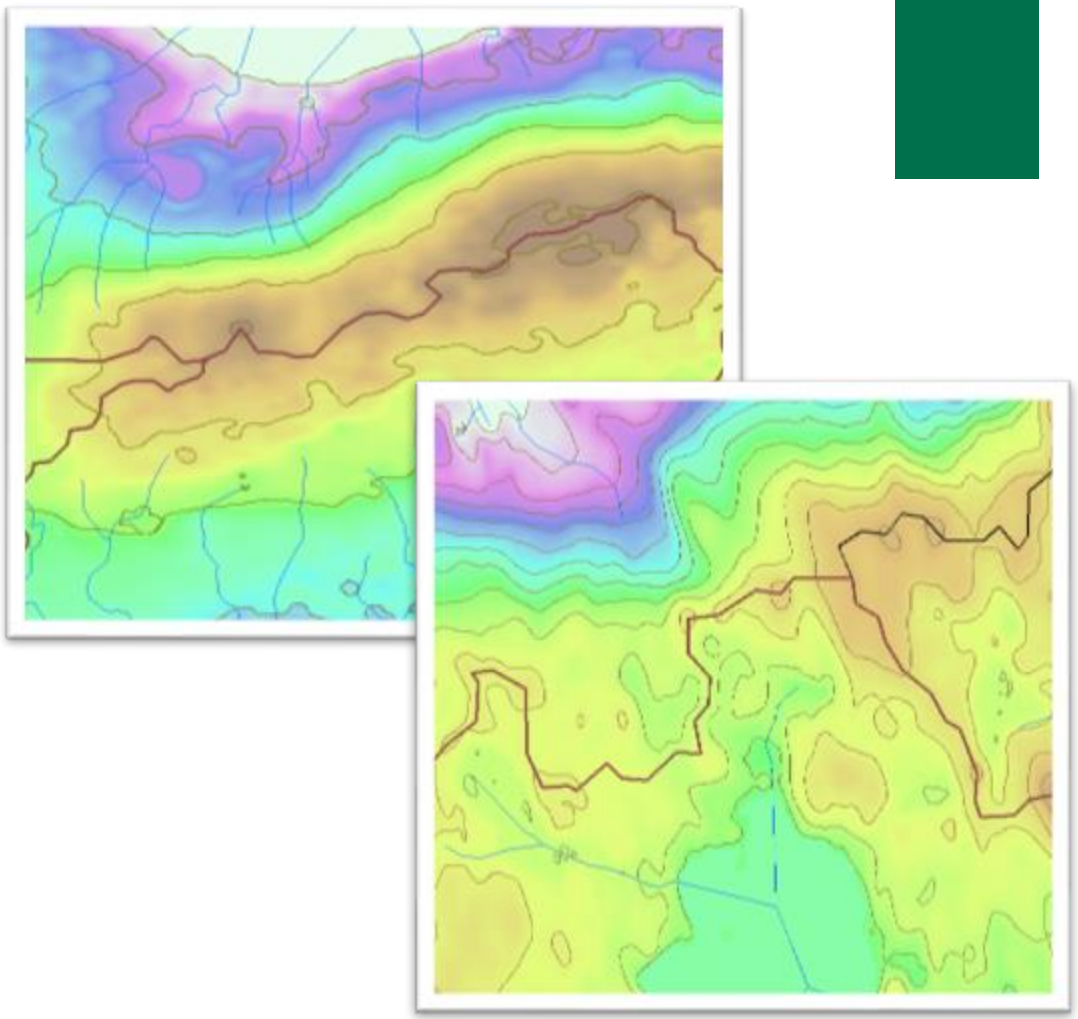


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Geometry Changes – Boundary Placement

- Drainage divides are determined by bisecting ridges, saddles and contour lines of equal elevation
- Boundaries should
  - Follow the middle of the highest ground elevation or the halfway point between contour lines of equal elevation
  - Follow the nose of the ridge
  - Delineate to high points where appropriate
- Supplemental contours should be used to help review the boundaries
  - Very important to use contours if manually adjusting a line to make sure it stays on the ridge

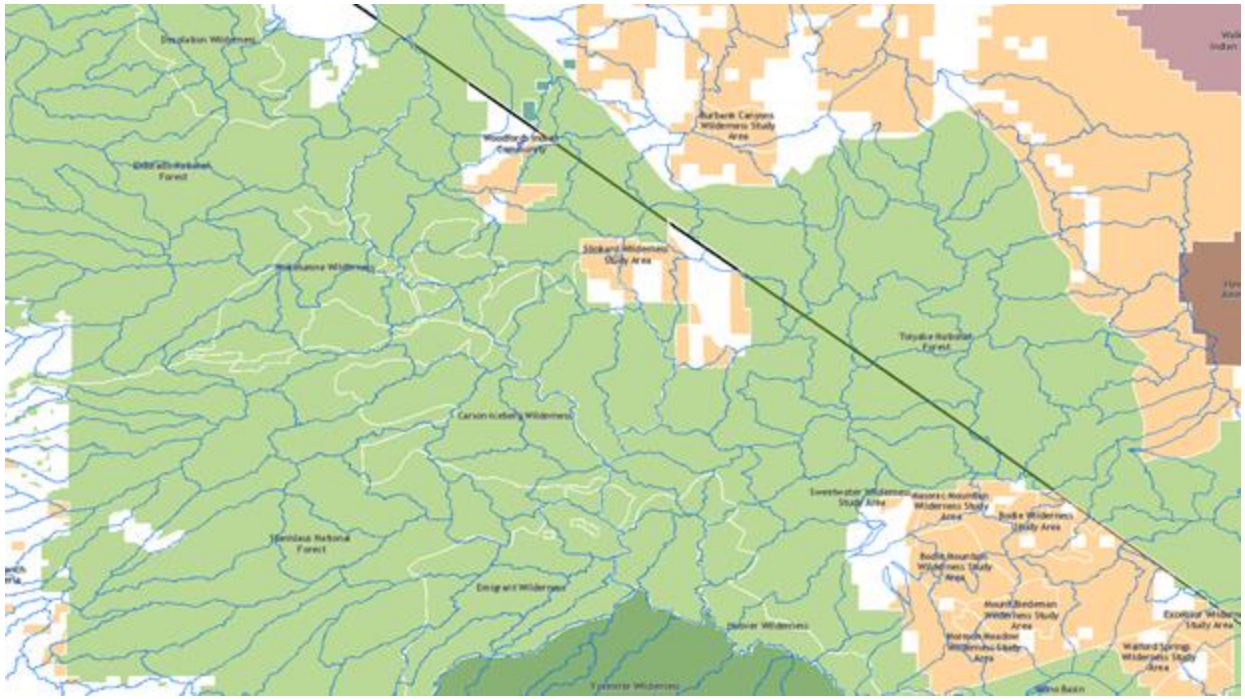


See WBD Standards V5 – Page 20 for additional guidance

Geometry Changes

General Standards

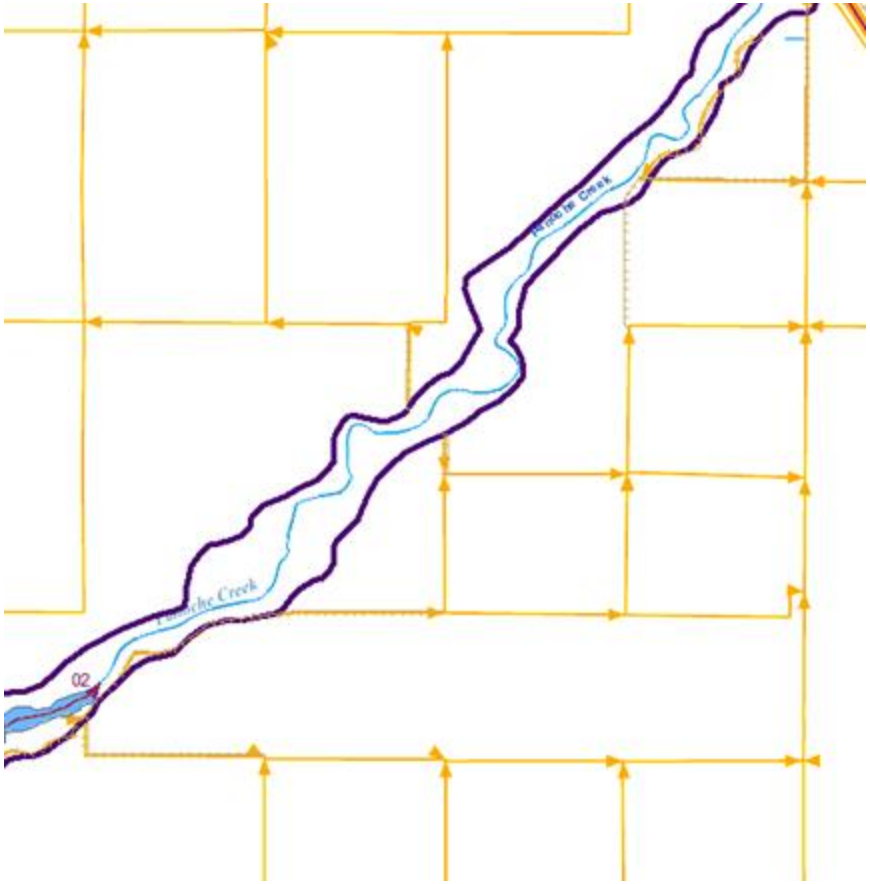
- No political/administrative boundaries, no groundwater boundaries, only topographic and hydrologic features depicting surface water flow



Geometry Changes

General Standards

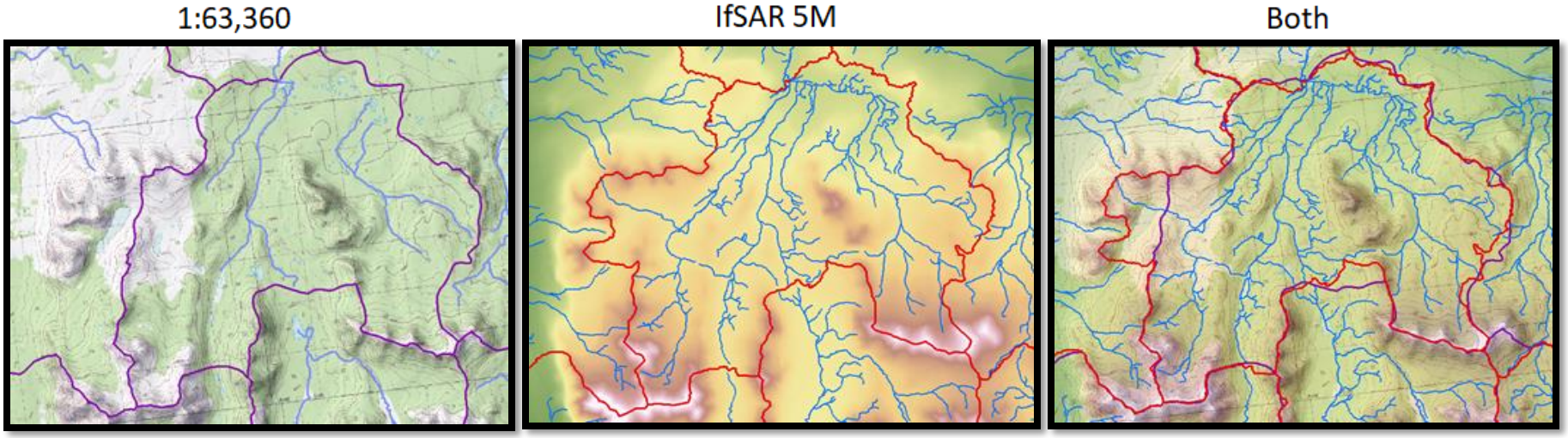
- WBD should not run parallel to flowlines, except where levees, berms, incised channels, etc. prevent water from flowing directly to outlet or are the new defined high points on the ground.
- Do not delineate boundaries down the middle of a stream



Geometry Changes

Higher Resolution Base Data

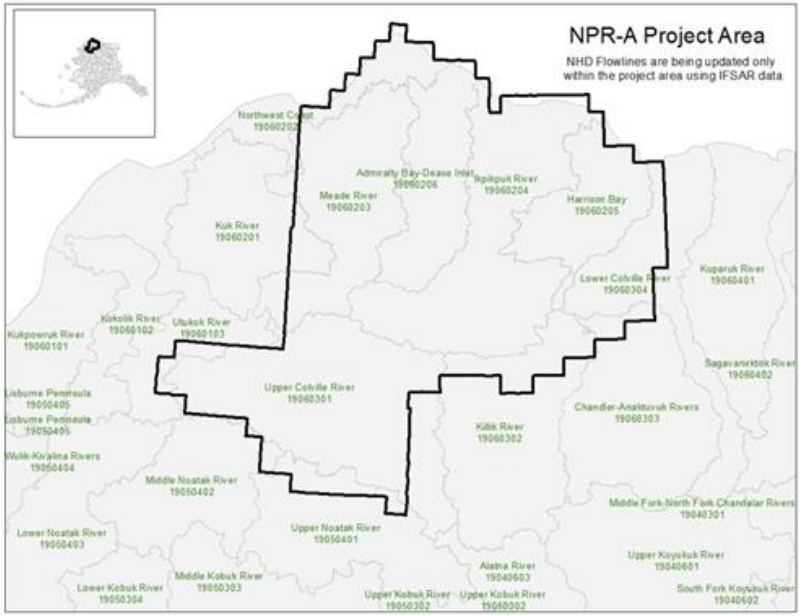
- New hydrography and new elevation can be used to create new and better boundaries
- **Expect changes and do not force data back to the old boundary if it does not match the new topography and hydrography.**
- Hydrologic unit outlets will need to be adjusted to reflect new hydrography. Make sure to review outlet placement to check that it reflects what the new hydro is representing.

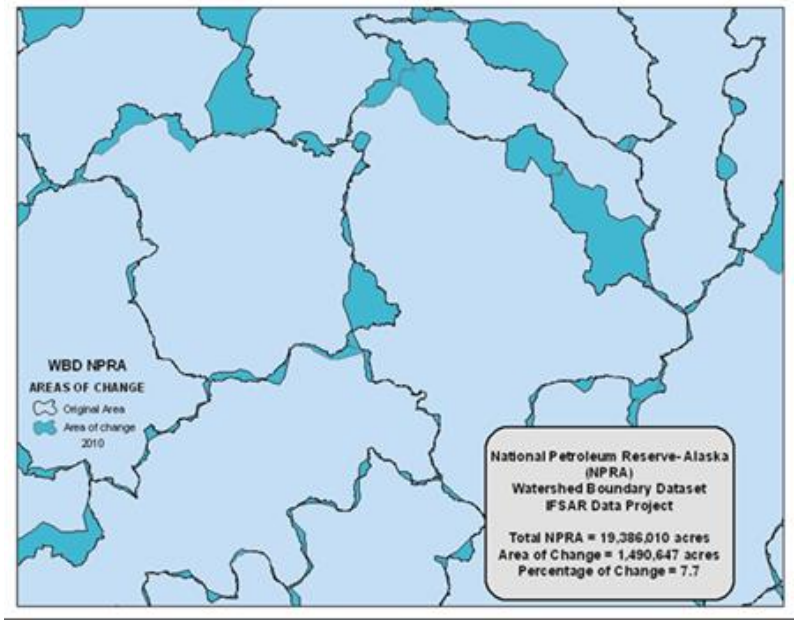


Geometry Changes

Example – Area of Change within National Petroleum Reserve-Alaska (NPR-A)

- WBD boundaries updated using new IFSAR data within NPR-A
- Area of change between 1:63,360 data and IfSAR





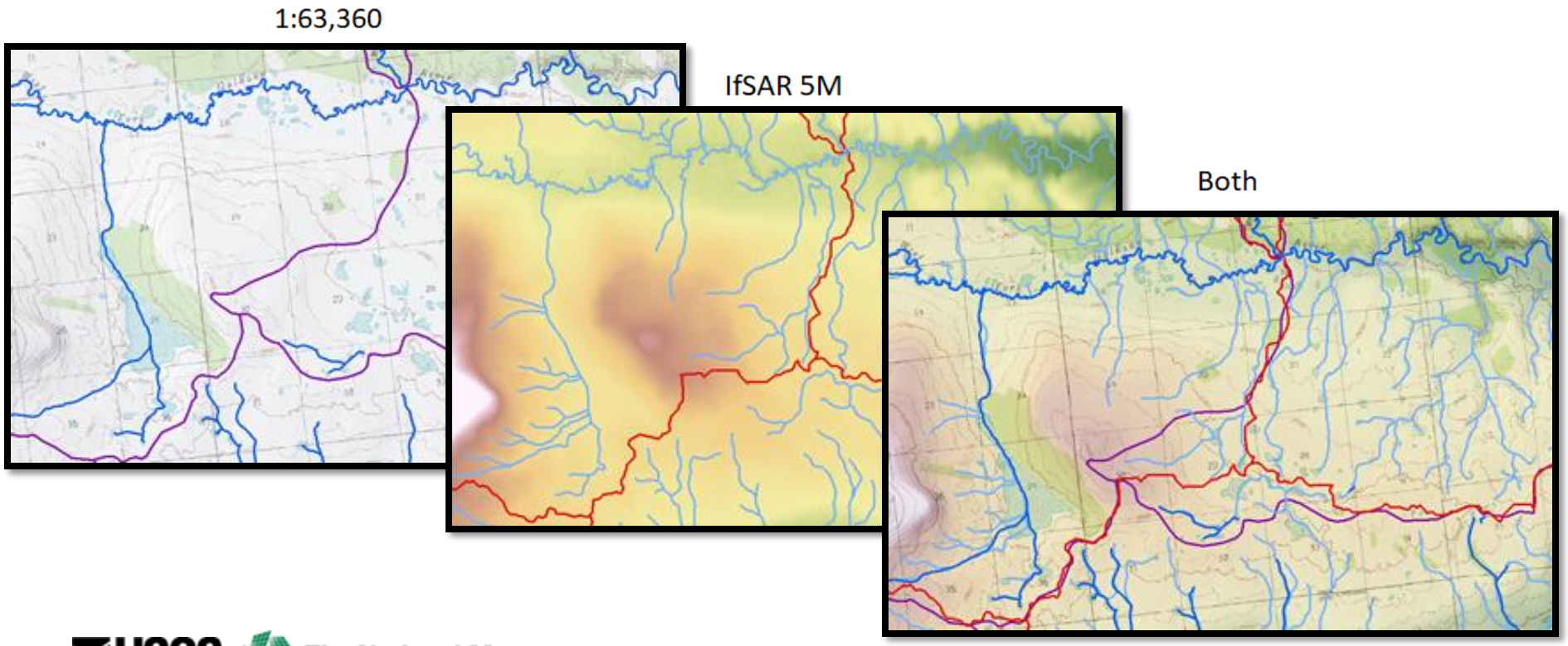
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Geometry Changes

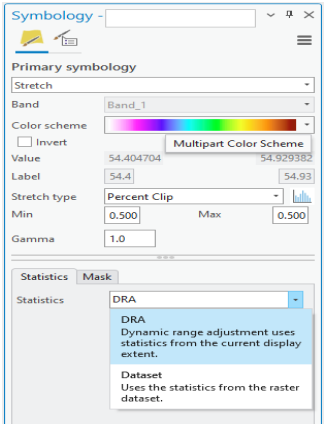
Higher Resolution Base Data

- Addition of the updated hydro and IfSAR DTM's provides a clearer understanding of where the boundary belongs



Supporting Datasets

- Current WBD
- Current NHD
- Elevation derived hydrography (EDH)
- DEM
  - DEM needs to include a buffer that is large enough to capture the full extent of the drainage area. WBD team recommends a 4-5 km buffer to start, but you may have to play around with larger buffer distances.
- DEM Hillshade



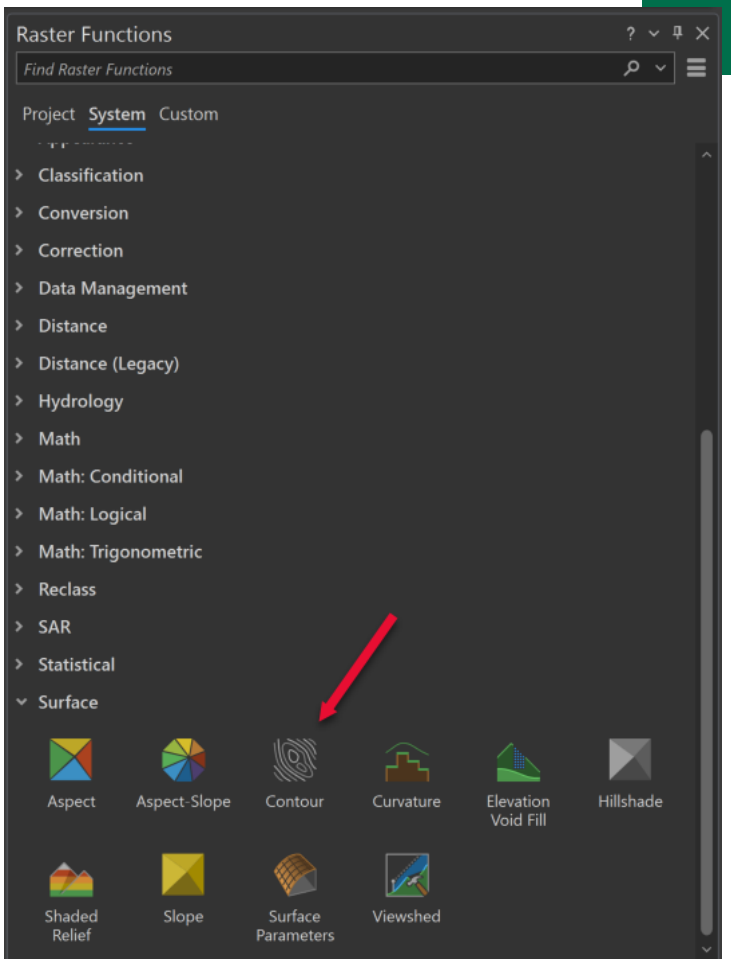
Symbology for DEM:

Suggest using a **Multipart color scheme** to better identify highs and lows in the DEM when doing manual updates. There are a few to choose from.

Suggest using the **DRA** option in statistics setting.

Supporting Datasets

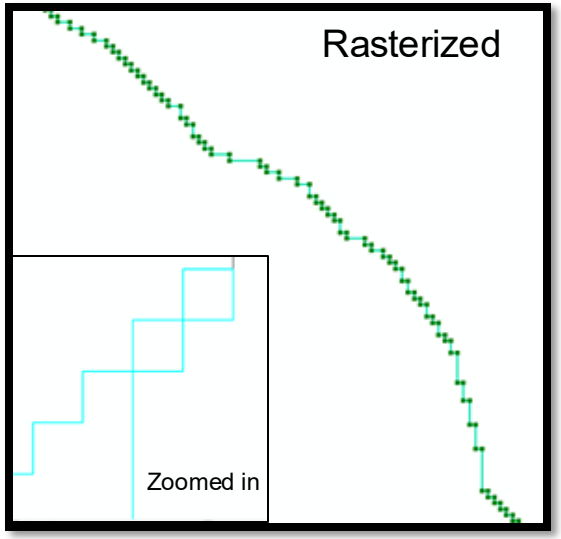
- Imagery
- ORI
- Breaklines
- Contours
  - Can be generated as a graphic in ArcPro using the Raster Functions in the Analysis tools
- U.S. Board on Geographic Names
  - Geographic Names Information System (GNIS)
- Thermokarst
  - To use for places with lots of DEM limitations, or no channelization
- Randolph Glacier Inventory

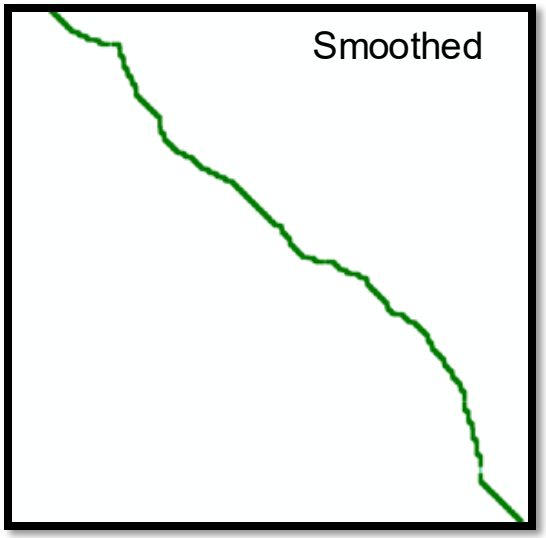


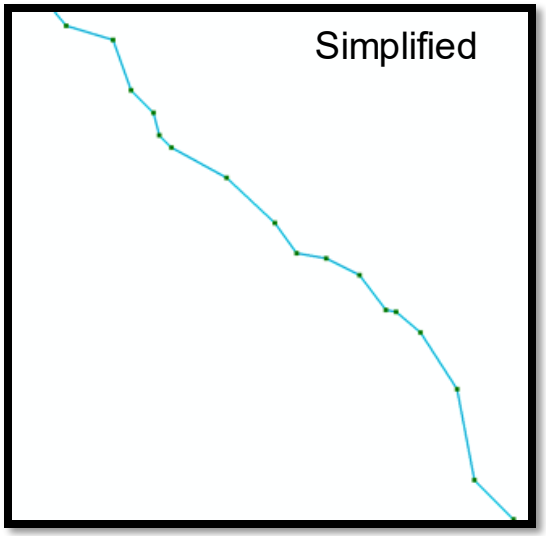
Geometry Changes

Raster Derived Hydrologic Unit Boundaries

- Boundaries based on raster datasets need to be smoothed and simplified
  - Cartographically pleasing
  - Too many vertices can cause data management issues; must strike a balance between smooth/simplify so the boundaries are not too dense, but also not too simplified
- Must not contain true curves (Bezier curves)
- Goal: Need to keep the integrity of the smoothness of the line, while making sure that the simplification isn't so much that the boundary is moved off the ridge







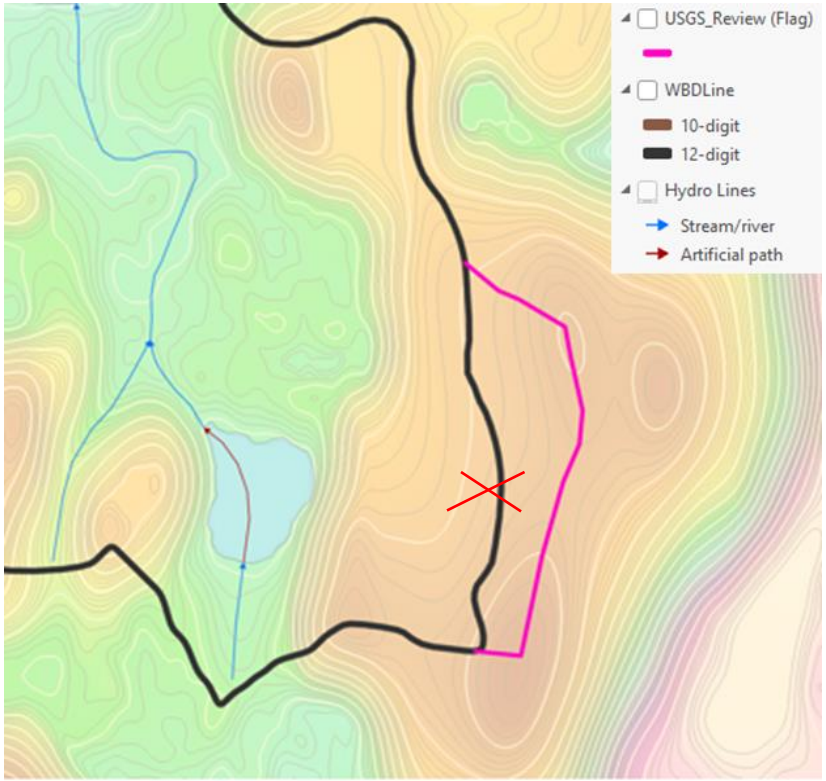
USGS science for a changing world

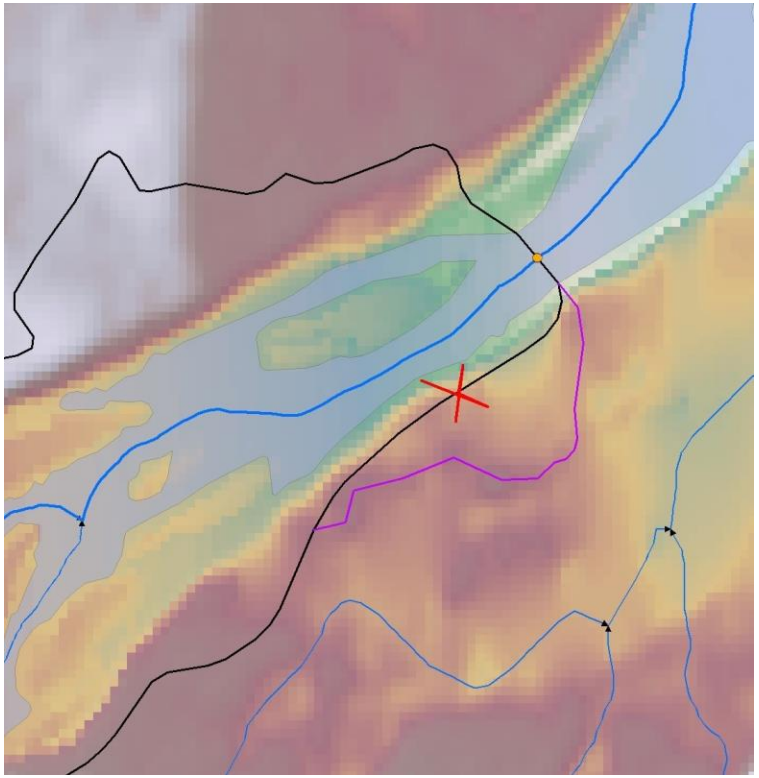
The National Map
Your Source for Topographic Information

See WBD Standards V5- Page 45 for additional guidance

Geometry Changes – Manual Updates

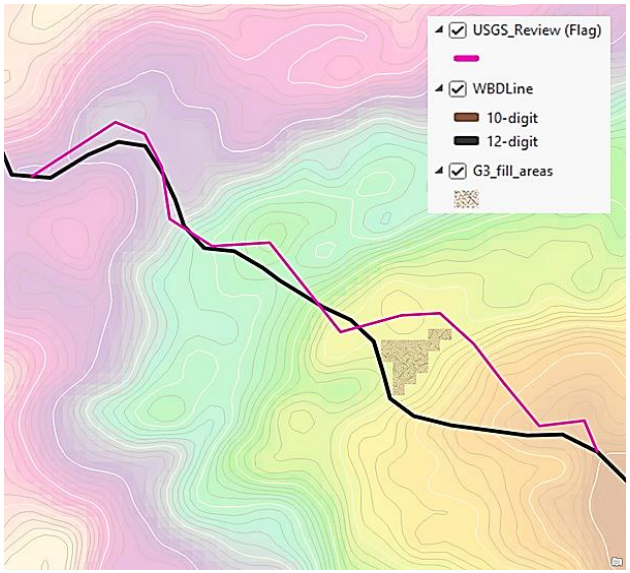
- When doing manual updates always place the new/updated line on the crest of the ridge.
- Use catchments or contours to help determine the correct placement for the line

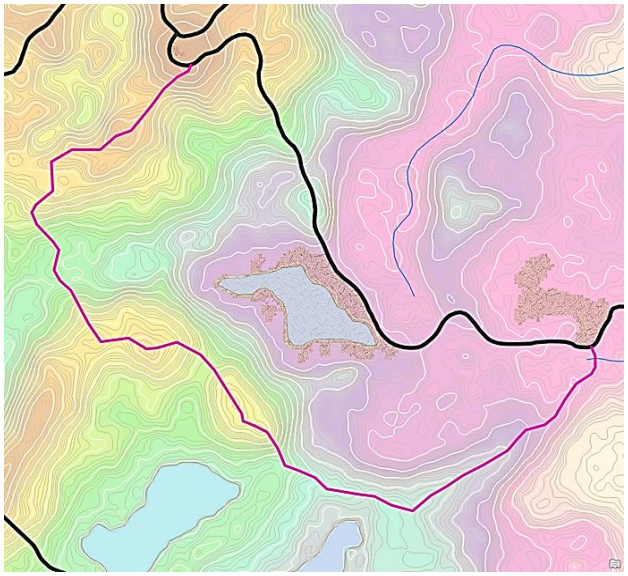




More examples of what we mean by on and off the ridge

- When doing manual updates always place the new/updated line on the crest of the ridge.
- Use catchment or contours to help determine the correct placement for the line
- Use G3 fill area to identify areas where boundary is not on the ridge

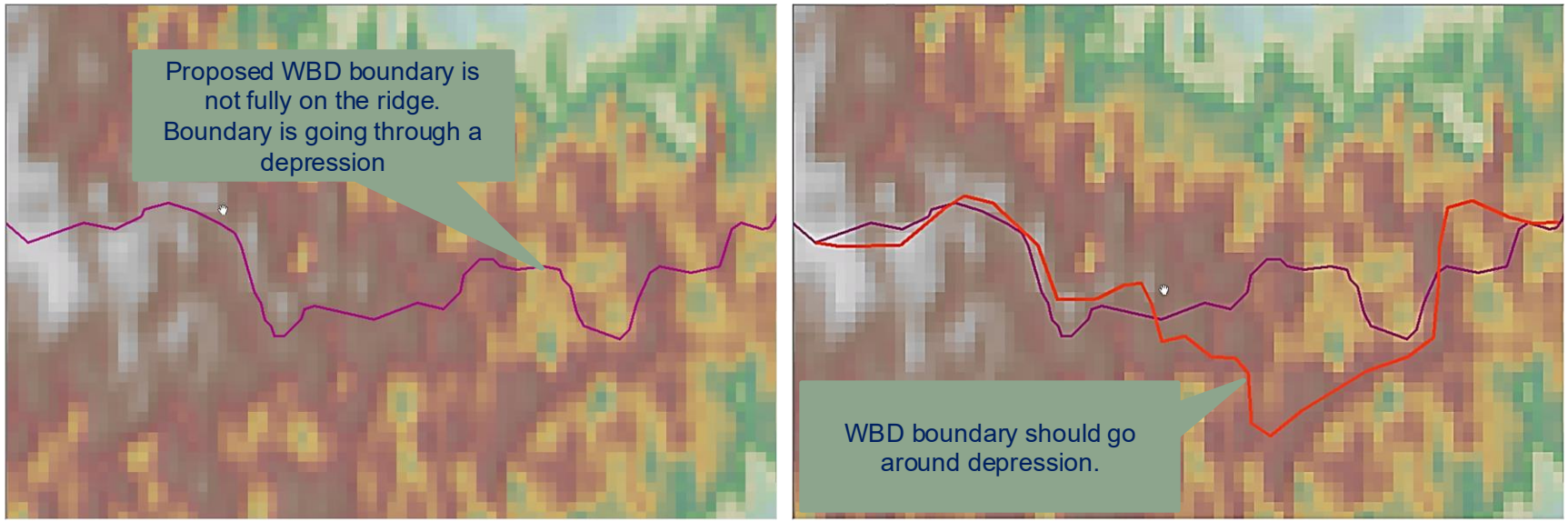






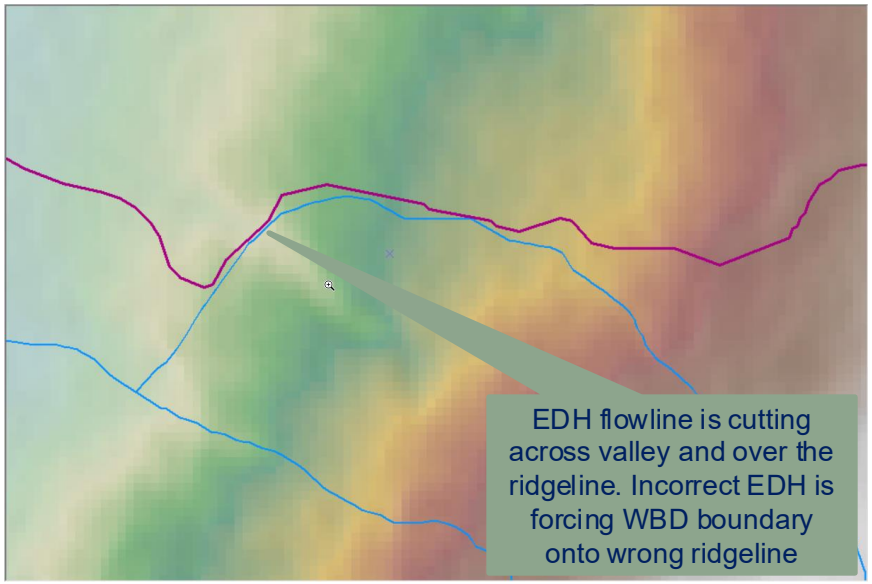
Geometry Guidance

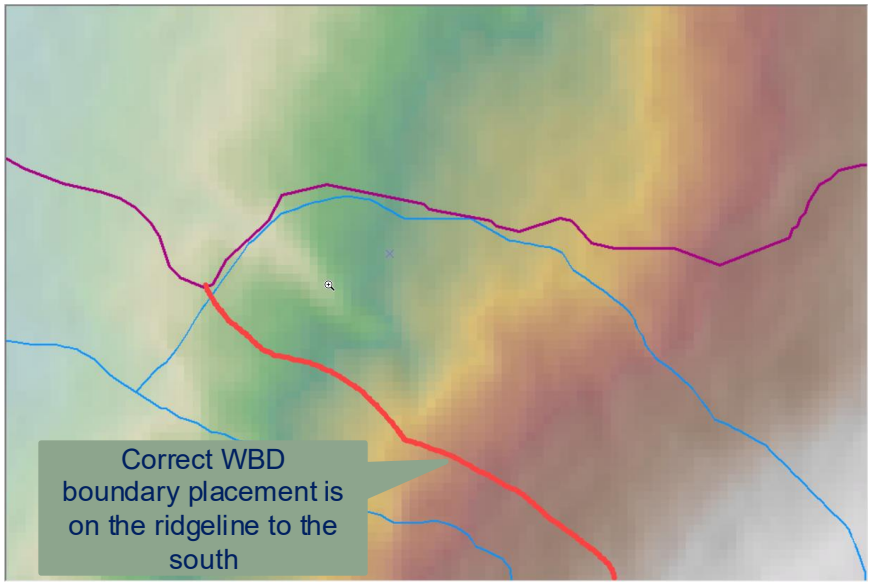
- Ridgelines – Things to consider and be aware of
  - Double check that your automated process or manual adjustments aren't bumping the boundary off of the ridgeline



Geometry Guidance

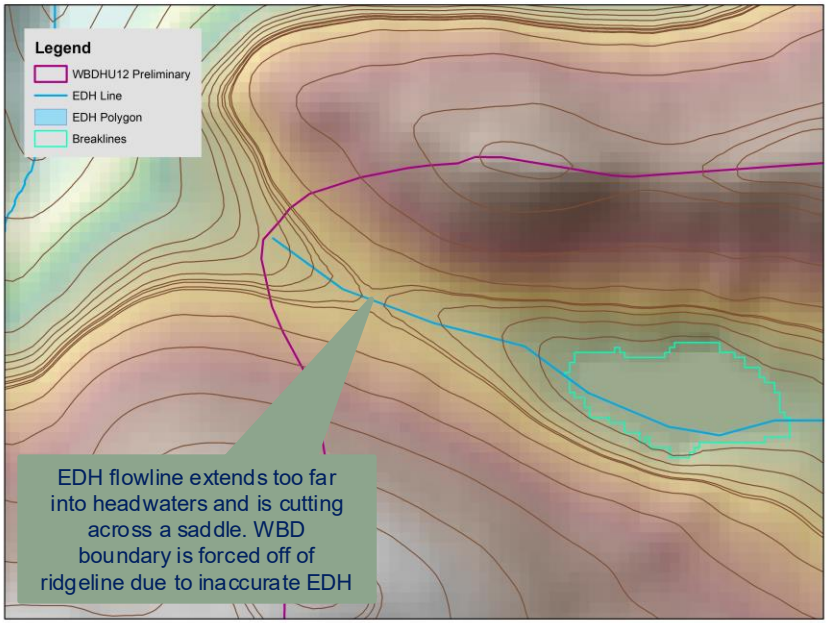
- Ridgelines - WBD near EDH process – Things to consider and be aware of
  - Make sure to review and adjust boundaries that are very close to or overlapping EDH lines

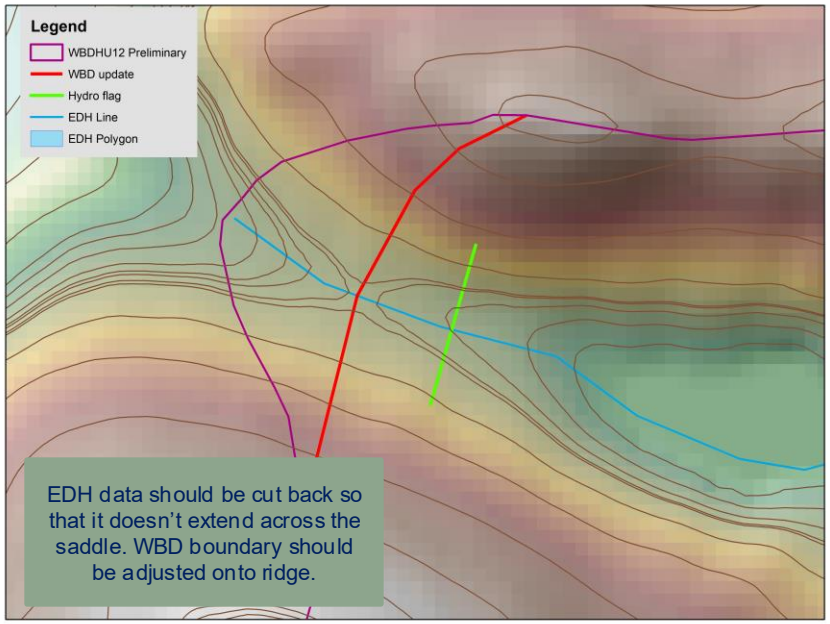




Geometry Guidance

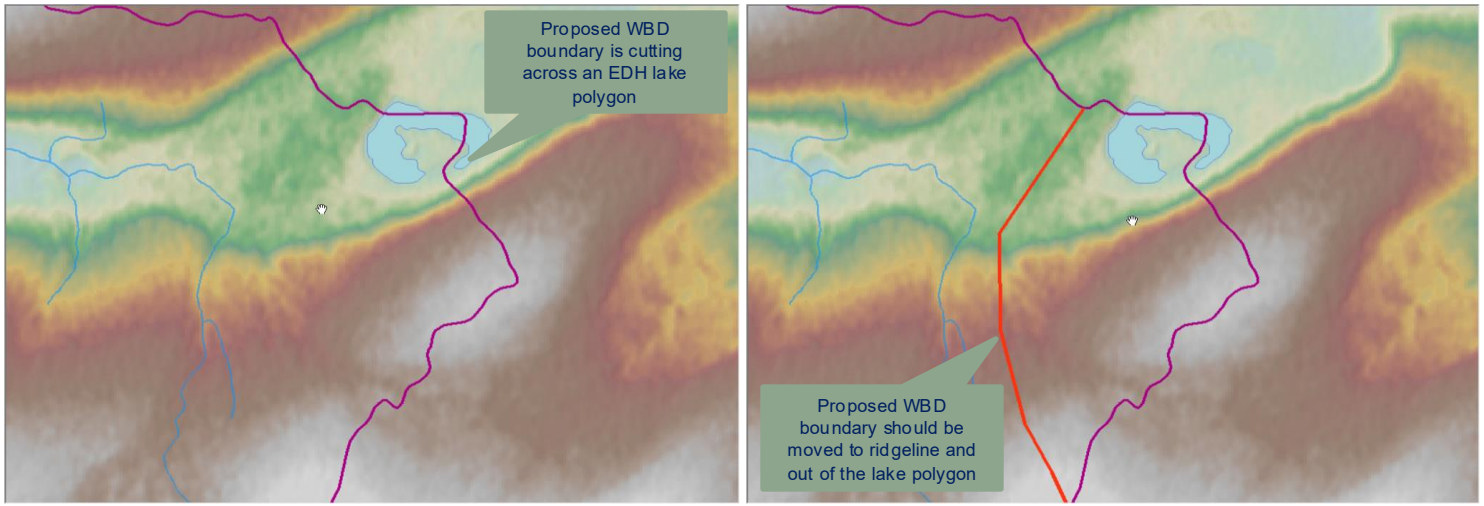
- Ridgelines - WBD near EDH process – Things to consider and be aware of
  - There are some cases where the EDH is inaccurate, and the boundary will need to be manually reviewed and adjusted back to the ridgeline
  - In general, it is a good idea to review your intersections between your EDH and WBD to make sure they are all valid





Geometry Guidance

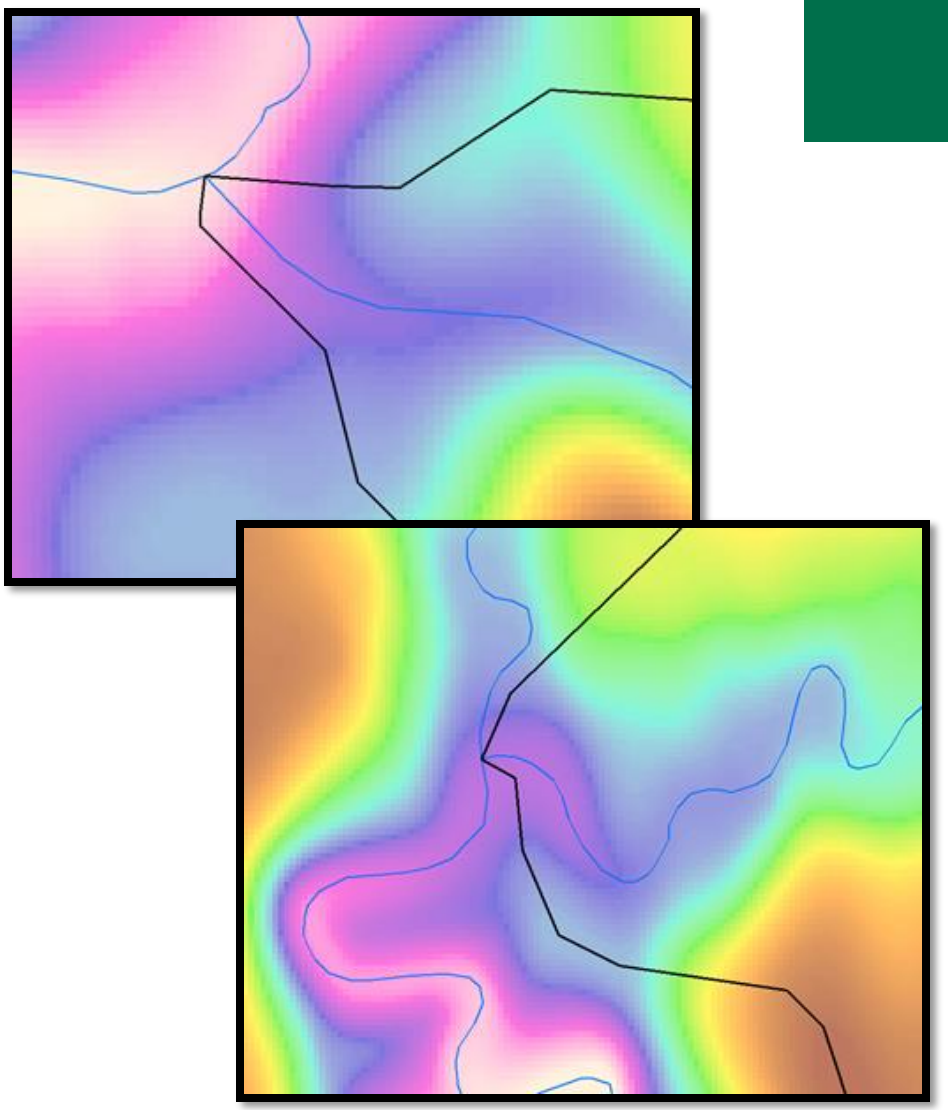
- WBD near EDH features – Things to consider and be aware of
  - In general, it is a good idea to review your intersections between your EDH lines and waterbodies and WBD to make sure they are all valid
  - Boundaries should not cut through waterbodies. If they do, these boundaries should be updated



WBD/EDH spatial integration

Junction of two 1D features

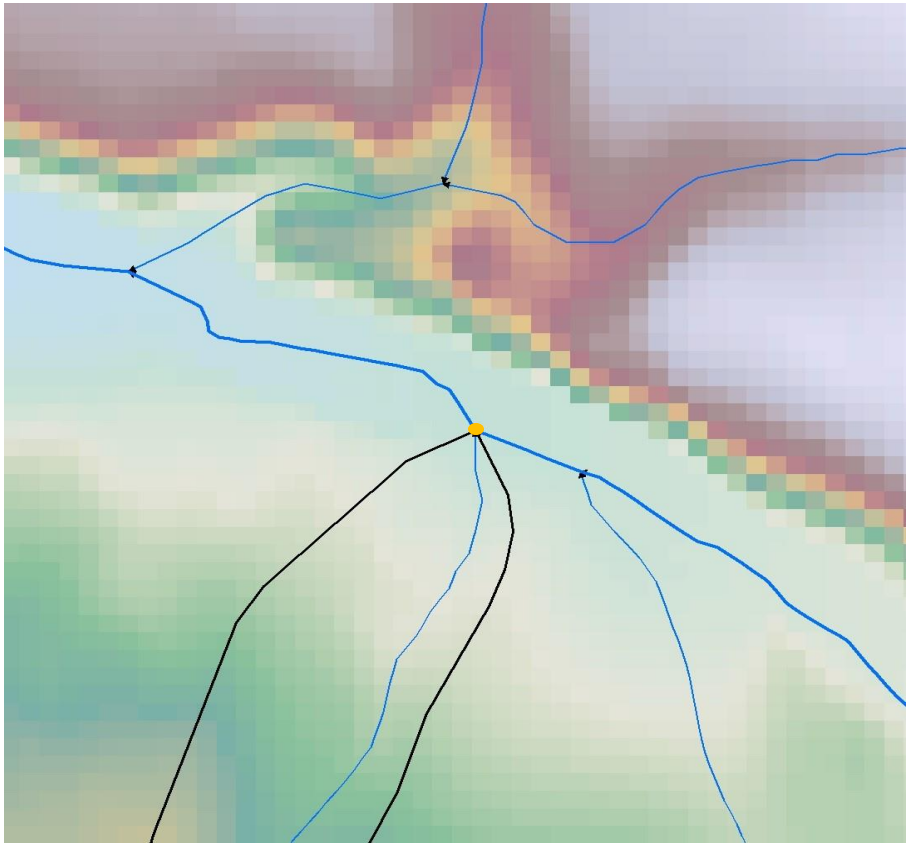
- WBD is snapped to the hydro junction of the two 1D features
- Make sure snapping is turned on and zoom in very tight to make sure you are snapping to the true junction of the hydro features



Outlet Guidance for 1D-1D confluences

Junction of two 1D features at a tributary/mainstem confluence

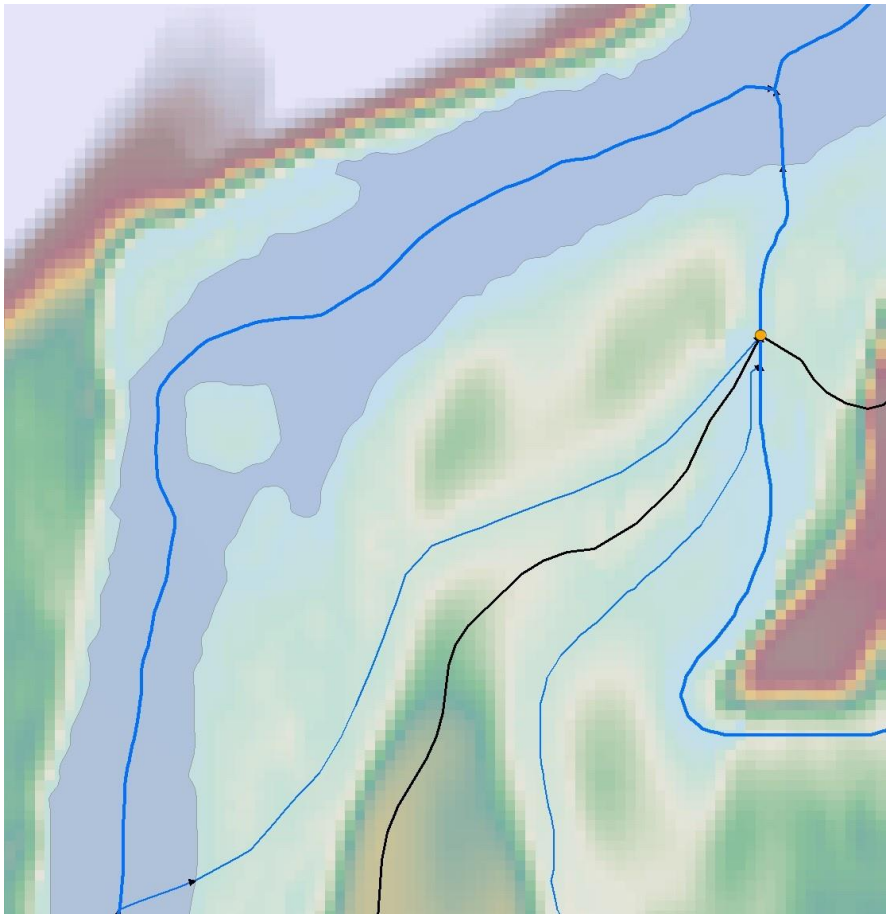
- Correct placement of an outlet to break out a 1D tributary in a 1D-1D confluence situation. The outlet is snapped to where the 1D tributary enters the 1D mainstem.
- Boundary will need to be refined after smoothing/simplifying to ensure that it is snapping correctly at the 1D-1D confluence.
- Think of what you are trying to break out when you define your outlet location
- Note: the end goal is that the delivered boundaries are snapped appropriately to the intersection of the 1D-1D confluence



Outlet Guidance for 1D-1D confluences

Junction of two 1D features at a side channel

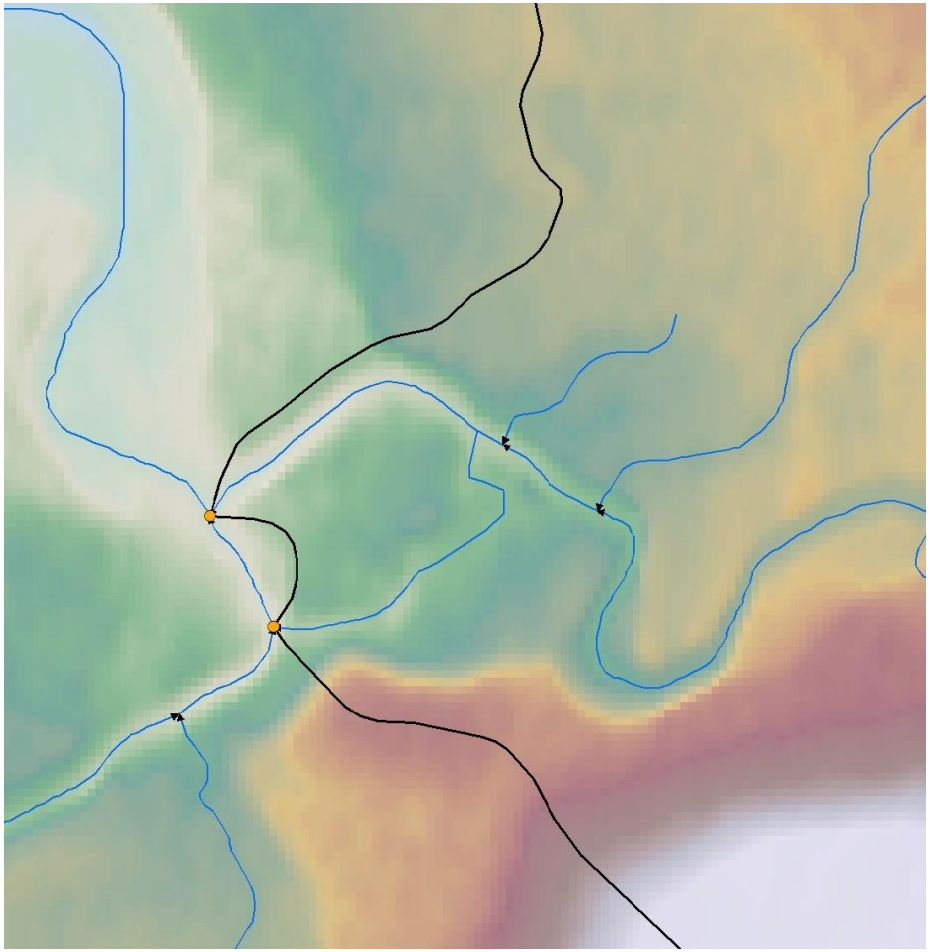
- WBD is snapped to the junction of the two 1D features (tributary and side channel)
- Do not include the side channel when breaking out the tributary unit



Outlet Guidance for 1D-1D confluences

Multiple outlets

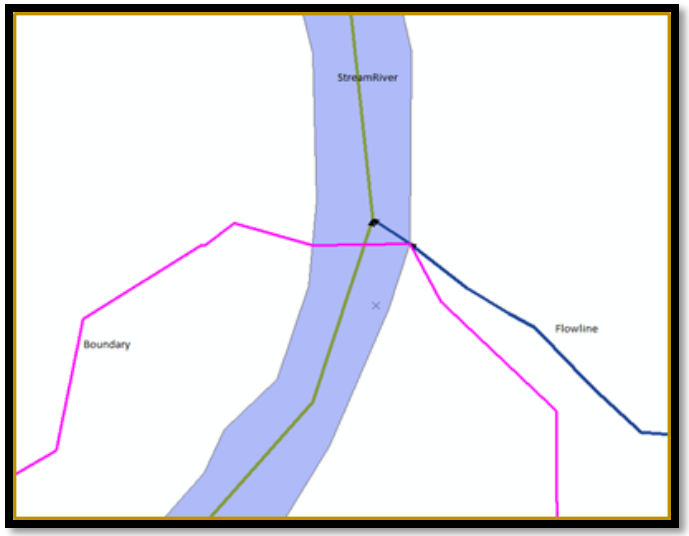
- This HU has two outlets for one system, making it a multiple outlet
- WBD is snapped to the junction of the 1D features in both locations where the tributary enters the mainstem

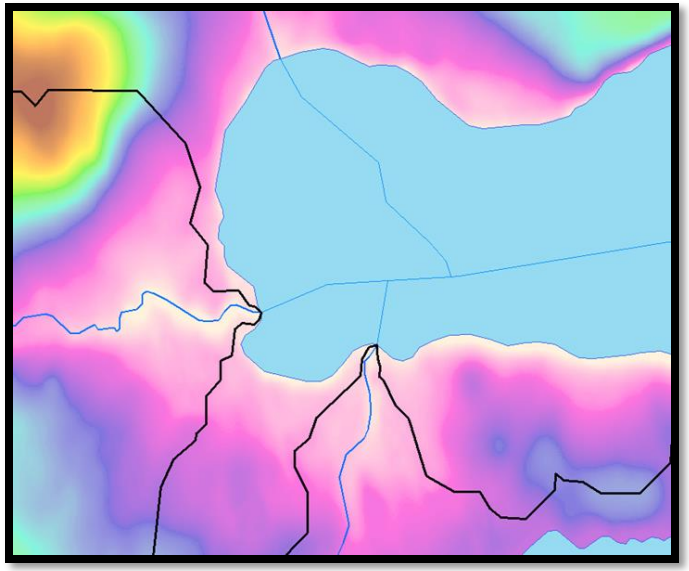


WBD/EDH spatial integration

Junction of a flowline and waterbody/area feature (1D/2D)

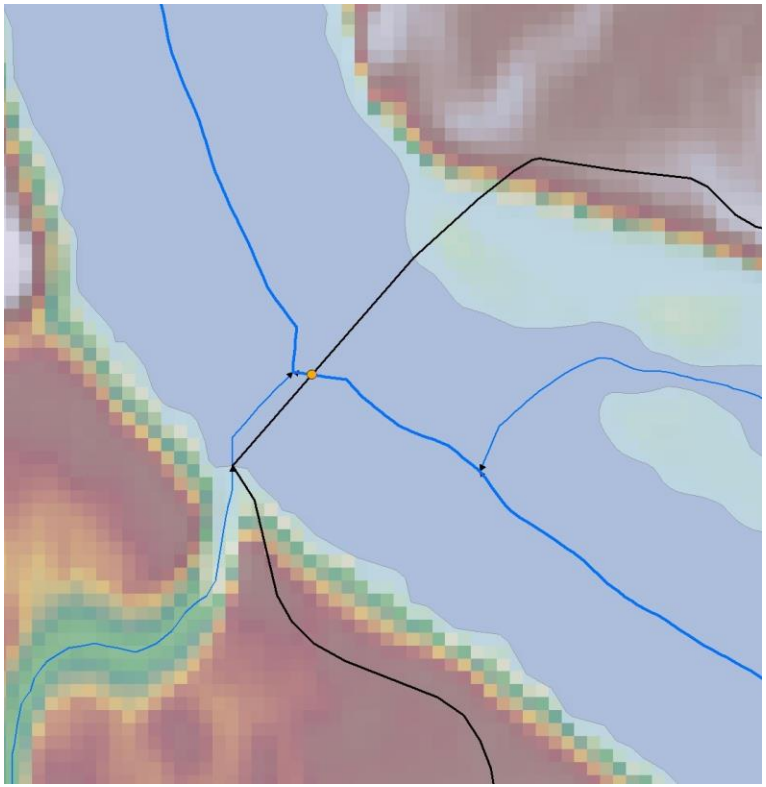
- WBD is snapped to the bank of double line features, such as wide rivers, lakes and reservoirs, where the flowline intersects the waterbody/area.
- In these images, the boundary should be snapped to the end of the flowline and the edge of the 2D stream/river or lake/pond
- Make sure snapping is turned on and zoom in very tight to make sure you are snapping to the true junction of the features





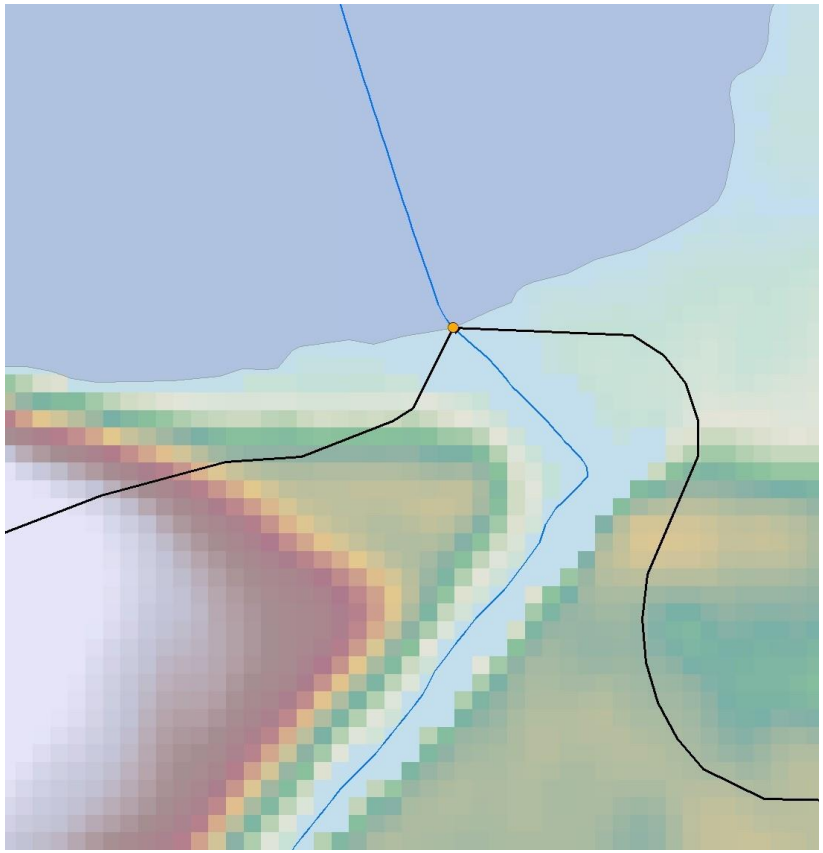
Outlet Guidance for 1D-2D confluences

- Correct example of a delineation at a 1D-2D confluence
- In this image, the boundary should be snapped to the end of the flowline and the edge of the 2D stream/river or lake/pond on both sides of the bank



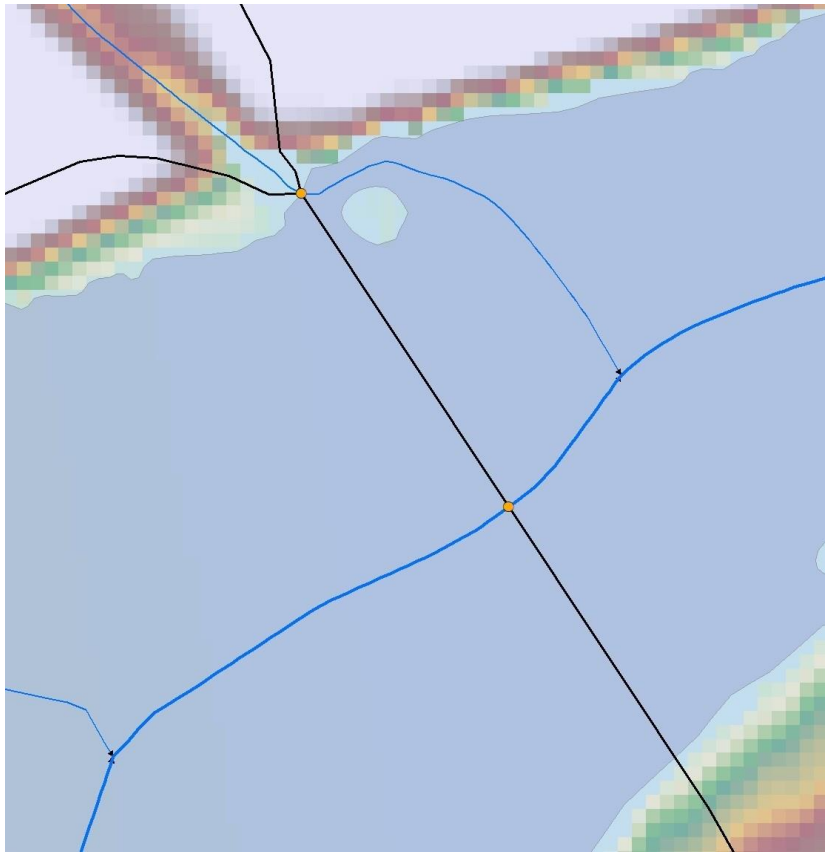
Outlet Guidance for 1D-2D confluences

- This is an example of a correct placement of an outlet to break out a 1D tributary in a 1D-2D confluence situation.
- The outlet is snapped to the 1D flowline where it enters the 2D lake/pond.
- Boundary will need to be refined after smoothing/simplifying to ensure that it is snapping correctly at the 1D-2D confluence.



Outlet Guidance for 1D-2D confluences

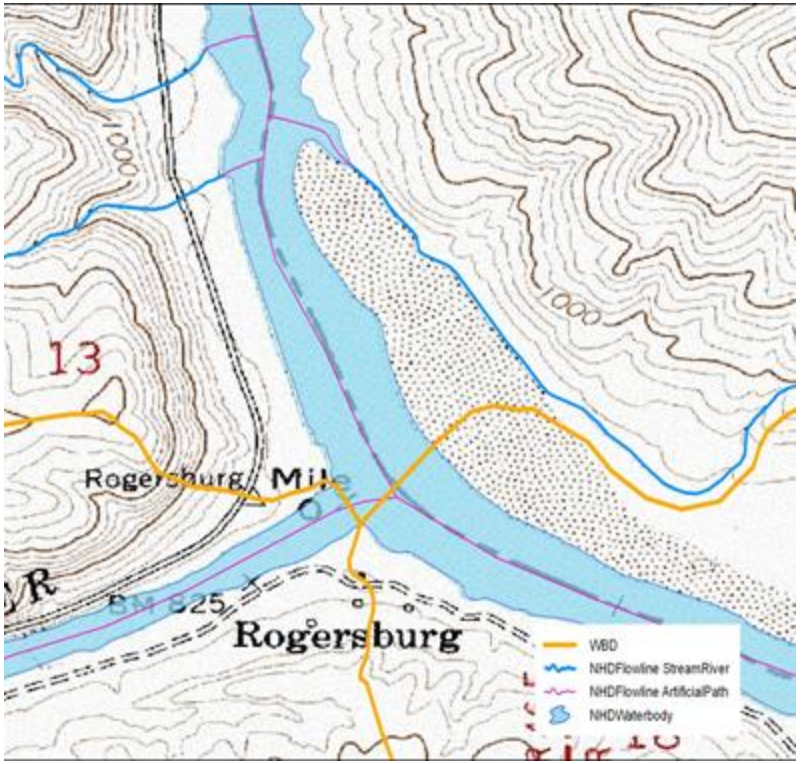
- Example of where the outlet for the tributary unit should be snapped to a 1D/2D confluence.
- Boundary break is snapped to the end of the 1D flowline and the edge of the 2D Stream/River.
- Ignore the artificial paths within the 2D waterbody
- Mainstem breaks straight across and snaps to the other edge of the 2D polygon.
- Outlet for tributary gets snapped to the end of the 1D flowline and the edge of the 2D Stream/River.



WBD/EDH spatial integration

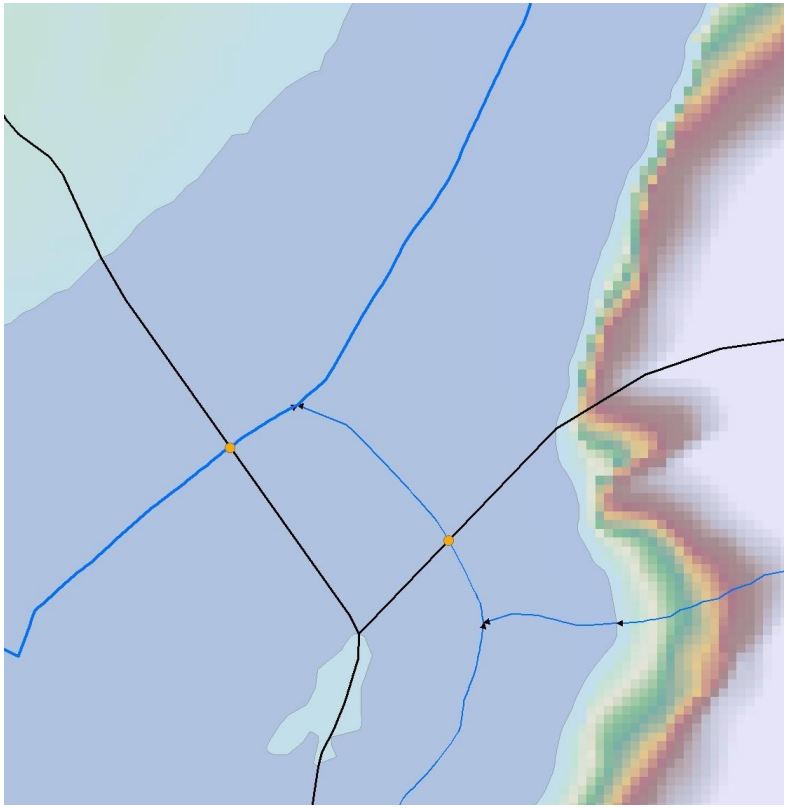
- WBD breaks on bank of waterbody/area.
- Break is perpendicular to flow from bank to bank.
- If the 2D polygon representation of the hydrologic feature is split at the two hydrologic features (i.e. tributary and mainstem) junction the WBD boundary should snap to the delimiter between those two 2D features.
- The boundary needs to snap to the edge of the 2D waterbody polygon on both sides of the bank
- There should not be any additional vertices in the lines that cuts across the mouth of the tributary and the mouth of the mainstem.
- Do not snap to artificial paths

Junction of two 2D features

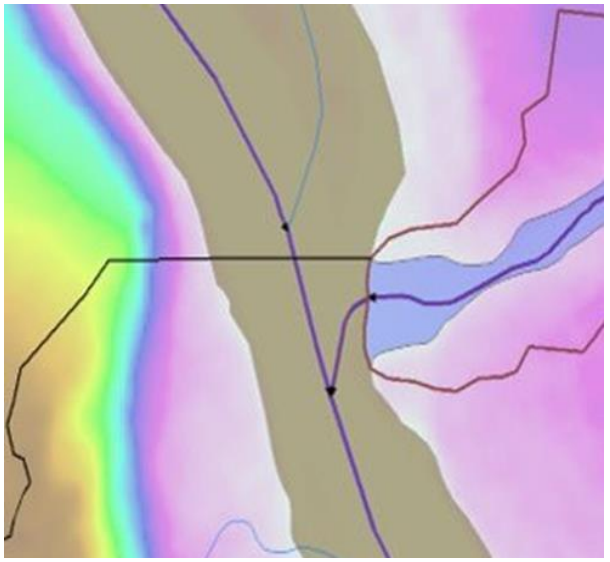


Outlet Guidance for 2D-2D confluences

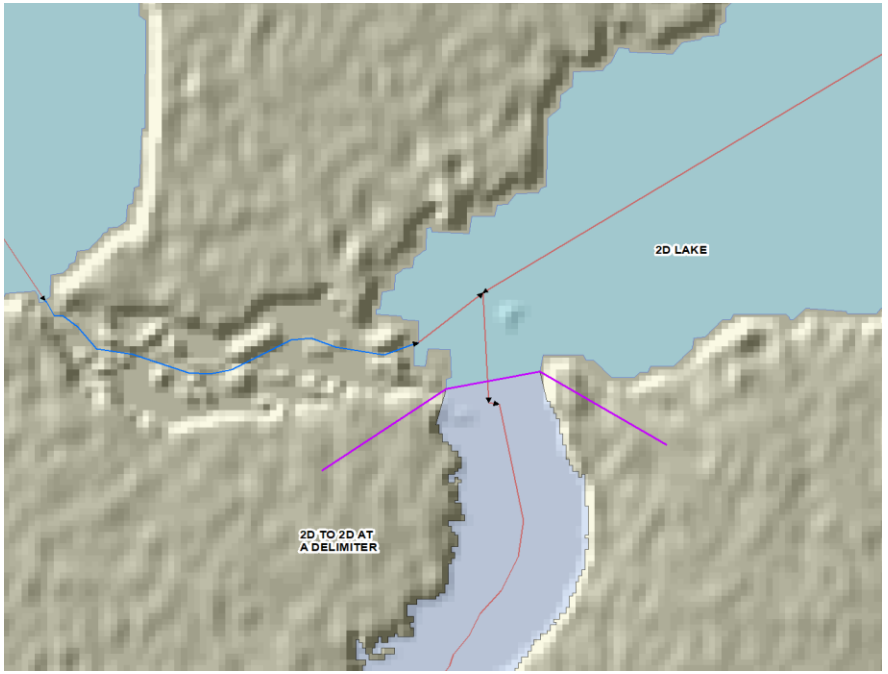
- This is an example of a correct placement of an outlet to break out a 2D tributary in a 2D-2D confluence situation. The outlet is snapped to the artificial path at the location where the boundary should be generated to accurately represent the 2D tributary.
- Boundary will need to be refined after smoothing/simplifying to ensure that it is snapping correctly at the 2D-2D confluence.
  - Boundary should not snap to artificial paths.
  - Boundary should snap to the edges of the 2D feature.



Outlets at Delimiters



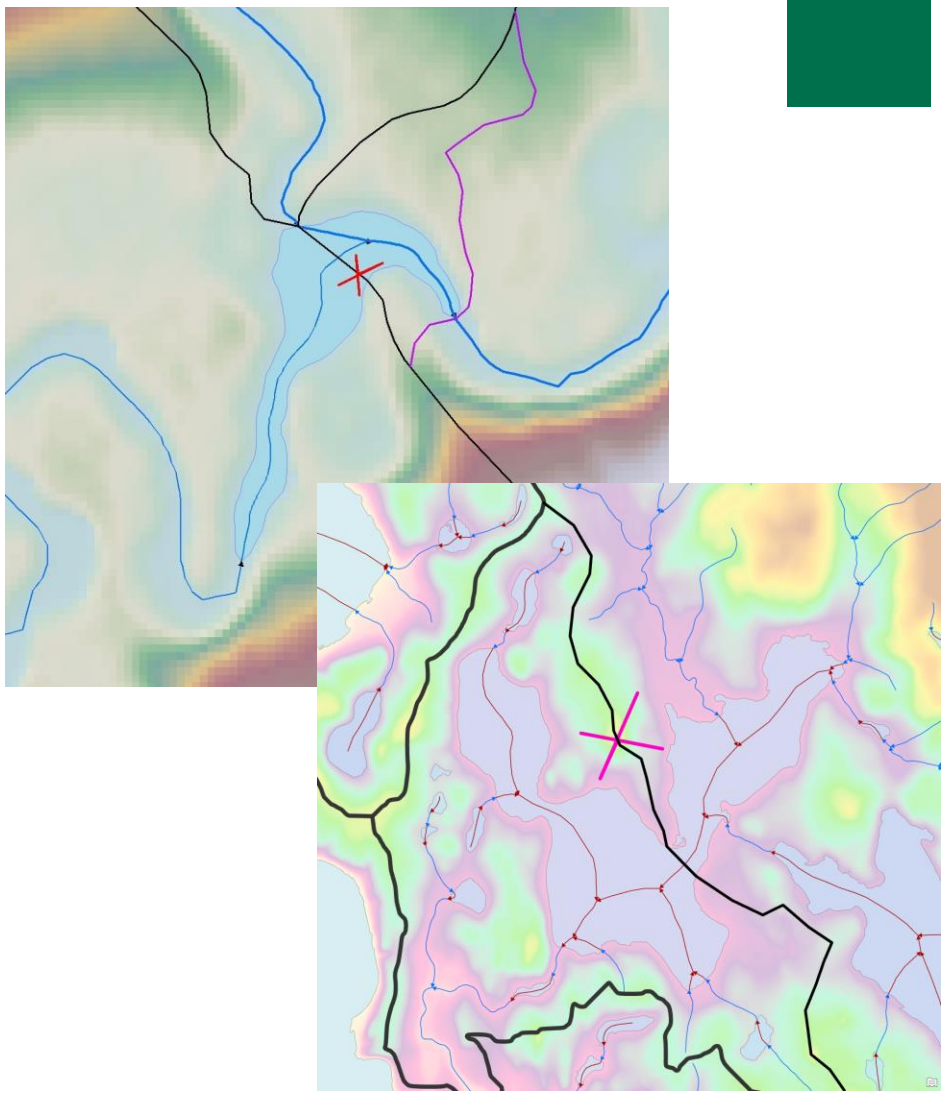
- The delimiter is the physical break between two 2D polygons (purple tributary polygons and brown stream/river or blue lake/pond polygons)
- These images show the correct placement of a outlet to break out a 2D tributary in a 2D-2D confluence situation where a delimiter is present. The outlet should be placed on the delimiter.
- Boundary will need to be refined after smoothing/simplifying to ensure that it is snapping correctly at the 2D-2D confluence.
  - Boundary should not snap to artificial paths.
  - Boundary should snap to both outer edges of the 2D feature.



Outlet Guidance for Lakes

Lakes

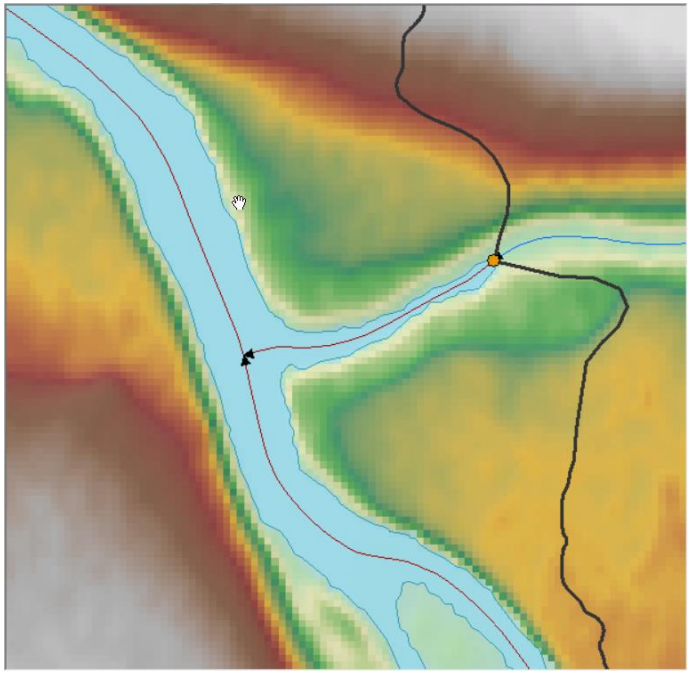
- Typically, we do not split lakes into multiple units
- Exception to this rule may exist for very large lakes or reservoirs with distinct arms-bays-inlets
- The boundary should be snapped to the inlet or the outlet of a Lake
- Move the boundary to the outlet and delete the section of the line cutting through the lake



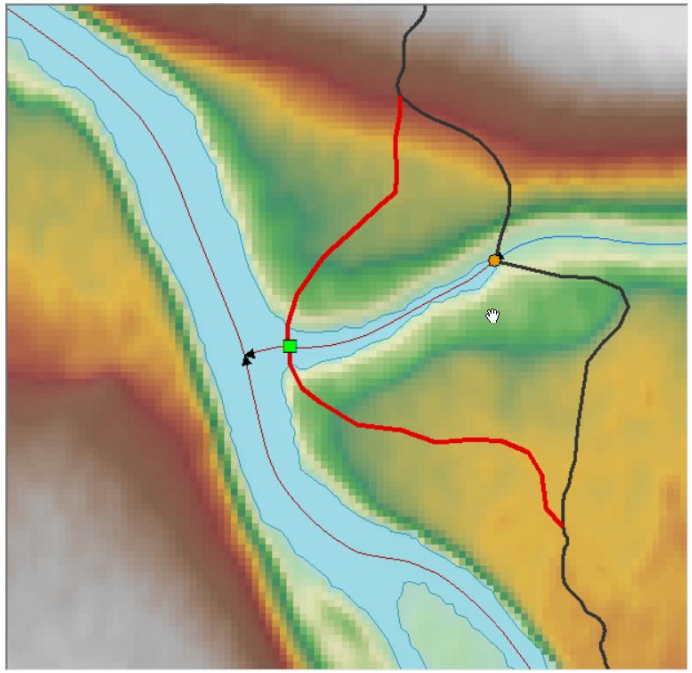
Outlet Guidance

Tributary hydrologic unit where mainstem 2D polygon extends into the tributary

Hydrologic unit boundary at outlet of a tributary unit should extend all the way to the outlet of the tributary. This requirement is not dependent on the type of hydrologic feature used to represent the tributary.



Incorrect delineation – The boundary should not snap to the 1D/2D junction when the 2D polygon representation extends into the tributary channel.

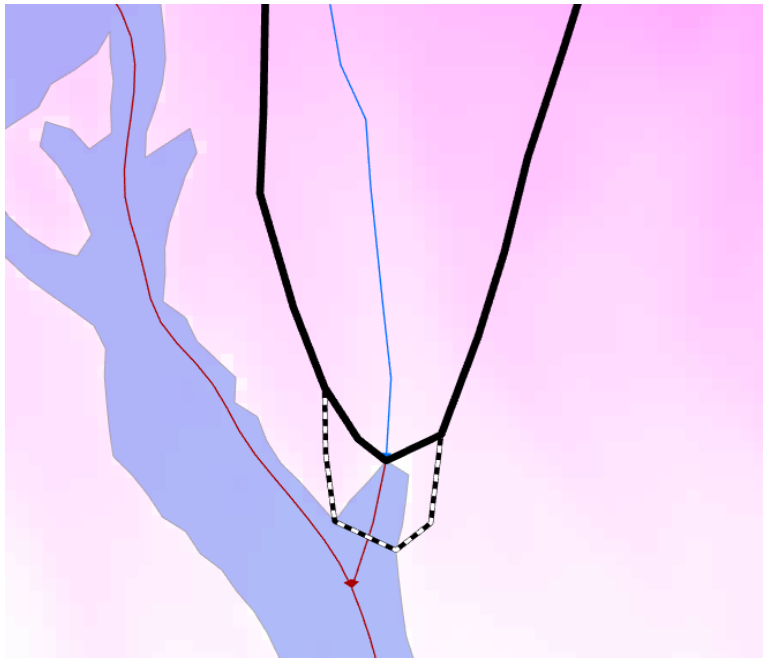


Correct delineation - The boundary should snap to the 2D polygon at the head-of-land

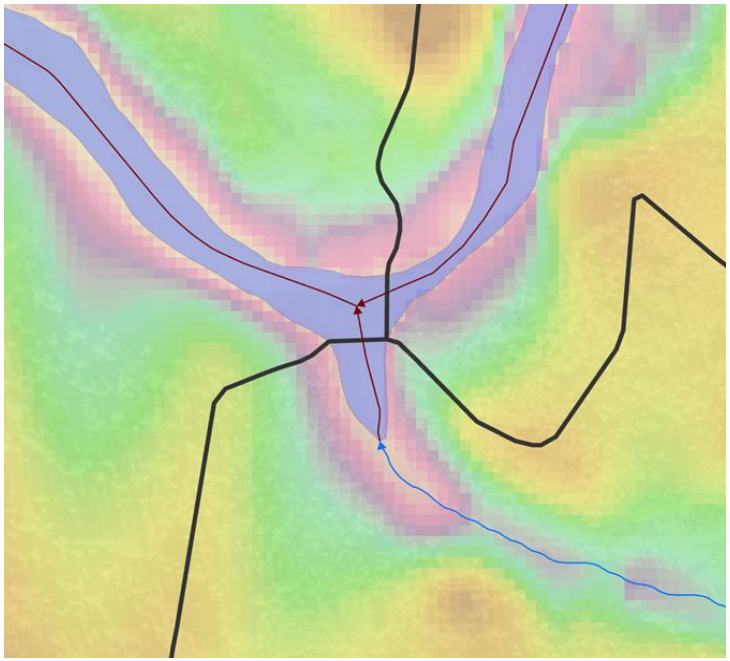
Outlet Guidance

Tributary hydrologic unit where mainstem 2D polygon extends into the tributary

Hydrologic unit boundary at outlet of a tributary when the 2D polygon goes into the tributary.



Correct delineation – The boundary may snap to either the 1D/2D or 2D/2D junction when breaking out the tributary and the 2D polygon slightly extends into the tributary channel (short tail).



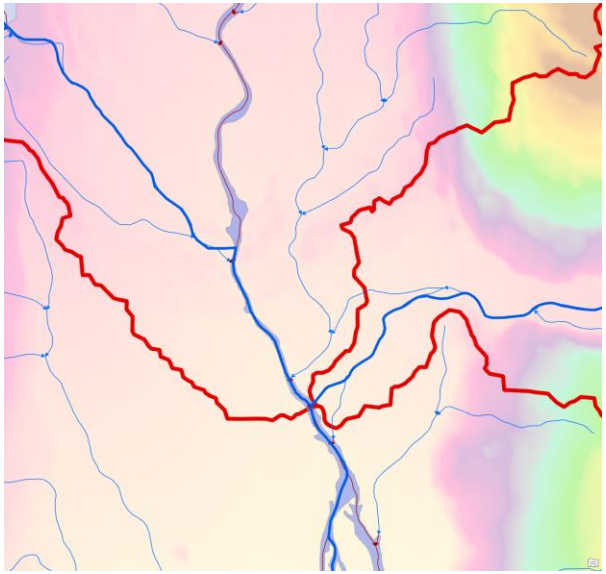
Correct delineation - The boundary should snap to the 2D polygon at the head-of-land when two 2D outlets (tributary and mainstem) are at a confluence, even when the tributary has a short tail.

Outlet Guidance

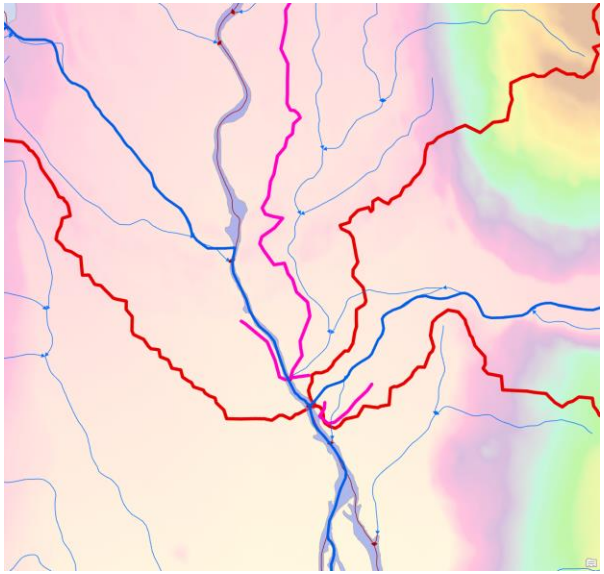
Multiple outlet tributary/ Mainstem breaks

- Tributary to the east is a multiple outlet so the mainstem boundary should be snapped to the upstream side of the tributary outlets
- Tributary boundary adjusted to include all tributary outlets

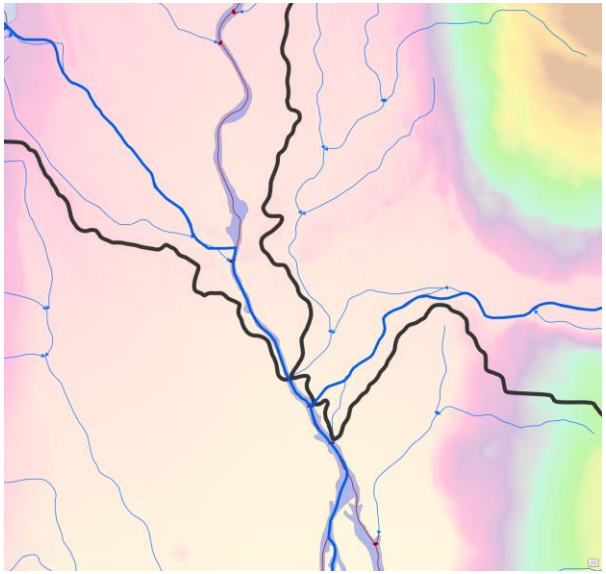




Before (red)



Flagged (pink)

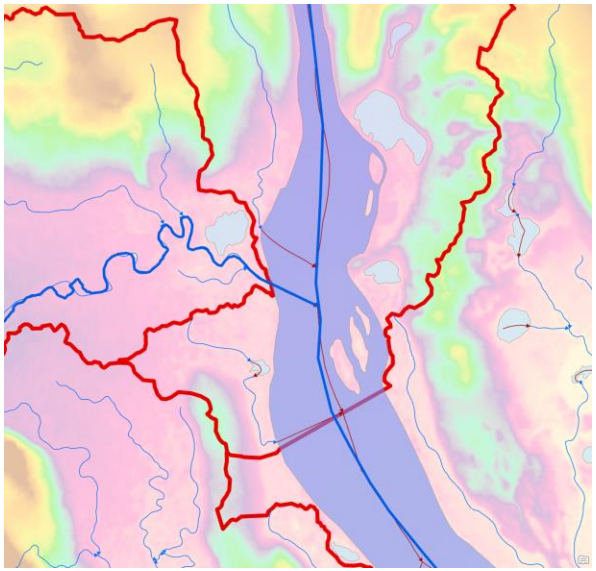


After (black)

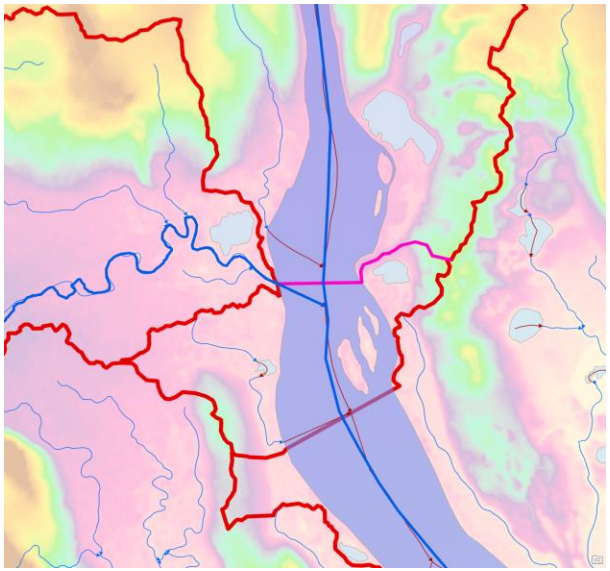
Outlet Guidance

Identifying mainstem break locations

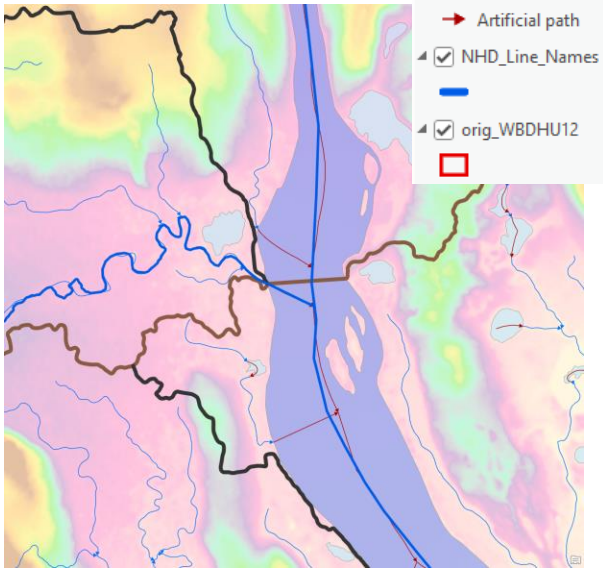
- Breaking across the mainstem should be based on locations of hydrographic significance such as confluences with tributaries, changes between rivers and lakes, areas where flow characteristics would change drastically.
- Moving the mainstem outlet upstream to the confluence with the tributary to the west



Before (red)



Flagged (pink)



After (brown/black)

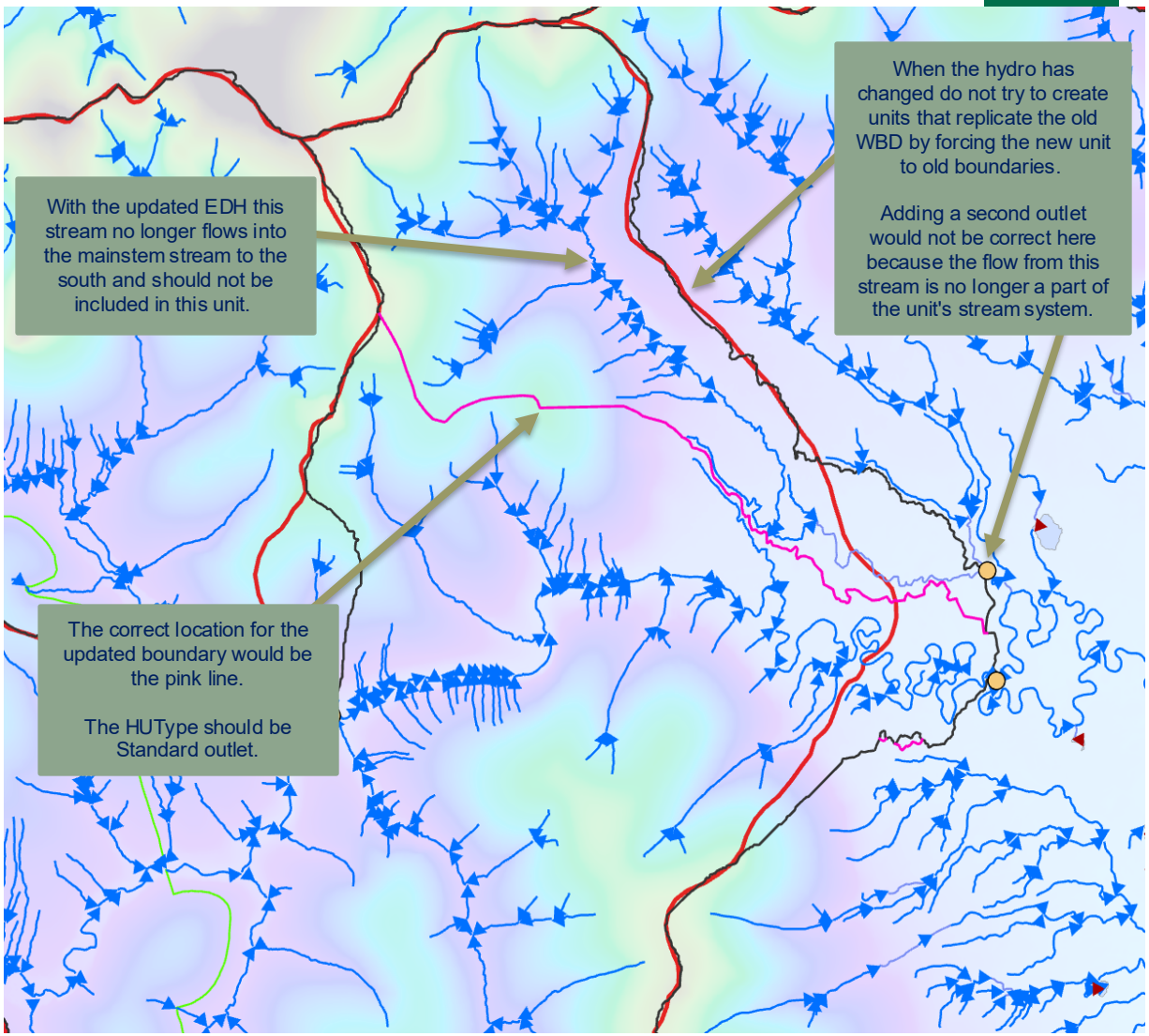
USGS science for a changing world

The National Map
Your Source for Topographic Information

Outlet Guidance

Use EDH features to determine boundary placement.

- Changes in EDH flowline data can affect boundary placement of the WBD.
- Do NOT include areas that are no longer part of the stream system.
- The original WBD is to be used as a guide and not the rule. Changes to boundary placement are in many cases necessary and expected.
- Before making big changes verify the EDH is correct by comparing it to imagery or other sources.



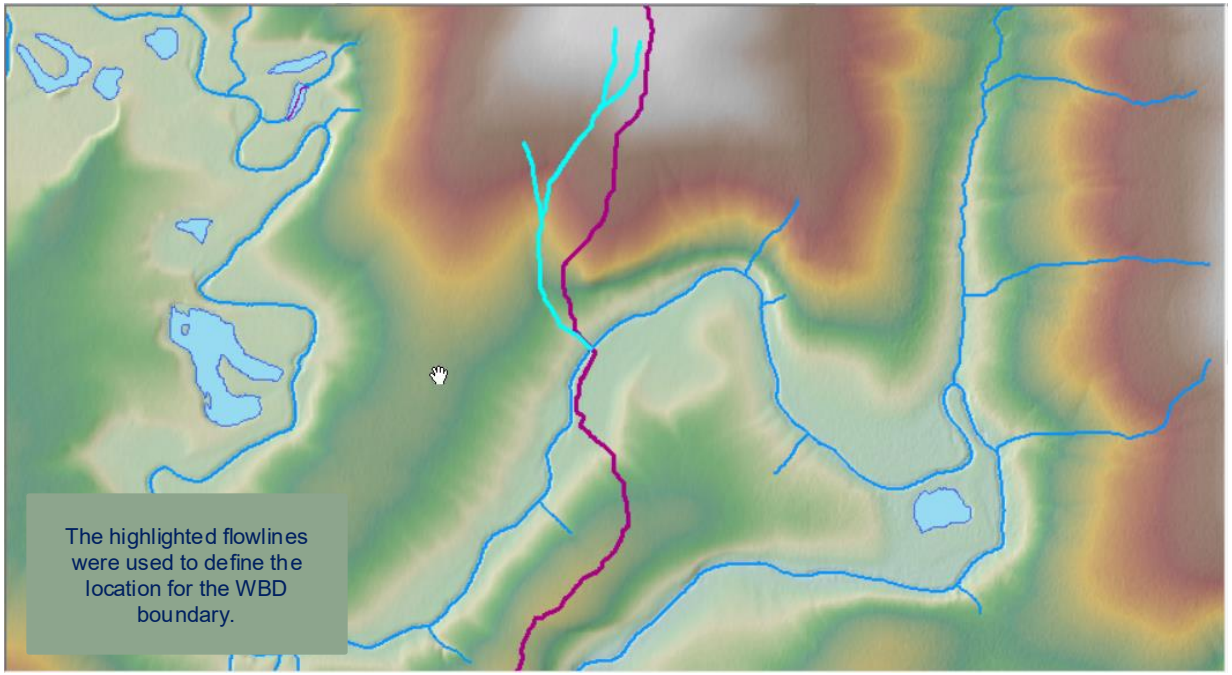
USGS science for a changing world

The National Map Your Source for Topographic Information

Outlet Guidance

Deletion of EDH features

Deletion of features can have a direct impact on the location of a boundary or outlet in the WBD.

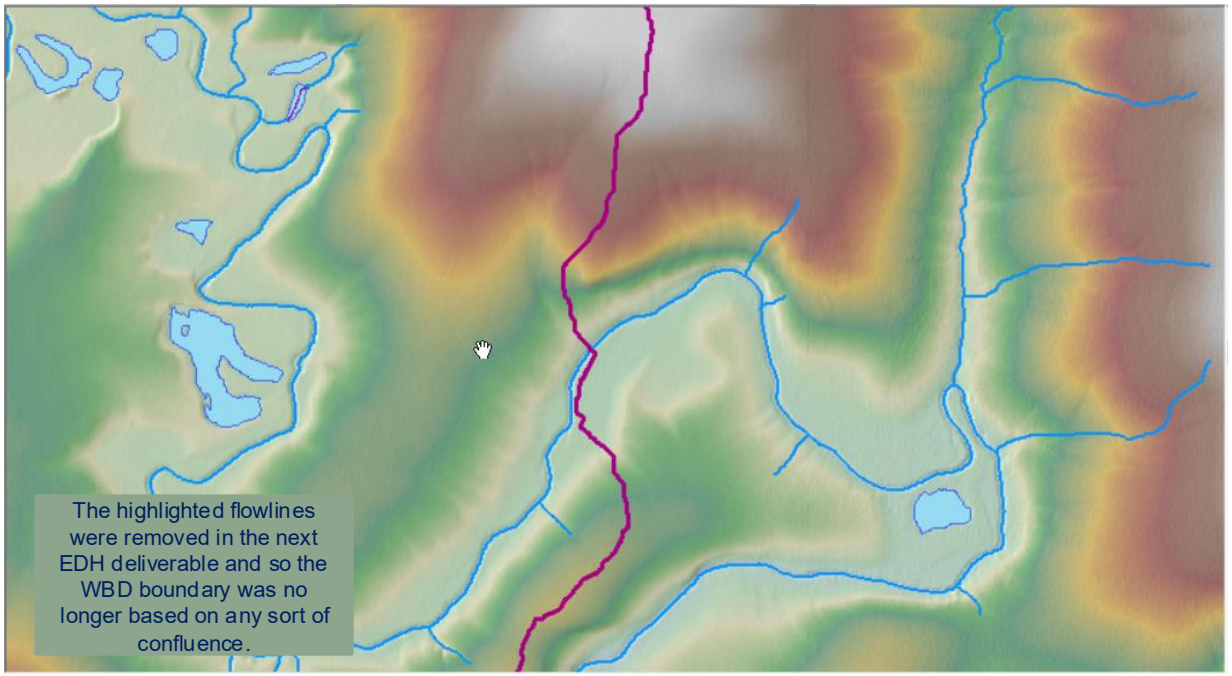


Outlet Guidance

Deletion of EDH features

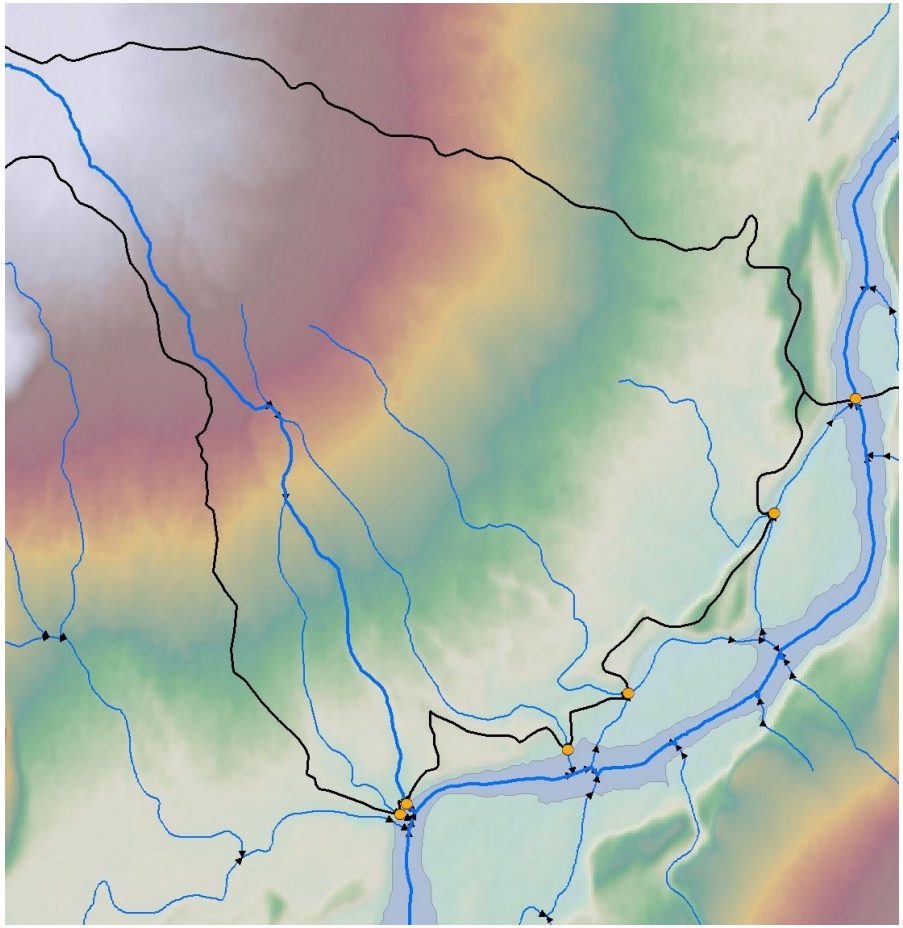
- Deletion of features can have a direct impact on the location of a boundary or outlet in the WBD.

Please be careful when thinning or removing flowlines from the EDH data. Removal of EDH data could affect the WBD.



Outlet Guidance for Alluvial Fans

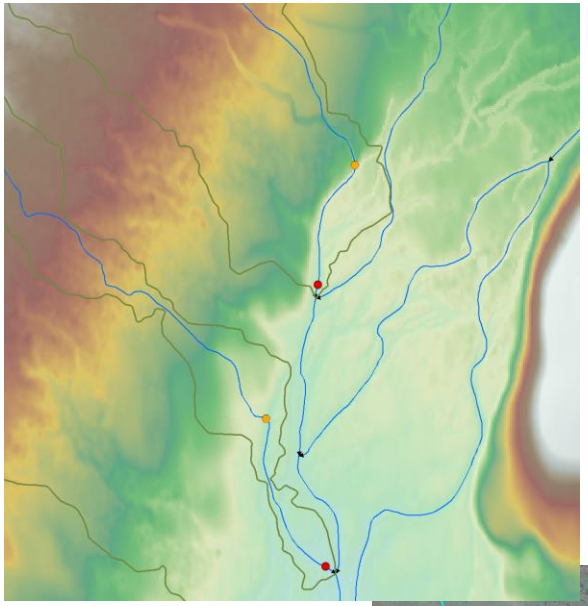
- Correct example of a delineation of a multiple outlet HU in an alluvial fan
- In this image, the boundary should be snapped to the endpoint of every flowline that enters the mainstem or side channel
- The goal of the HU here is to capture the full extent of the alluvial fan
- You can see the upstream ends of EDH are not connected, but when you look at the hydrologic characteristics of the area, we know this is an alluvial fan and are delineating the HU accordingly.

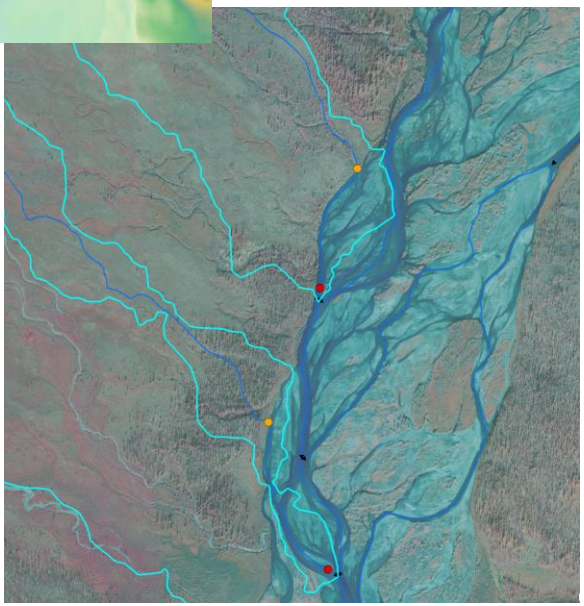


Outlet Guidance for Braided Systems

Tributaries entering mainstem side channels

- The boundary should be snapped to the endpoint of the tributary where it enters the mainstem or mainstem side channel
- The goal of the HU here is to capture the tributary without going into the mainstem or side channel
- Using imagery is very important in identifying these types of issues
- Missing flowlines may need to be added – these will be noted in the EDH flags during the NQC process
- Red point = was auto generated.
- Orange point = updated to the correct location.
- *Note: The boundary has not been updated to the correct location in this example*

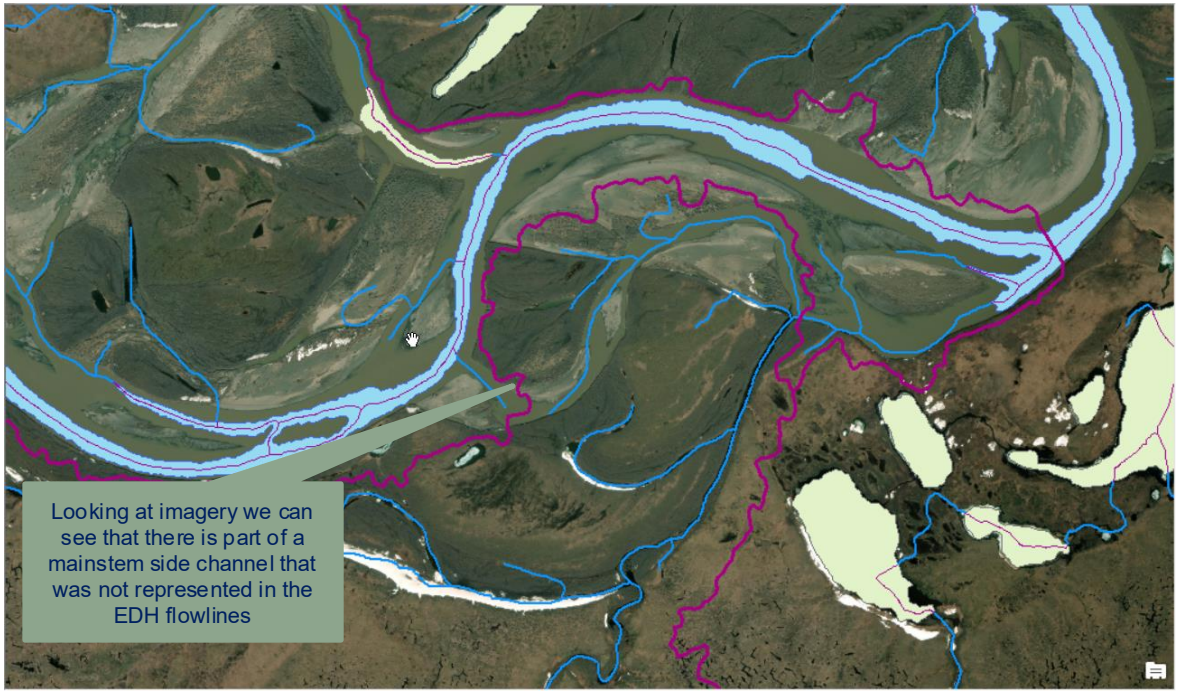




Geometry Guidance in Braidplains

Missing side channels – things to be aware of

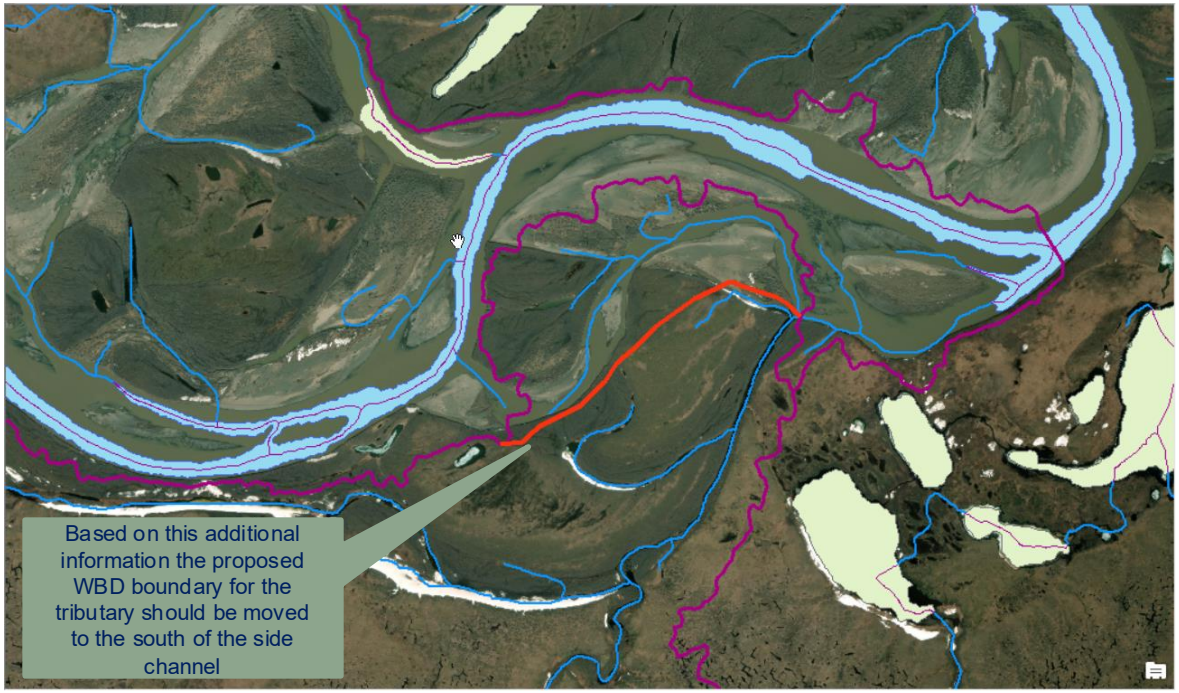
- Be sure to keep an eye out for missing side channels that may not have been included in the original EDH delineation. They will impact the delineation of the WBD.



Geometry Guidance in Braidplain

Missing side channels – things to be aware of

- Sometimes with this new knowledge the WBD boundary will have to be manually adjusted from the automated placement so that we are representing the tributary and mainstem units correctly.

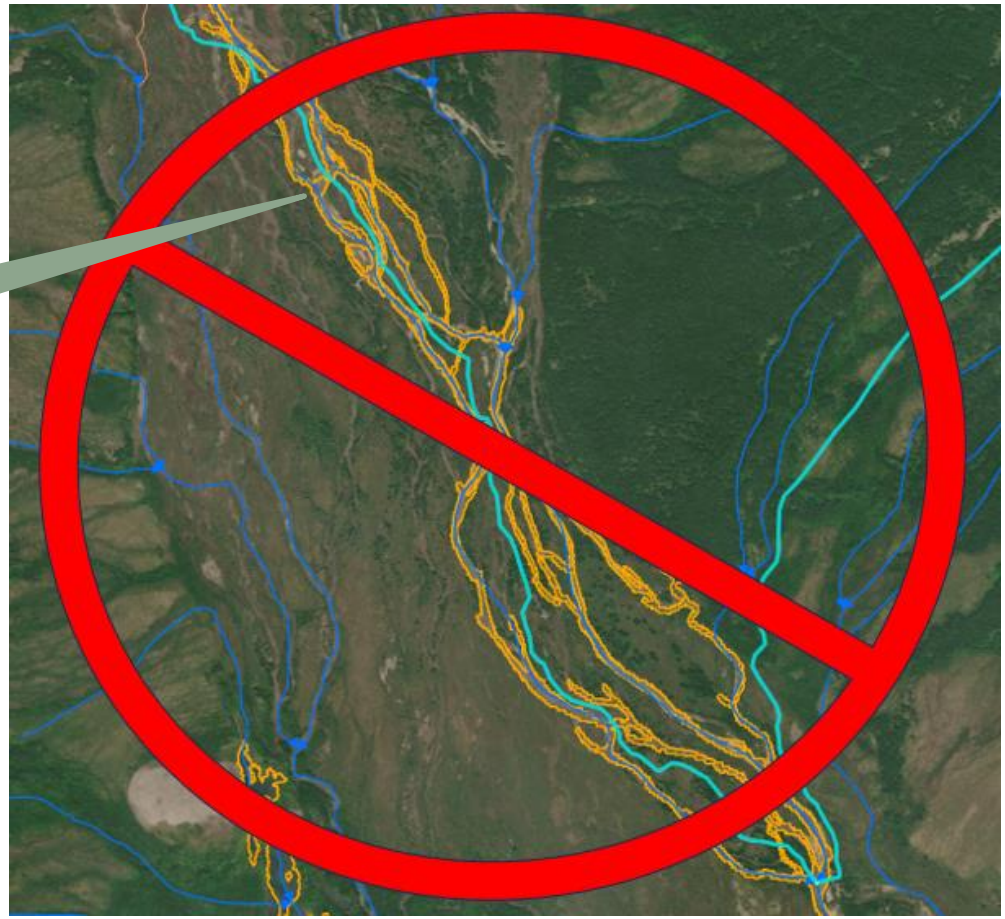


Geometry Guidance in Braidplains

Missing side channels – things to be aware of

- DO NOT WEAVE BOUNDARY THROUGH THE BRAIDED CHANNELS – Pull boundary out of braided channels.
- The autogenerated boundaries will need to be reviewed and updated during WBD delineation.

Looking at imagery we can see the boundary is going through the middle of the mainstem braided channels and there are multiple flow channels that are not represented in the EDH flowlines



Legend:
Cyan = Boundary
Blue = Flowlines
Yellow = Break lines

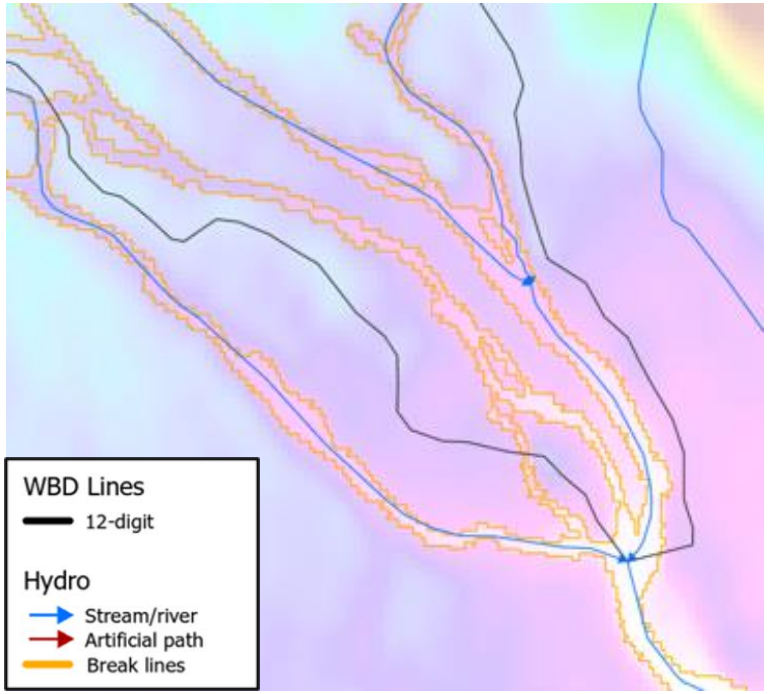
USGS science for a changing world

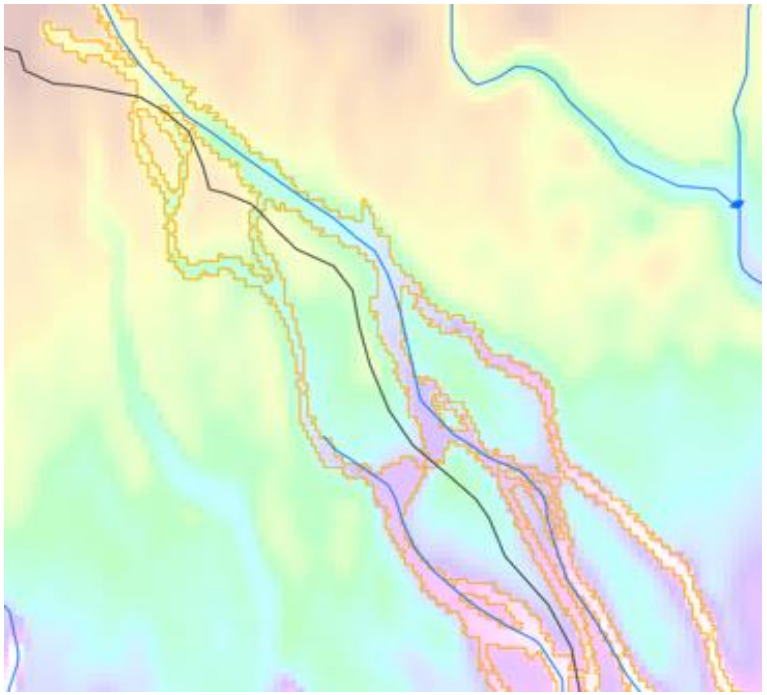
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Geometry Guidance in Braidplains

Missing side channels – things to be aware of

- DO NOT WEAVE BOUNDARY THROUGH THE BRAIDED CHANNELS – Pull boundary out of braided channels.
- The autogenerated boundaries will need to be reviewed and updated during WBD delineation.





Zoomed in views from the previous slide.

OUTLET: The boundary is going through the middle of the mainstem braided channels and there are multiple flow channels that are not represented in the EDH flowlines.

UPSTREAM: The EDH flowlines in braided channels are not always connected at the upstream end. This can make automated processes think they are tributaries and not braided channels.

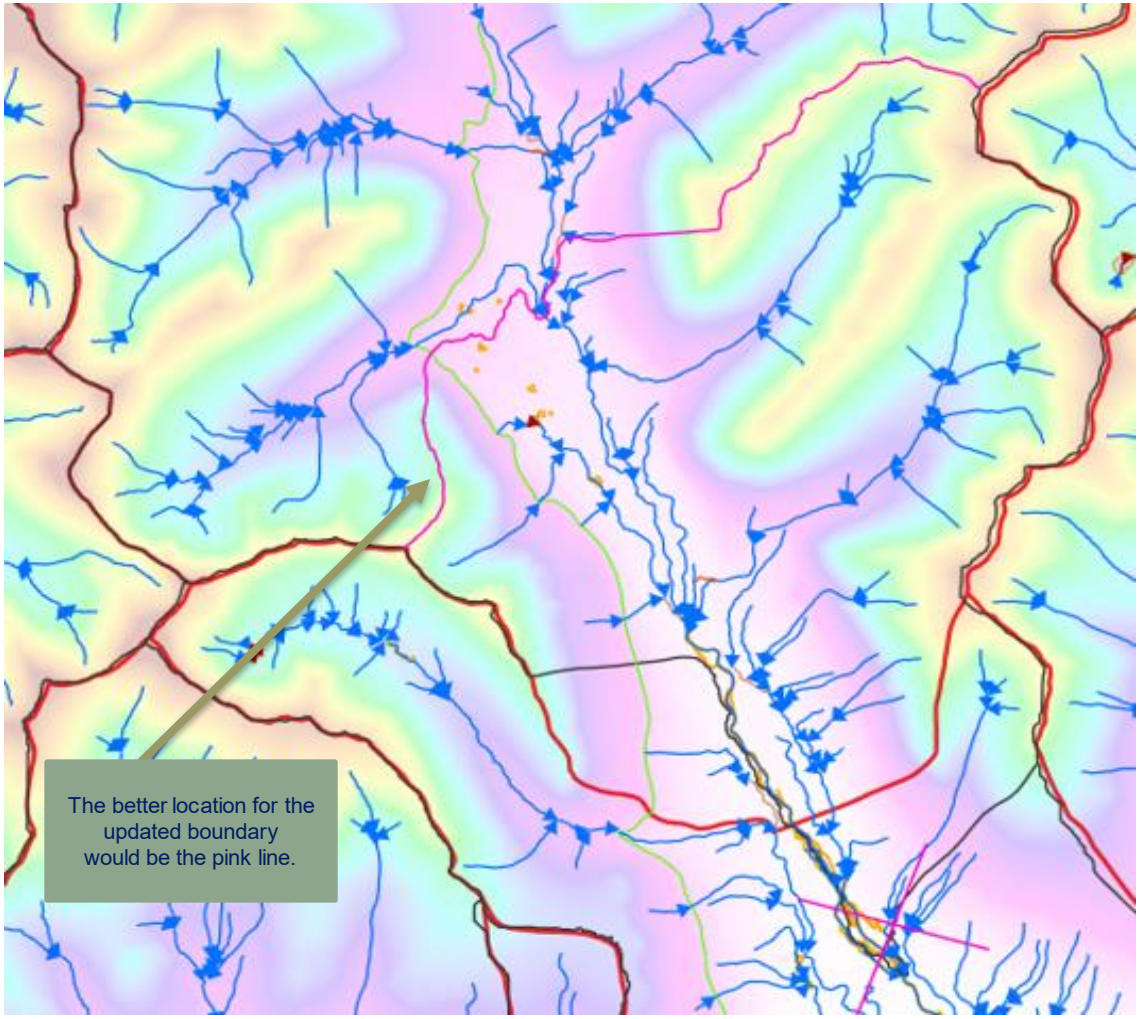
Geometry Guidance in Braidplains

Missing side channels – things to be aware of

- DO NOT WEAVE BOUNDARY THROUGH THE BRAIDED CHANNELS – Pull boundary out of braided channels.

Sometimes the better option is to move the outlet up or down stream to better reflect the topography and hydro. The autogenerated boundaries will need to be reviewed and updated during WBD delineation.

Keep size limits in mind when moving boundary.



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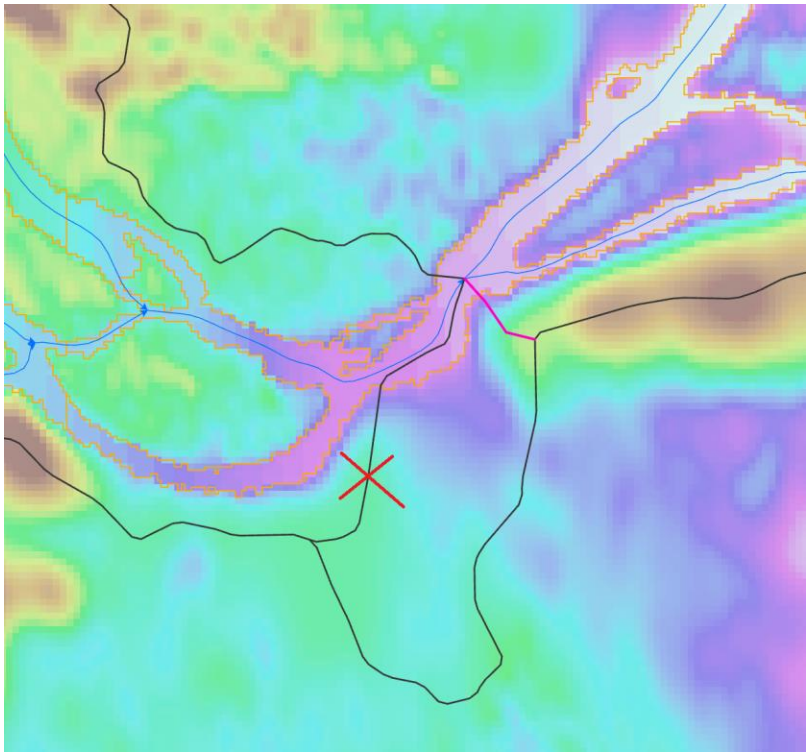
The National Map Your Source for Topographic Information

Geometry Guidance

WBD and Hydro-flattened Surfaces – Things to consider and be aware of

Due to the nature of the hydroflattened dems and the specification criteria for when to collect 2D EDH features there are instances when the automated watershed delineation methods pick up a ridgeline that is either too far upstream or downstream from the true outlet of a tributary that is entering the mainstem 2D polygon.

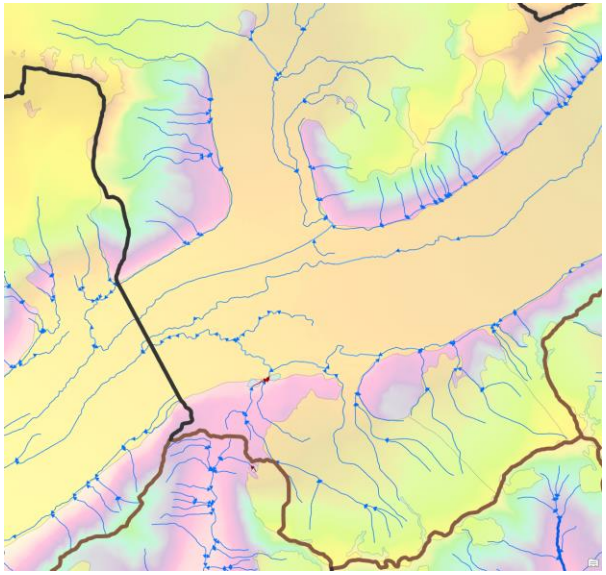
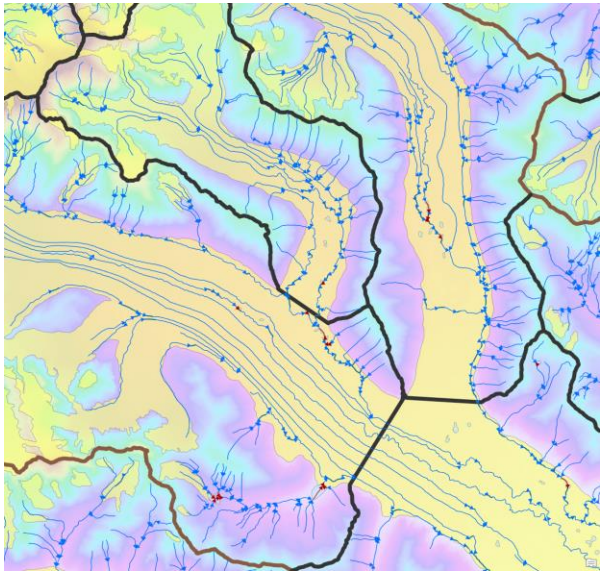
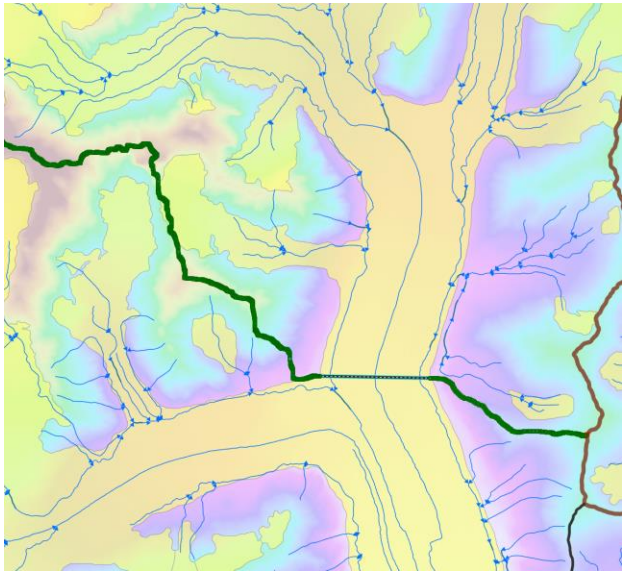
In the example to the right the black outline represents the hydrologic unit. Due to the hydroflattened dem surface the hydrologic unit boundary on the east side of the unit followed a ridgeline that was too far upstream and now the hydrologic unit is not on the correct ridge but is going through the mainstem drainage area represented by the red X in the figure. The true location for the WBD boundary is represented by the pink line.
Orange = Breaklines, Blue = Flowlines.



Outlet Guidance Involving Glaciers

Glaciers as outlet of unit

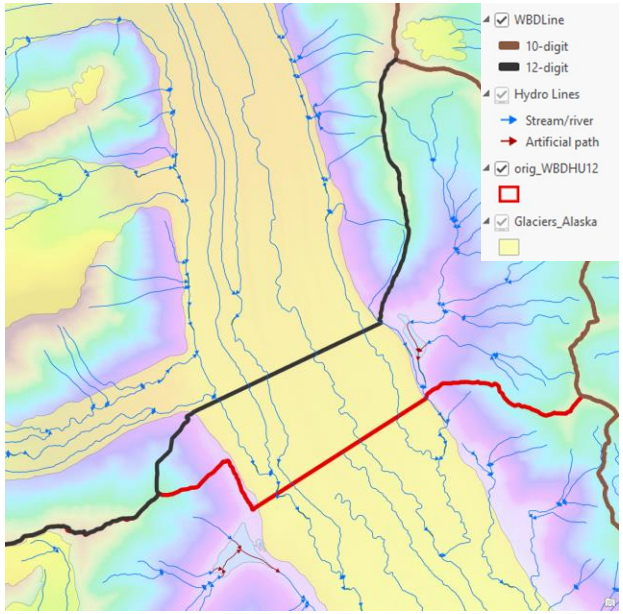
- Treat Glaciers like 2D rivers, breaking at the head of land where the tributary enters the mainstem flow
- Snap to the outer edges of the glacier polygon, then go straight across
- Do not snap to the flowlines inside the 2D glacier polygon

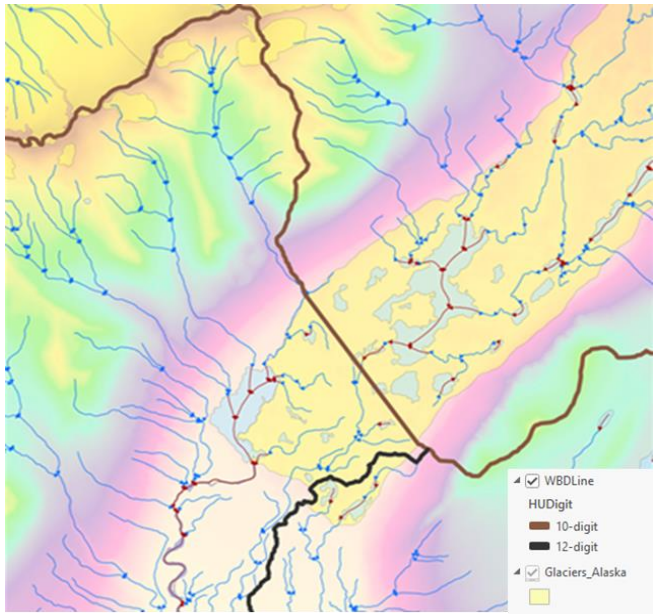
Outlet Guidance Involving Glaciers

Glaciers

- Glacier outlet boundary may need to be move up or down stream to match the updated base data
- Glacier outlets should not use the terminus of the glacier polygon or delimiters



Move upstream to glacier confluence

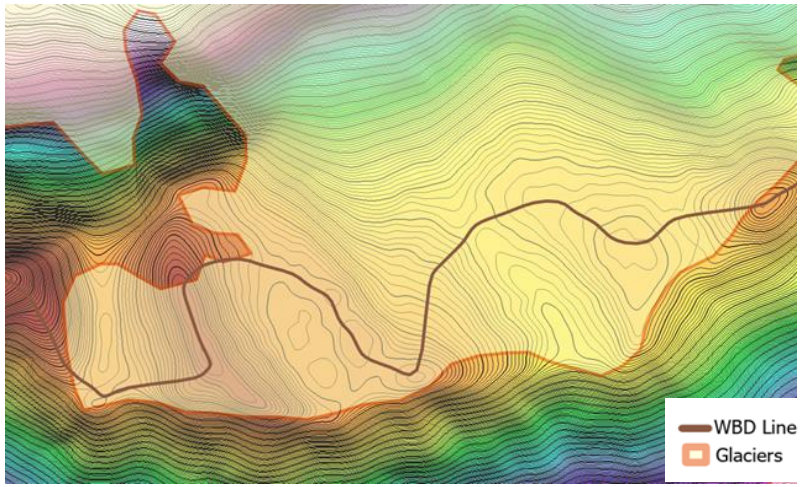


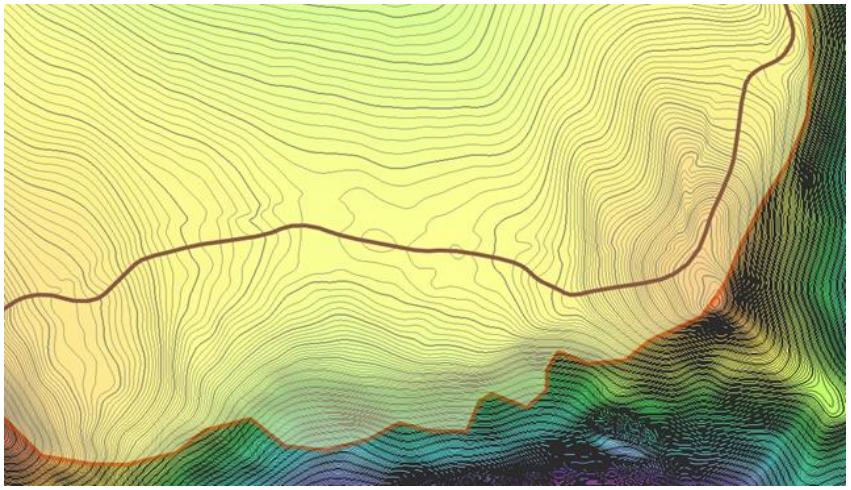
Break across at 1D tributary confluence

Geometry Guidance involving Glaciers

Glacier Headwaters

- Reference the Randolph Glacier Inventory to identify areas with glaciers and ice fields
  - Use the RGI to help delineate units at the outlet of the unit
- Glacier data is very generalized and does not follow the ridgeline. It is capturing the area of the ice mass
- Use the DEM and contours to identify the crest of the ridge
- Do not snap to the glacier data except at the outlet of the hydrologic unit
- Ice Fields may need additional data and review for correct delineation

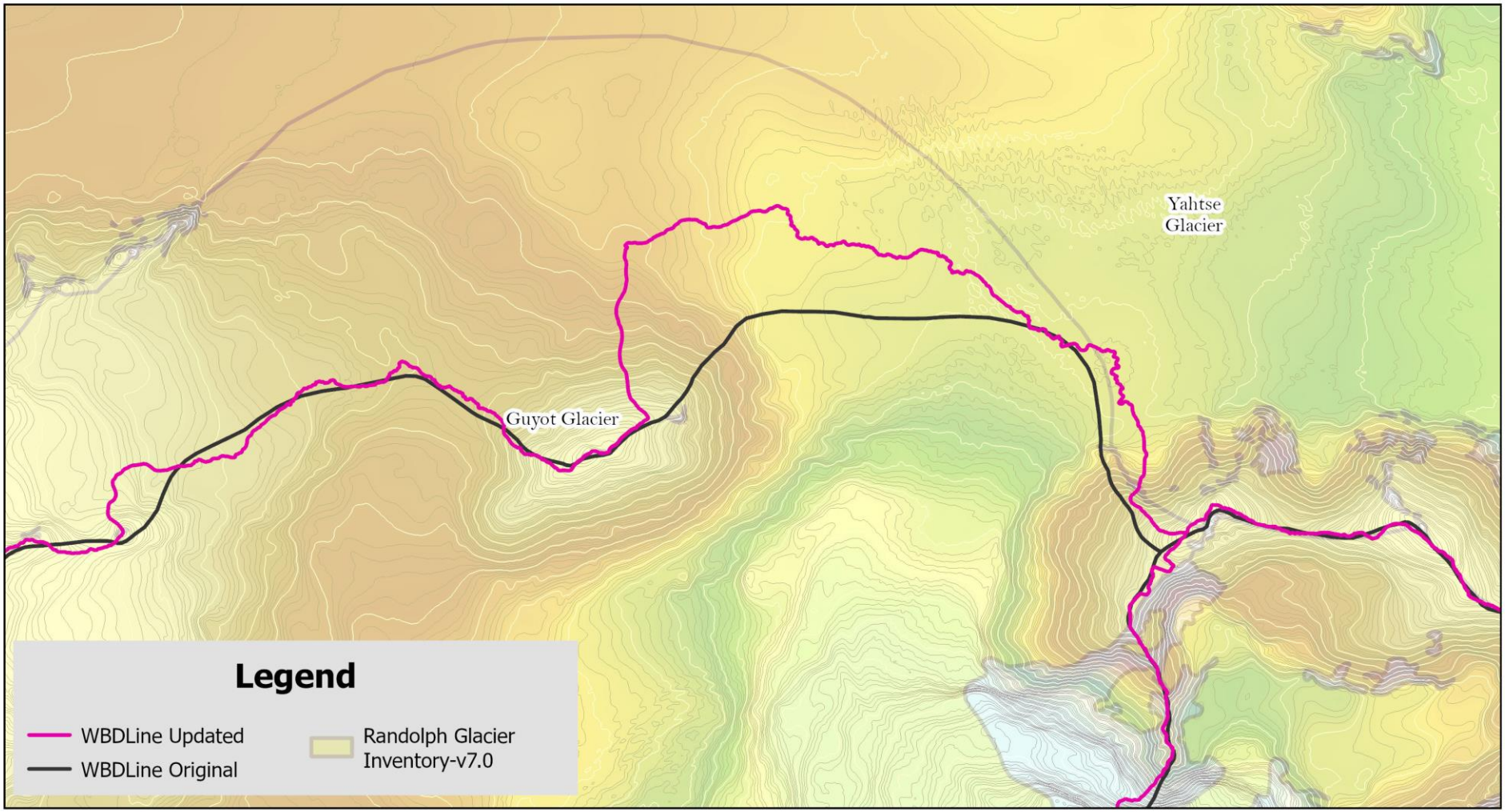




Geometry Guidance Involving Glaciers

Example of WBD delineation when there are multiple large glaciers adjacent to each other

NOTE: May need to coordinate with WBD team if updated boundary cuts through the middle of a glacier due to the dem representing the top of the glacier and not the bedrock underneath



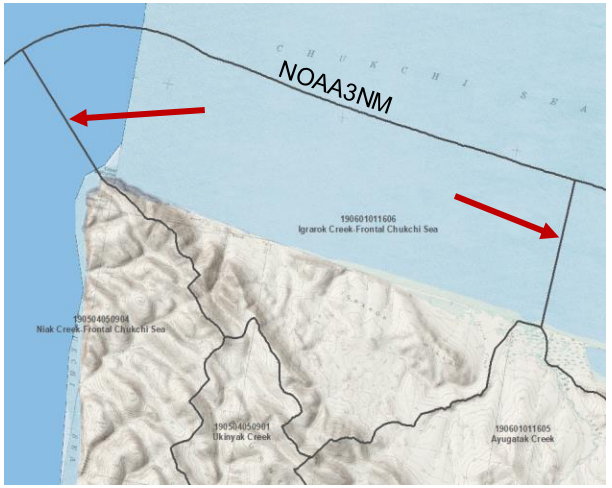
Outlet Guidance in Coastal Areas

Coastal – Offshore Boundaries

- Types of offshore boundaries:
  - **Open-ocean boundary**
    - NOAA 3 NM Line
      - Required for 2-digit open-ocean boundary
      - Current WBD includes agreed-upon NOAA 3 NM Line. Any updated units MUST use existing boundary that represents the 3NM Line
    - HU boundaries (most commonly 8 and 10-digits) should follow submerged ridges out to 3 NM Line, if not available, use arbitrary perpendicular line straight out to 3 NM Line.
    - **Do not modify the NOAA3NM line from the original WBD.** If working in an area that has the 3NM, use the original line that represents it in the national WBD.







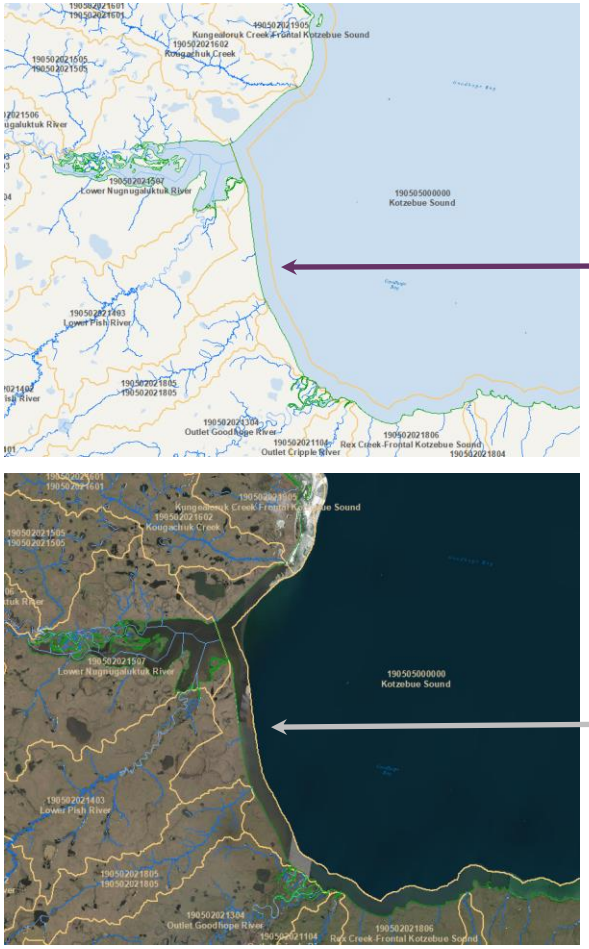
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Outlet Guidance in Coastal Areas

Coastal – Offshore Boundaries

- **Nearshore boundary (common in Alaska)**
  - Optional
    - Might meet programmatic or modeling needs such as land/water separation (or as close as possible) or where nearshore science might be significant (i.e. studying eelgrass beds or fisheries)
    - 10- or 12-digit breaks where additional nearshore subdivisions are needed for nearshore science practices
    - Can occur in bays, sound, estuaries and rivers where there's tidal influence
    - In Alaska, the nearshore boundary is based on the Alaska Mean Low Lower Water line. **These buffer lines should not be modified at this time.**



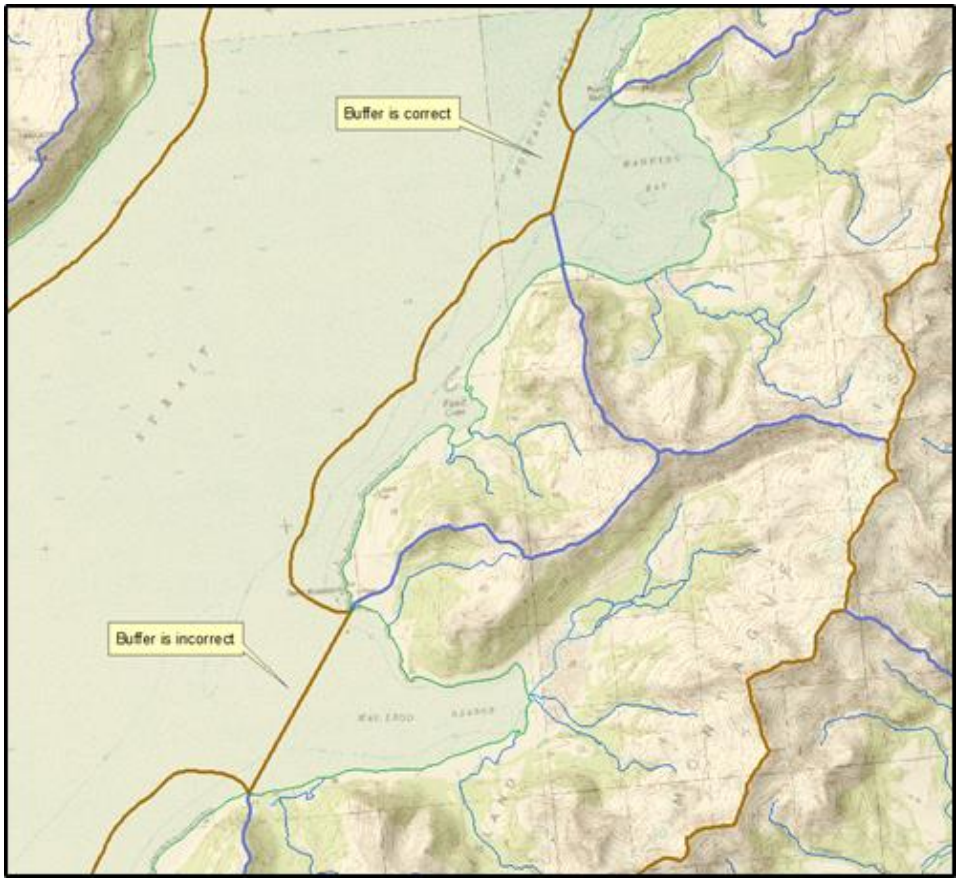
Outlet Guidance in Coastal Areas

Coastal – Offshore Boundaries

- Buffers – **Lesson Learned**:

- When adding an offshore boundary, it is very important that the onshore boundary be taken out to the buffer and not the other way. If not done correctly it will cause issues when running analysis.

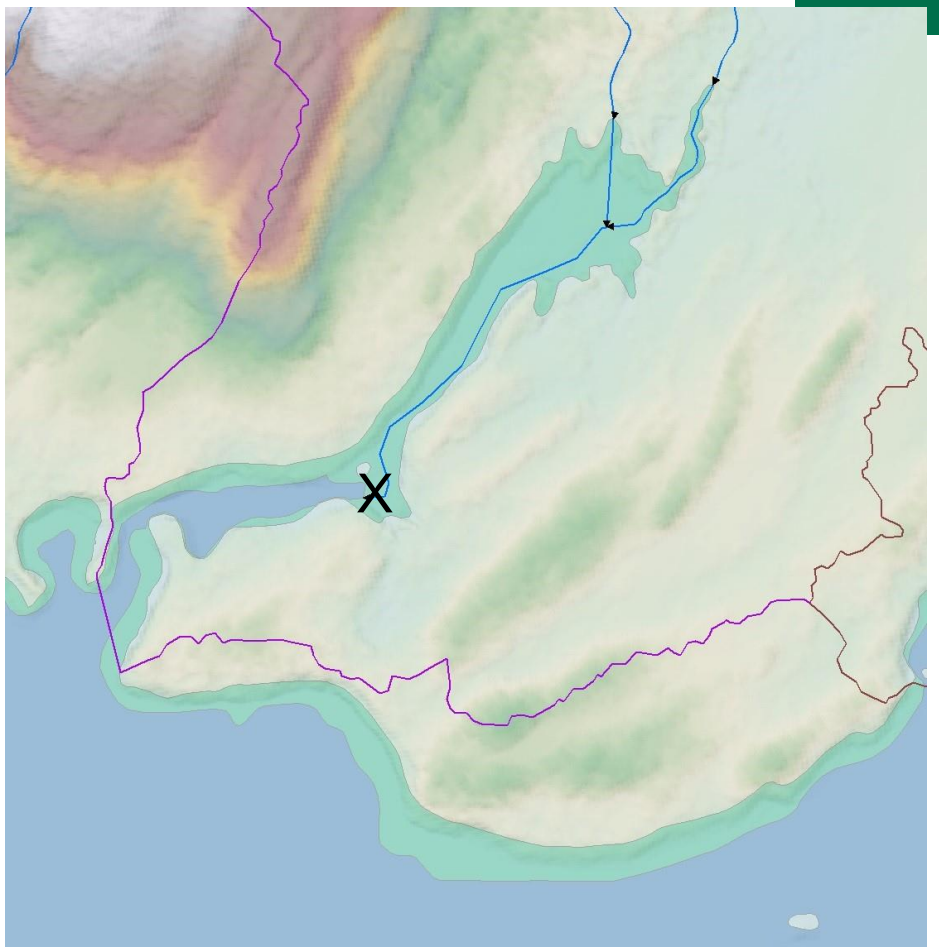
- This also applies to all offshore boundaries including the NOAA 3 NM line.



Outlet Guidance in Coastal Areas

Coastal – Head of Land

- Example of the correct placement of a boundary at a 2D-2D confluence with an ocean tail
- Take the boundary to the head of the land mass, as it relates to the tributary channel. Boundary breaks across 2D polygon snapping at the edge on both sides and goes straight across.
- Do not snap to the Artificial Path line if one exists



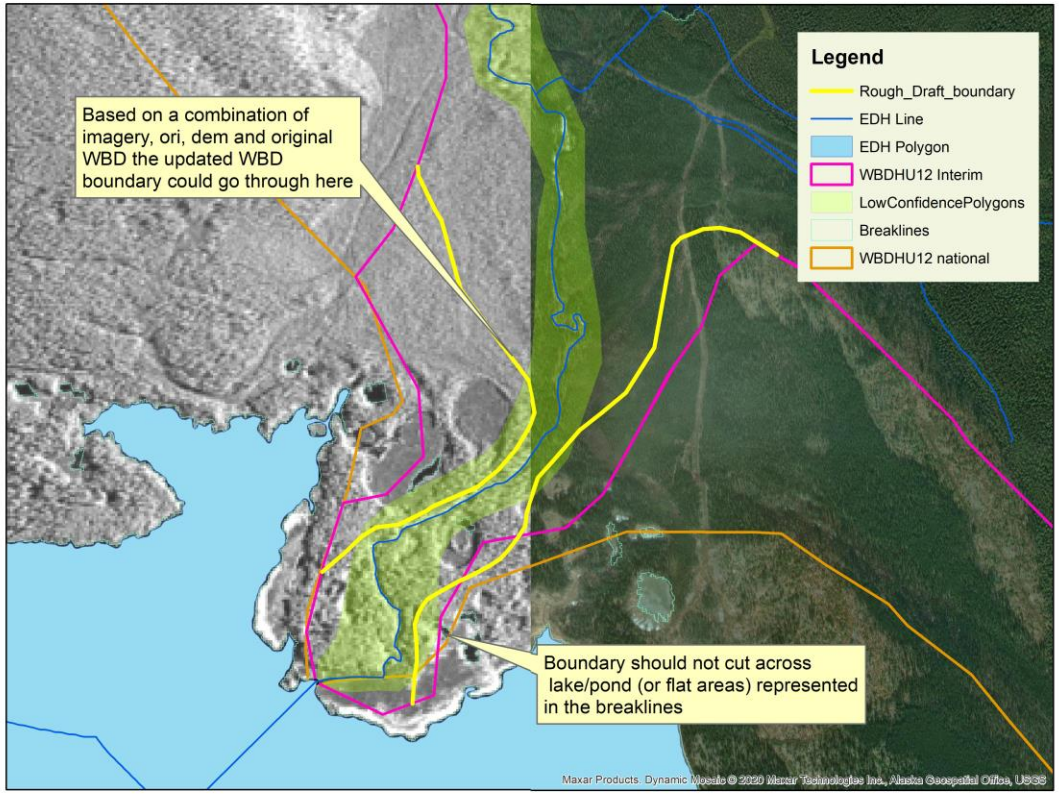
DEM Limitation (Low Confidence Areas)

For areas where the hydrography is developed based on sources other than the dem it may be necessary to also delineate the WBD based on other sources.

Sources may include
- ORI
- Imagery
- DRG
- Original WBD

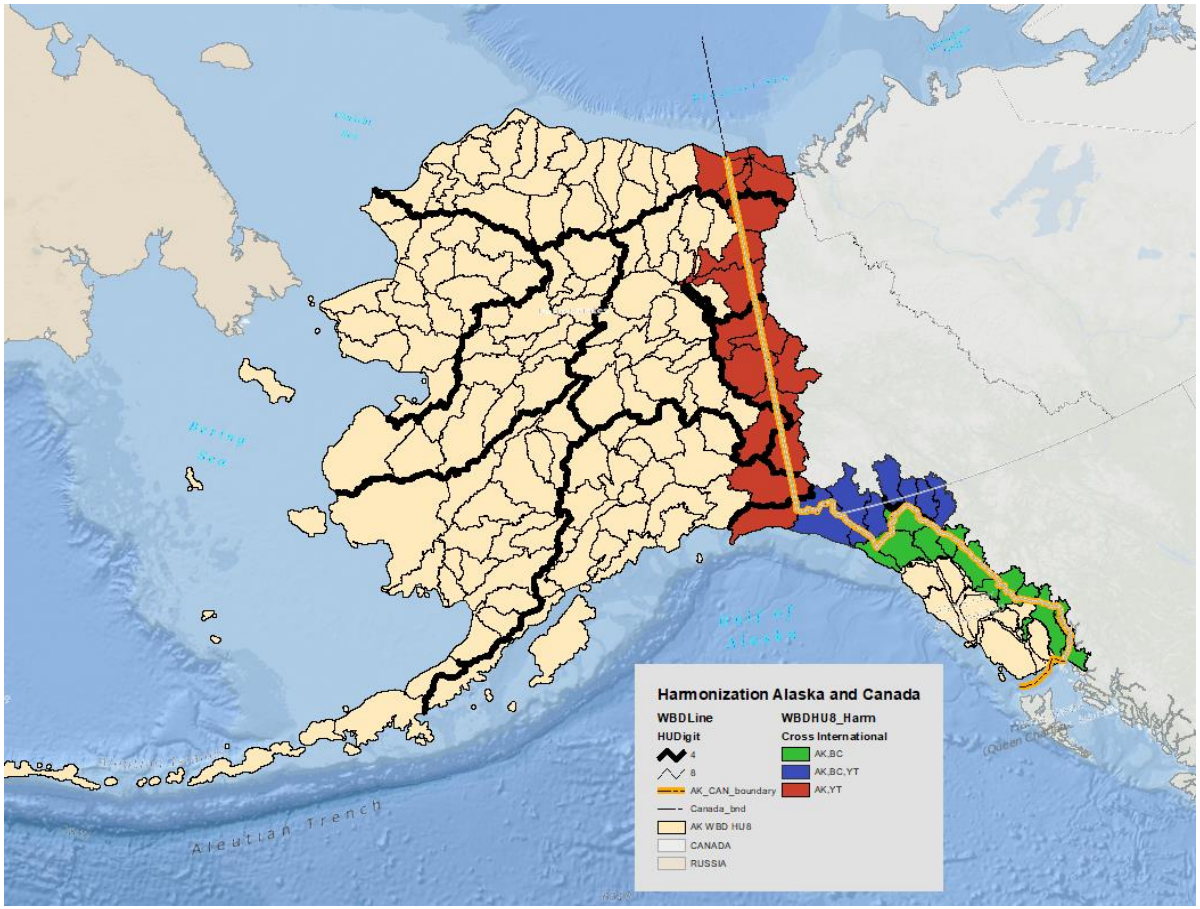
- Please note DEM Limitations per HU12 within a Notes field in the preliminary WBD line dataset.

- For full WBD deliverables please note all ancillary data sources within the LineSource field on the WBDLine dataset



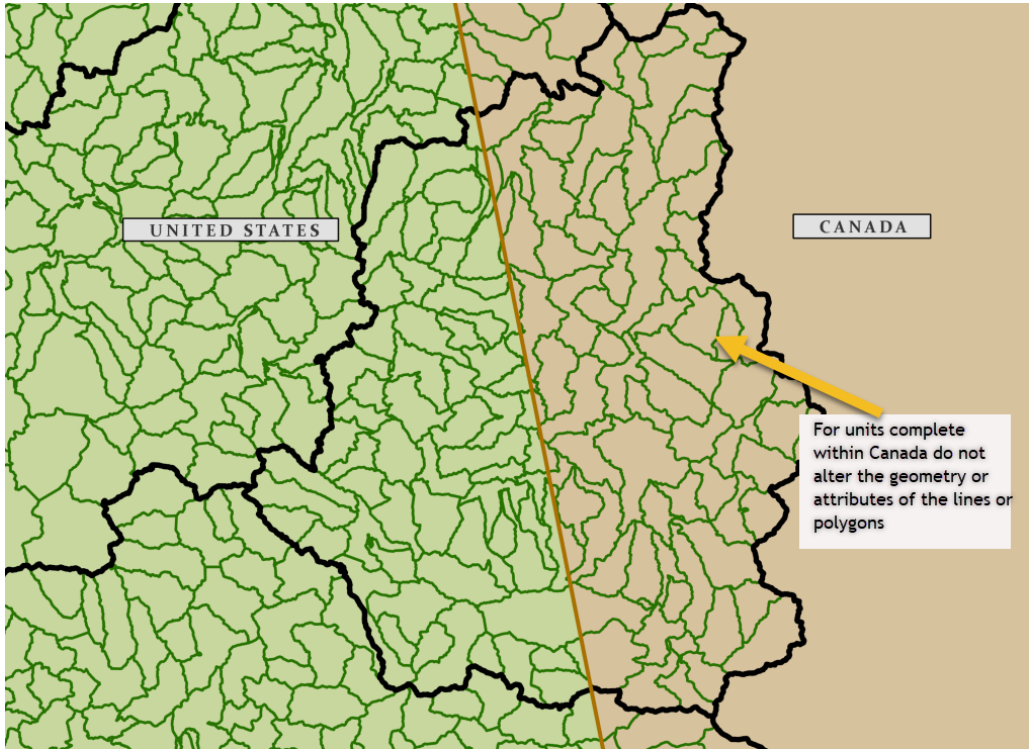
Canada-US Border

- Differences in boundary placement between the two countries datasets needs to be harmonized
- The WBD team facilitates any international collaboration that needs to be done
- A significant amount of collaboration and effort went into the international boundary harmonization



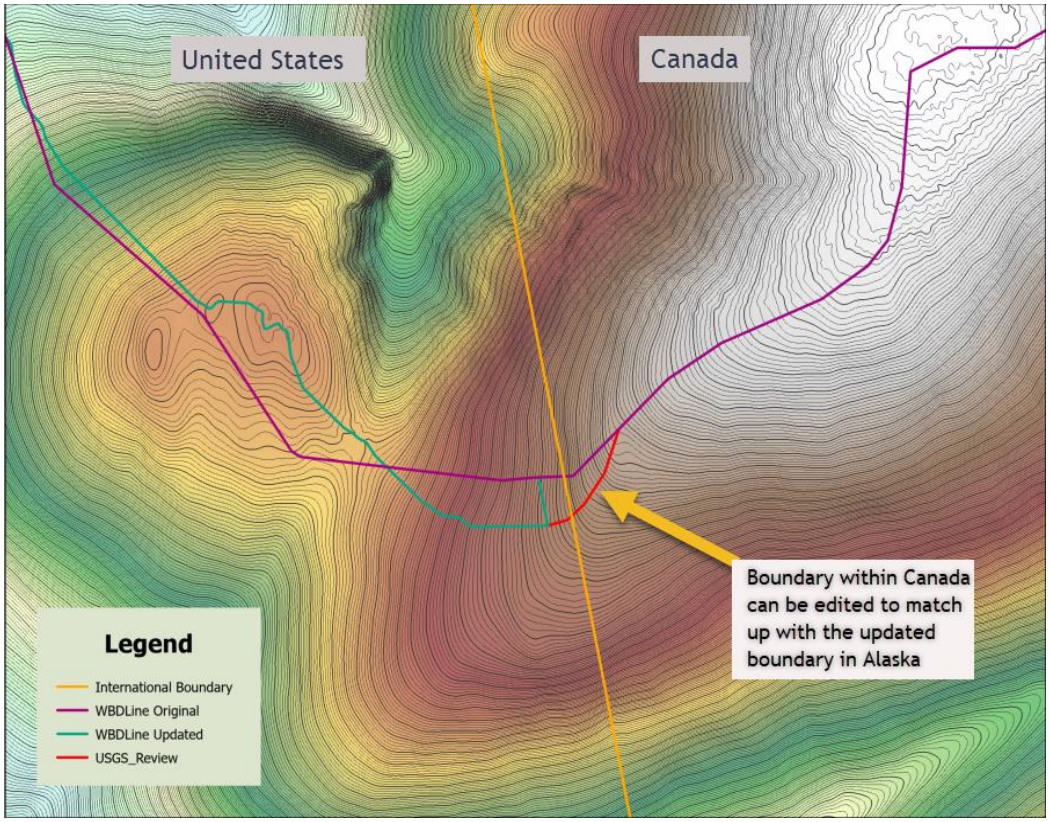
Canada-US Border

- Include data for the full HU8 in international areas
- For units fully within Canada include data that currently exists within the WBD
  - Do Not edit the geometry or attributes unless requested by WBD team



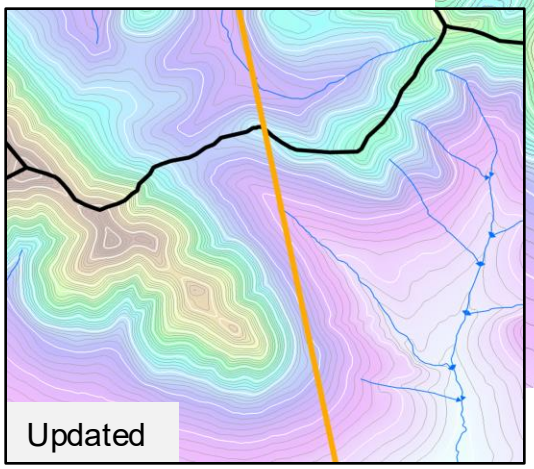
Canada-US Border

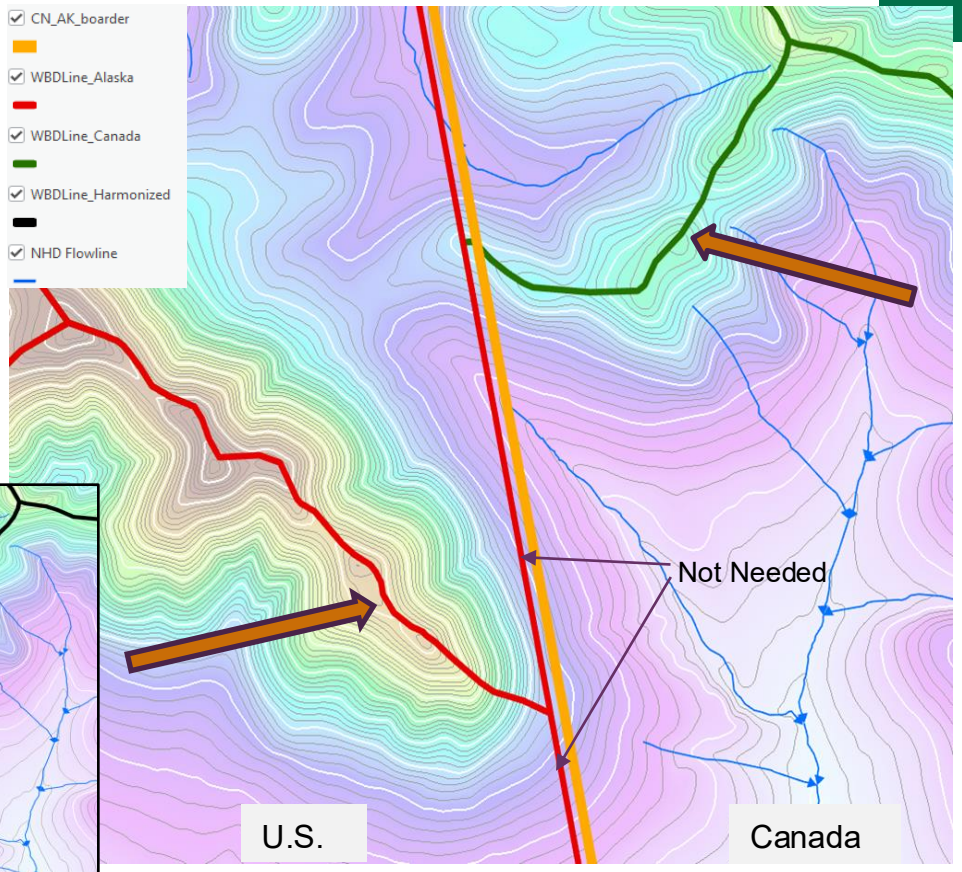
- Boundaries that cross the international border may be edited within Canada in order to connect up with the updated boundary in Alaska
- WBDLines along the international border may be split at the border in order to identify features that reside in Canada from features within the U.S.
  - Keep split in the WBDLines (pseudo nodes in topology are okay here
  - Update WBDLine "LineSource" field to include the IfSAR source.



Canada-U.S. Border

- Data from both British Columbia and Yukon Territory was needed to harmonize the boundary with Alaska
- **Data mismatches needed manual inspection and cleanup**





Large arrows point to two lines that need to match up.

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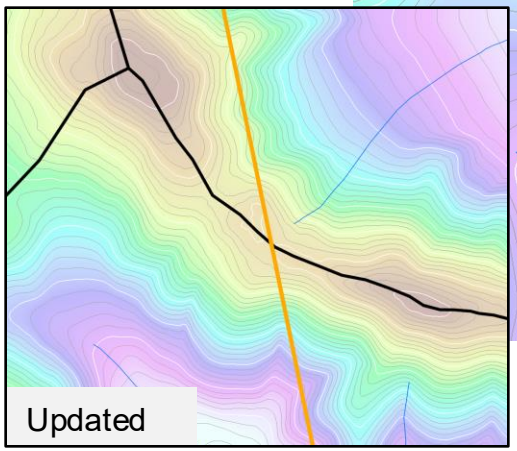
Environment and Climate Change Canada

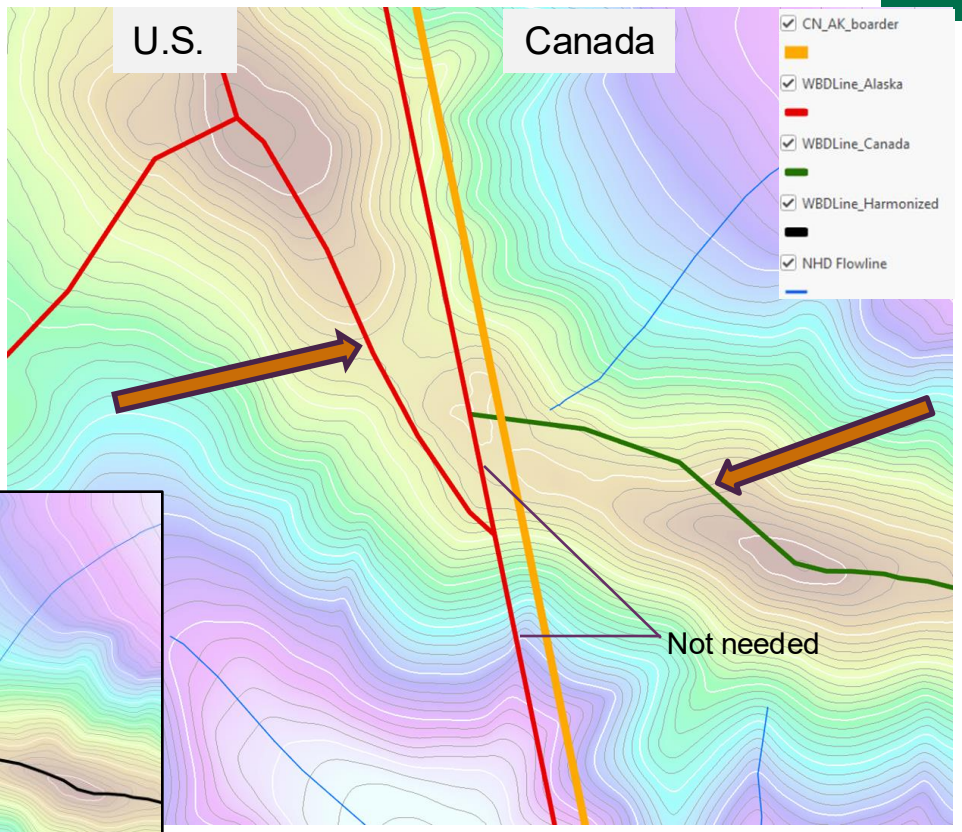
Natural Resources Canada

Canada-U.S. Boarder

- Data from both British Columbia and Yukon Territory was needed to harmonize the boundary with Alaska
- **Data mismatches needed manual inspection and cleanup**

NOTE: It is okay to edit the WBD lines within Canada along the border in order to align with the updated data on the US side.





Large arrows point to two lines that need to match up.

USGS science for a changing world

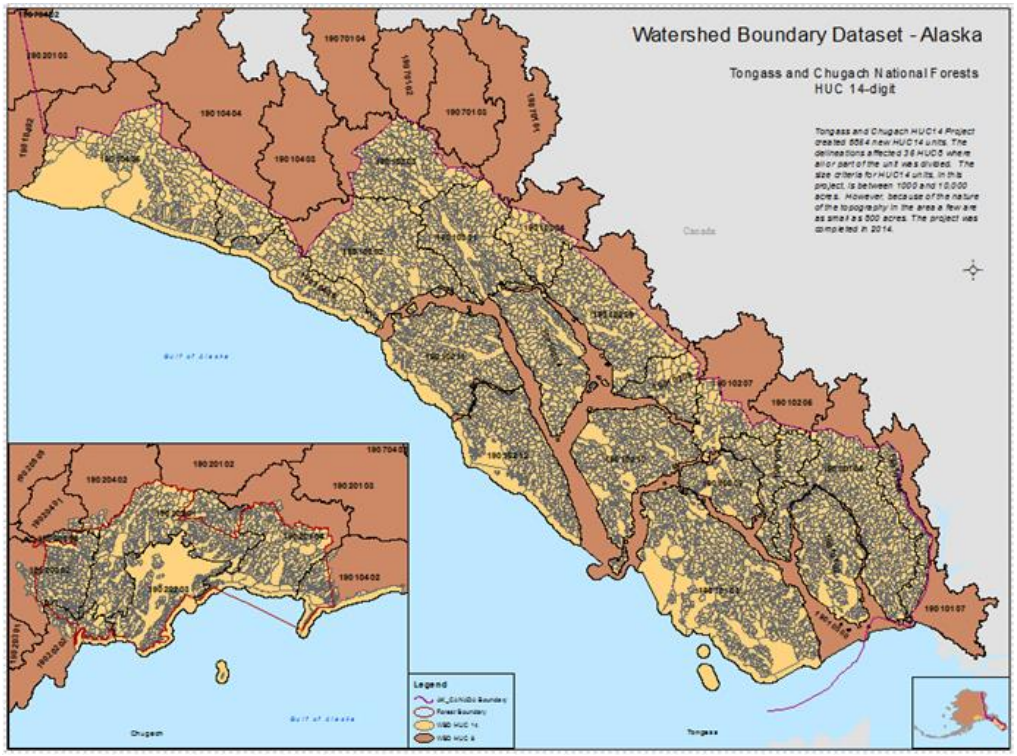
Environment and Climate Change Canada

Natural Resources Canada

Geometry Changes

HU14 now a part of Alaska WBD

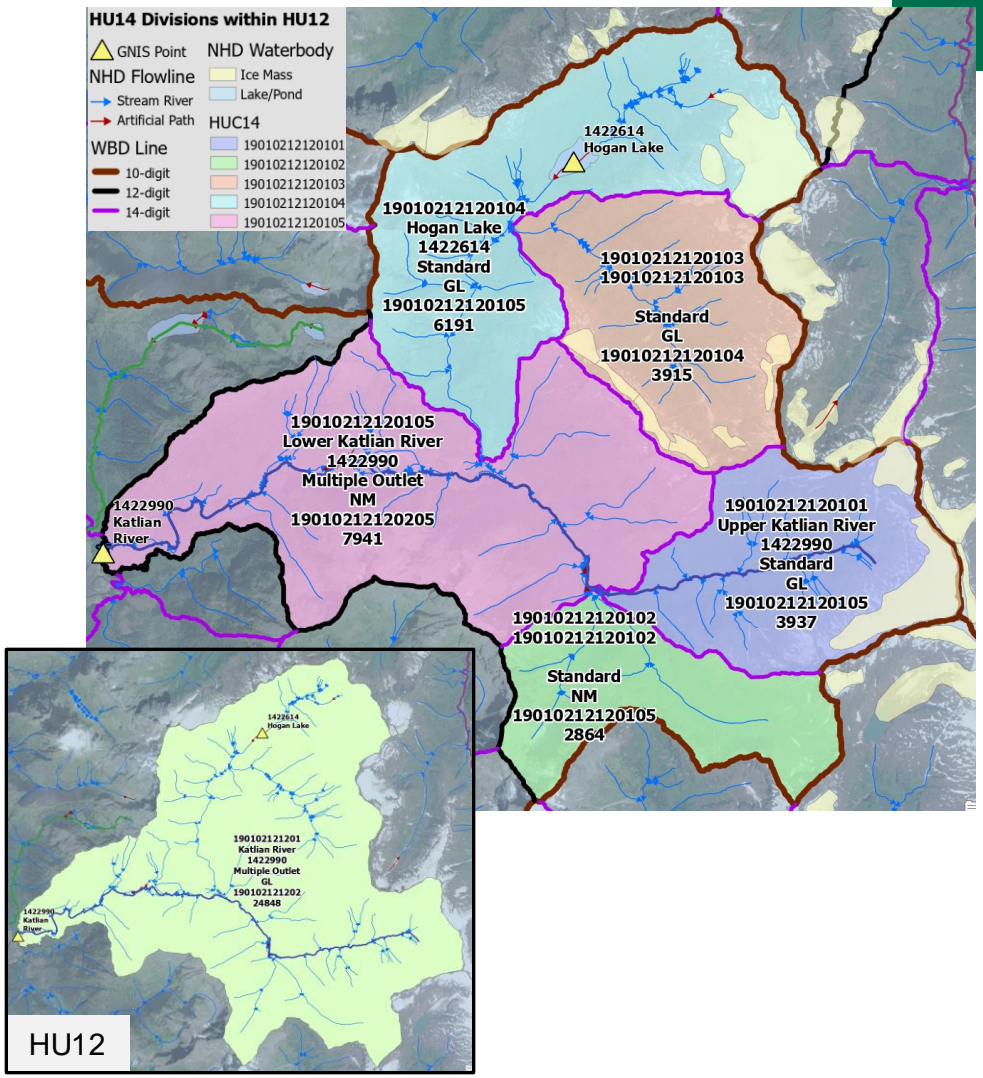
- Alaska was the first state in the USA to have 14-digit watershed data in the National WBD
- Southeast and Southcentral Alaska currently have 14-digit watersheds within Tongass and Chugach National Forests
- HU1901 (Tongass NF) has 14-digit watersheds that have been completed in Canada where the HU12 crosses the international boundary nested within the 12-digit watersheds
- **Where 14-digit boundaries exist, make sure to work at the 14-digit, then update the 12-digit to ensure the boundaries are coincident**
- **Topology needs to be consistent starting at the 14-digit and rolling up through the other HU levels**



Geometry Guidance: HU14

HU14 nested within the HU12

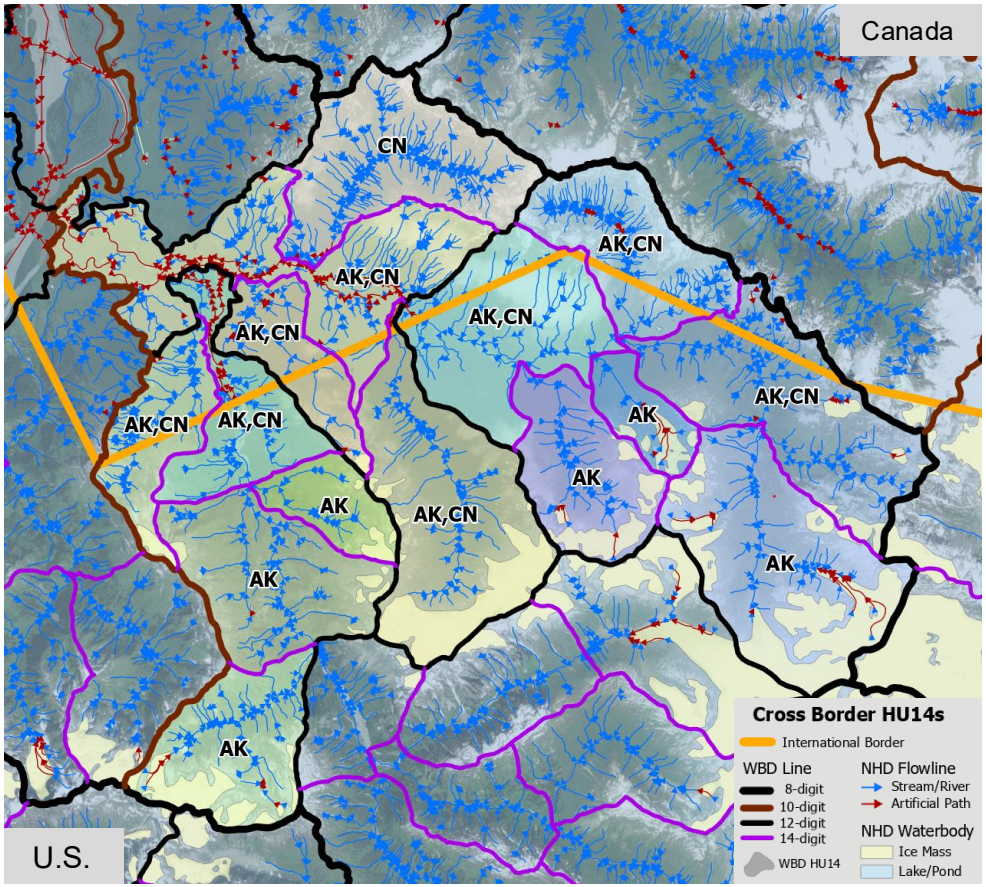
- Southeast and Southcentral Alaska currently have 14-digit watersheds within Tongass and Chugach National Forests
- 14-digit watersheds are nested within the 12-digit watersheds
- For Alaska, HU14 size limits are 3000 to 10,000. Note: Many 14-digit units were created before these limits were established and are much lower. These will be reviewed on a case-by-case basis
- **Where 14-digit boundaries exist, make sure to work at the 14-digit, then update the 12-digit to ensure the boundaries are coincident**
- **Topology needs to be consistent starting at the 14-digit and rolling up through the other HU levels**



Geometry Guidance: HU14

HU14 nested within the HU12

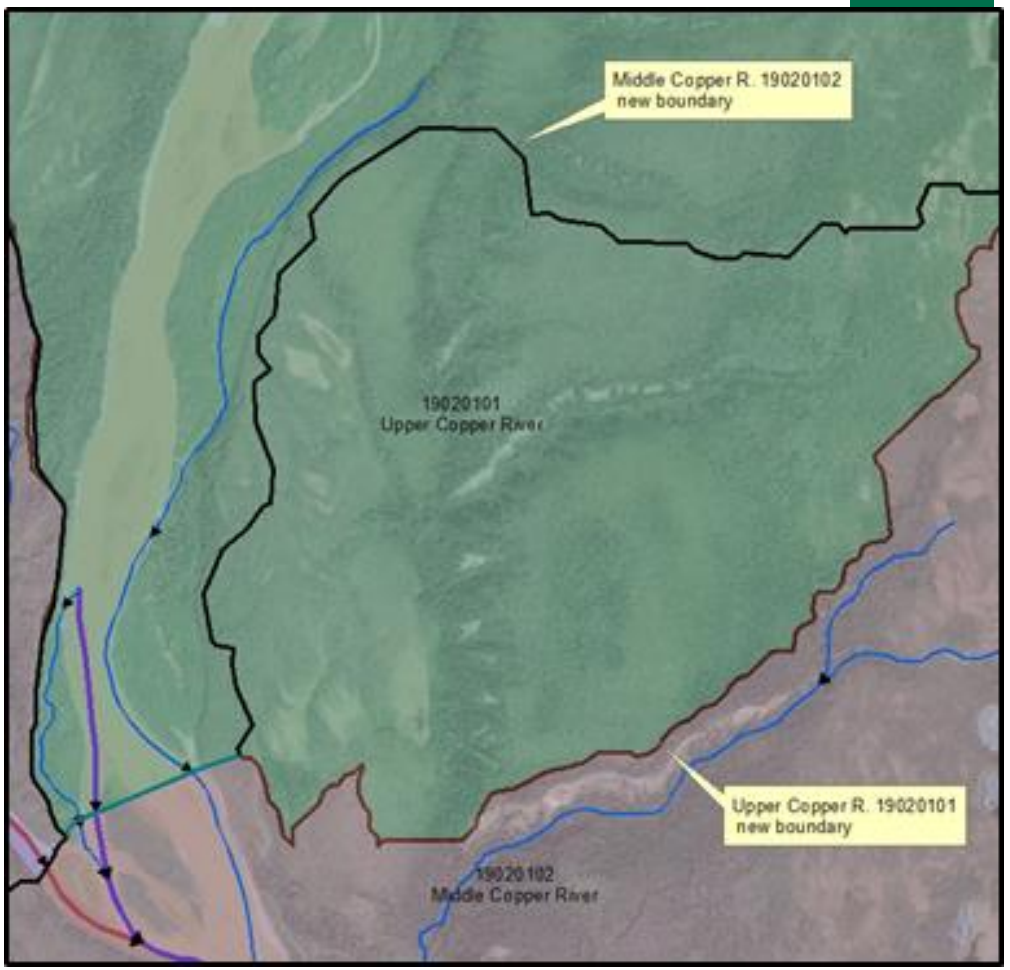
- 14-digit watersheds have been completed **in Canada** for only the HU12s in Tongass National Forest that cross the international boundary
- These HU12 have been delineated to the HU14 for the entire 12-digit unit.
- State code for cross boundary units is AK,CN AK = Alaska, CN = Canada
- When delineating HU14s the entire HU12 must be delineated. Cannot only delineate part of a HU12



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Major 8-digit Boundary Changes

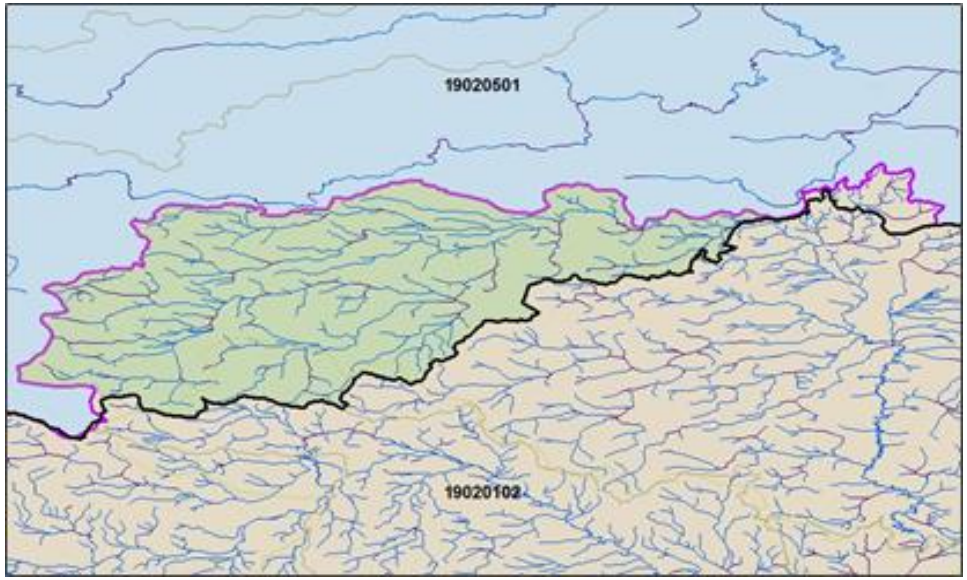
- Boundaries will move and sometimes that means from one HU8 to another HU8 (example to the right)
- These should first be reviewed by the national WBD team
- Expect the new boundaries to be different from the old WBD. **Don't force the new boundary back to the old WBD unless it is justified by the hydro and elevation**

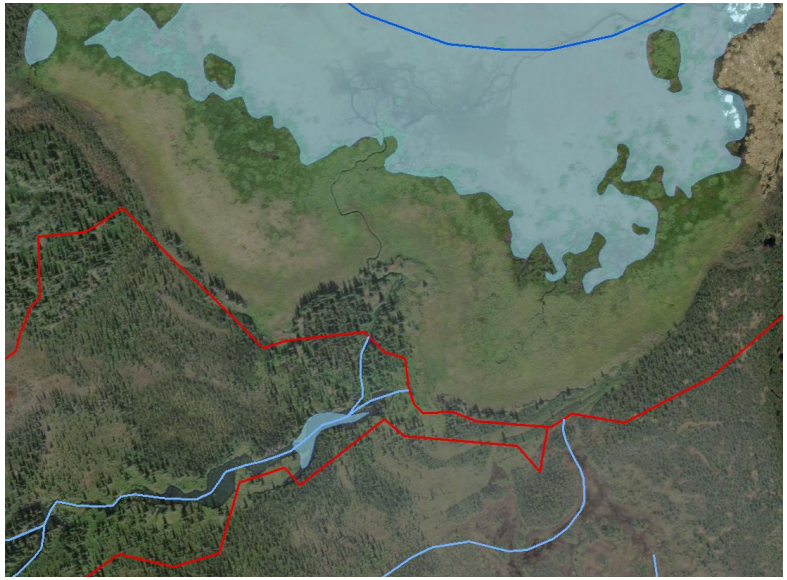


Geometry Changes

Things to consider and be aware of…

- Sometimes issues with the boundaries are due to issues within the hydrography
- In the example below the hydrography and WBD (black lines) for 19020501 were updated before 19020102 using lower resolution base data. The hydrography for 19020102 was updates using the 5m IfSAR data. This new hydrography data highlighted errors within the hydrology and WBD along the border between 19020102 and 19020501. This resulted in 8-digit boundary updates between 19020102 and 19020501 (purple lines).

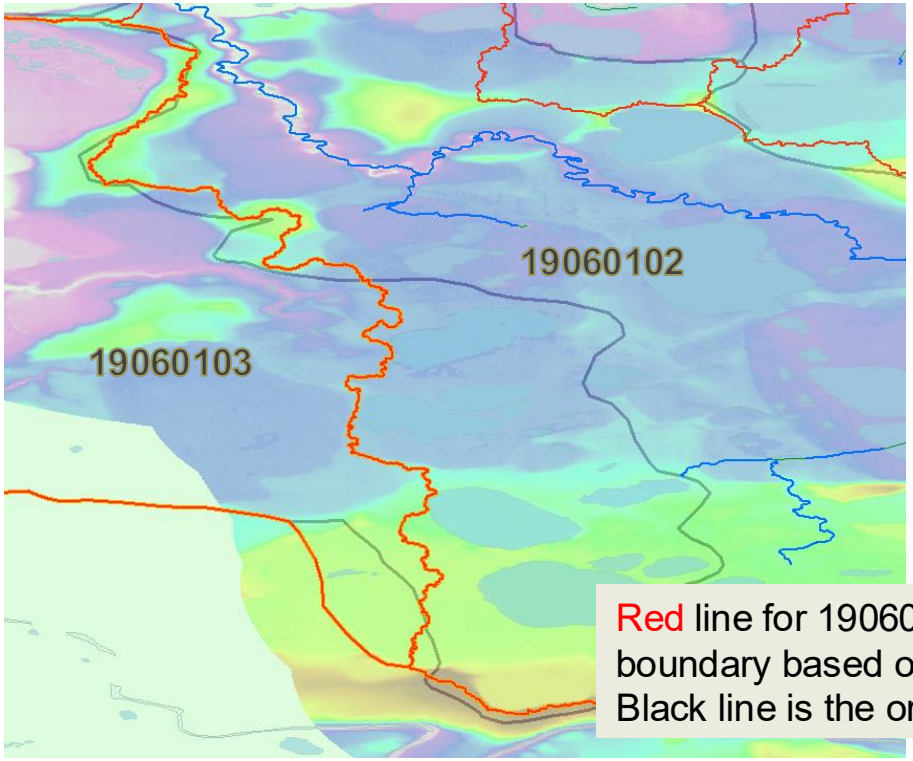


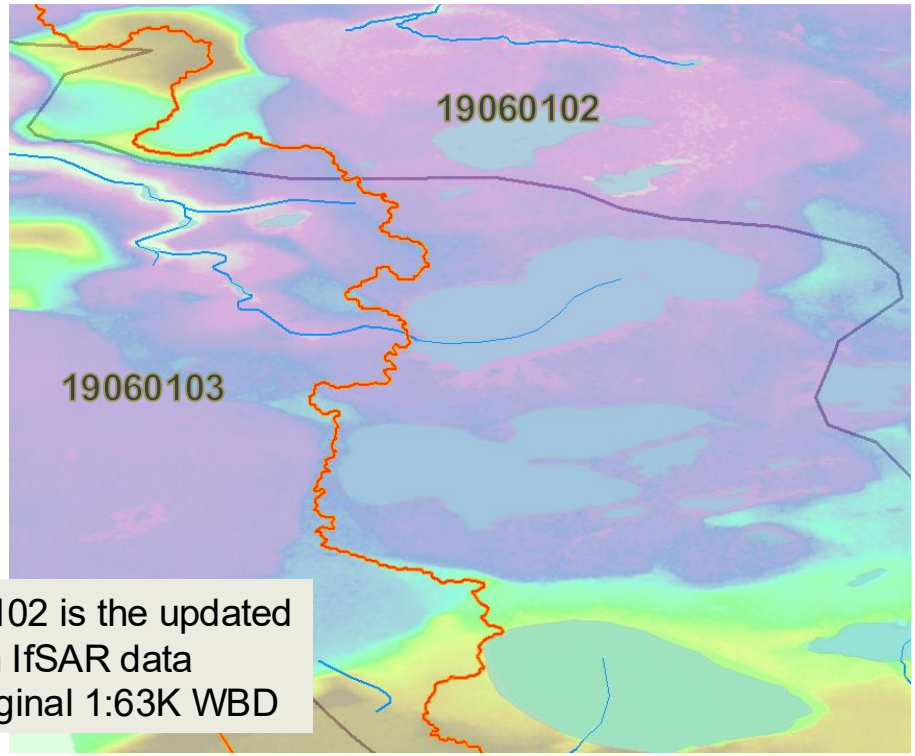


Geometry Changes

Things to consider and be aware of…

- Sometimes issues with the boundaries are due to issues within the hydrography; especially in flat areas
- The picture on the left depicts the updated hydro and boundary for 19060102. When the hydro 19060103 was processed, it was identified that the boundary conflicted with the updated hydro and needed to be adjusted around the lakepond feature.





Red line for 19060102 is the updated boundary based on IfSAR data
Black line is the original 1:63K WBD

Topological Integrity

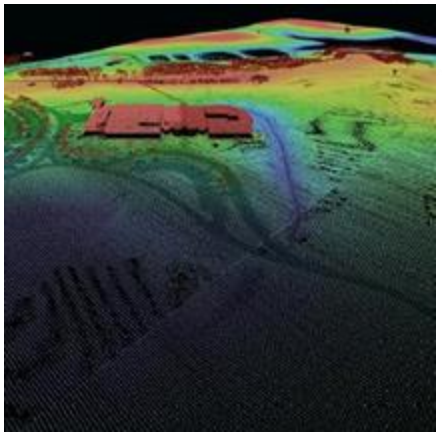
- WBD polygon and WBD Line datasets must be topologically aligned
- Recommendations:
  - Work in a geodatabase and create geodatabase topology
  - Best way to ensure integrity between the different hydrologic unit levels
  - Allows you to edit all features participating in coincident (shared) boundaries at the same time, instead of editing the features separately
  - Tracks your dirty features so you know where you've edited and if the edits are sound
  - Topology rule sets are available via the WBD NTC if requested

Attribution Changes and Guidance









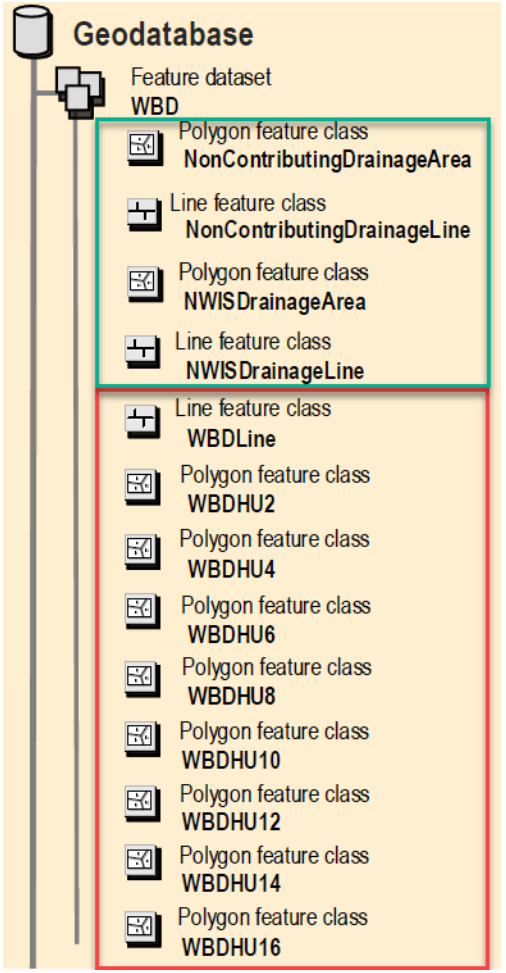
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Watershed Boundary Dataset (WBD)

WBD Polygon Feature Classes and Associated Attributes

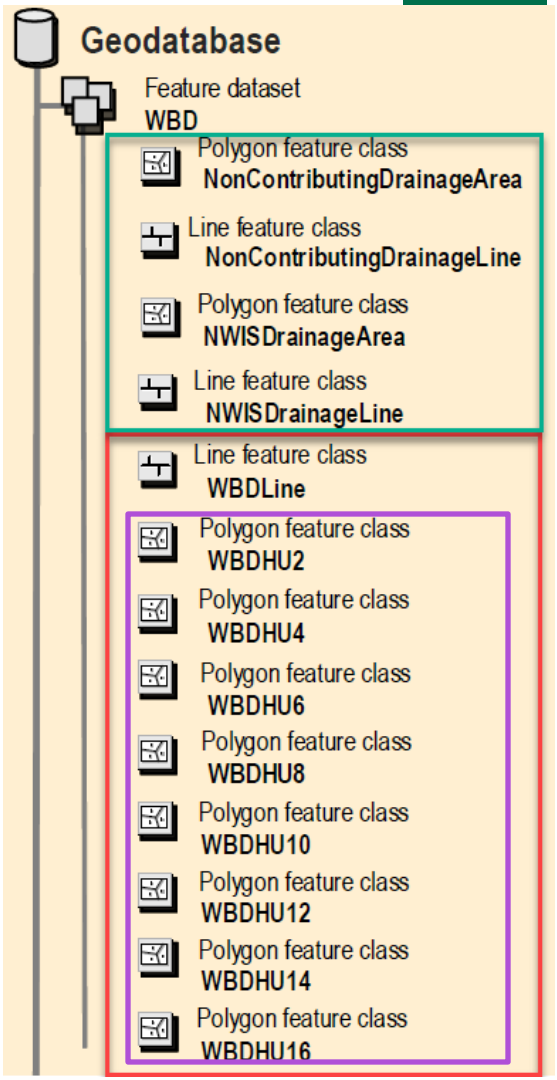
Attribute	Feature Classes	Editor Involvement
TNMID	All HUC polygon datasets	Maintain by transferring from original to updated data.
MetaSourceID	All HUC polygon datasets	Automatically generated
SourceDataDesc	All HUC polygon datasets	Automatically generated
SourceOriginator	All HUC polygon datasets	Automatically generated
SourceFeatureID	All HUC polygon datasets	Automatically generated
LoadDate	All HUC polygon datasets	Automatically generated
ReferenceGNIS_IDs	All HUC polygon datasets	Editor populated
AreaAcres	All HUC polygon datasets	Automatically generated. ***Please populate this for your data so that you know the sizes of the units you are proposing.***
AreaSqKM	All HUC polygon datasets	Automatically generated.
States	All HUC polygon datasets	Automatically generated



Watershed Boundary Dataset (WBD)

WBD Polygon Feature Classes and Associated Attributes

Attribute	Feature Classes	Editor Involvement
HUC<Code>	All HUC polygon datasets	Maintain and Update as needed
Name	All HUC polygon datasets	Maintain and Update as needed
HUType	HUC10, HUC12, HUC14, HUC16	Maintain and Update as needed
HUMod	HUC12, HUC14, HUC16	Maintain and Update as needed
ToHUC	HUC12, HUC14, HUC16	Maintain and Update as needed
NonContributingAreaAcres	HUC12, HUC14, HUC16	Maintain and Update as needed. Null values are not allowed in updated data.
NonContributingAreaSqKM	HUC12, HUC14, HUC16	Maintain and Update as needed. Null values are not allowed in updated data.



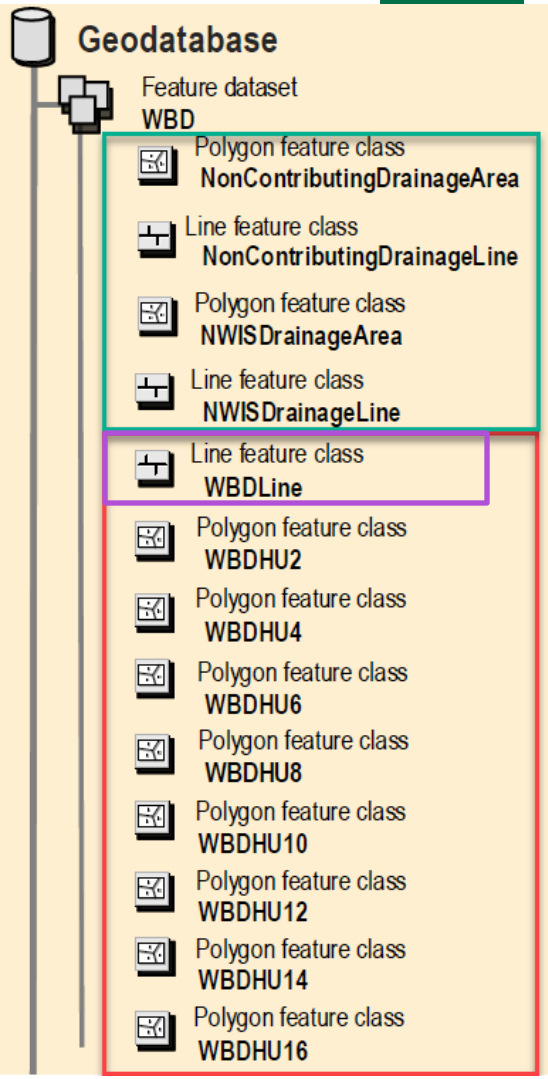
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Watershed Boundary Dataset (WBD)

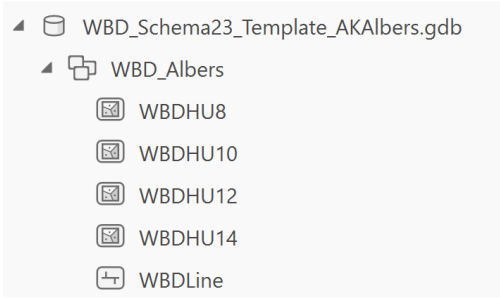
WBDLine Feature Class and Associated Attributes

Attribute	Feature Classes	Editor Involvement
TNMID	All Feature Classes	Maintain by transferring from original to updated data.
MetaSourceID	All Feature Classes	Automatically generated
LoadDate	All Feature Classes	Automatically generated
HUDigit	WBDLine	Maintain and Update as needed
HUMod	WBDLine	Maintain and Update as needed
Linesource	WBDLine	Maintain and Update as needed

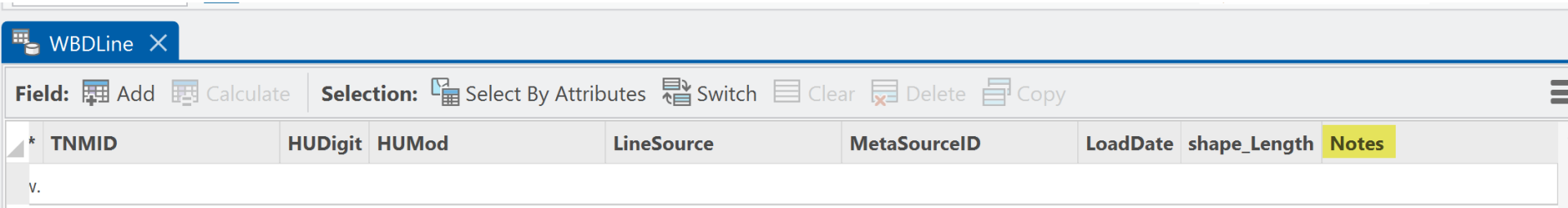


WBD compliant format

- WBD NTC will provide a blank schema compliant template that you can load your data into during your work process to make sure that you populate the necessary attributes for each feature class



  - In the correct schema
  - In the correct projection
  - With the necessary attribution
  - All feature classes will include a Notes field
    - Use the Notes field to add additional information that you would like the WBD validation team to know about



WBD Polygon Attributes

WBDHU8 and WBDHU10 Attribution

For HU8s, please verify and/or update: TNMID, HU8 code, Name, ReferenceGNIS_ID

For HU10s, please verify and/or update: TNMID, HU10 code, Name, ReferenceGNIS_ID and HUType

- Please do not delete any fields from the attribute tables.
- Attributes marked as "automatically generated" in slides 71-73 will be populated on the back end when the data is checked back into the national dataset. All other fields should be updated and maintained as necessary in all deliverables.
- AreaAcres and AreaSqKm will be recalculated on the backend upon data check-in. ***However, please recalculate the AreaAcres field as edits are being completed to ensure that units still meet the size limits.***

Hydrologic unit name	Example hydrologic unit code	Recommended size range (acres)
2 digit[1]	01	—
4 digit[1]	0108	—
6 digit[1]	010802	—
8 digit[1]	01080204	—
10 digit[1]	0108020401	40,000–250,000
12 digit[1]	010802040101	10,000–40,000
14 digit[2]	01080204010103	1,000–10,000[3]
16 digit[2]	0108020401010302	100–1,000[3]

WBDHU12, WBDHU14 and WBDHU16 Attribution

TNMID	AreaSqKm	AreaAcres	States	HUC12	Name	ReferenceGNIS_IDs	HUType	HUMod	ToHUC	NonContributingAreaAcres	NonContributingAreaSqKm
12C5D-6A7F-46F1-9952-8F65AECB0385}	88	21718	AK	190102040705	Kanalku Bay-Frontal Mitchell Bay	1422941,1423745	F	KA	190102040706	0	0
66BC7-FD74-4CE7-A849-C76281A589BC}	104	25798	AK	190102040301	190102040301-Frontal Gambier Bay	1422092	F	KA	190102040304	0	0
40EE3-B70C-411B-9D46-C2D3E4ACC086}	82	20189	AK	190102040802	Hawk Inlet-Frontal Chatham Strait	1403242,1420995	F	KA	190102040809	0	0
E1CD9A-BC38-4F1D-8428-8645D42CFFB3}	39	9668	AK	190102040306	West Brother Island	1415673	I	NM	190105000100	0	0
F9C015-D7C0-4192-8171-77DC8B8F03C5}	136	33588	AK	190102040805	Ward Creek	1415614	M	NM	190102040809	0	0
31602-8979-463D-9580-BD27471921BC}	72	17771	AK	190102040801	Greens Creek	1402969	M	KA	190102040802	0	0
5AA0F-1E5B-4D1E-83EA-A7F3C23E36F4}	64	15854	AK	190102040606	190102040606		S	NM	190102040607	0	0
0593D0-2ADD-4EBB-A655-4D8614F9E41C}	66	16375	AK	190102040207	Salt Lake-Mole River	1414452,1423756	S	NM	190102040208	0	0
A6BF1-A3E3-4846-B9EB-0D12FA49818D}	109	27022	AK	190102040806	Lake Florence	1421988	S	GL	190102040809	0	0
487155-976B-4B0F-B0B0-ACEA8B4CD600}	155	38249	AK	190102040803	Wheeler Creek	1411943	S	KA	190102040809	0	0

HU12 Attribution:

- These are the fields WBD editors are responsible for verifying and or updating.
- However, WBD editors must also maintain all fields and data in the table.

HU14-HU16 Attribution:

- HU14 and HU16 attribute tables are similar to the HU12 table list above.
- These are the fields WBD editors are responsible for verifying and or updating.

Note:

- AreaAcres and AreaSqKm will be recalculated on the backend upon data check-in. ***However, please recalculate the AreaAcres field as edits are being complete to ensure that units still meet the size limits.***
- States is also calculated on the backend
- Please do not delete any fields from the attribute tables.
- Attributes marked as "automatically generated" in slides 71-73 will be populated on the back end when the data is checked back into the national dataset. All other fields should be updated and maintained as necessary in all deliverables.

WBD Polygon and Line Attribute

TNMID

- The TNMID (the National Map Identification) is a unique identifier for each element in the WBD database
- It is used to tie a metadata record to each feature in the dataset
- For existing features in the database, it is already assigned and must be maintained
  - **Duplicate TNMIDs are not allowed!**
    - If a feature is split, the resulting child feature with the biggest area or longest length should retain the original TNMID
    - The smaller area or length should be Null during the review
- TNMID is automatically assigned for new features during the rebuild process.

WBD Polygon Attribution

HU Code – Unique identifier

- A unique identifier assigned to each hydrologic unit
- Number of digits indicates what level of sub-division the hydrologic unit is
  - 18090203 is an 8-digit HU
- If there is no scientific justification for subdividing a hydrologic unit, then code the hydrologic unit 00
  - For example, if 10 digit 1020305108 cannot be further subdivided based on hydrologic principles then the 12-digit HU should be coded 102030510800
- Need to make sure that the HU is nested in the correct parent HU, for example 180902 must be nested in 1809
- **No duplicate HU Codes are allowed**

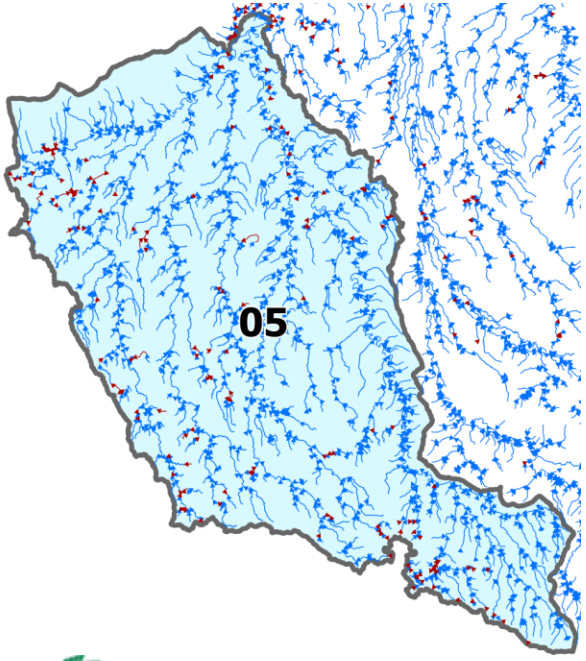
See WBD Standards V5- Page 42 for additional guidance

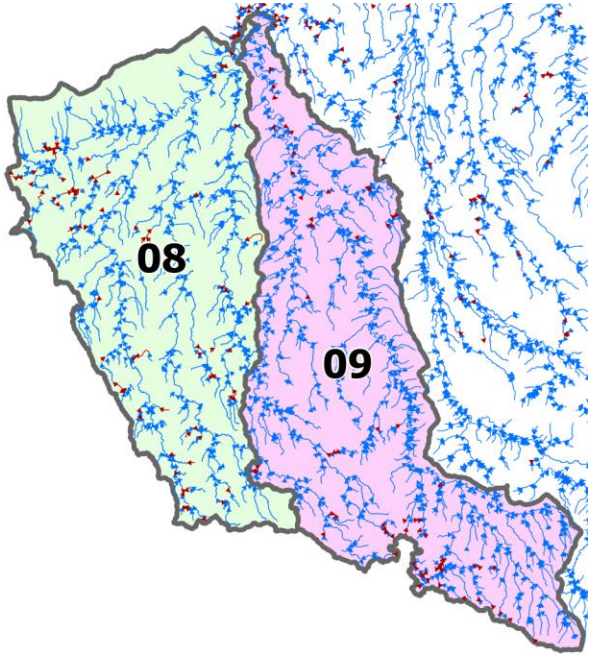
Hydrologic Unit Name	Example of Code
2 digit	18
4 digit	1809
6 digit	180902
8 digit	18090203
10 digit	1809020303
12 digit	180902030303
14 digit	18090203030301
16 digit	1809020303030101

WBD Polygon Attribution

HU Code – Unique identifier

- Splitting at the HU10 level
  - Example: Current HU10 codes within this HU8 go from 01 – 07
  - Splitting 05, the code 05 will be retired and the new codes assigned will be 08 and 09, starting at the most upstream of the new units
  - All attributes for both lines and polygons will need to be reviewed and updated for correctness, they may no longer be relevant

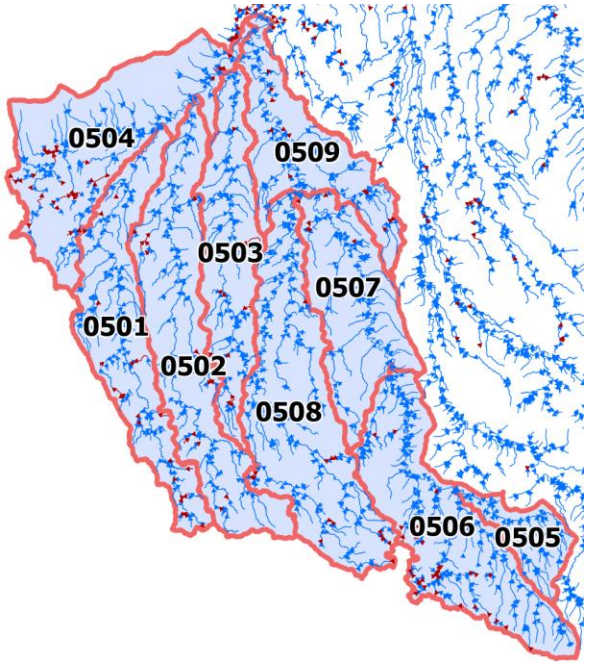


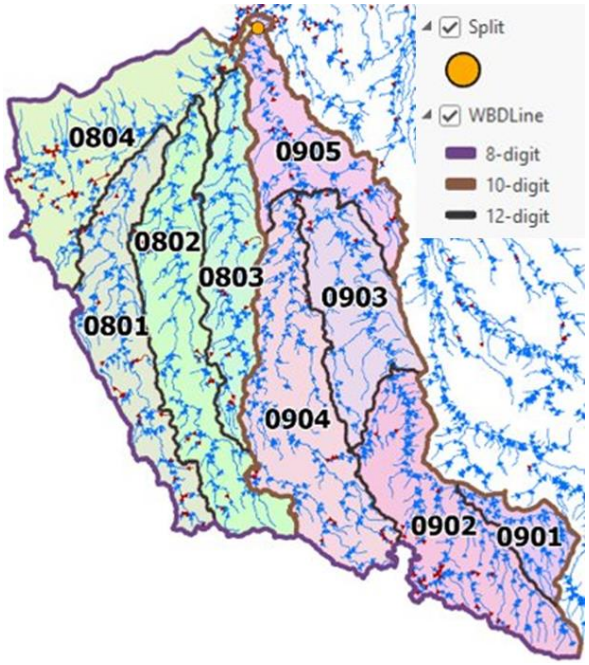


WBD Polygon Attribution

HU Code – Unique identifier

- Splitting at the HU10 level- continued
  - Example: After splitting 05, 05 is retired for the 10, 12 & 14 *(if delineated)*
    - New HU10 codes are 08 and 09
    - Then the HU12 codes must be recoded to match the new HU10 coding
    - New HU12 codes nested within HU10; 08 unit are 0801, 0802, 0803 and 0804
    - New HU12 codes nested within HU10; 09 unit are 0901, 0902, 0903, 0904 and 0905
    - The ToHUC codes for these units and units flowing into these units will need updating





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WBD Guidance – Polygon Attribution

HU Code – Unique identifier

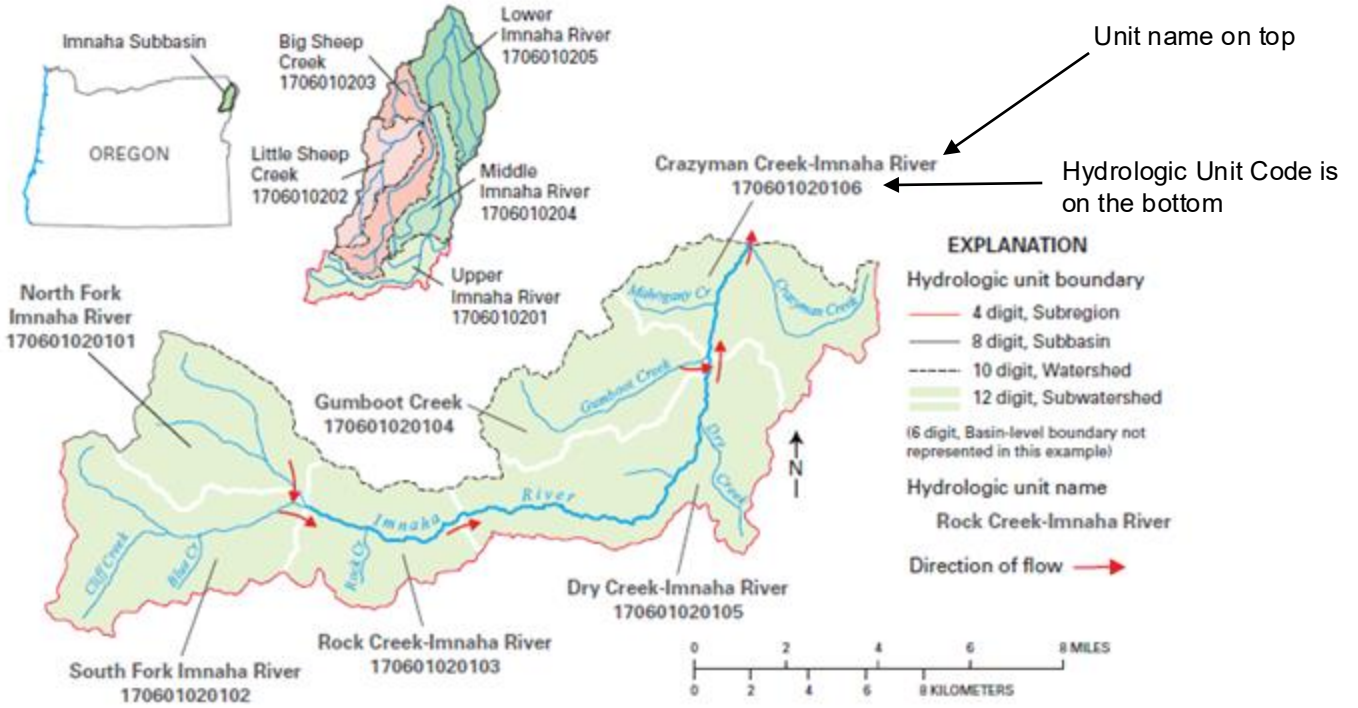
- Code updates to already existing units at the **10-,12-,14-digit** should be coordinated with the WBD-NTC. Code updates at these levels can be proposed when data is submitted for NQC. Please include a justification for the change in the notes field.
- Code updates at the **2-, 4-, 6- and 8-digit HU** are more rare and will need to coordinated with and approved by the WBD-NTC and State Steward. ***Code updates at these levels need to be coordinated before data is submitted for NQC.***
- If you are fixing something between revisions and need to change a code that we did not flag, please coordinate with us before submitting the data back for QC. This interim coordination can save us a correction cycle.

Hydrologic Unit Name	Example of Code
2 digit	18
4 digit	1809
6 digit	180902
8 digit	18090203
10 digit	1809020303
12 digit	180902030303
14 digit	18090203030301

WBD Guidance – Polygon Attribution

HU Code – Unique identifier

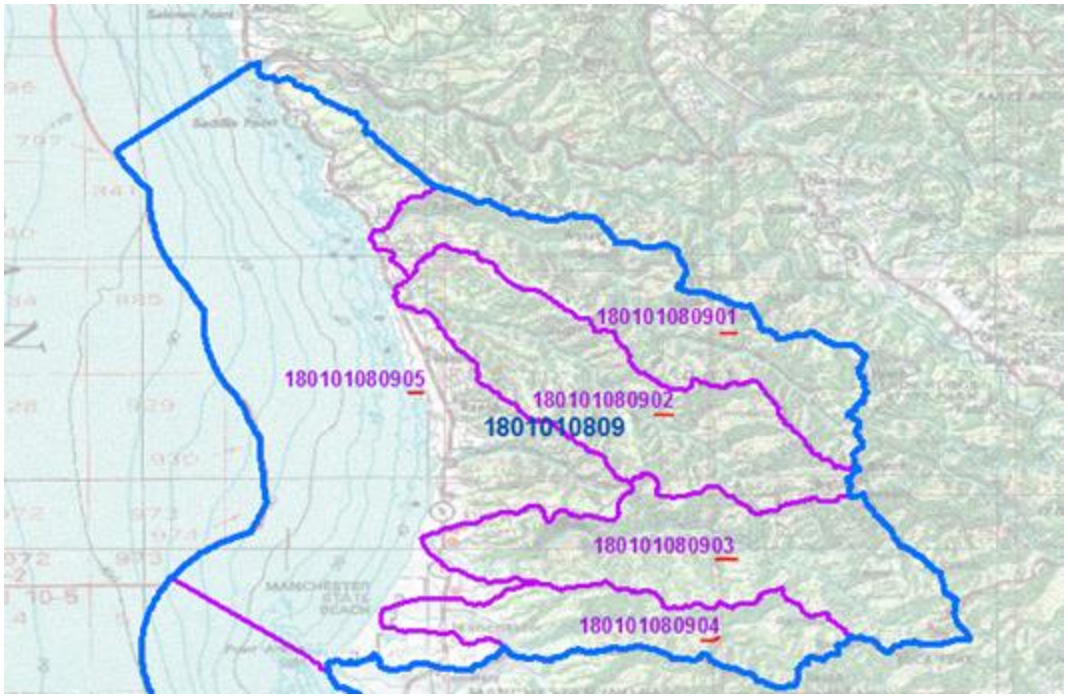
- Number hydrologic units sequentially starting with the uppermost stream outlet.
- The mainstem hydrologic unit should be assigned the highest number when outlets are adjacent.



WBD Guidance – Polygon Attribution

HU Code – Unique identifier

- In coastal areas
  - Code standard units first (01, 02, 03 and 04)
  - Code frontal units second (05)
  - Code lower to higher in a clockwise direction either from north or east

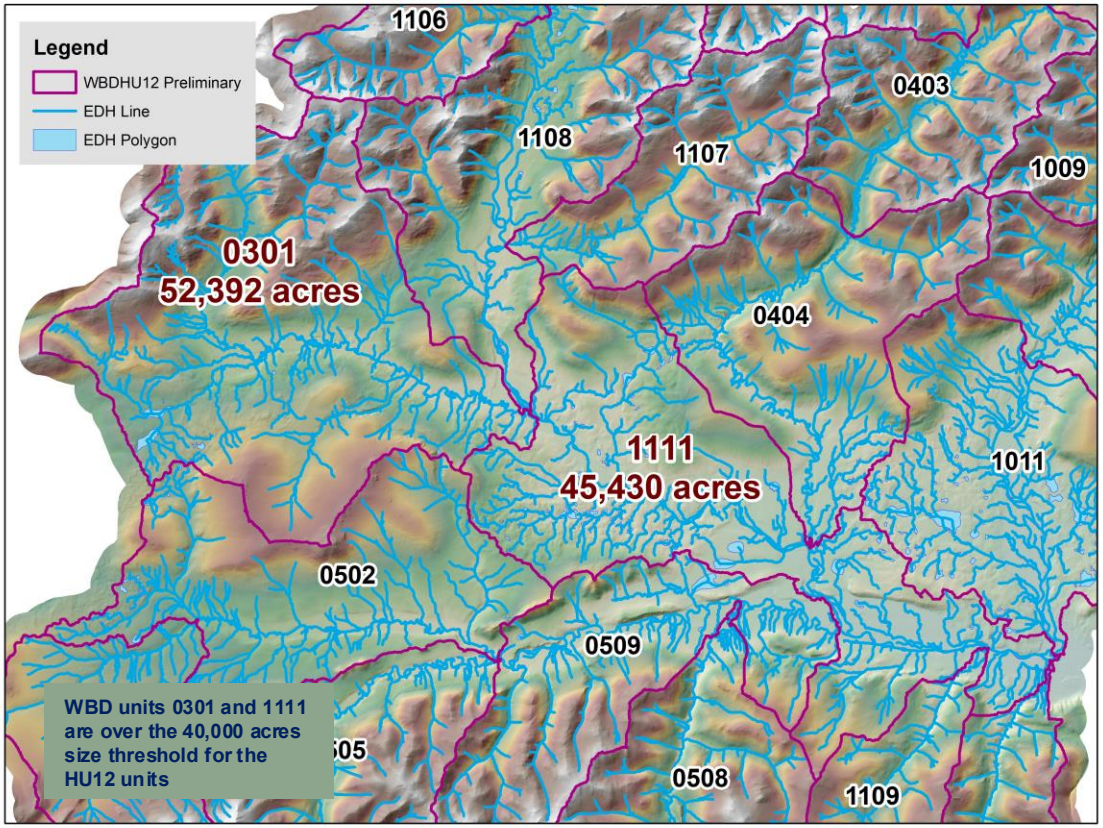


WBD Guidance – Addition of New Units

Additions

When an oversized unit is sub-divided into multiple units the original WBD HU code should be retired, and the new units coded with the next highest number within the parent unit. For example: If splitting out new 12-digit HUs then use the next highest code within that parent 10-digit HU.

If multiple code changes are being suggested for a given parent HU start the new coding with the new upstream unit and then working downstream.

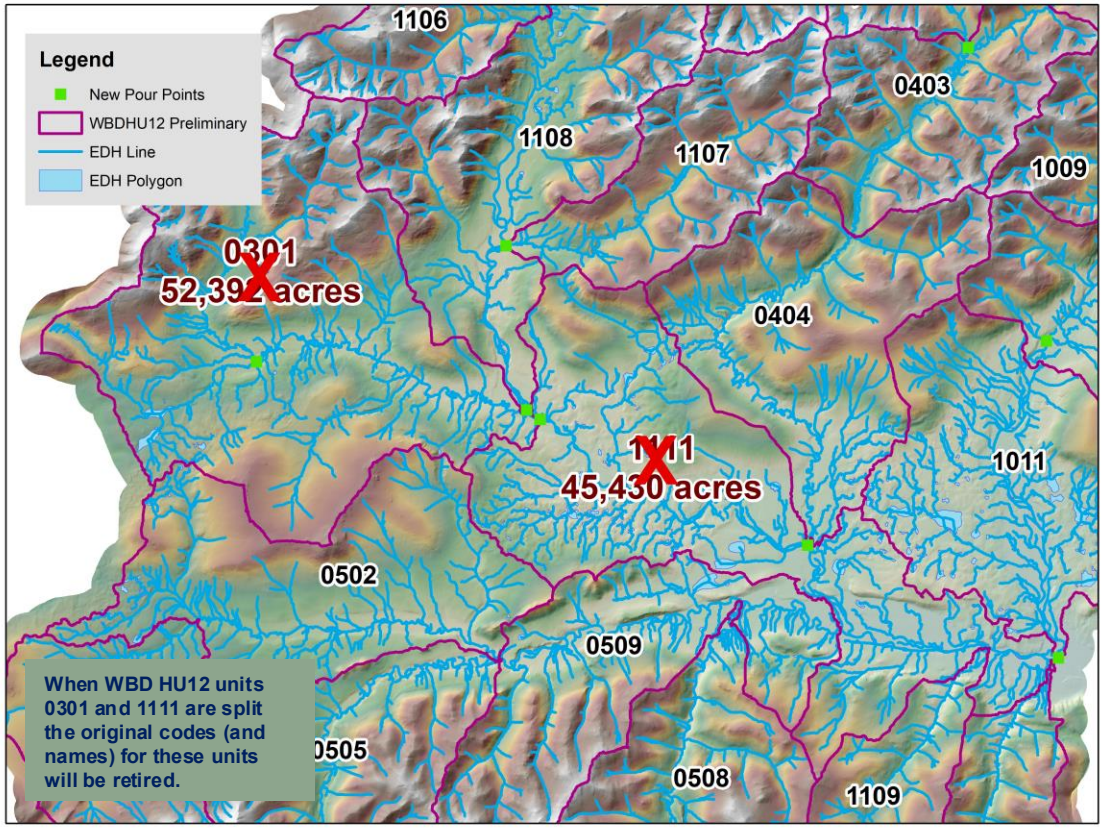


WBD Guidance – Addition of New Units

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If multiple code changes are being suggested for a given parent start the new coding with the new upstream unit and then working downstream.

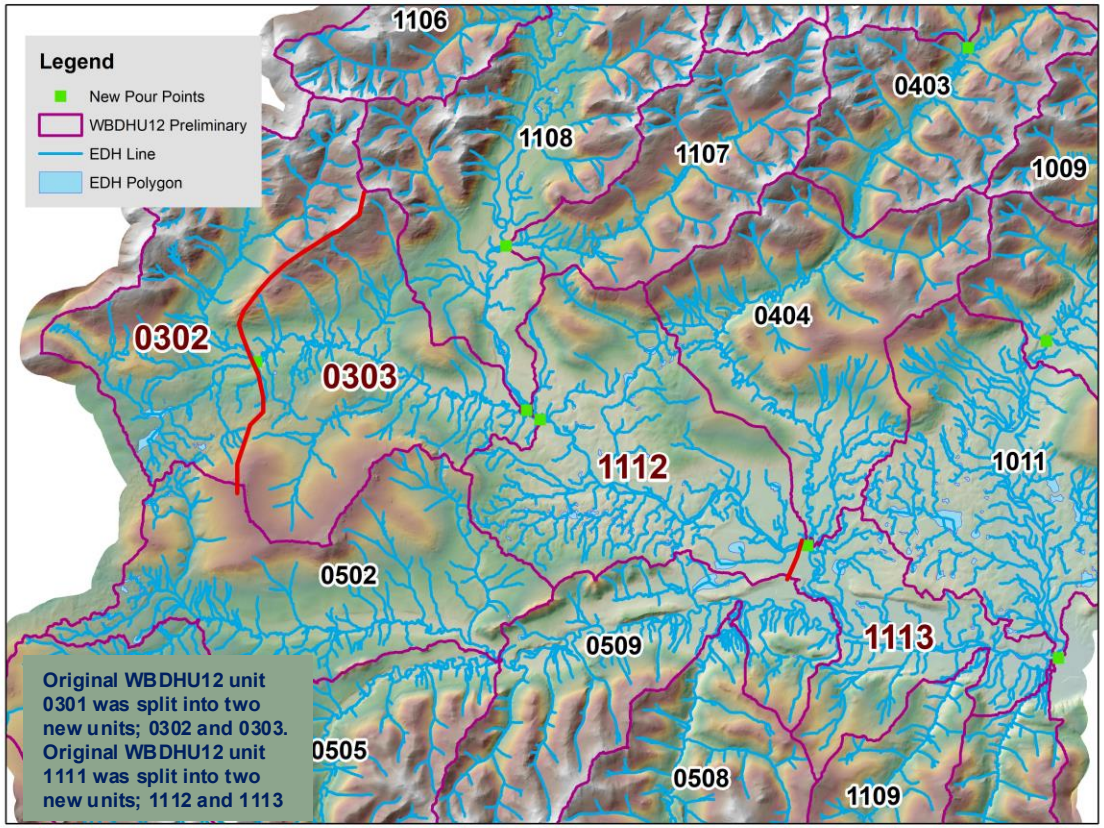


WBD Guidance – Addition of New Units

Additions

When an oversized unit is sub-divided into multiple units the original WBD HU code should be retired and the new units coded with the next highest number within the parent unit. For example: If splitting out new 12-digit HUs then use the next highest code within that parent 10-digit HU.

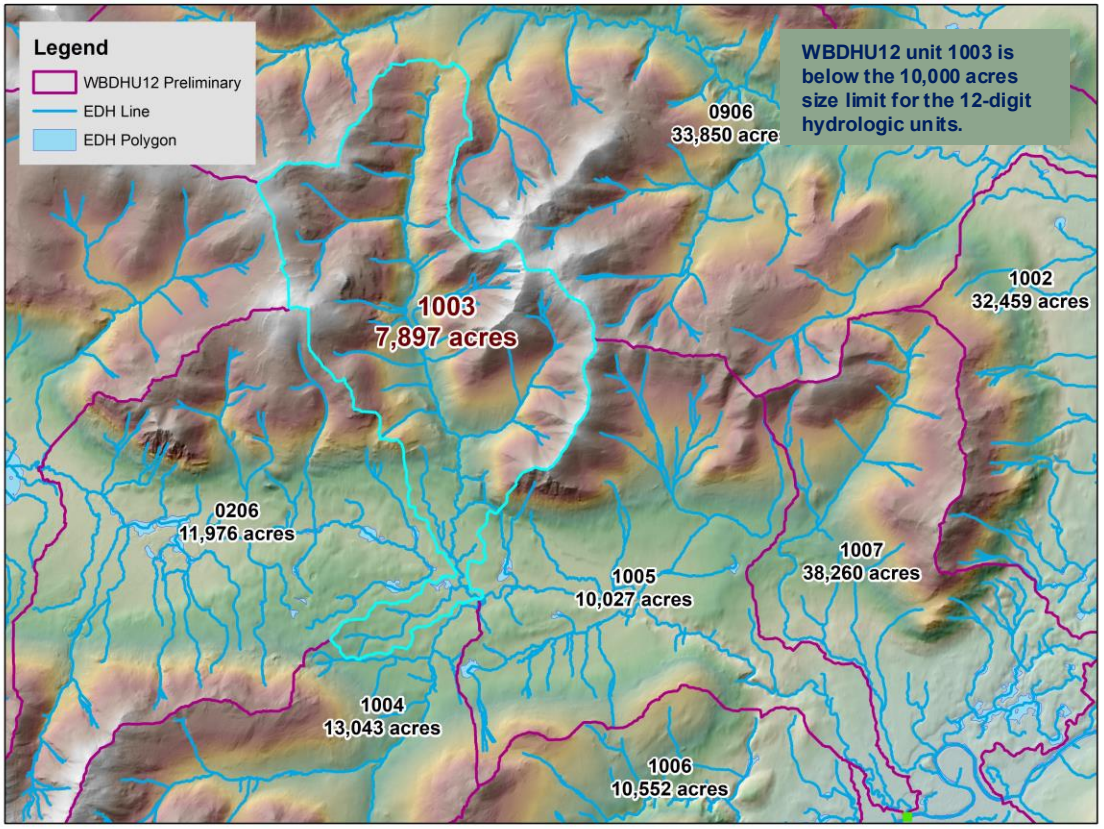
If multiple code changes are being suggested for a given parent start the new coding with the new upstream unit and then working downstream.



WBD Guidance – Deletion of Units

Deletions

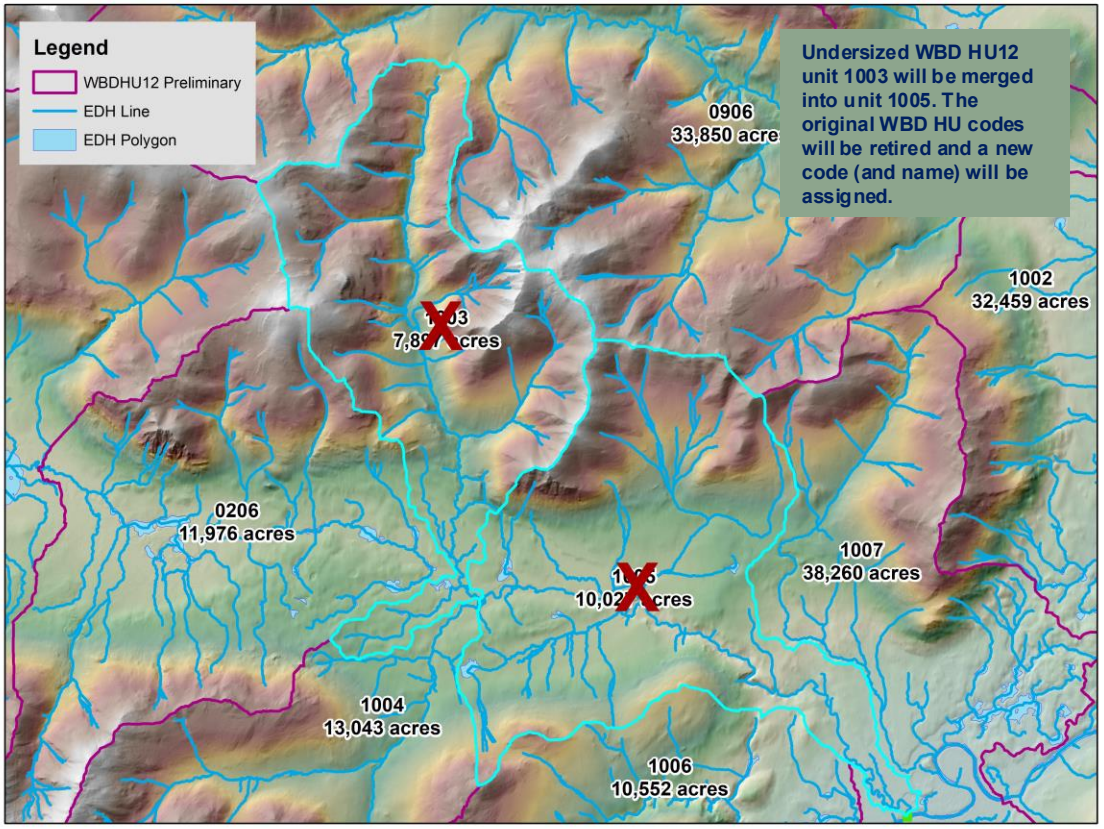
- When an updated unit becomes too small to be maintained as its own HU the small unit should be merged with a surrounding unit that makes hydrologic sense. The original HU code for each unit will be retired and a new code assigned. Use the next highest code within the parent unit. For example, if the updates are occurring at the 12-digit HUs use the next highest 12-digit code within the parent 10-digit HU.



WBD Guidance – Deletion of Units

Deletions

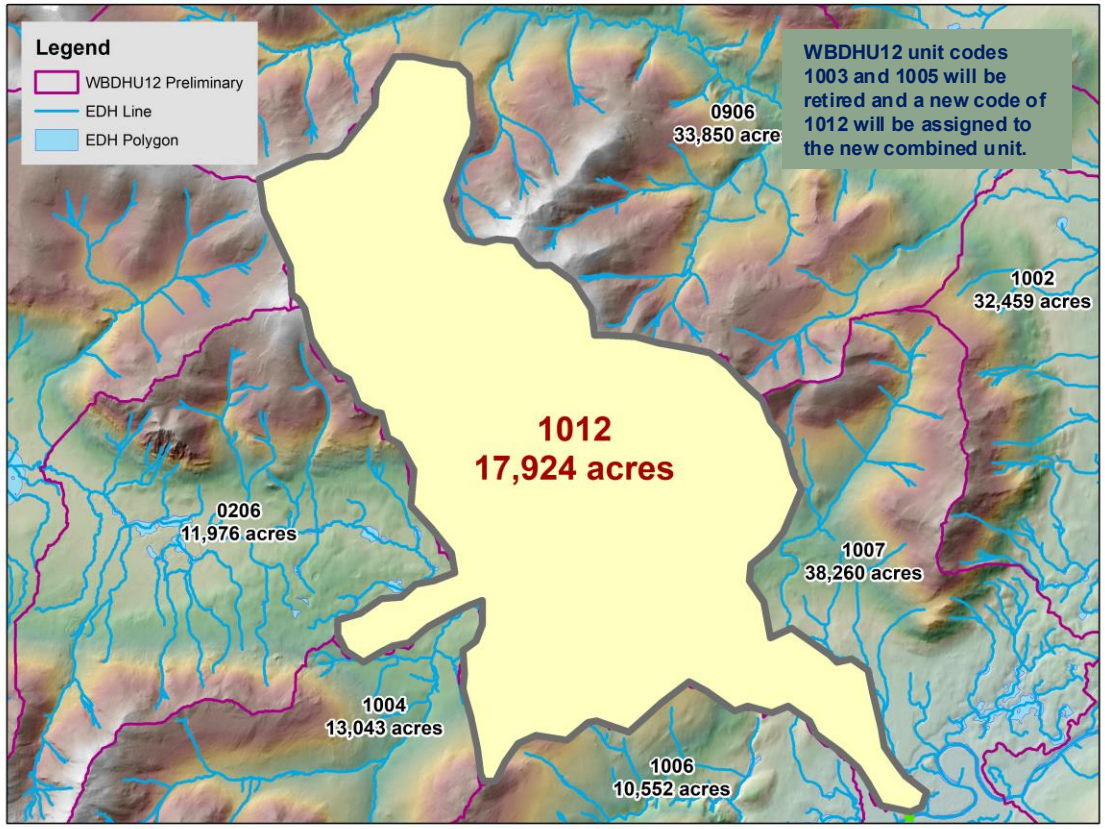
- When an updated unit becomes too small to be maintained as its own HU the small unit should be merged with a surrounding unit that makes hydrologic sense. The original HU code for each unit will be retired and a new code assigned. Use the next highest code within the parent unit. For example, if the updates are occurring at the 12-digit HUs use the next highest 12-digit code within the parent 10-digit HU.



WBD Guidance – Deletion of Units

Deletions

- When an updated unit becomes too small to be maintained as its own HU the small unit should be merged with a surrounding unit that makes hydrologic sense. The original HU code for each unit will be retired and a new code assigned. Use the next highest code within the parent unit. For example, if the updates are occurring at the 12-digit HUs use the next highest 12-digit code within the parent 10-digit HU.

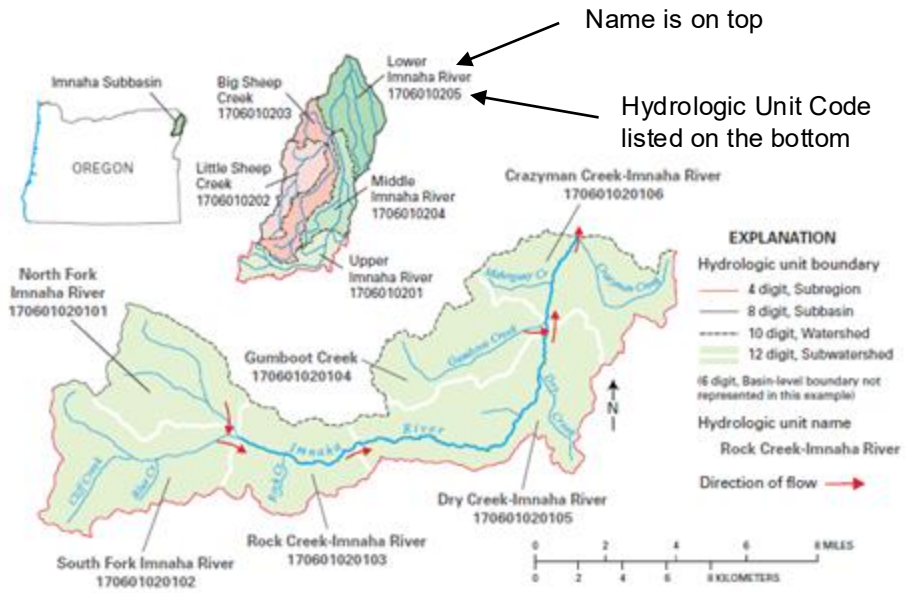


WBD Guidance – Polygon Attribution

Name

- Adds local and geographic identity to the hydrologic units
- Helpful for understanding the geographic location of the hydrologic unit
- Choose names of prominent hydrologic or physical features within the HU that are officially recognized.

See WBD Standards V5- Page 43 for additional guidance

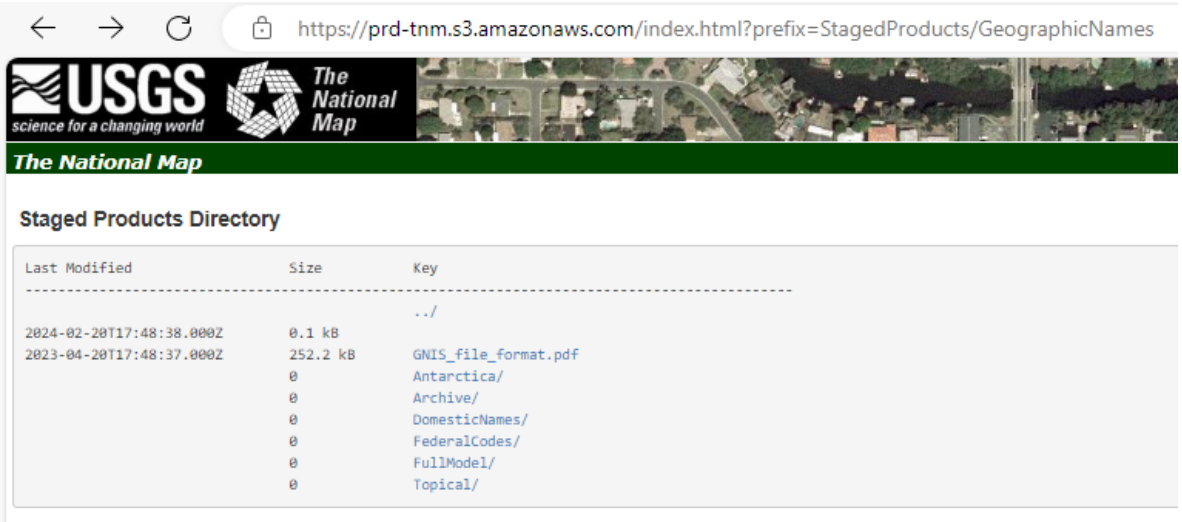


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WBD Guidance – Polygon Attribution

Name - GNIS

- Names must be based on officially recognized feature within the Geographic Names Information System (GNIS)
- GNIS text files by state or national .zip are available from U.S. Board on Geographic Names | U.S. Geological Survey (usgs.gov)



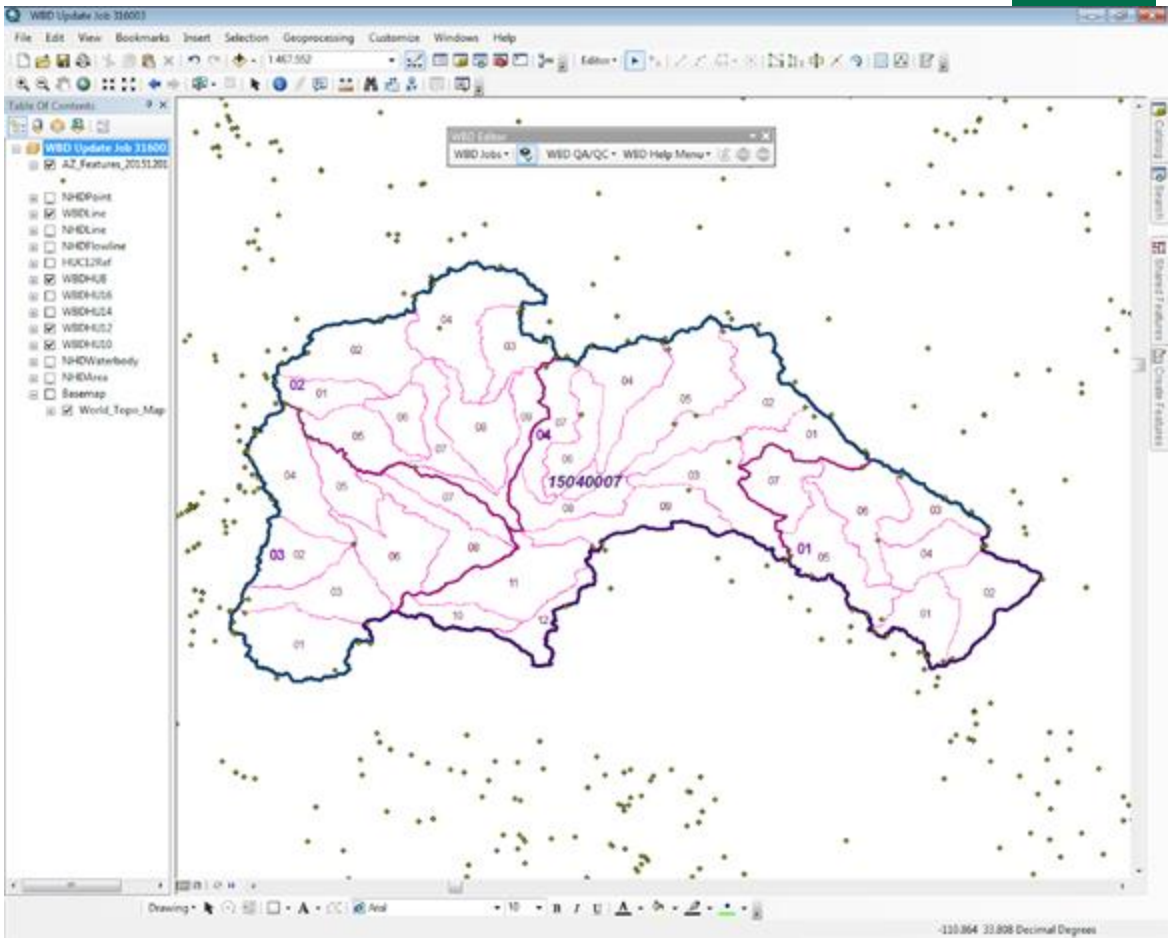
WBD Guidance – Polygon Attribution

Name - GNIS

Limitations

- Every data has limitations

- GNIS points represent the beginning, end, or centroids of the extent of the feature being input into the system



WBD Guidance – Polygon Attribution

Name - Priority

1. Hydrologic Feature
   - Rivers, streams, lakes, reservoirs, falls, etc.
   - Primary feature is usually the hydrologic feature found at the outlet
   - Stream names are preferred, but other hydrologic features like sloughs, lakes, reservoirs, dams, bays, inlets, falls, and springs may be used when they are the most important feature
     - For example, “Crescent Lake,” “Sequim Bay,” and “Grays Harbor.”
2. Geologic Feature
   - Canyons, mountains, buttes, summits, etc.

NOTE: Priority order can change depending on importance/prominence of features in HU.

A canyon may be more prominent than an upstream spring

WBD Guidance – Polygon Attribution

Name - Priority

3. City, Town, or Village
   - Use prefixes “City of”, “Town of”, or “Village of” *(Populated Place)* if not already in official name
   - Please make sure to use the GNIS id of the "Civil" or "Populated Place" feature type and not the GNIS "Census" feature type from the GNIS database
4. Official Local Name (Removed from GNIS, but still acceptable according to WBD Standards)
   - Cemeteries, municipal or international airports, etc.
   - Do not use this naming convention unless the WBD already uses it.
5. HU Code
   - If no appropriate features exist within HU

"Civil" feature type: political division formed for administrative purposes.

"Populate Place" feature type: Place or area with clustered or scatted buildings and a permanent human population.

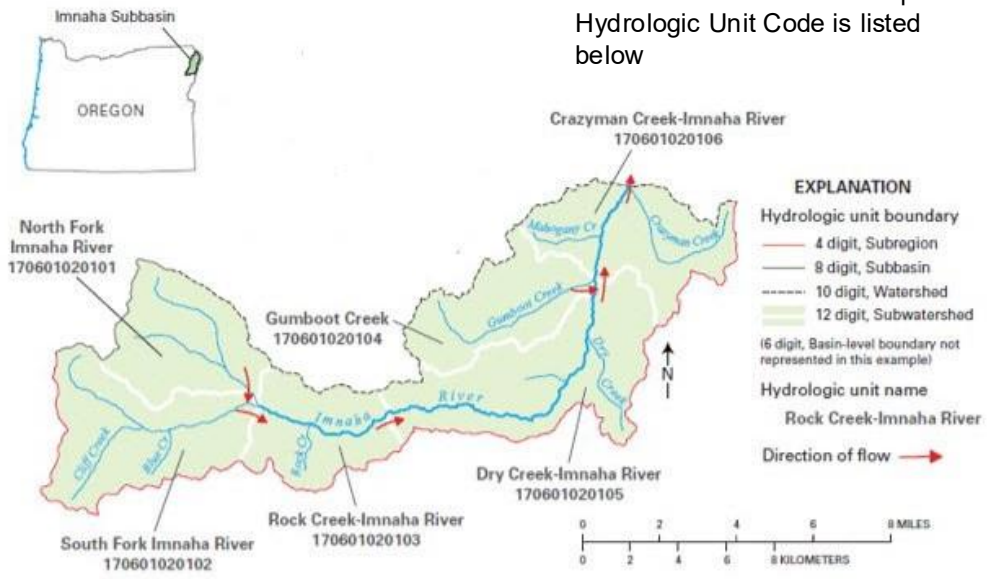
A "Populated Place" feature may not have a cooresponding "Civil" feature
A "Civil" feature should have a cooresponding "Populated Place" feature

WBD Guidance – Polygon Attribution

Name – Hyphenated Names

- When the same primary water feature exists within equivalent-level hydrologic units or if a main-stem stream is subdivided into more than one hydrologic unit
  - Main-stem subdivided amongst five or more HU
  - Main-stem subdivided into 2-5 HUs and the “Upper”, “Middle” Lower”, “Headwaters” and “Outlet naming method isn’t the preferred method
- Append the primary water feature name (Imnaha River) onto a secondary feature such as a large tributary name (Rock Creek)
  - 170601020103: Rock Creek-Imnaha River
  - The name after the hyphen should be the feature at the outlet of the unit

Labels: Name is listed on top
Hydrologic Unit Code is listed below



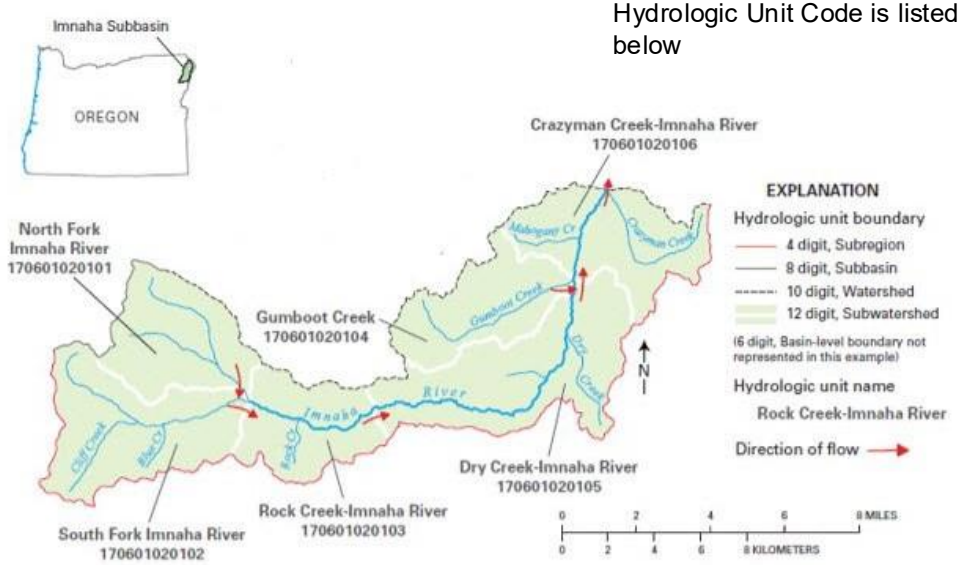
WBD Guidance – Polygon Attribution

Name – Hyphenated Names

- Usually consists of two names separated by a hyphen with no spaces
  - Can have three names, two hyphens in special cases.

For example: A large reservoir flowing through multiple units also contains a large mainstem river that flows through multiple units. In order to identify both major features the name could be Tributary Name-Reservoir Name-Main-stem River Name

Labels: Name is listed on top
Hydrologic Unit Code is listed below



WBD Guidance – Polygon Attribution

Name – Hyphenated Names

- Prefix of Headwater or Outlet may be used with the hyphenated naming structure

- When a feature is split into multiple units the headwater unit can be named using Headwater, the outlet unit can be named using Outlet, and units between the headwater unit and outlet unit can be named using the hyphenated naming convention. I.e., Headwater Copper River, Clear Creek-Copper River, Fish Lake-Copper River, <HUC code>-Copper River, Outlet Copper River

WBD Guidance – Polygon Attribution

Name – Prefix Structure

- Prefix of Headwater or Outlet may be used with the hyphenated naming structure
- When a feature is split into multiple units the units should be named using the feature and;
  - (5 units) Headwaters, Upper, Middle, Lower, Outlet
  - (4 units) Headwaters, Upper, Middle, Lower
  - (4 units) Upper, Middle, Lower, Outlet
  - (3 units) Upper, Middle, Lower
  - (2 units) Headwaters, Outlet
  - (2 units) Upper, Lower

  As many as needed;
  - Headwaters, Hyphenated names, Outlet
  - Headwaters, Hyphenated names
  - Hyphenated names, Outlet

  Do not use;
  - Headwaters, Middle, Outlet
  - Upper, Middle
  - Middle, Lower

Additional Prefixes:
- Town of
- City of
- Village of
- -Frontal

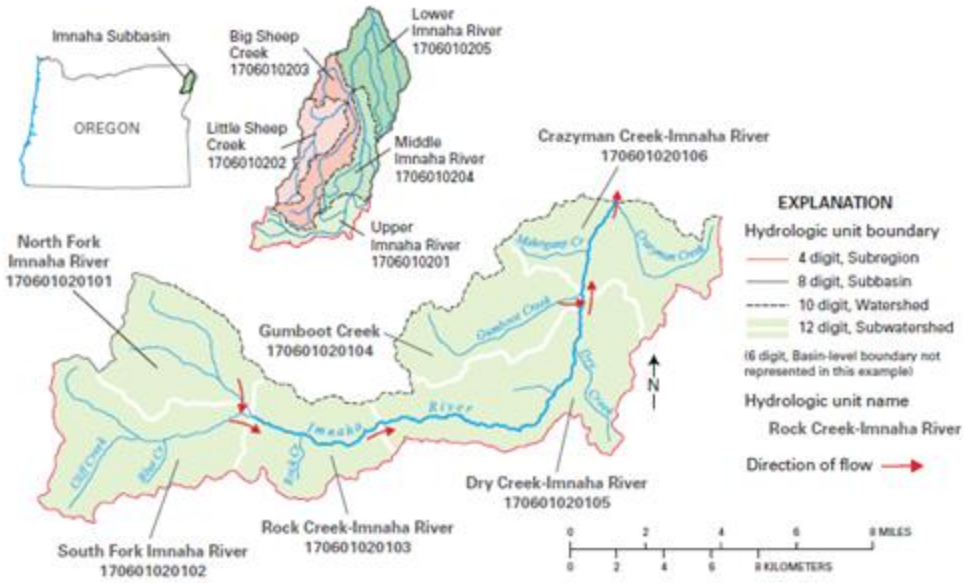
Units must contain the feature that it is being named after.

Note: If "Middle" is part of the GNIS official name then use Middle as listed in the official name.

WBD Guidance – Polygon Attribution

Name – Prefixes

- "Upper", "Middle", "Lower, "Headwaters", and "Outlet"
  - Main-stem of major stream is subdivided amongst 3-5 HUs
  - Main-stem subdivided amongst 5 HUs:
    - "Headwaters", "Upper", "Middle", "Lower" and "Outlet" in that order
  - Main-stem subdivide amongst 3 HUs:
    - "Upper", "Middle", and "Lower" in that order
  - Main-stem subdivided between 2 HUs:
    - "Upper" and "Lower" or "Headwaters" and "Outlet"



Labels: Name is listed on top
Hydrologic Unit Code is listed below

WBD Guidance – Polygon Attribution

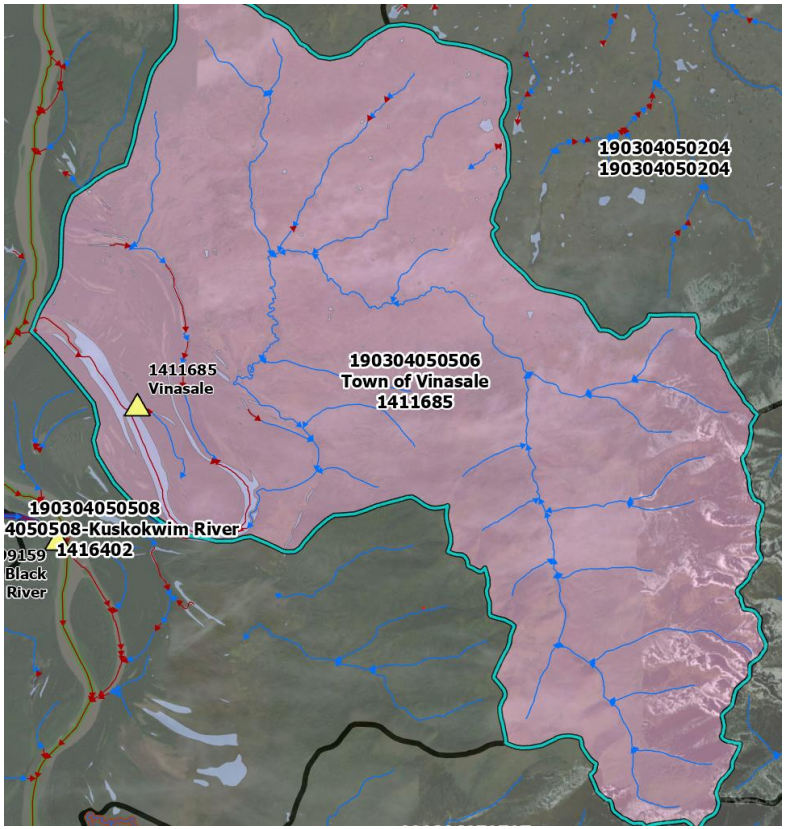
Name – Prefixes

- Do not use “Upper”, “Middle” or “Lower” individually or “Middle” with only one of the others
- Do not use “Upper, Middle” or “Lower” with the hyphenated naming structure
  - May be exceptions to this rule in coastal areas where the mainstem is part of a frontal unit where the frontal naming convention must be used
  - Lower Fish River–Frontal Pacific Ocean
- “Headwaters” or “Outlet may be used with “Upper”, “Middle” or “Lower”
- “Headwaters” or “Outlet may be used with a hyphenated name
- I.e. for a subdivision of three units: Headwaters Colorado River, Rock Creek-Colorado River, Outlet Colorado River

WBD Guidance – Polygon Attribution

Name – Prefixes

- "City of", "Town of", and "Village of"
  - Use when naming HU after a city, town or village if prefix is not already in official name
  - Ensures that users understand that the unit was named after a place over hydrologic feature
  - Make sure to use the GNIS Id of the "Civil" or "Populated Place" feature type and not the "Census" feature type from the GNIS database



Labels:
Hydrologig Unit Code
Name
GNIS ID

WBD Guidance – Polygon Attribution

Name – Prefixes

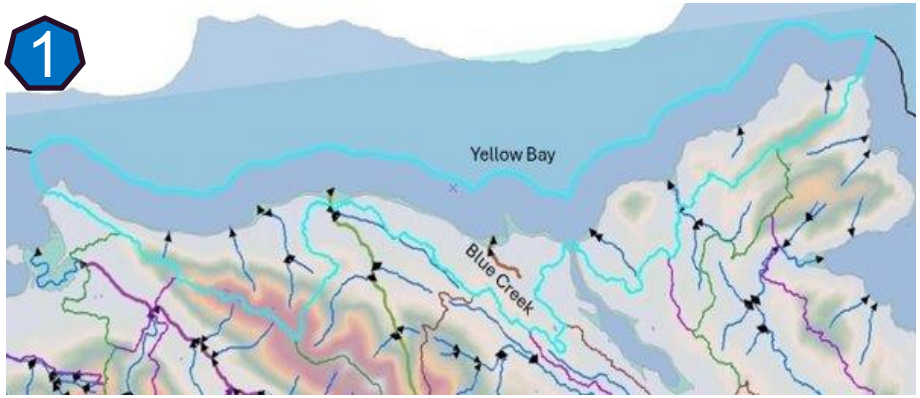
- "Frontal"
  - For coastal or lake areas with multiple, non-convergent streams
  - Name HU after the major hydrologic feature and use "Frontal" as a prefix to the name of the hydrologic feature into which the unit drains
    - 0204030101: Manasquan River-Frontal Atlantic Ocean

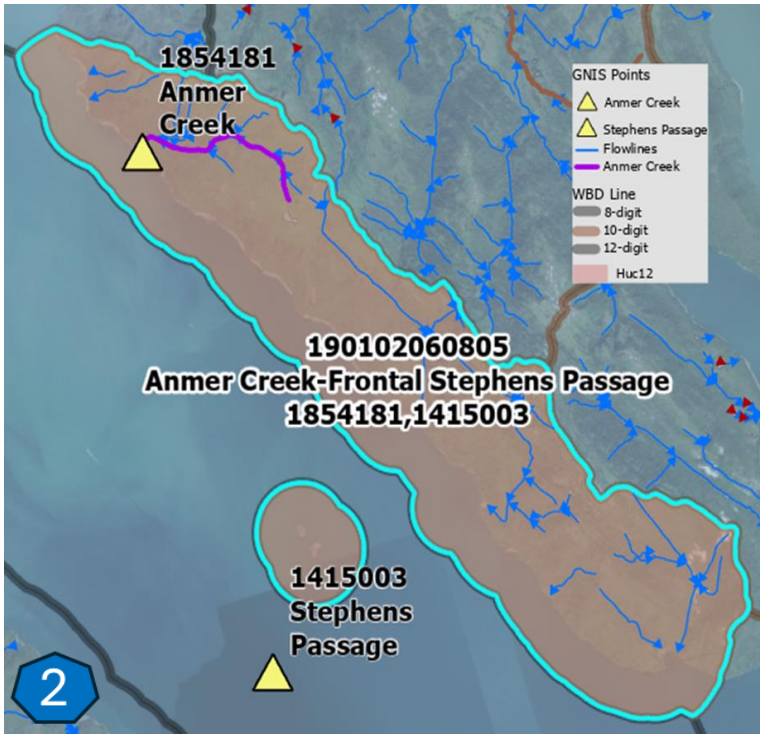


WBD Guidance – Polygon Attribution

Examples of Frontal Area

- **Frontal units** must have the word “Frontal” in the name and what the unit drains into.
  - Example 1: Blue Creek-Frontal Yellow Bay
  - Example 2: Anmer Creek-Frontal Stephens Passage





Labels:
Hydrologic Unit Code
Name
GNIS ID

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Frontal Area Name Updates

- **Frontal Name Update**: In Alaska there are cases where bays, coves, harbors, etc. that where delineated in a unit maps to the head-of-land. These units were coded as frontals and used the "Frontal" naming convention. For updates to the WBD in these situations the hydrologic unit should be changed to "S" standard and the name should be updated to not include the "Frontal" naming convention.

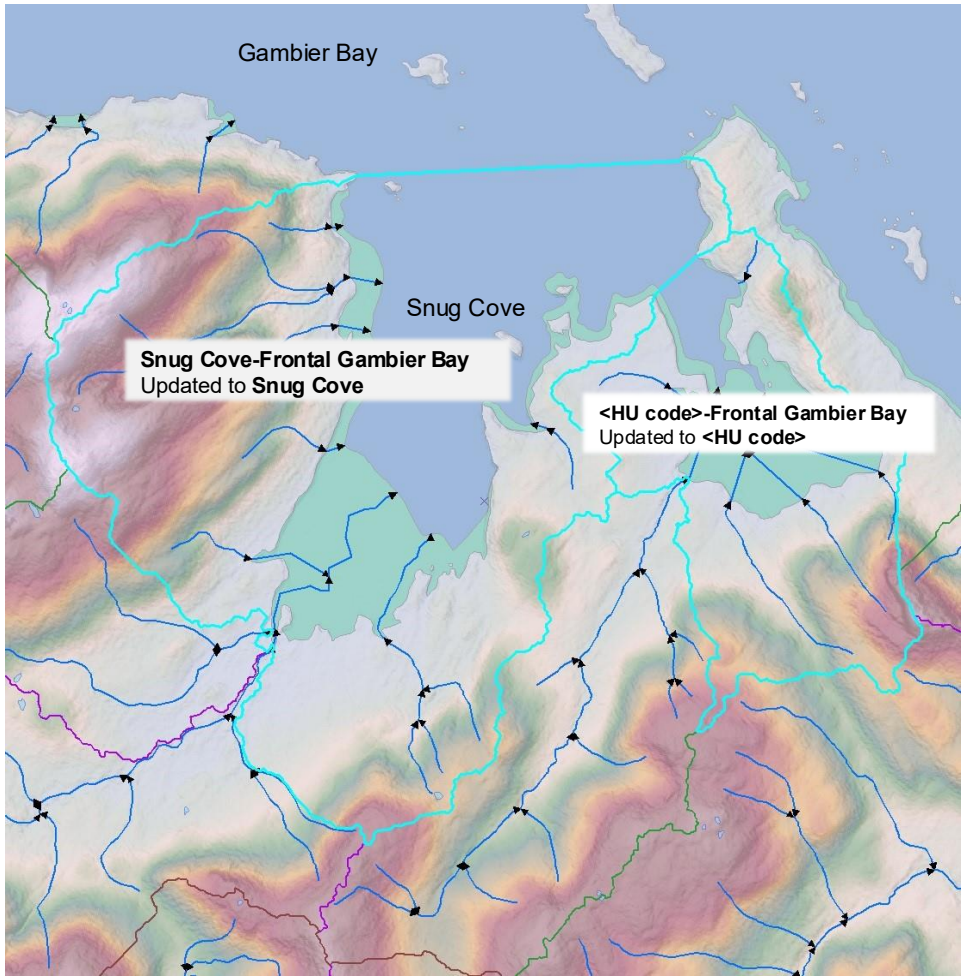
Example:

- Current name: Snug Cove-Frontal Gambier Bay
- Updated name: Snug Cove

- Any true Frontals will still use the Frontal naming convention.

- The HUType will also need to be changed from F to S (or M if appropriate).

- **NOTE: These have been updated in the most recent version of the WBD. If you are working from an older version the bay units will still have the frontal naming convention. Please use a current version of the WBD**



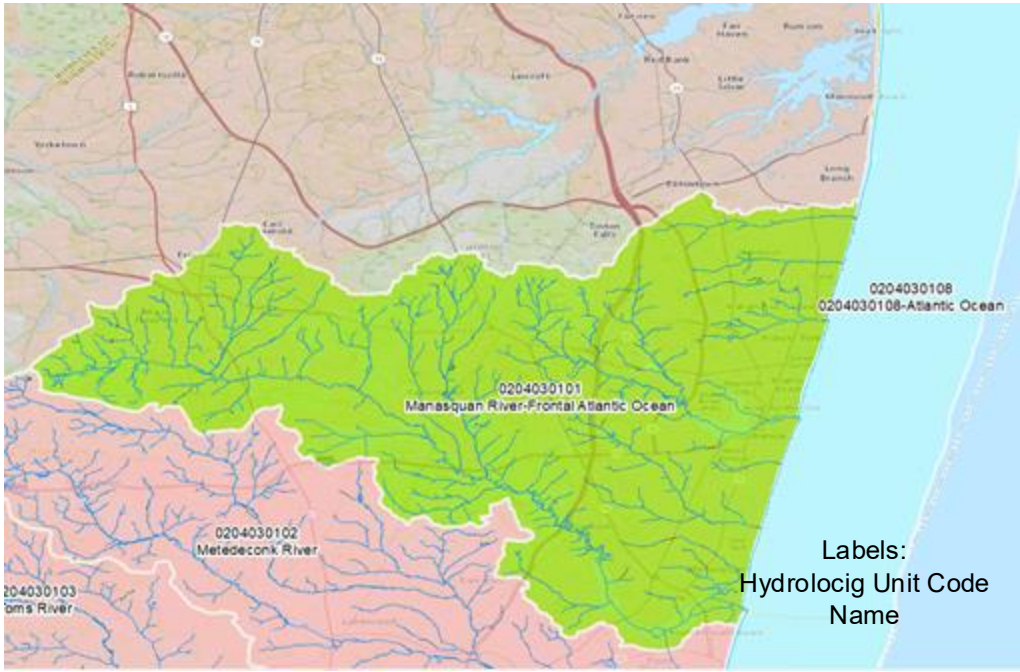
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Name – Coastal Water

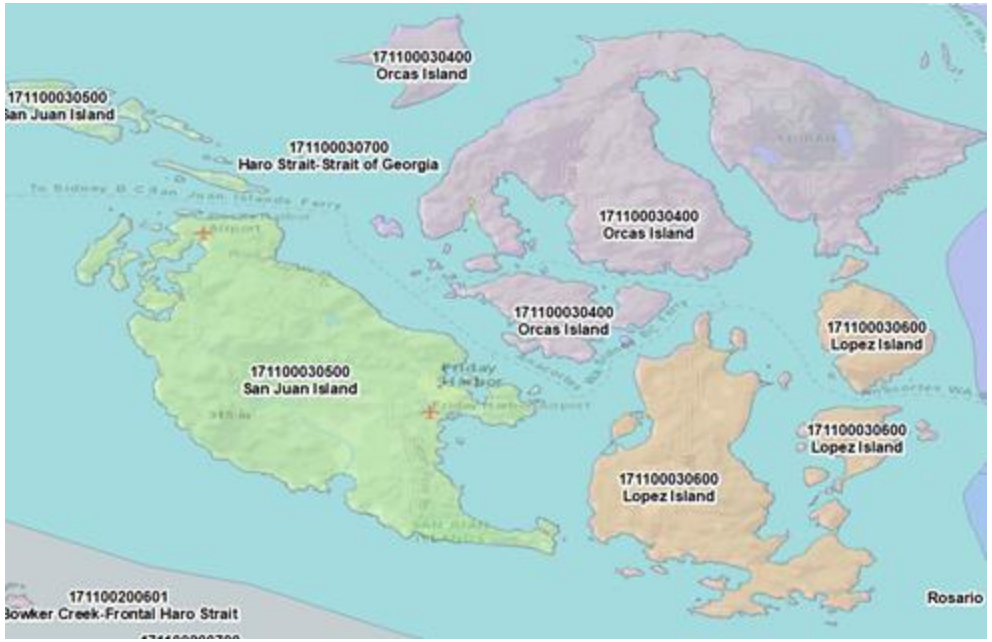
- When bathymetry is used to delineate submerged morphologic features, the resulting coastal water unit may not contain any other named features except the main water body name (for example, Atlantic Ocean). For these units, use the “hydrologic unit code-primary water feature” for the name, for example, 0204030108-Atlantic Ocean



WBD Guidance – Polygon Attribution

Name – Islands

- When islands are large enough to be subdivided, use the standard naming convention for standard and frontal hydrologic units.
- Islands large enough to be their own unit use the island name.
- Hydrologic units composed of a group of islands use the name of the major island within that group or the hyphenated naming convention.
- Exception to the single hyphenation rule: Can use 2 hyphens to represent 3 separate islands that have been grouped together. For example, Otter Island-Fox Island-Bear Island is ok for an island group



Labels:
Hydrologig Unit Code
Name
GNIS ID

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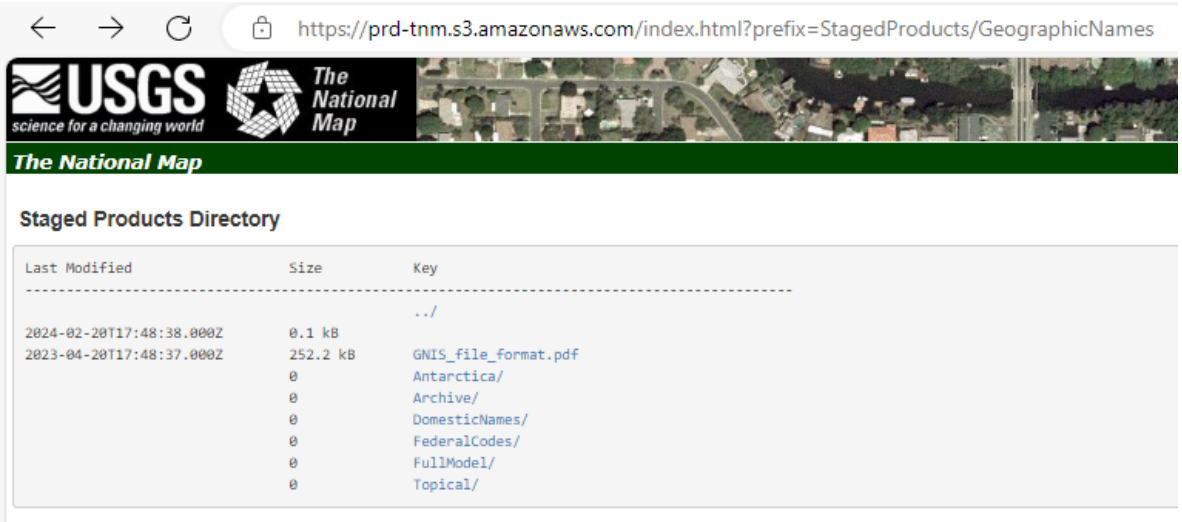
ReferenceGNIS_ID

- ReferenceGNIS_ID is an attribute on all hydrologic unit polygons
- ReferenceGNIS_ID is a unique code that represents the GNISID of the feature that the hydrologic unit is named after
  - Field is comma delimited, no spaces
  - If you have a hyphenated name, there should be two ReferenceGNIS_IDs populated for the unit, on rare occasions there could be three
    - Exception is when the HU code is used with a hyphenated name. In this instance only one GNISID is required.
- For GNIS ids the GNIS point dataset or the GNISIDs from the named NHD features can be used.
  - If using the GNISIDs from the NHD, make sure to remove the leading zeros

WBD Guidance – Polygon Attribution

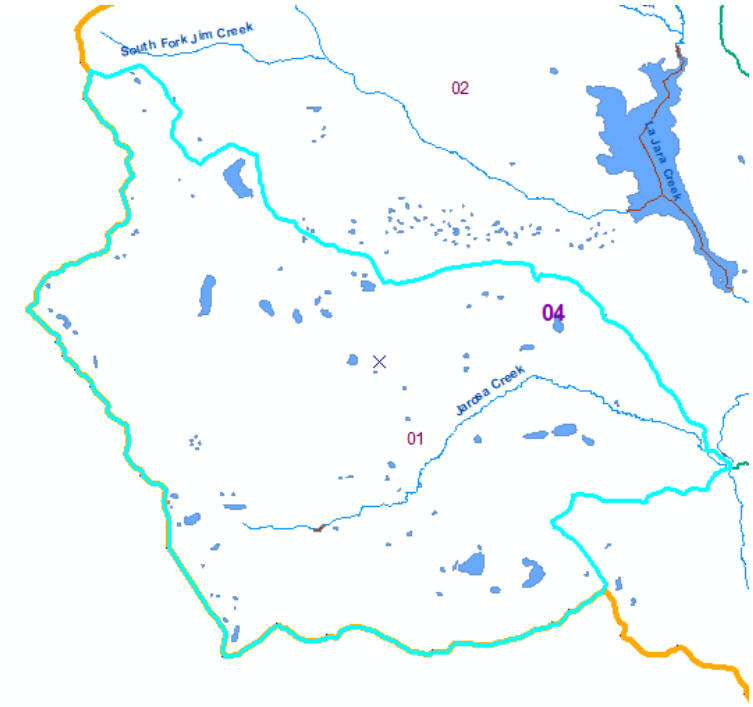
Geographic Names Information System

- Names must be based on officially recognized feature within the Geographic Names Information System (GNIS)
- GNIS text files by state or national .zip are available from [U.S. Board on Geographic Names | U.S. Geological Survey (usgs.gov)]



WBD Guidance – Polygon Attribution

ReferenceGNIS_ID example



Date	ReferenceGNIS_IDs	HUC12	Name
:09 AM	190804	130100020401	Jarosa Creek

WBD Guidance – Polygon Attribution

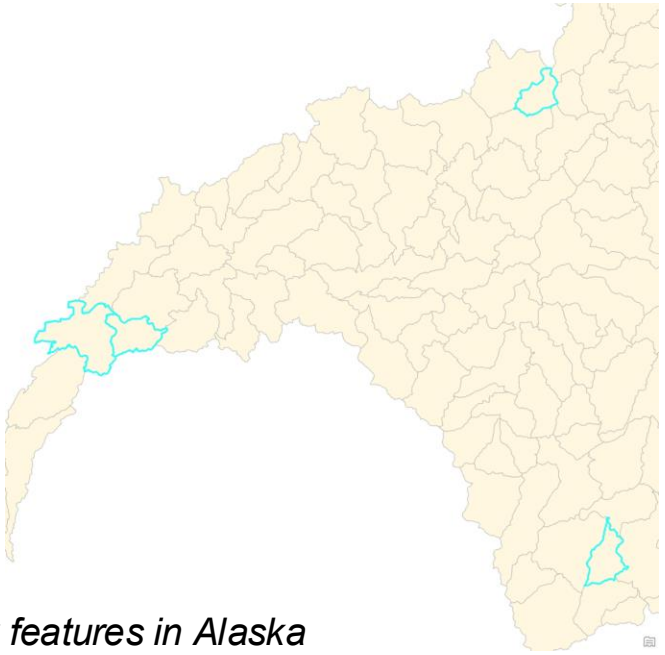
GNISID within your hydrologic unit

- Make sure that the GNISID that is applied is within the unit that is being worked on. The same name in GNIS can be on multiple features that are in completely different areas. It is important to assign the correct GNISID to the unit based on the feature within that unit.

- **Duplicate names are not allowed at the same level**, may need to hyphenate the unit's name. (Examples: Bear Creek-Gold Creek or <HU code>-Gold Creek)

feature_id	feature_name	feature_class	state_name
1402682	Gold Creek	Populated Place	Alaska
1402686	Gold Creek	Stream	Alaska
1402687	Gold Creek	Stream	Alaska
1402696	Gold Creek	Stream	Alaska

This HU8 has 4 units with a feature name of Gold Creek.
The Feature_Id is key to knowing which location is correct.



There are 22 Gold Creek features in Alaska

WBD Guidance – Polygon Attribution

GNISID for units named after a Town or City

- If the town or city exists as a "Civil" feature class within GNIS use that feature id
- If not use the feature id for the "Populated Place"
- Do not use the GNIS feature type of "Civil" for anything thing other than a Town, City, Village.
- Do not use the "Census" from the GNIS database.
- Do not use feature names that have ”(historical)” after the name.

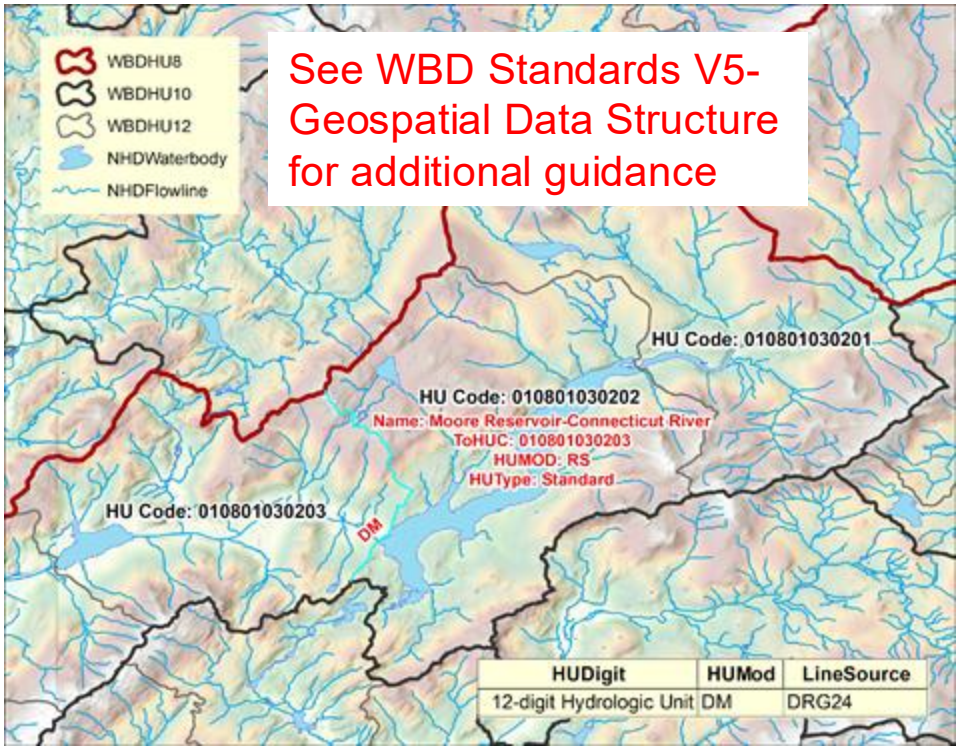
feature_id	feature_name	feature_class	state_name
1398881	Bergh Lake (historical)	Lake	Alaska
1402743	Golden City (historical)	Populated Place	Alaska
1410629	Tanana	Populated Place	Alaska
1410630	Tanana Island	Island	Alaska
1416408	Tanana River	Stream	Alaska
1419967	Bristol Bay Borough	Civil	Alaska
2418859	City of Tanana	Civil	Alaska
2419247	Tanana Alaska Native Village Statistical Area	Census	Alaska

Do not use the blue highlighted

WBD Guidance – Polygon Attribution

HU Type

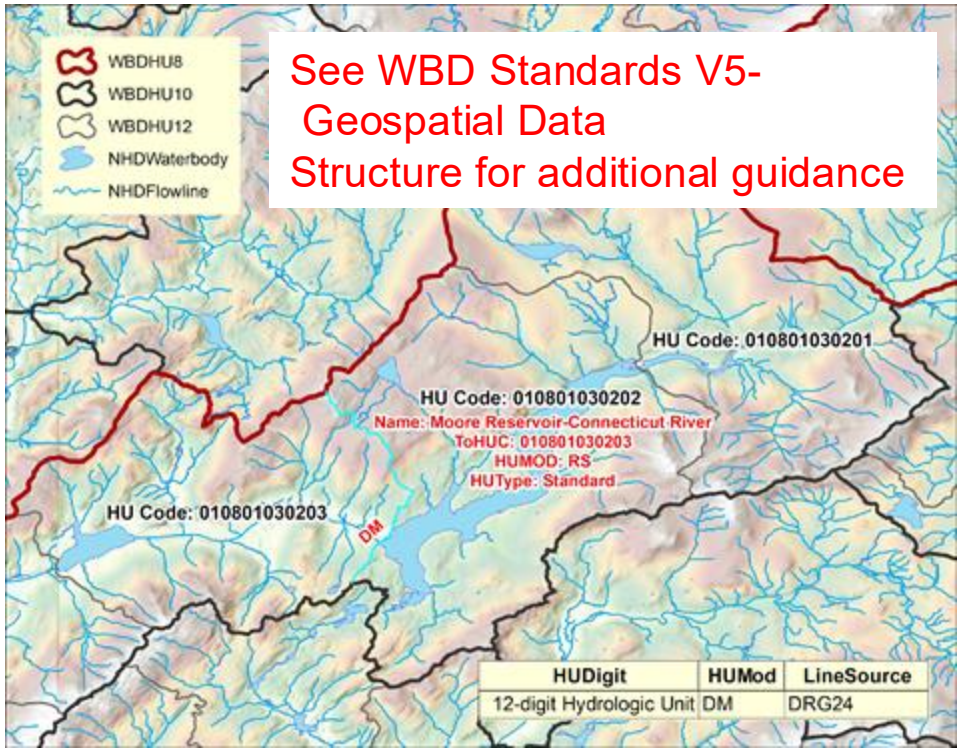
- A single-letter abbreviation that most closely describes the hydrologic unit drainage characteristics
- Values:
  - S (Standard) – An area with drainage flowing to a single outlet point, excluding noncontributing areas
  - C (Closed Basin) – A drainage area where all surface flow is internal; no overland flow leave the hydrologic unit through the outlet point
  - F (Frontal) – An area along the coastline of a lake, ocean, bay, etc., that has more than one outlet for separate hydrologic features
  - M (Multiple Outlet) – An area that has more than one natural outlet for the same hydrologic feature



WBD Guidance – Polygon Attribution

HU Type

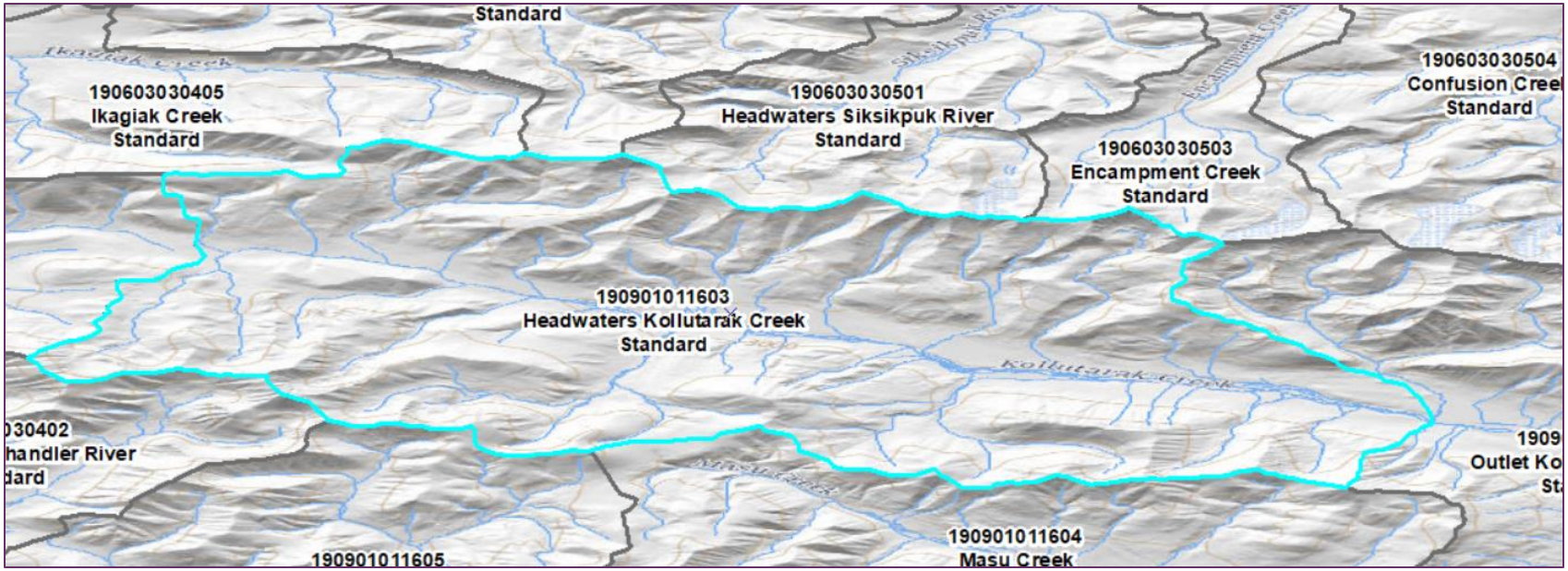
- A single-letter abbreviation that most closely describes the hydrologic unit drainage characteristics
- Values:
  - W (Water) – An area that is predominantly water with adjacent land areas; for example, a lake, estuary or harbor
  - I (Island) – And area that is comprised on one or more islands and adjacent water
  - U (Urban) – Drainage areas in urban areas that are altered by engineered surface and sub-surface drainage systems
  - D (Indeterminant Flow) – Areas of complex terrain or hydrology where flow within or connections between hydrologic units are uncertain or have the potential to change



WBD Guidance – Polygon Attribution

HU Type - Standard

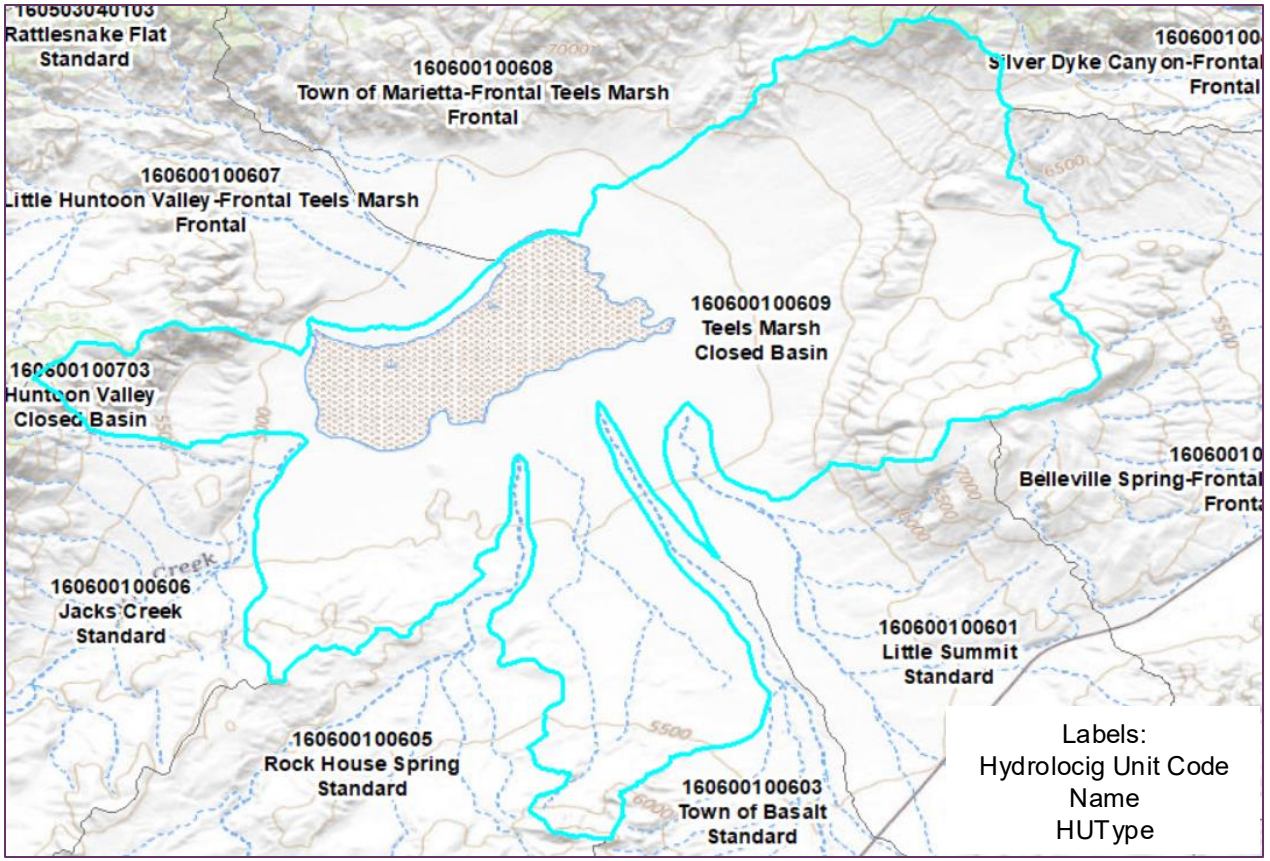
- S (Standard) – An area with drainage flowing to a single outlet point, excluding noncontributing areas



WBD Guidance – Polygon Attribution

HU Type – Closed Basin

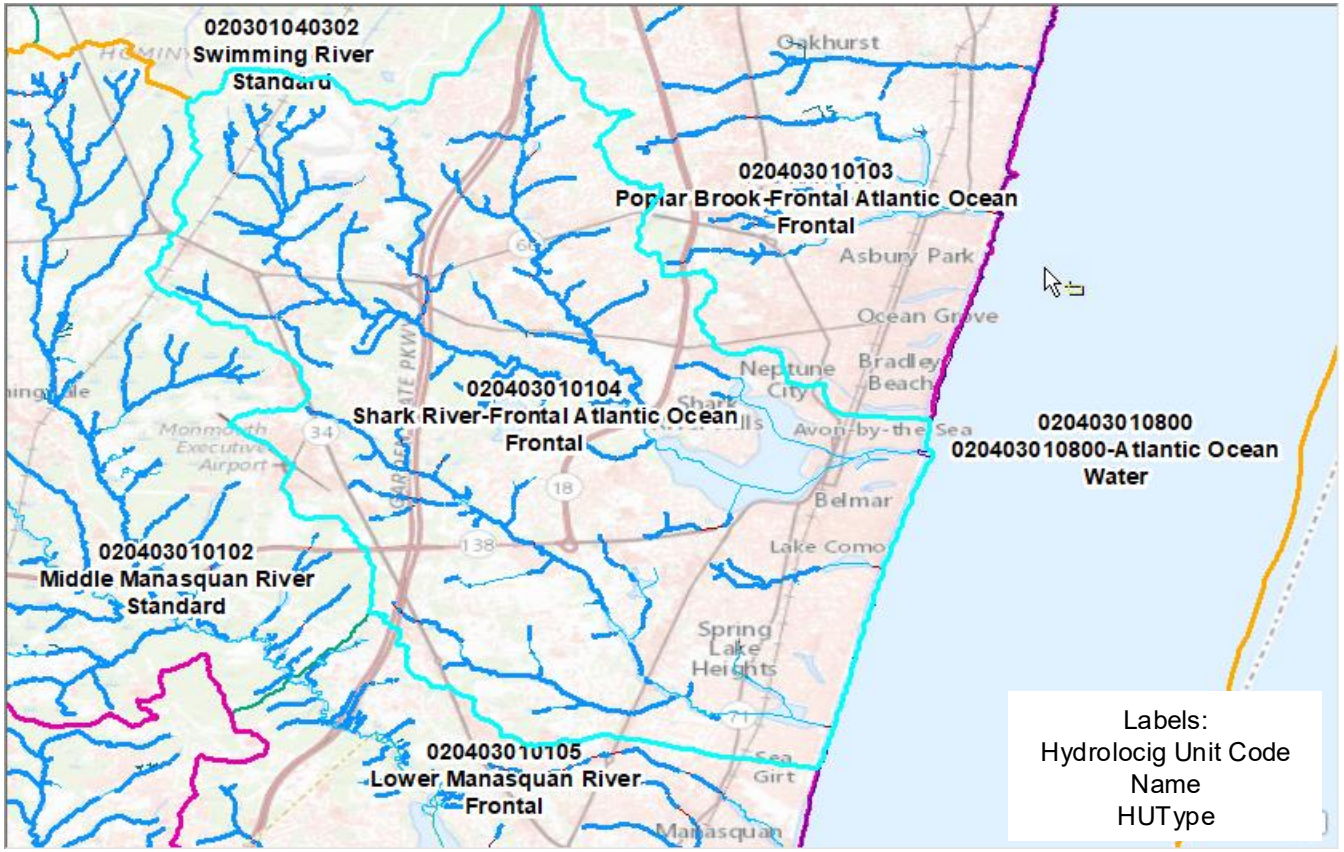
- C (Closed Basin) – A drainage area where all surface flow is internal; no overland flow leave the hydrologic unit through the outlet point



WBD Guidance – Polygon Attribution

HU Type - Frontal

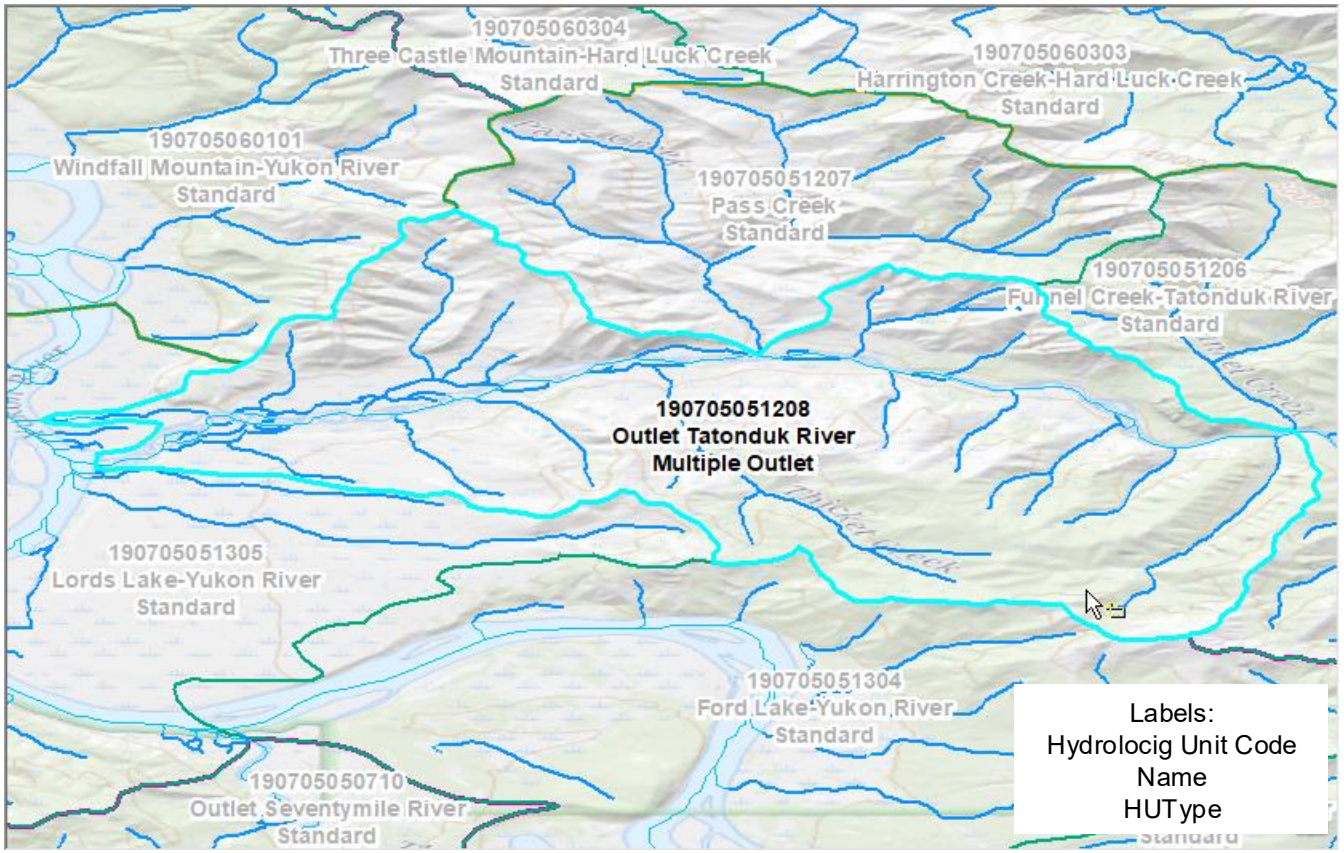
- F (Frontal) – An area along the coastline of a lake, ocean, bay, etc., that has more than one outlet for separate hydrologic features



WBD Guidance – Polygon Attribution

HU Type – Multiple Outlet

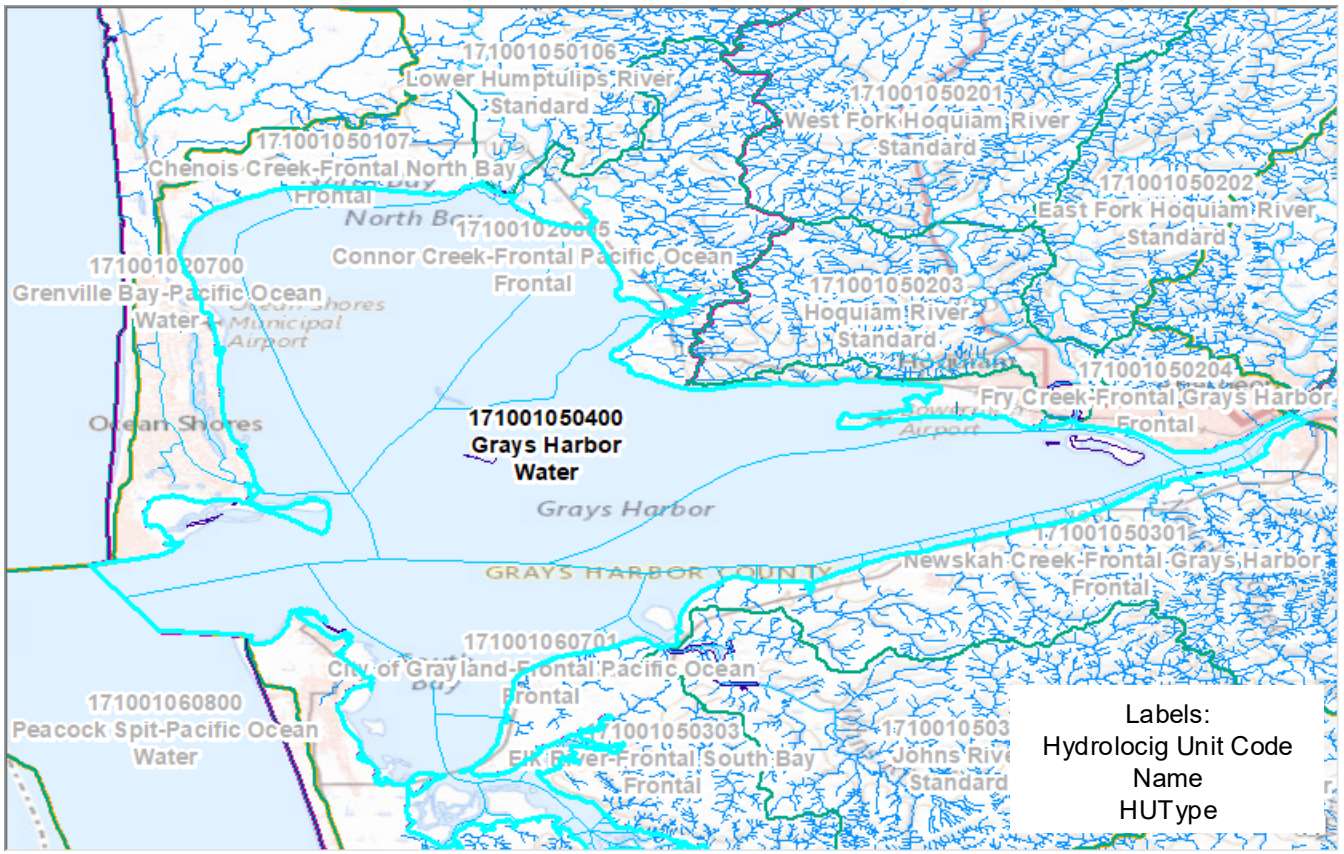
- M (Multiple Outlet) – An area that has more than one natural outlet for the same hydrologic feature



WBD Guidance – Polygon Attribution

HU Type - Water

- W (Water) – An area that is predominantly water with adjacent land areas; for example, a lake, estuary or harbor



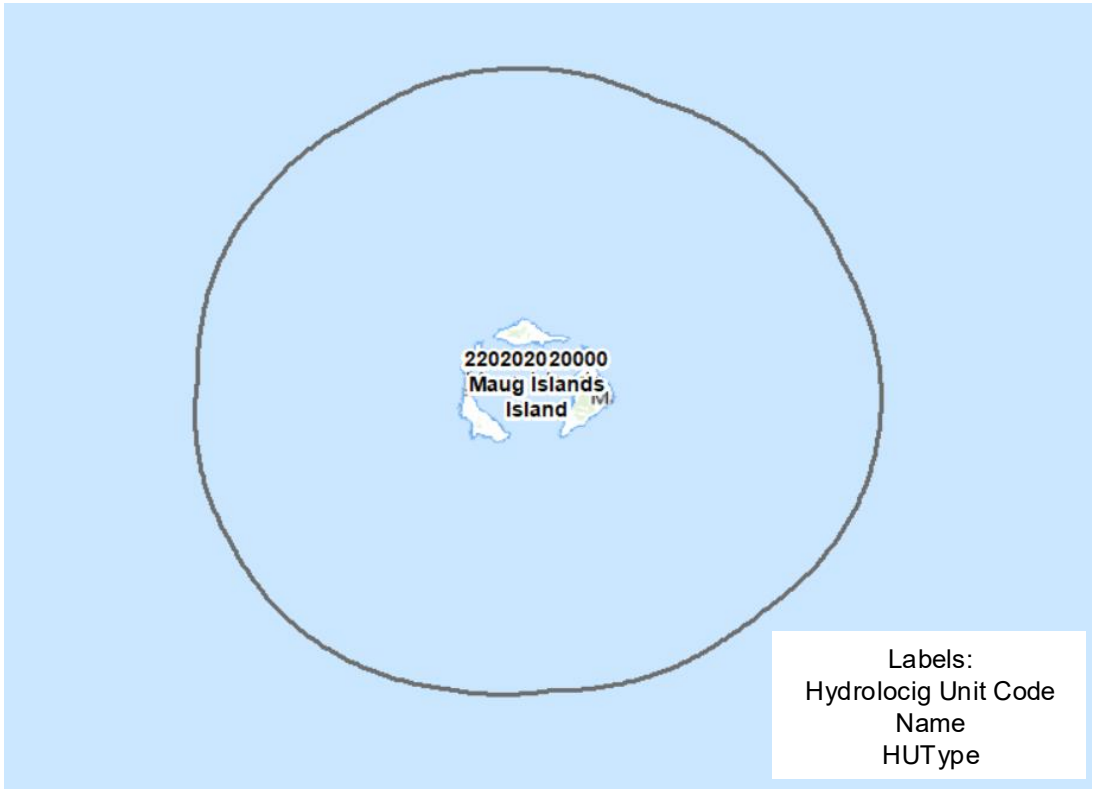
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HU Type – Island

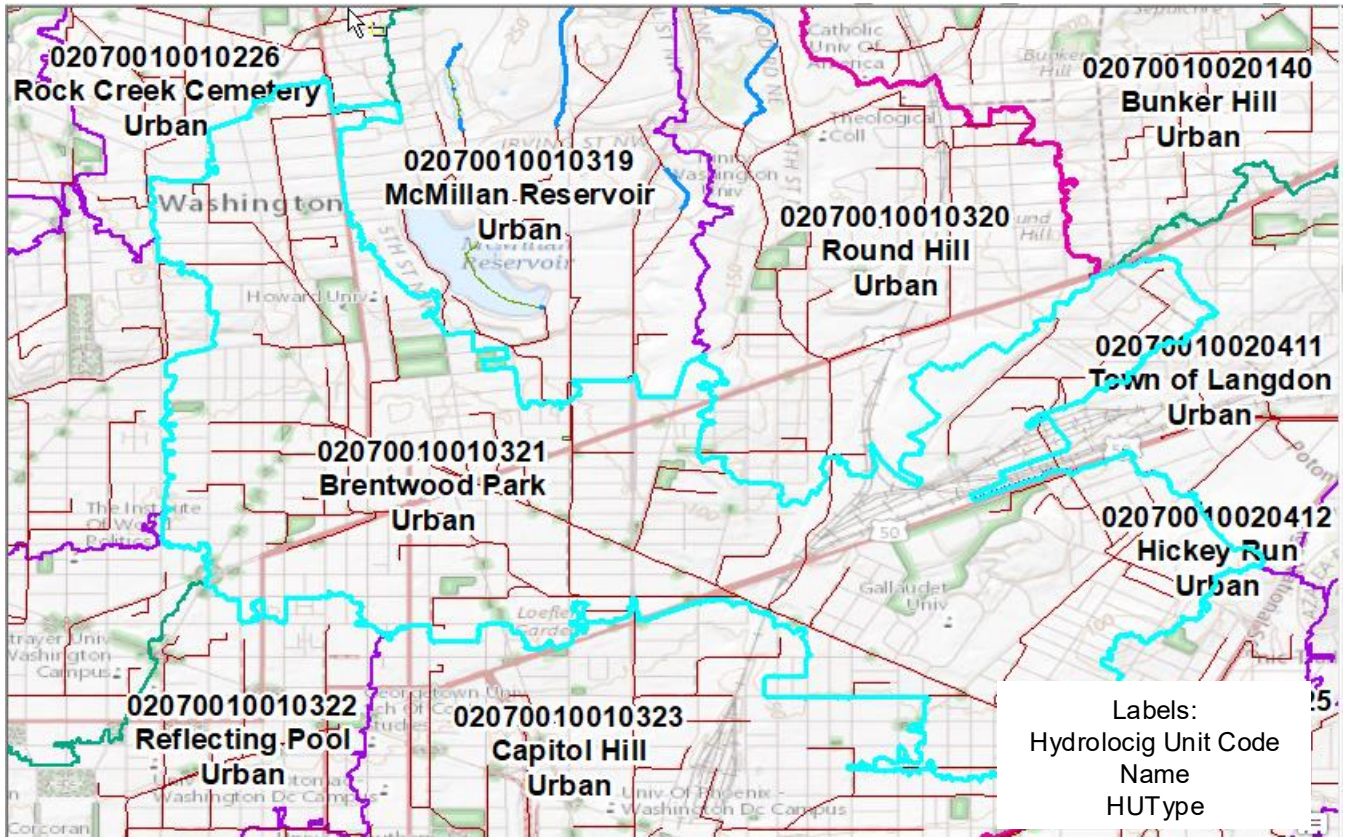
- I (Island) – And area that is comprised on one or more islands and adjacent water



WBD Guidance – Polygon Attribution

HU Type – Urban Area

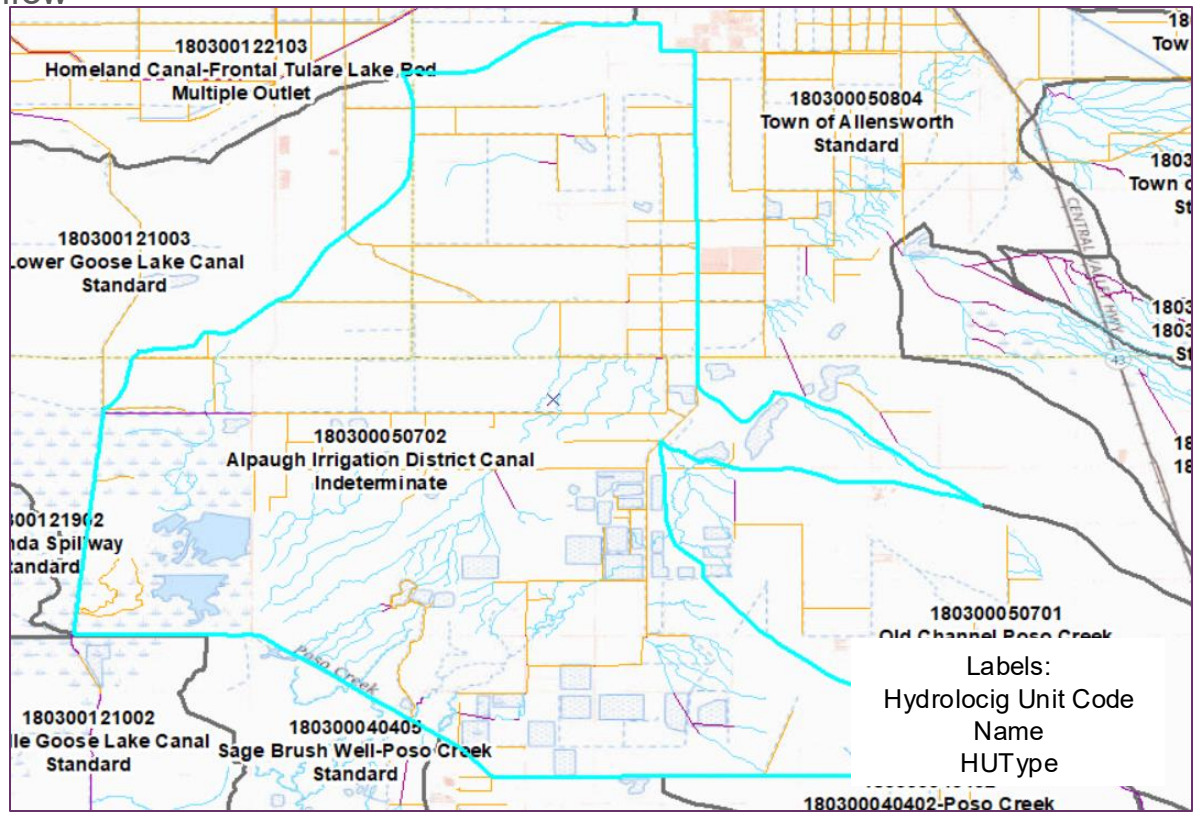
- U (Urban Area) – Drainage areas in urban areas that are altered by engineered surface and sub-surface drainage systems



WBD Guidance – Polygon Attribution

HU Type – Indeterminate Flow

- D (Indeterminant Flow) – Areas of complex terrain or hydrology where flow within or connections between hydrologic units are uncertain or have the potential to change, should only be used if true outlet really cannot be defined given topography, imagery and surface flow



WBD Guidance – Polygon Attribution

HU Mod - Polygons

- Many HUs are impacted by activities that alter the boundaries of the HUs and/or alter the hydrologic conditions within the HUs
- Polygon HU Mod codes are used to describe the presence and type of modification that affects flow within and between hydrologic units
- Syntax is a two-character upper case abbreviation representing the modification
- If more than one modification is present, values are listed in order of most to least predominant
- Codes are comma delimited, no spaces

Polygon Modification

AW - Artificial Waterway
GF - Groundwater Flow
GL - Glacier
IF - Ice Field
KA - Karst
LA - Lava Field
MA - Mining Activity
NC - Noncontributing Area
NM - No Modification
OC - Overflow Channel or Flume
OF - Overbank Flow
PD - Pipe Diversion
PS - Pumping Station
RC - Receiving
RS - Reservoir
SI - Siphon
UA - Urban Area
WD - Withdrawal

See WBD Standards V5- Geospatial Data Structure for additional guidance. Table 6.

WBD Guidance – Polygon Attribution

Table 6. Polygon hydrologic unit modification (HUMod) codes and definitions, Watershed Boundary Dataset.

Polygon "HUMod" code	Polygon "HUMod" description	Polygon "HUMod" modification definition
AW[1]	Artificial waterway	A canal, ditch, or drain used to transport surface water that alters the natural flow out of the hydrologic unit. Withdrawing and receiving hydrologic units should carry this designation, as well as all hydrologic units in which the flow is altered by an artificial waterway.
GF	Groundwater or shallow subsurface flow	Hydrologic unit in which most of the runoff drains underground.
GL	Glacier	The hydrologic unit crosses or includes a body or stream of ice moving outward and downslope from an area of accumulation; area of relatively permanent snow or ice on the top or side of a mountain or mountainous area.
IF	Ice field	The hydrologic unit crosses or includes a field of ice, formed in regions of perennial frost.
KA	Karst	The hydrologic unit is within an area of, or includes an area of, geologic formations of irregular limestone deposits with sinks, underground streams, or caverns.
LA	Lava field	The hydrologic unit contains or crosses nearly flat-lying lava flows.
MA	Mining activity	Topographic modification by surface mining that alters the natural flow in or out of the hydrologic unit.
NC	Noncontributing area	A naturally formed area that does not contribute surface-water runoff to a hydrologic unit outlet under normal conditions, for example, a playa. This does not include groundwater flow.
NM	No modifications	No modifications are present. Use if no other options with the modification domain have been cited.
OC	Overflow channel or flume	An artificial channel built to control excess high flow from a natural channel; alters the natural flow out of the hydrologic unit.
OF	Overbank flow	A natural condition in which a stream surpasses bankfull stage and the excess flows into a nearby channel draining to a different hydrologic unit. The losing and receiving hydrologic units should both carry the HUMod code "OF". An example of overbank flow is shown in figure 3.
PD	Pipe diversion	A redirection of surface water by a pipeline from one hydrologic unit to another, which alters the natural flow into or out of the hydrologic unit.
PS	Pumping station	A facility along a stream or other water body used to move water over a levee or other obstruction that alters the natural boundary location.
RC	Receiving	A hydrologic unit that receives diverted water.
RS	Reservoir	A constructed basin formed to contain and store water for future use in an artificial lake; alters the natural flow out of the hydrologic unit.
SI	Siphon	An artificial diversion, which is usually named "siphon" on maps, to move surface water from one stream channel to another; alters the natural boundary location.
UA	Urban area	Heavy modification of hydrologic unit topography by urban development.
WD	Withdrawal	A hydrologic unit from which water is diverted.

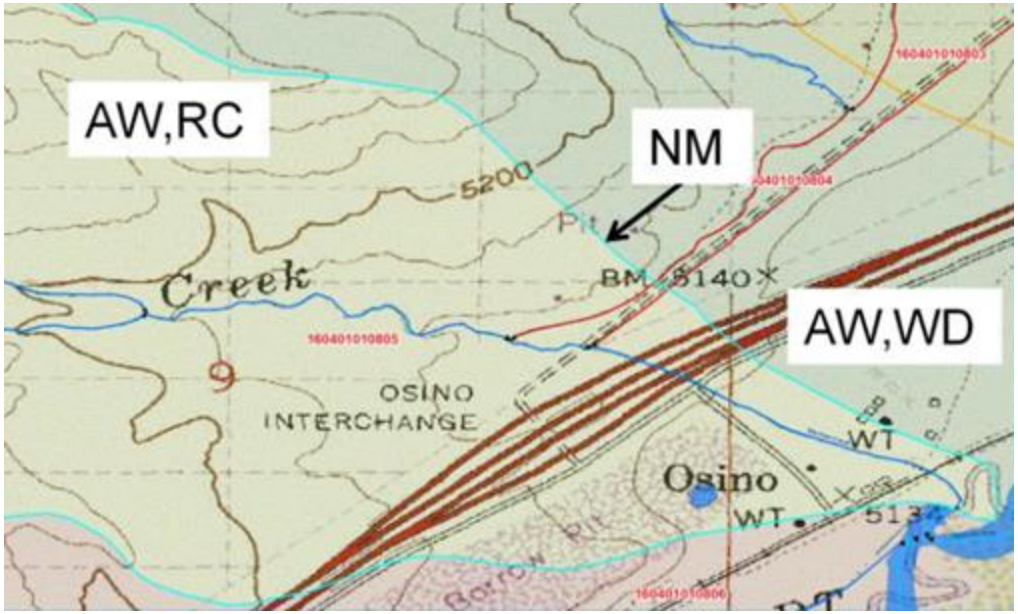
[1]Retired codes AD (Aqueduct), DD (Drainage Ditch), GC (General Canal/Ditch), ID (Irrigation Ditch), IT (Interbasin Transfer), SD (Stormwater Ditch), SC (Stormwater Canal), and BC (Barge Canal) are grouped into this single modification code.

See WBD Standards V5- Geospatial Data Structure for additional guidance. Table 6.

WBD Guidance – Polygon Attribution

HU Mod Example

A canal diverting water from one HU to another doesn't necessarily mean that the WBDLine is modified because of it, so the WBDLine would get NM, but the HUs are impacted by it, so they would get the AW (Artificial Waterway) mod. Whichever HU receives the diversion, would get RC (receiving) mod, and whichever HU the water is diverted from would get WD (withdrawal).

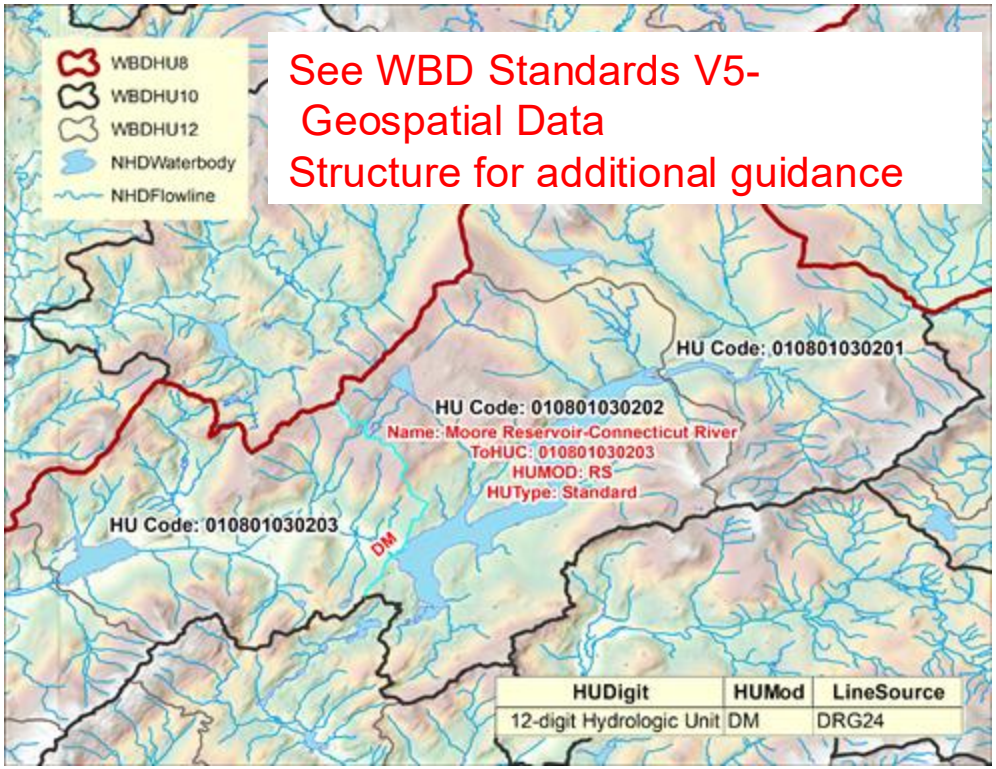


Additional help documents on HUMods can be provided upon request

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ToHUC

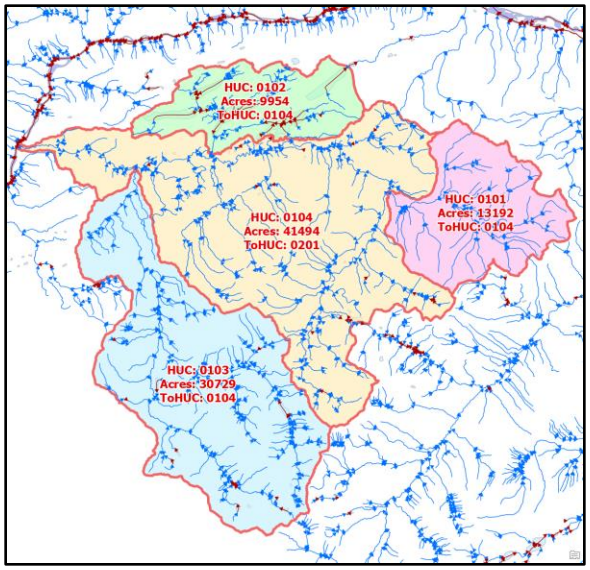
- Hydrologic Unit code for the hydrologic unit that is downstream from and naturally receives the majority of the flow from the hydrologic unit
  - For example: 010801030202 flows into 010801030203 so the ToHUC for this unit would be 010801030203
- If the hydrologic unit flow into the Ocean or Gulf of Mexico populate this field with “Ocean”
- If the hydrologic unit flows into either Canada or Mexico, then use the appropriate value of “CANADA” or “MEXICO
- If the hydrologic unit is a closed basin, then populate this field with “CLOSED BASIN”



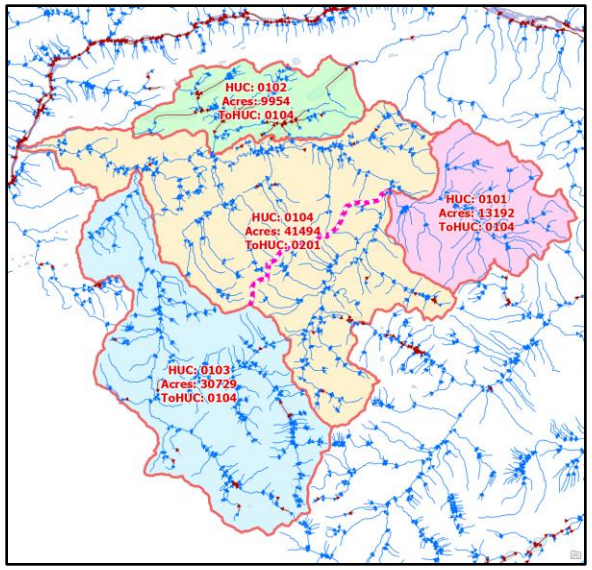
WBD Guidance – Polygon Attribution

ToHUC

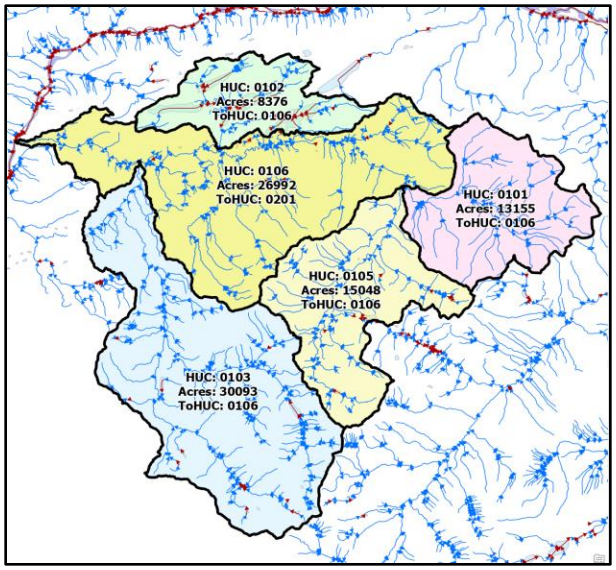
- Hydrologic Unit code reassigned and updating the ToHucs after splitting a unit
  - For example: 0101, 0102, 0103 flows into 0104 so the ToHUC for these units would be 0104
  - **After splitting** unit 0104 the code is retired and new codes 0105 and 0106 are then assigned
  - All units flowing into the newly coded units need their ToHUC codes reviewed and updated
  - Example; units 0101, 0102, 0103, 0105 all flow into 0106, the ToHUCs need updating to 0106



Before (red)



Flagged - split (pink)



After (black)

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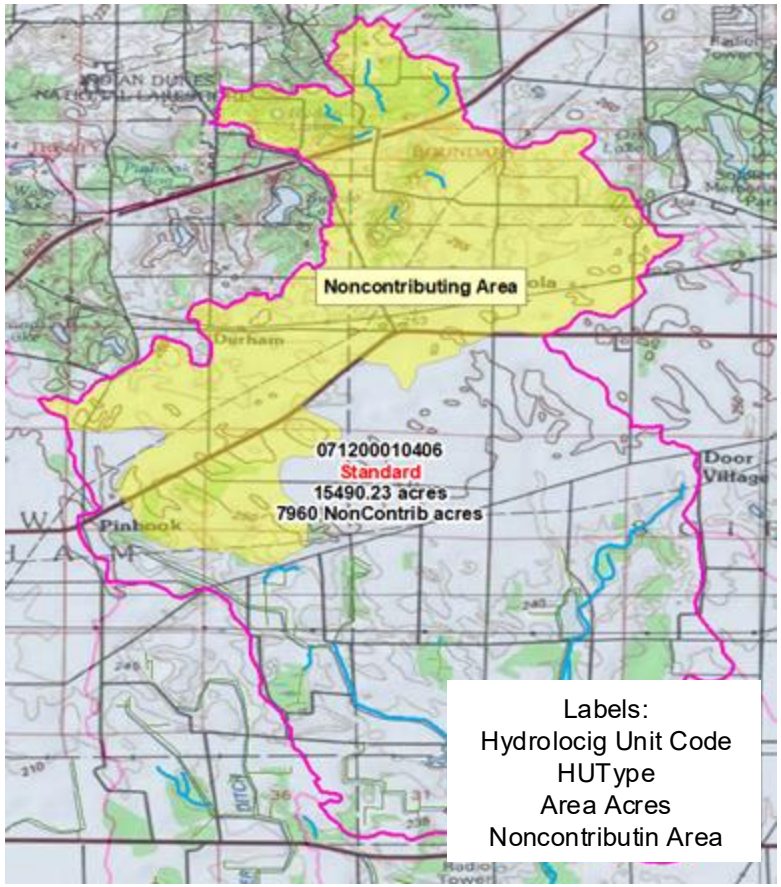
NonContributingAreaAcres and SqKm

- Two Scenarios

1. Some noncontributing areas may not be large enough to be their own HU, they might be present in a standard or frontal HU
   - Populate these fields with how much of the total HU area is noncontributing

2. Some noncontributing areas are large enough to be their own HU
   - They have an HUType of Closed Basin
   - The entire polygon area can be calculated for these fields (should match AreaAcres and AreaSqKm

NOTE: Null values are not allowed in the updated data. Please calculate Null values to zero in the deliverable.

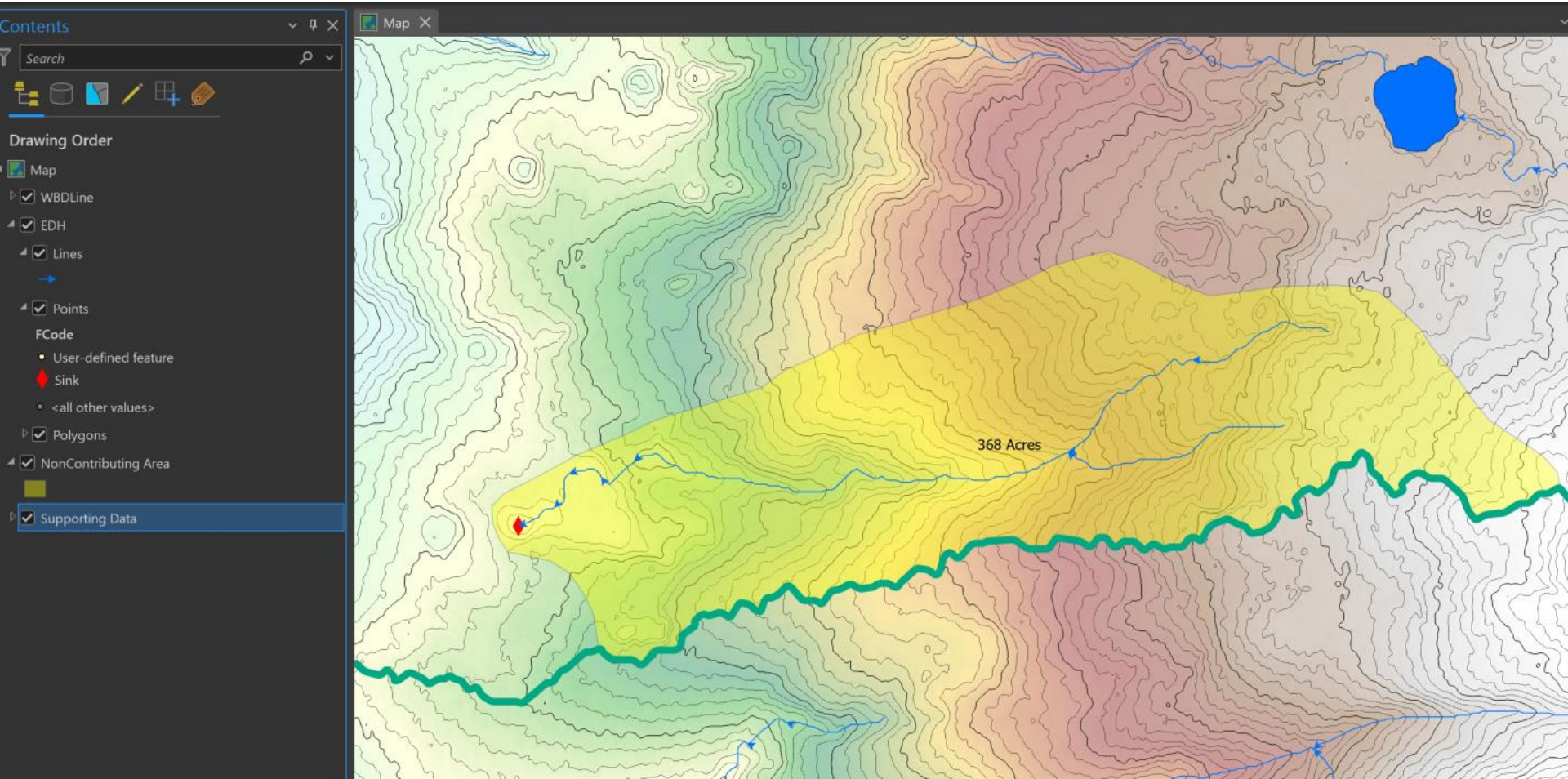


Example of Scenario 1

WBD Guidance – Polygon Attribution

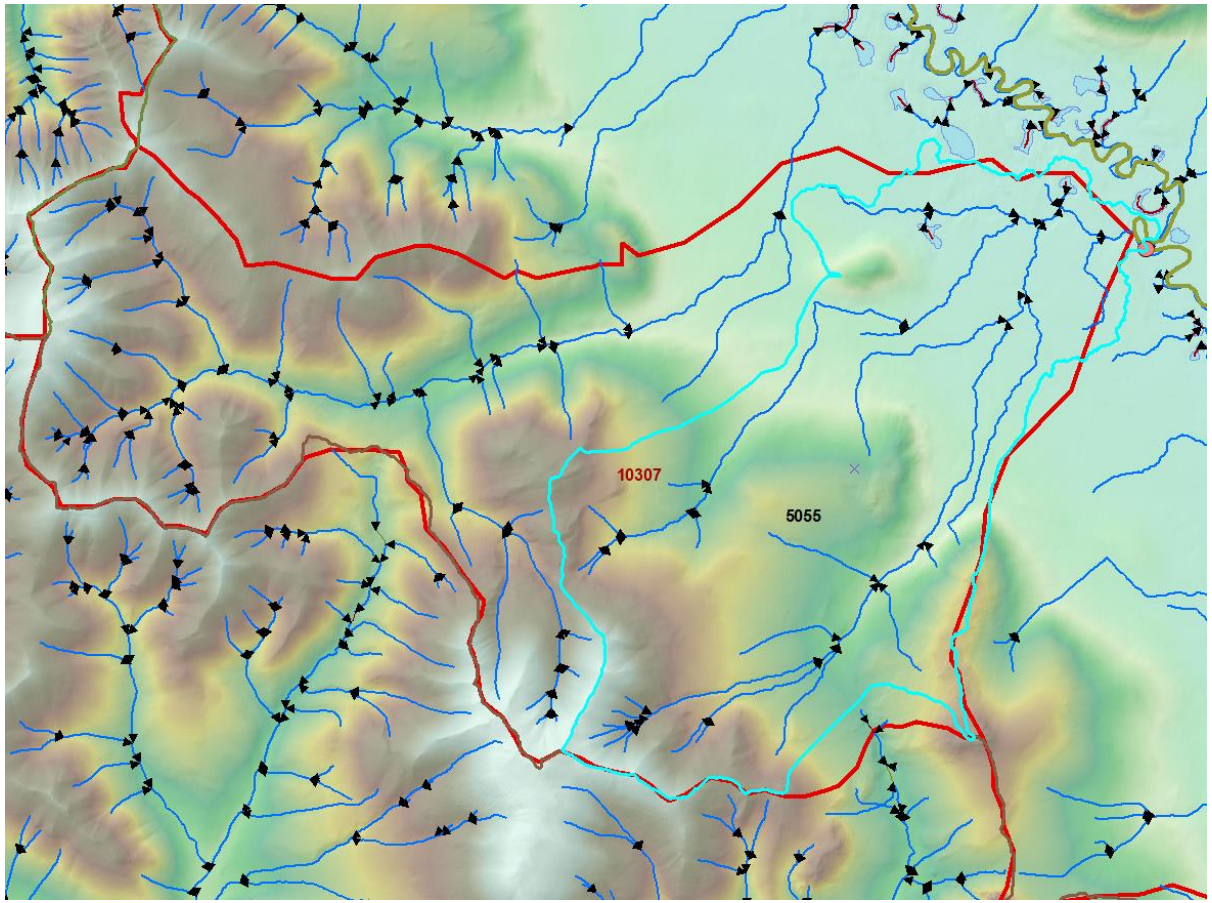
NonContributingAreaAcres and SqKm

- If there is a sink in the EDH data, you need to include noncontributing area for the HU being delineated/revised.



Attribution: AreaAcres

- Recalculate the acres to check for units that are over or under the assigned limits.
- This example shows a HU12 unit that was over the 10,000-acre limit but when it was updated using the new IfSAR hydro and DEM it is now 5055 acres which is under the limit. It needs to be merged into the downstream unit.
- When merging units both of the original codes will need to be retired and a new code assigned



WBDLine Attributes

WBDLine Attribution:

Attribution: Things to be aware of

TNMID	HUDigit	HUMod	LineSource
{0E180809-DAF1-48D5-BDEE-CFA61F0E492B}	6	NM	BUFFER1000M
{26A931F5-56E9-49A8-A017-BA234F4062BD}	6	NM	BUFFER1000M
{395B5C2C-046E-4F8D-B3C2-12B1A7F03C90}	10	NM	IFSAR5M2012,NHD25,OTH
{691F2BDD-3DB7-5C13-E054-0208209DA544}	10	NM	IFSAR5M2012,NHD25,OTH
{691F2BDD-2813-5C13-E054-0208209DA544}	10	NM	IFSAR5M2012,NHD25
{691F2BDD-39E7-5C13-E054-0208209DA544}	12	NM	IFSAR5M2012,NHD25
{691F2BDD-838B-5C13-E054-0208209DA544}	12	NM	IFSAR5M2012,NHD25
{680BDE48-04F5-4FCB-8DC6-DAFD30531D6E}	14	NM	IFSAR5M2012,NHD25
{8FEBBB42-A40F-40F7-AEB8-07D00244472D}	14	NM	IFSAR5M2012,NHD25

Line Attribution:

- These are the fields WBD editors are responsible for verifying, updating.
- Please do not delete any fields from the attribute tables.
- Attributes marked as "automatically generated" on slides 71-73 will be populated on the back end when the data is checked back into the national dataset. All other fields should be updated and maintained as necessary in all deliverables.

WBD Polygon and Line Attribute

TNMID

- The TNMID (the National Map Identification) is a unique identifier for each element in the WBD database
- It is used to tie a metadata record to each feature in the dataset
- For existing features in the database, it is already assigned and must be maintained
  - **Duplicate TNMIDs are not allowed**
    - If a feature is split, the resulting child feature with the biggest area or longest length should retain the original TNMID
- TNMID is automatically assigned for new features during the rebuild process.

WBD Guidance – Line Attribution

HUDigit

- Indicates the minimum number of digits used to represent the hydrologic boundary by the line.
  - For example: if the line represents the boundary between two 12-digit hydrologic units this field will be populated with 12-digit Hydrologic Unit.
- Used for cartographic purposes
- Update if adding new data or if moving existing boundaries
  - For example, migrating a 12-digit HU from one HU8 to another



See WBD Standards V5- Geospatial Data Structure for additional guidance

WBD Guidance – Line Attribution

HU Mod - Lines

- Many HUs are impacted by activities that alter the boundaries of the HUs and/or alter the hydrologic conditions within the HUs
- Line HU Mod codes are used to describe modifications to natural overland flow that alters the location of the HU boundary or other conditions that affect the HU boundary
- Syntax is a two-character upper case abbreviation representing the modification
- If more than one modification is present, values are listed in order of most to least predominant
- Codes are comma delimited, no spaces

Line Modification

AW - Artificial Waterway
DM - Dam
LA - Lava Field
LE - Levee
MA - Mining Activity
NM - No Modification
OC - Overflow Channel or Flume
OF - Overbank Flow
PD - Pipe Diversion
PL - Playa
SL - Shoreline
TF - Transportation Feature
UA - Urban Area

See WBD Standards V5- Geospatial Data Structure for additional guidance. Table 9.

WBD Guidance – Line Attribution

Table 9. Line hydrologic unit modification (HUMod) codes and definitions, Watershed Boundary Dataset.

[WBD, Watershed Boundary Dataset]

Code	Description	"HUMod" modification definition
AW[1]	Artificial waterway	A canal, ditch, or drain used to transport surface water that alters the natural flow out of the hydrologic unit.
DM	Dam	A barrier constructed to control the flow or raise the level of water at a hydrologic unit outlet or on the hydrologic unit boundary. The dam alters the natural boundary location.
LA	Lava field	The hydrologic unit boundary crosses nearly flat-lying lava flows.
LE	Levee	An artificial bank used to confine a stream channel or limit flooding in adjacent areas. The location of the levee alters natural flow and the hydrologic unit boundary location.
MA	Mining activity	Substantial topographic modification of a hydrologic unit boundary by surface mining that alters natural boundary location.
NM	No modifications	No modifications are present. Use if no other options with the modification domain have been cited.
OC	Overflow channel or flume	An artificial channel built to control excess high flow from a natural channel. The location of the channel alters the natural boundary location.
OF	Overbank flow	A natural condition in which a stream surpasses bankfull stage and the excess flows into a nearby channel and discharges to a different hydrologic unit.
PD	Pipe diversion	A redirection of surface water by a pipeline from one hydrologic unit to another that alters the natural flow in or out of the hydrologic unit.
PL	Playa	A playa is a dry, vegetation-free, flat area at the lowest part of an undrained desert basin. Closed basins are often marked at their terminal ends by a playa, which sometimes contains a shallow lake covering all or part of the playa surface.
SL	Shoreline	A demarcation of shoreline in the WBD agreed upon by in-state groups. Inclusion of shoreline in WBD is an exception and is not preferred.
TF	Transportation feature	An overland transportation feature, for example, a road, railroad, dock, airport, and so on, that alters the natural boundary location.
UA	Urban area	Heavy alteration of a hydrologic unit boundary by urban development beyond that described previously in "transportation feature."

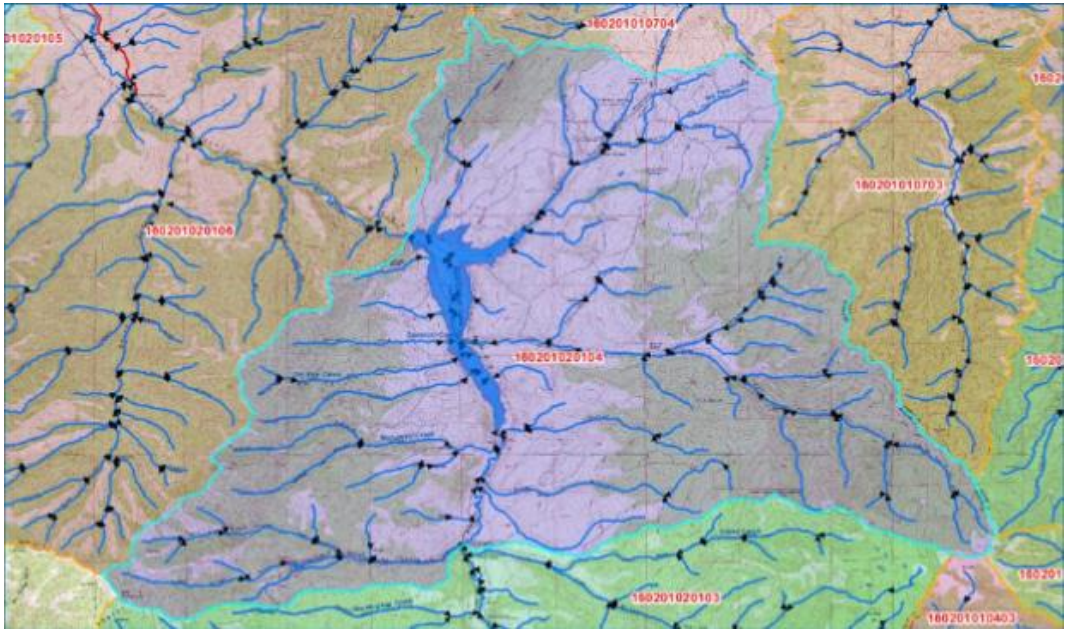
[1]Retired codes AD (Aqueduct), DD (Drainage Ditch), GC (General Canal/Ditch), ID (Irrigation Ditch), IT (Interbasin Transfer), SD (Stormwater Ditch), SC (Stormwater Canal), and BC (Barge Canal) are now grouped into this single modification code.

See WBD Standards V5- Geospatial Data Structure for additional guidance. Table 9.

WBD Guidance – Line Attribution

HU Mod Example

This hydrologic unit has a large reservoir within it. The natural boundary location is being altered by the presence of a dam at the outlet of the reservoir. In this case, a code of DM would be applied to the line that follows the dam (highlighted in cyan in the image to the right).

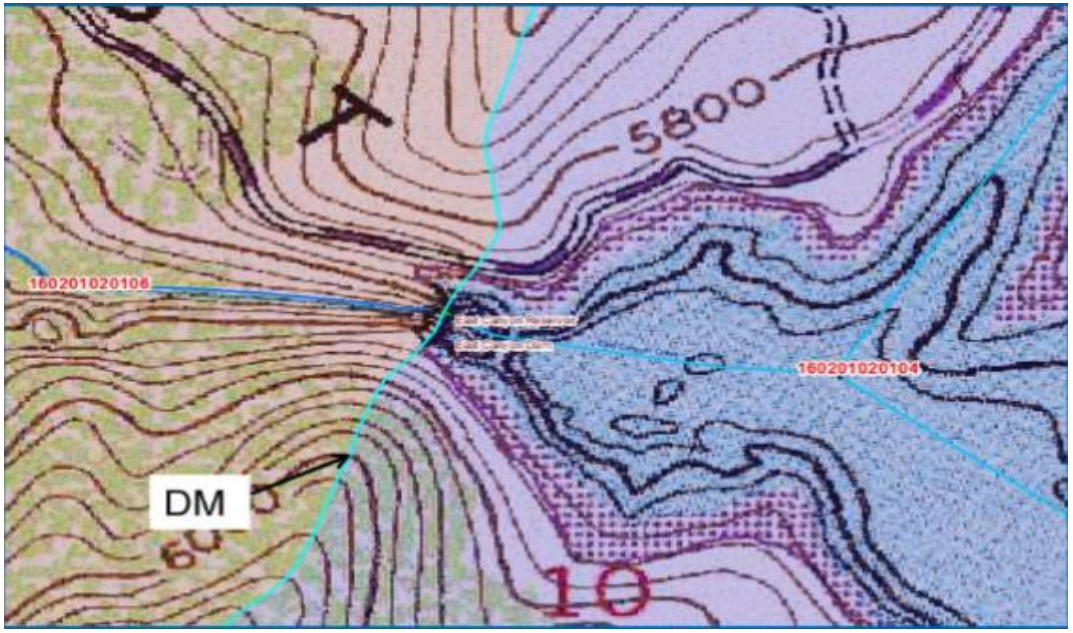


Additional help documents on HUMods can be provided upon request

WBD Guidance – Line Attribution

HU Mod Example

This hydrologic unit has a large reservoir within it. The natural boundary location is being altered by the presence of a dam at the outlet of the reservoir. In this case, a code of DM would be applied to the line that follows the dam (highlighted in cyan in the image to the right).



Additional help documents on HUMods can be provided upon request

WBD Guidance – Polygon & Line Attribution

HUMod common mistakes

OC - Overflow Channel or Flume - **Artificial** channel alters natural boundary

OF - Overbank Flow - **Natural** condition spills into a different unit

NM - No Modification - Not to be used with other HU Mod codes

Code	Description	"HUMod" modification definition
AW[1]	Artificial waterway	A canal, ditch, or drain used to transport surface water that alters the natural flow out of the hydrologic unit.
DM	Dam	A barrier constructed to control the flow or raise the level of water at a hydrologic unit outlet or on the hydrologic unit boundary. The dam alters the natural boundary location.
LA	Lava field	The hydrologic unit boundary crosses nearly flat-lying lava flows.
LE	Levee	An artificial bank used to confine a stream channel or limit flooding in adjacent areas. The location of the levee alters natural flow and the hydrologic unit boundary location.
MA	Mining activity	Substantial topographic modification of a hydrologic unit boundary by surface mining that alters natural boundary location.
NM	No modifications	No modifications are present. Use if no other options with the modification domain have been cited.
OC	Overflow channel or flume	An artificial channel built to control excess high flow from a natural channel. The location of the channel alters the natural boundary location.
OF	Overbank flow	A natural condition in which a stream surpasses bankfull stage and the excess flows into a nearby channel and discharges to a different hydrologic unit.
PD	Pipe diversion	A redirection of surface water by a pipeline from one hydrologic unit to another that alters the natural flow in or out of the hydrologic unit.
PL	Playa	A playa is a dry, vegetation-free, flat area at the lowest part of an undrained desert basin. Closed basins are often marked at their terminal ends by a playa, which sometimes contains a shallow lake covering all or part of the playa surface.
SL	Shoreline	A demarcation of shoreline in the WBD agreed upon by in-state groups. Inclusion of shoreline in WBD is an exception and is not preferred.
TF	Transportation feature	An overland transportation feature, for example, a road, railroad, dock, airport, and so on, that alters the natural boundary location.
UA	Urban area	Heavy alteration of a hydrologic unit boundary by urban development beyond that described previously in "transportation feature."

[1]Retired codes AD (Aqueduct), DD (Drainage Ditch), GC (General Canal/Ditch), ID (Irrigation Ditch), IT (Interbasin Transfer), SD (Stormwater Ditch), SC (Stormwater Canal), and BC (Barge Canal) are now grouped into this single modification code.

WBD Guidance – Polygon & Line Attribution

Applying the same HU Mod to Polys and Lines

Line Modification

AW - Artificial Waterway
DM - Dam
LA - Lava Field
LE - Levee
MA - Mining Activity
NM - No Modification
OC - Overflow Channel or Flume
OF - Overbank Flow
PD - Pipe Diversion
PL - Playa
SL - Shoreline
TF - Transportation Feature
UA - Urban Area

Polygon Modification

AW - Artificial Waterway
GF - Groundwater Flow
GL - Glacier
IF - Ice Field
KA - Karst
LA - Lava Field
MA - Mining Activity
NC - Noncontributing Area
NM - No Modification
OC - Overflow Channel or Flume
OF - Overbank Flow
PD - Pipe Diversion
PS - Pumping Station
RC - Receiving
RS - Reservoir
SI - Siphon
UA - Urban Area
WD - Withdrawal

Type	Artificial Waterway (AW)
Polygon	An aqueduct, canal, ditch, or drain used to transport surface water that **alters the natural flow out of into the hydrologic unit.**
Line	An aqueduct, canal, ditch, or drain used to transport surface water, **alters the natural boundary location.**

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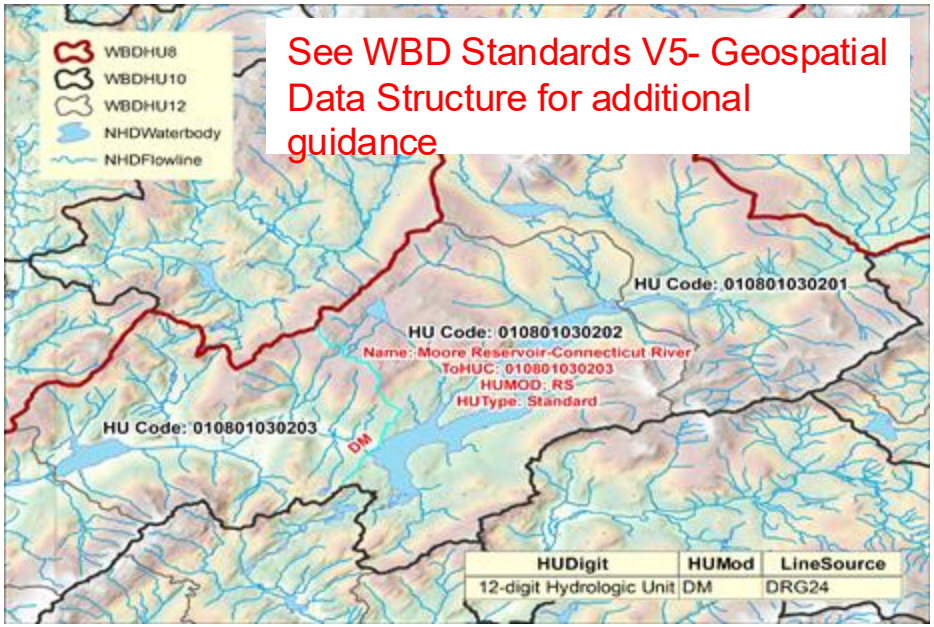
WBD Guidance – Line Attribution

LineSource

- Represents the code for the base data used for developing / delineating the hydrologic unit boundaries
- Populate the field by using one or more of the standardized values
  - Separate multiple values with a comma and no spaces
  - List most recent LineSource value first in the sequence
- Only update code for new features or for features that are updated

LineSource
BUFFER1000M
CANVEC50,NHN50
IFSAR5M2016,OTH
IFSAR5M2018,IFSAR5M2014
NOAA3NM

A few examples of the correct format for LineSource codes



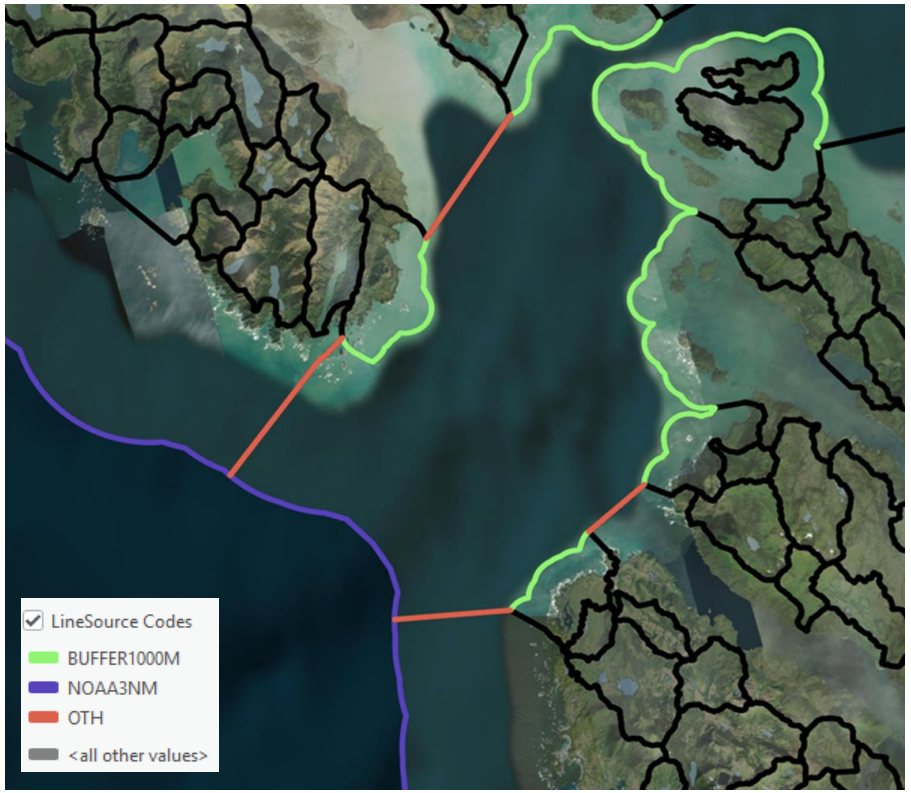
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WBD Guidance – Line Attribution

LineSource

- In coastal areas the offshore boundaries will be based on one of two options
  - Open Ocean areas will be based on NOAA 3NM limit
    - LineSource code is NOAA3NM
  - Inner coastal areas will be based on a buffer distance from the NHD coastline
    - LineSouce code format BUFFER"distance""units" (BUFFER1000M)
- Do not alter the offshore coastal delineations as they are based on very specific data



WBD Guidance – Line Attribution

LineSource

LineSource code	Example	Description
3DEP"resolution""units	3DEP10M	Interpreted from USGS 3D Elevation Program (3DEP) elevation data.
BATH "scale"	BATH24	Interpreted from NOAA 1:24,000-scale or other bathymetric data.
BUFFER "distance" "unit"	BUFFER400F	A near offshore limit used in bays, sounds, or estuaries. The distance offshore is determined by local groups in the State.
CanVec	CANVEC	Interpreted from topographic data of Canada - CanVec Series: topographic information in vector format
DEDEM "resolution" "units"	DEDEM10M	Derived from a drainage enforced Digital Elevation Model.
DEM "resolution" "units"	DEM10M	Derived from a U.S. Digital Elevation Model (DEM) other than the specific sources listed (e.g NED, or 3DEP).
DRG "scale"	DRG24	Delineated from U.S. Digital Raster Graphics. Typically 1:24,000, 1:25,000, or 1:63,360-scale.
EDNA30	EDNA30	Derived from 30-meter Elevation Derivatives for National Applications (EDNA).
IFSAR "resolution" "units" "year"	IFSAR5M2015	Derived from interferometric synthetic aperture radar (ifsar) data.
FIELD	FIELD	Verified using field observation including Global Positioning System (GPS) measurements where applicable.
HYPSO "scale"	HYPSO24	Delineated from U.S. 1:24,000-scale or other contour data.
LIDAR "resolution" "units" "year"	LIDAR1M2016	Derived from lidar data. See required metadata form for details about resolution and acquisition.
MEX "scale"	MEX50	Delineated from Mexico Digital Raster Graphics.
MEXHYPSO "scale"	MEXHYPSO50	Delineated from contours derived from Mexico topographic maps.

Note: See WBD Standards V5- Table 10

WBD Guidance – Line Attribution

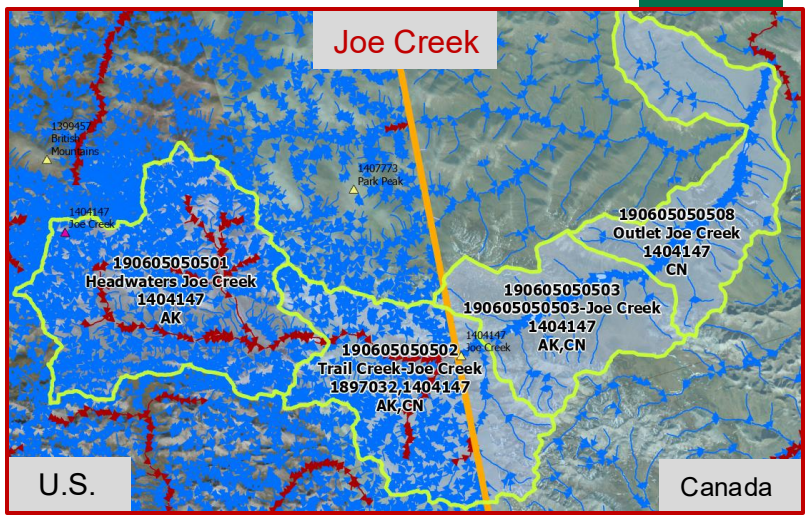
Linesource

LineSource code	Example	Description
NAIP "resolution" "units" "year"	NAIP1M2017	Delineated from aerial photography produced by the National Agriculture Imagery Program (NAIP).
NED "resolution" "units"	NED30M	Derived from the U.S. National Elevation Dataset (NED).
NHD (EDH)	NHD (EDH)	Interpreted from the National Hydrography Dataset (NHD). (Elevation Derived Hydrography)
NHN	NHN	Interpreted from the Canada National Hydrography Network (NHN).
NOAA3NM	NOAA3NM	National Oceanic and Atmospheric Administration three nautical mile demarcation. May be generalized by the user in complex areas for example where island buffers overlap.
NRN	NRN	Interpreted from Canada GPS transportation data captured at 10-meter accuracy.
ORTHO "resolution" "units" "year"	ORTHO10CM2017	Interpreted from orthoimagery.
OTH	OTH	Other. Store additional information in required metadata template or accompanying FGDC metadata.
PFRA	PFRA	Delineated from Canada's Agriculture and Agri-Food Canada Watersheds (Prairie Farm Rehabilitation Administration - PFRA)
"Province" "scale"	NB20	Derived from Canadian Provincial GIS layers.
SPOT "resolution" "units" "year"	SPOT5M2013	Interpreted from System for Earth Observation (SPOT) imagery.
TOPO "scale"	TOPO250	Delineated from hardcopy topographic maps.

Note: See WBD Standards V5- Table 10

Attribution Along the Canadian Border

- Do Not change any attribution for units/ boundaries complete within Canada
  - WBD National team may identify exeptions to this rule through the QC process and will include in the validation results
- States code for Canada is **CN**
- Units crossing the boarder should be coded AK,CN no spaces



TNMID	HUDigit	HUMod	LineSource
{9EB593A2-A8BF-47B4-...	10-digit Hydrologic Unit	NM	BCFWA
{766EC683-49C0-4A87-...	12-digit Hydrologic Unit	NM	CANVEC50,NHN50,CDED30
{8EA5D5D3-4804-4F10-...	12-digit Hydrologic Unit	NM	CAN50,BCFWA

TNMID	AreaSqKm	AreaAcres	States	HUC12	Name	ReferenceGNIS_IDs	HUType	HUMod	ToHUC	NonContributingAreaAcres	NonContributingAreaSqKm
{95C2478E-8338-40A8-...	103	25532	AK,CN	190103040701	Wilms Creek	<Null>	Standard	GL	190103040706	0	0
{7EE2AA32-6E5E-4287-...	160	39508	AK	190605050501	Headwaters Joe Creek	1404147	Standard	NM	190605050502	0	0
{8DBC215B-1144-46B4...	127	31354	AK,CN	190605050502	Trail Creek-Joe Creek	1897032,1404147	Standard	NM	190605050503	0	0
{7B0E9DEE-8665-4123-...	84	20857	AK,CN	190605050503	190605050503-Joe Creek	1404147	Standard	NM	190605050508	0	0
{7419673B-2BC2-4CE4-...	102	25266	CN	190605050508	Outlet Joe Creek	1404147	Standard	NM	190605050606	0	0
36b60f13-3895-42c5-b...	131	32266	CN	190701010601	190701010601	<Null>	Standard	GL	190701010603	0	0

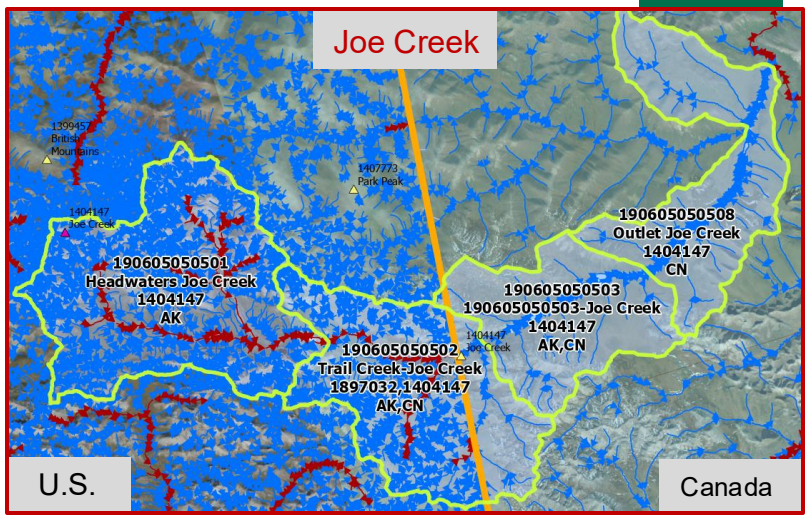
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*Verify that the name is the same in both AK and CN data. Also works for named streams flowing from CN to AK.

Attribution Along the Canadian Border

- Units with **named** streams flowing from AK into Canada should use the AK GNIS codes*
- Named streams in Canada do NOT have GNISIDs, leave ReferenceGNIS_IDs as Null The stream Wilms Creek is completely within Canada it has no GNIS ID code
- LineSource codes within Canada should be for Canada's data, do NOT use the Alaska's IfSAR code unless the data along the border has been revised with the IfSAR data to edgematch.



TNMID	HUDigit	HUMod	LineSource
{9EB593A2-A8BF-47B4-...	10-digit Hydrologic Unit	NM	BCFWA
{766EC683-49C0-4A87-...	12-digit Hydrologic Unit	NM	CANVEC50,NHN50,CDED30
{8EA5D5D3-4804-4F10-...	12-digit Hydrologic Unit	NM	CAN50,BCFWA

TNMID	AreaSqKm	AreaAcres	States	HUC12	Name	ReferenceGNIS_IDs	HUType	HUMod	ToHUC	NonContributingAreaAcres	NonContributingAreaSqKm
{95C2478E-8338-40A8-...	103	25532	AK,CN	190103040701	Wilms Creek	<Null>	Standard	GL	190103040706	0	0
{7EE2AA32-6E5E-4287-...	160	39508	AK	190605050501	Headwaters Joe Creek	1404147	Standard	NM	190605050502	0	0
{8DBC215B-1144-46B4...	127	31354	AK,CN	190605050502	Trail Creek-Joe Creek	1897032,1404147	Standard	NM	190605050503	0	0
{7B0E9DEE-8665-4123-...	84	20857	AK,CN	190605050503	190605050503-Joe Creek	1404147	Standard	NM	190605050508	0	0
{7419673B-2BC2-4CE4-...	102	25266	CN	190605050508	Outlet Joe Creek	1404147	Standard	NM	190605050606	0	0
36b60f13-3895-42c5-b...	131	32266	CN	190701010601	190701010601	<Null>	Standard	GL	190701010603	0	0

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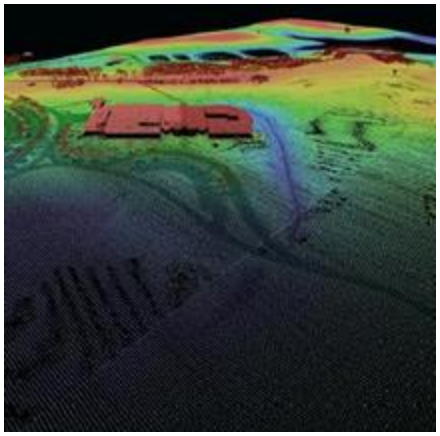
*Verify that the name is the same in both AK and CN data. Also works for named streams flowing from CN to AK.

QA/QC









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WBD Quality Control

QA/QC and the NQC Process

- Ensures that data going back into the national dataset is compliant with the WBD standard and specifications
- Ensures that any cross-state coordination or review is completed before data is incorporated into the national dataset
- Ensures that the editor and NTC have an opportunity to refine any geometry or attribution if needed
- **Important things to be aware of:**
  - All edit submissions are reviewed by the WBD NTC prior to being submitted back into the national dataset
  - If edit submissions do not meet the WBD standards, they will be returned for rework

WBD Quality Control

Things the WBD NTC checks for

- Is data in a WBD compliant schema?
- Is the data provided in the correct projection? NAD83 Alaska Albers
- Was metadata included with the submission and was it correctly populated?
- Are geometry edits topologically sound and compliant with standards?
  - Are polygons and lines topologically clean?
- Are the units within the defined HU size criteria?
  - **It is helpful to recalculate the AreaAcres after making geometry updates to ensure the new/adjusted units meet the appropriate HU size range**

WBD Quality Control

Things the WBD NTC checks for: Geometry

- Do boundaries accurately follow ridgelines?
  - **It is helpful to double check the boundaries with contours after applying a smooth/simplify process to make sure they are still in alignment with the DEM**
- Are boundaries spatially integrated with the hydro at outlets and confluences?
- Are HU boundaries consistent across international borders?
- Are there any edits to 2, 4, 6, and/or 8-digit boundaries via coincident 12-digits, are they minor or major?
  - If major, were the edits coordinated with the state steward and WBD NTC?
- Are there any Bezier (true) curves in the data?

WBD Quality Control

Things the WBD NTC checks for - Attribution

WBDLine	WBDHU8	WBDHU10	WBDHU12	WBDHU14/16
• TNMID • HUDigit • LineSource • HUMod	• TNMID • HUC Code • Name • ReferenceGNIS_ID	• TNMID • HUC Code • Name • ReferenceGNIS_ID • HUType	• TNMID • HUC Code • Name • ReferenceGNIS_ID • HUType • HUMod • ToHUC • NonContributingAreaAcres • NonContributingAreaSqKm	• TNMID • HUC Code • Name • ReferenceGNIS_ID • HUType • HUMod • ToHUC • NonContributingAreaAcres • NonContributingAreaSqKm

WBD Quality Control

Things the WBD NTC checks for: Attribution

- **Polygon Attributes**
  - Were original TNMIDs maintained as appropriate?
    - Make sure there are no duplicate TNMIDs in the WBDHU10, WBDHU12, WBDHU14/16
  - Are HU Code and ToHUC values correct?
  - Are the ReferenceGNIS_ID values populated, and correct?
    - Make sure that ReferenceGNIS_IDs are populated for all units within the DPA that contain a name (not needed if the HUName is the HUCode)
  - Are the name values correct?
  - Are there any duplicate names at the same HU-level within an 8-digit HU?

WBD Quality Control

Things the WBD NTC checks for: Attribution

- **Polygon Attributes**
  - Are the HUMod values correct?
  - Are the HUType values correct?
  - Are the NoncontributingAreaAcres and NoncontributingAreaSqKm maintained and/or updated if needed?
    - If there was a previous NonContributing value in the WBD, the new unit needs to be assessed to see if that value still applies to the new hydrologic unit delineation
    - If there are sinks represented in the EDH then the area contributing to the sink must be included in the NonContributing area fields.
    - Make sure that NonContributingAreasAcres and NonContributingAreaSqKm attributes are populated. All units that have no NonContributingAreaAcres/SqKM should be changed from "Null" to "0"

WBD Quality Control

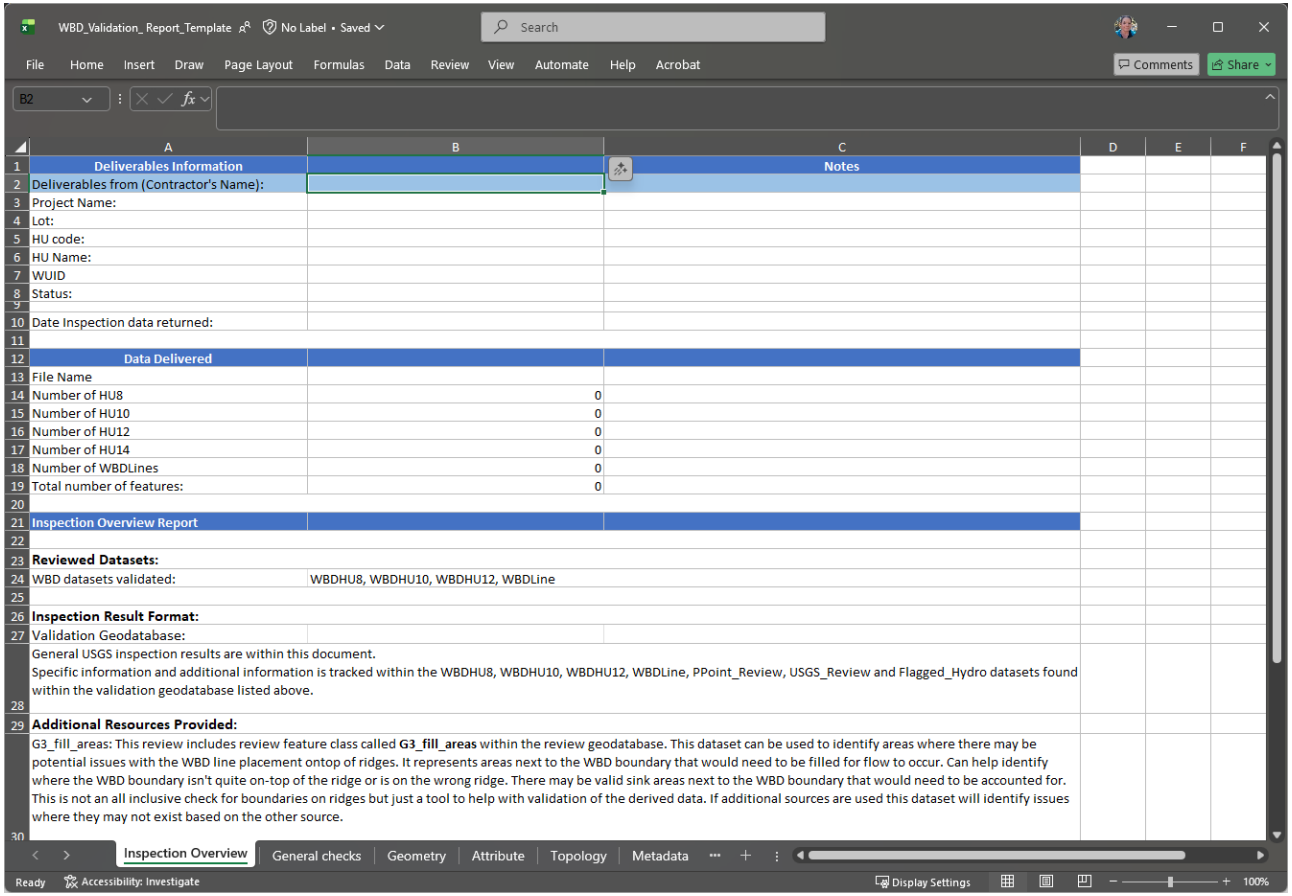
Things the WBD NTC checks for: Attribution

- **Line Attributes**
  - Were original TNMIDs maintained where appropriate?
    - Make sure there are no duplicate TNMIDs in the WBDLine
  - Are the HUMod values correct?
  - Are the HUDigit values correct?
  - Is the LineSource populated correctly and is the syntax correct, listed comma delimited with no spaces?

Reviewed data what you will get back from USGS

- WBD Validation Report

190xxxxx_<UnitName>_WBD_Validation_Report_<Date>.xlsx



WBD_Validation_ Report_Template — No Label • Saved

File Home Insert Draw Page Layout Formulas Data Review View Automate Help Acrobat

	A	B	C
1	**Deliverables Information**		**Notes**
2	Deliverables from (Contractor's Name):		
3	Project Name:		
4	Lot:		
5	HU code:		
6	HU Name:		
7	WUID		
8	Status:		
10	Date Inspection data returned:		
12	**Data Delivered**		
13	File Name		
14	Number of HU8	0	
15	Number of HU10	0	
16	Number of HU12	0	
17	Number of HU14	0	
18	Number of WBDLines	0	
19	Total number of features:	0	
21	**Inspection Overview Report**		
23	**Reviewed Datasets:**		
24	WBD datasets validated:	WBDHU8, WBDHU10, WBDHU12, WBDLine	
26	**Inspection Result Format:**		
27	Validation Geodatabase:		
28	General USGS inspection results are within this document. Specific information and additional information is tracked within the WBDHU8, WBDHU10, WBDHU12, WBDLine, PPoint_Review, USGS_Review and Flagged_Hydro datasets found within the validation geodatabase listed above.		
29	**Additional Resources Provided:**		
30	G3_fill_areas: This review includes review feature class called **G3_fill_areas** within the review geodatabase. This dataset can be used to identify areas where there may be potential issues with the WBD line placement ontop of ridges. It represents areas next to the WBD boundary that would need to be filled for flow to occur. Can help identify where the WBD boundary isn't quite on-top of the ridge or is on the wrong ridge. There may be valid sink areas next to the WBD boundary that would need to be accounted for. This is not an all inclusive check for boundaries on ridges but just a tool to help with validation of the derived data. If additional sources are used this dataset will identify issues where they may not exist based on the other source.		

Inspection Overview | General checks | Geometry | Attribute | Topology | Metadata

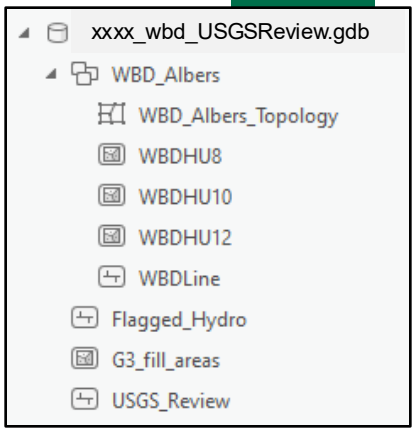
Ready — Accessibility: Investigate — Display Settings — 100%

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Reviewed data what you will get back from USGS

- Geodatabase that includes:
  - WBDHU8, HU10, HU12 and Line feature classes
  - WBDHU14 will be included for areas where HU14 are delineated
  - Feature attribute tables will include new fields "_Review"
    - _Review fields include suggested attribute updates
    - Outlet_Review and Geometery_Review note geometry updates



WBDLine

Field: Add Calculate | Selection: Select By Attributes Zoom To Switch Clear Delete Copy

	TNMID_Review	HUDigit_Review	Linesource_Review	HUMod_Review	Outlet_Review	Geometry_Review
1	<Null>	ok	ok	ok	<Null>	Update Needed: Boundary is not fully on the crest of the ridge as...
2	<Null>	ok	ok	ok	<Null>	Update Needed: Boundary is not fully on the crest of the ridge as...
3	<Null>	ok	ok	ok	<Null>	Update Needed: Boundary is not fully on the crest of the ridge as...

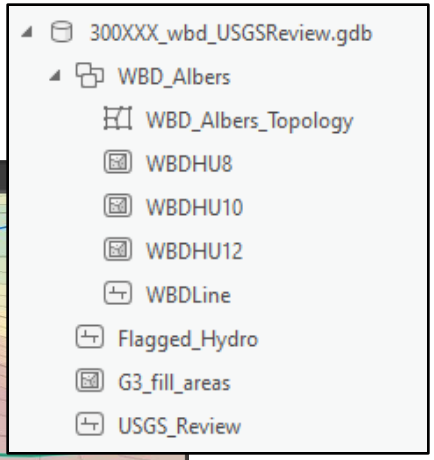
WBDHU12

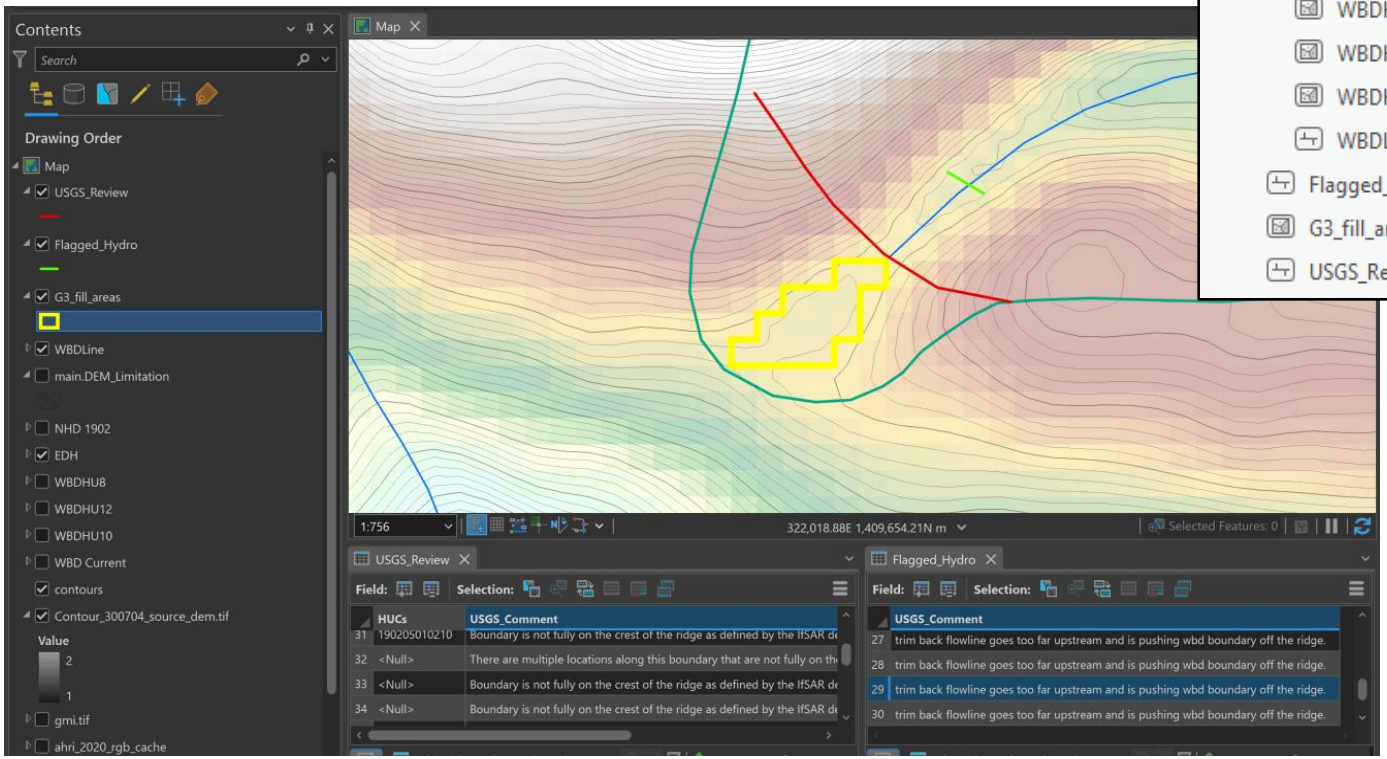
Field: Add Calculate | Selection: Select By Attributes Zoom To Switch Clear Delete Copy

	TNMID_Review	HUC12_Review	Name_Review	RefGNISID_Review	HUType_Review	HUMod_Review	ToHUC_Review	NonContribAcres_Review	NonContribSqKm_Re...
6	ok	ok	ok	ok	ok	ok	ok	ok	ok
7	ok	Update Needed: Or...	Update Needed: afte...	Update Needed: revi...	Update Needed: re...	Update Needed: re...	Update Needed: In...	ok	ok
8	ok	ok	ok	ok	ok	ok	Update Needed: af...	ok	ok
9	ok	ok	ok	ok	ok	ok	Update Needed: af...	ok	ok

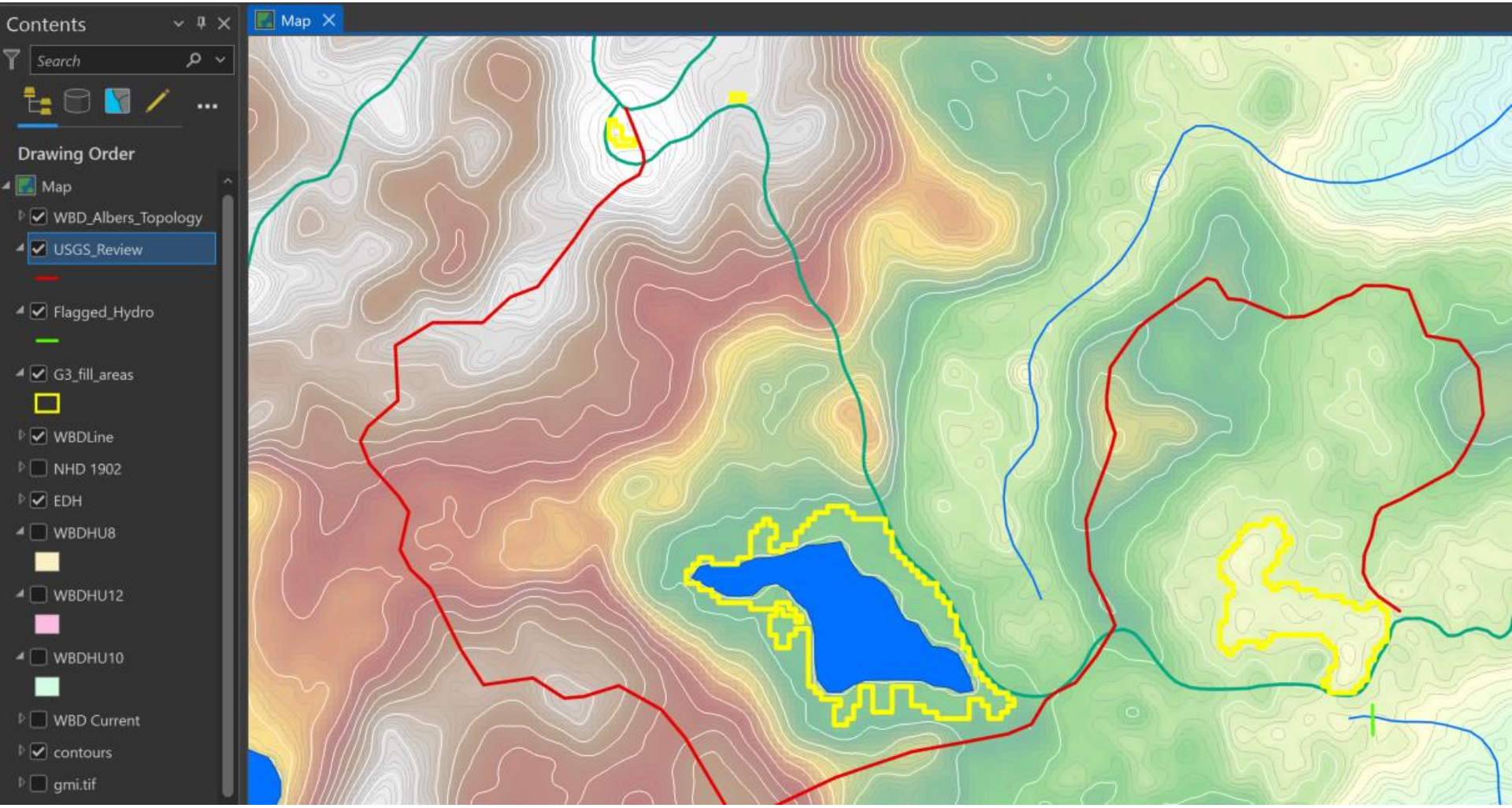
Reviewed data what you will get back from USGS

- Geodatabase that includes (continued):
  - Flagged Hydro and USGS Review feature classes
  - G3_fill_area feature class
  - Topology (optional if there are no errors)

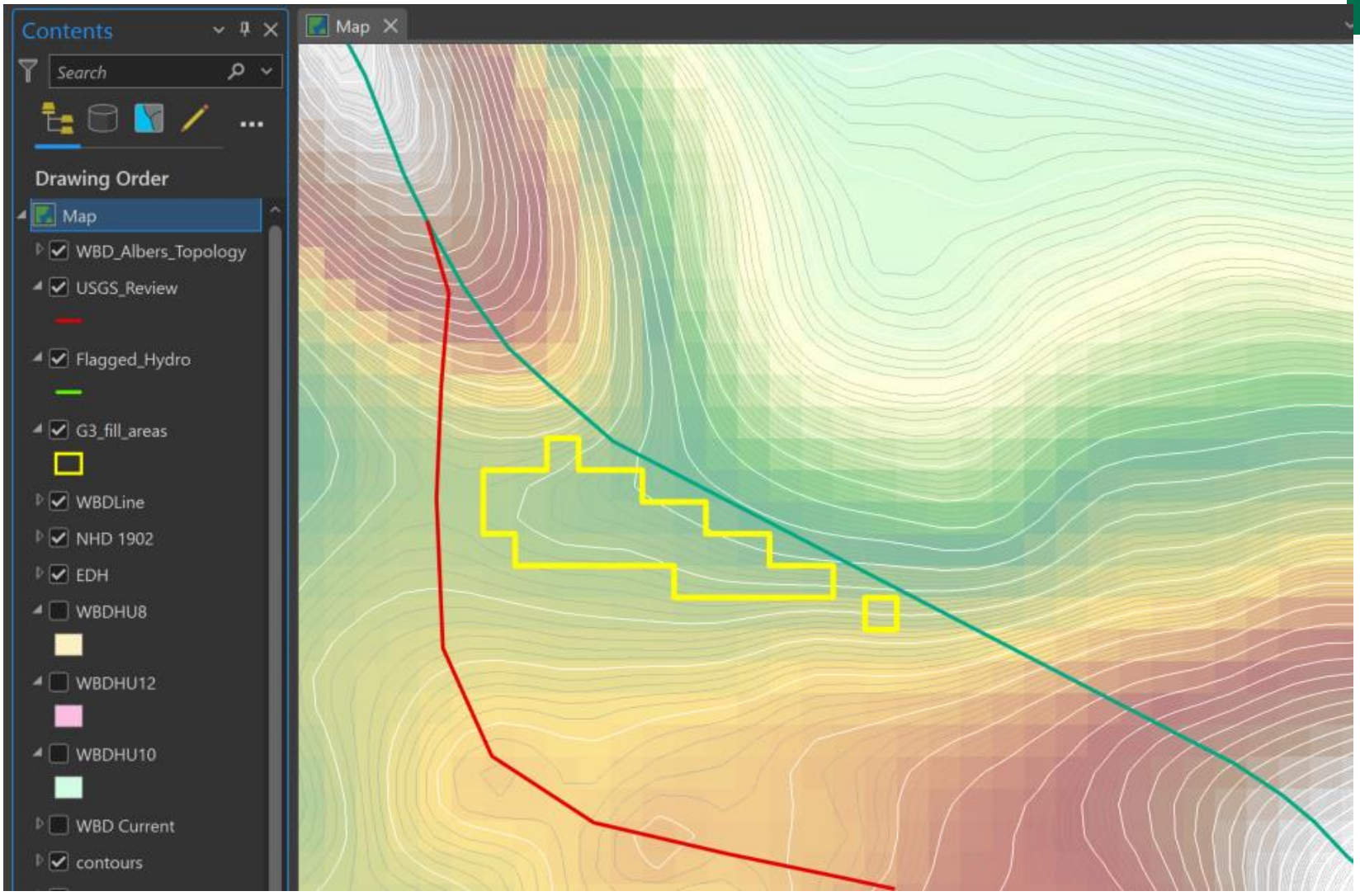




Reviewed data what you will get back from USGS

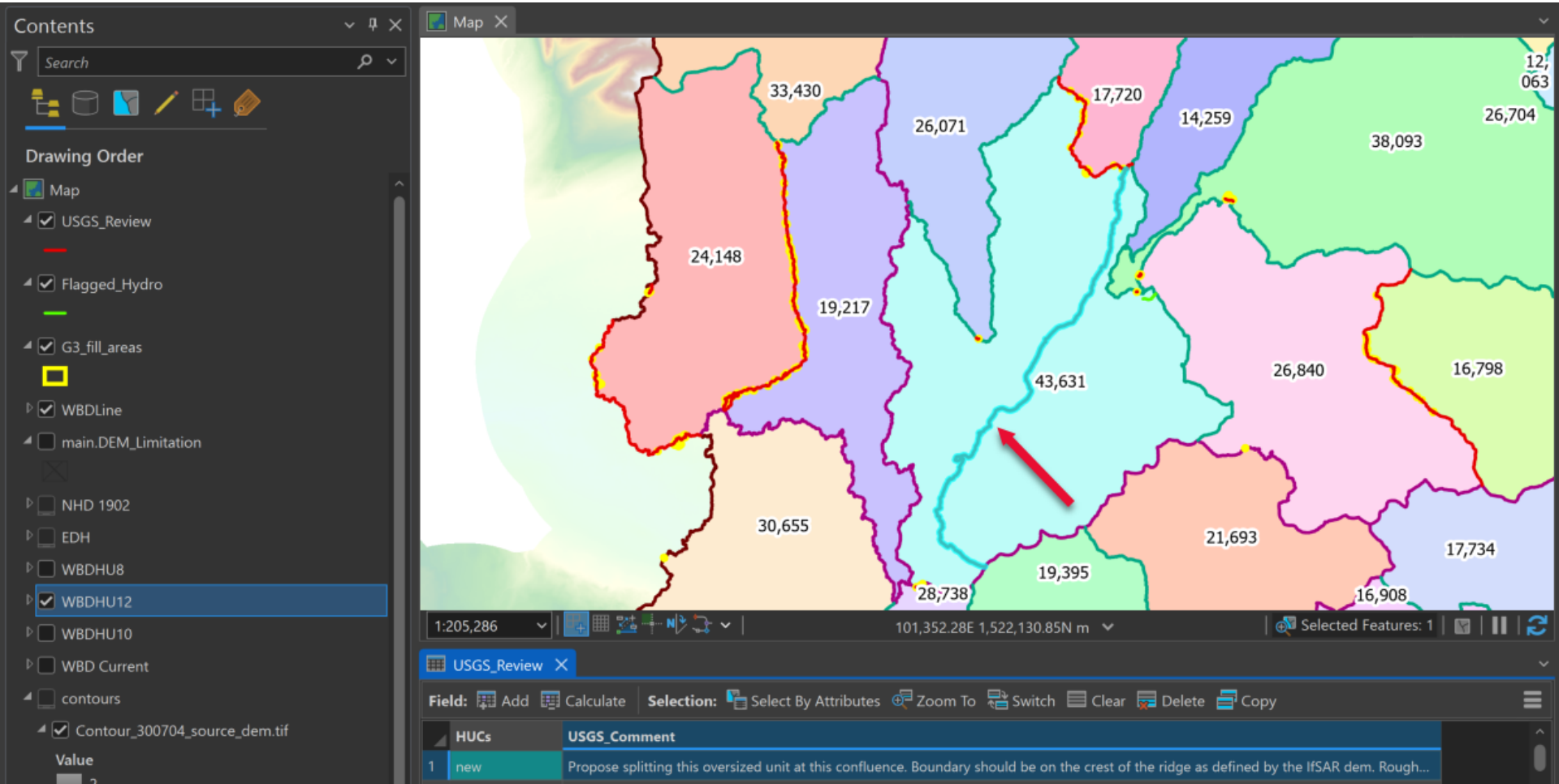


Reviewed data what you will get back from USGS



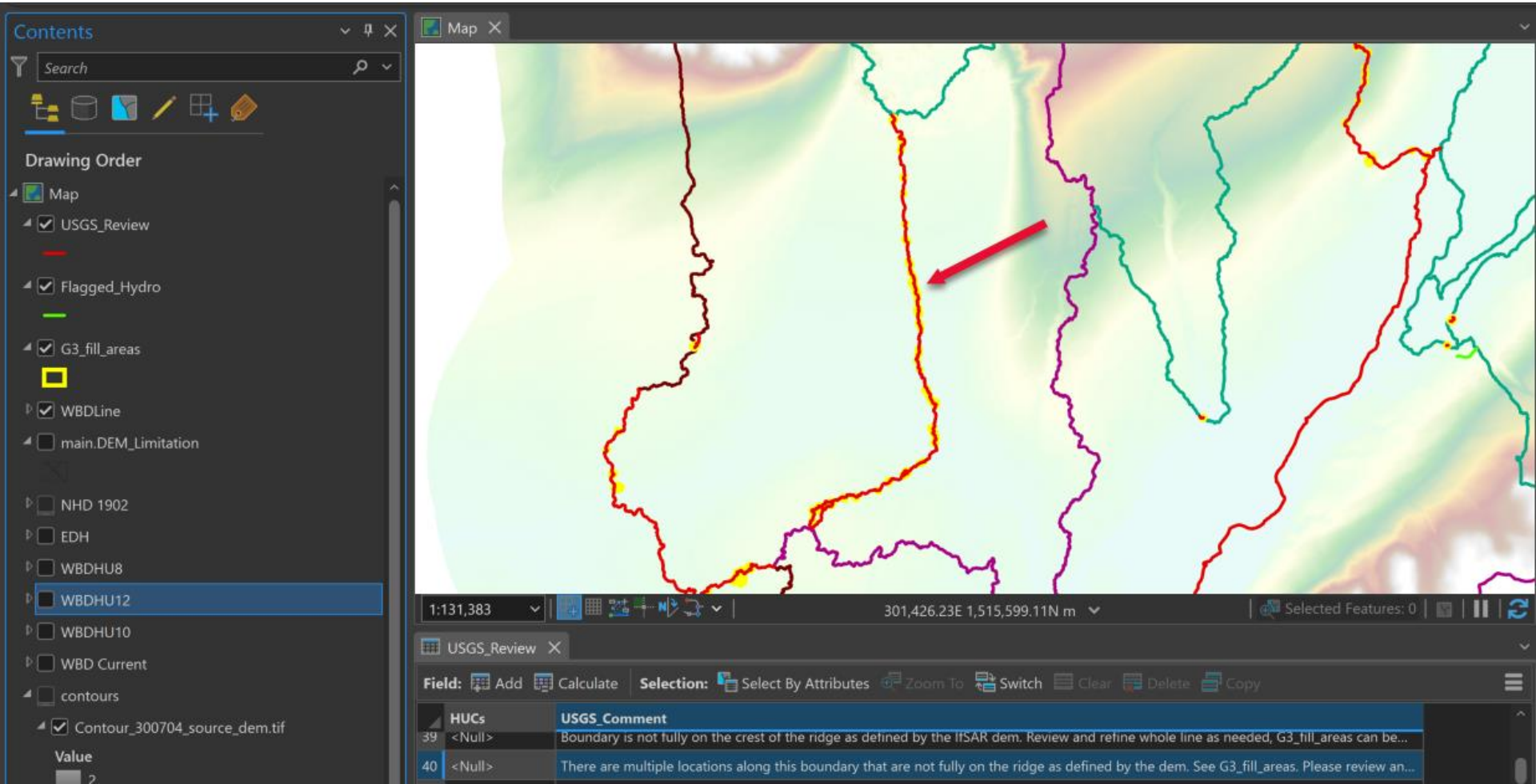
Reviewed data what you will get back from USGS

- USGS_Review: Propose splitting a large unit



Reviewed data what you will get back from USGS

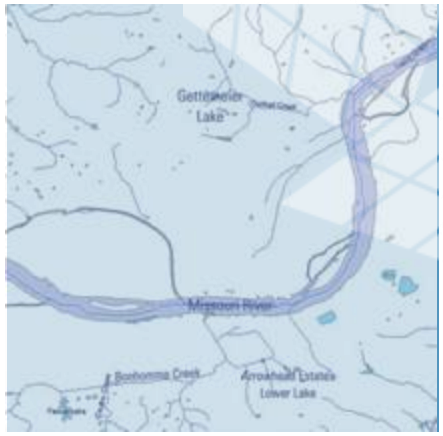
- USGS_Review: Mulitiple areas along the line not fully on the ridge

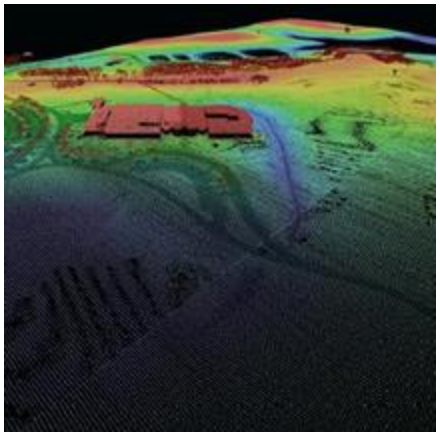


Questions?









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