

# Mapping Standard Compliant Wetlands Data-Supplement (version 2)

U.S. Fish and Wildlife Service National Wetlands Inventory

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## Introduction

This updated document rescinds and replaces the September 2021 memorandum titled “Revised Mapping Approach for Narrow Linear Habitats” and the “Mapping Standard Compliant Data-Supplement” guidance. These previous documents led to confusion that impeded workflow for cooperators, and NWI staff, notably:

1. Inconsistency among data producers resulting in drastically different and regionally inconsistent NWI datasets.
2. Increased workload by Regional Wetland Coordinators in providing guidance and clarification to data producers as well as increased time reviewing data.

The update is being provided by the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) Program to clarify Federal Geographic Data Committee (FGDC) Wetlands Mapping Standard requirements to aid in polygonal wetland feature interpretation and standards-related expectations. Data producers (e.g., contractor or cooperator) are requested to bring their funders and NWI program staff together to clarify project-specific needs at the beginning of a project. A pre-mapping discussion of the project area and expectations will greatly assist data producers in making consistent, project-wide mapping decisions and ensure a final standard-compliant data product that is completed on time and within budget. If potential mapping issues or questions arise, it is the responsibility of the data producer and/or the project funder to work with NWI staff to determine the best path forward.

## Background

The NWI Program continues to update the National Wetlands Data Layer to enhance its applicability. The Data Layer has advanced considerably from a collection of analog maps to a highly detailed geospatial dataset of wetlands and deepwater habitats within CONUS. In Alaska, a comprehensive wetland map is anticipated in the next decade. In 2009, the Federal Geospatial Data Committee, in partnership with the USFWS, adopted the Wetlands Mapping Standard (FGDC 2019). In 2015, the NWI Program updated the National Wetlands Data Layer (NWI Version 2) to include long, narrow, non-vegetated wetland features (i.e., streams) not previously incorporated into the polygonal dataset. These features were not included in the earlier polygonal dataset due to cartographic conventions and limitations. The goal in adding these features was to increase the usefulness of the wetland data by showing connectivity with riverine and lacustrine systems. Many of these narrow wetland features had been created as part of the earlier analog NWI mapping process, including features from the U.S. Geological Survey’s Digital Raster Graphics (DRG) and National Hydrography Dataset (NHD).

## Creating Standard Compliant Data

There is no nationwide funding available through NWI to update or complete a wetlands layer for the nation, so the Program primarily relies on other federal agencies, Tribes, and state and local governments to fund mapping updates in CONUS and new mapping in Alaska. The NWI Program strives for national data consistency based on technical mapping and classification standards yet recognizes that data funders’ needs vary. Provided the wetland mapping data produced meets the minimum standards outlined in the Wetlands Mapping Standard, data funders and producers have the flexibility to establish project-specific objectives to meet their data needs.

## Feature Inclusion Using the Hydrologic Reference Data Set (HRDS)

***This guidance is only given for the Conterminous United States (CONUS) and excludes Alaska, Hawaii, and the Pacific Trust Territories.*** To ensure consistency in the representation of narrow features nationwide, the NWI Program has

created a reference layer to aid in data creation which will simplify the process of determining which features should be included in the polygonal dataset.

The previous guidance put the responsibility on data producers to measure stream widths and demonstrate that features not included in the polygonal dataset were less than 15 feet wide, and therefore, were not required to meet the Wetlands Mapping Standard. This guidance resulted in confusion and inconsistent data products, as well as increased workload on Regional Wetland Coordinators during data review. In order to reduce confusion, the NWI Program is establishing a minimum cartographic density for stream and river features that are to be included in the polygonal dataset. This density will be incorporated into the Hydrologic Reference Data Set<sup>1</sup> (HRDS, reference layer).

***The HRDS dataset will be provided to data producers as a reference layer within the project geodatabase checkout from the Madison Data Center and will also be available for download from the NWI website.***

This updated guidance requires **all** features in the supplemented HRDS be included in the NWI polygonal dataset using the following guidelines:

1. Polygonal stream/river features must meet the required horizontal accuracy standard and match the source imagery (Figure 1). Features generated using ancillary data, such as High Resolution NHD or 3DHP, may remain in their original position if they meet horizontal accuracy requirements. Each feature in the HRDS needs to be evaluated for inclusion in the polygonal dataset, ensuring that the features are legitimate, active, and that horizontal accuracy requirements are met. The HRDS is not meant to be buffered and included “as is” in the polygonal layer.
2. If a feature contained in the HRDS reference layer is not included as an NWI polygon, there should be visible evidence on imagery demonstrating that the feature is no longer active (e.g., the feature was removed from the landscape through development or other drivers) and/or verified by a field site visit (Figure 2).
3. If a reference layer feature is obscured in the source imagery and has no other supporting evidence suggesting the feature should be excluded from the dataset (e.g. field visit), it should be considered active and added to the project dataset as an NWI polygon (Figure 3).
4. Wetland features should always be mapped to the higher lifeform. For example, if imagery around a reference layer line has a strong vegetation signature and appears as a palustrine wetland in the imagery, the feature should be mapped as palustrine, and not as riverine (Figure 4).
5. All riverine features added as an NWI polygon should be connected to another wetland, deepwater, or riparian feature. The connection should be at either its origin or destination unless depicted as an isolated stream segment within the reference layer dataset (e.g., some agricultural ditches streams in the arid West ending on alluvial fans or Pleistocene playas) (Figures 5 - 7). Special exceptions may be allowed with the agreement of NWI Regional Wetland Coordinator and should be documented in the metadata report.
6. The HRDS is the minimum stream density network required in the NWI polygonal dataset. Additional riverine features from High Resolution NHD/3DHP or other wetland features may be added at the discretion of funders and/or data producers to meet project goals (Figure 8).

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<sup>1</sup> The Medium Resolution NHD was used as a baseline to establish the minimum density of streams required in the HRDS. However, the NHD dataset does not have a consistent density across the country. Therefore, in low density areas, the NWI Program supplemented the NHD layer with features identified using the VisibilityFilter attribute of the High Resolution NHD (based on a scale of 1:100,000). More information about the VisibilityFilter attribute can be found on the USGS website: <https://www.usgs.gov/national-hydrography/visibilityfilter>.

7. If a feature is above the TMU as described in the Wetland Mapping Standard is not included in the HRDS, then it is required to be mapped as an NWI polygon.

The examples below provide data producers with additional clarity to the guidelines for producing narrow wetland features in the polygonal NWI Dataset. Data producers may encounter situations that are not explicitly described in this guidance document and should consult the assigned Regional Wetland Coordinator for clarification to questions as they arise to maintain efficient mapping workflows.

## Examples to Illustrate the Mapping Guidelines:

### Guideline 1 – Horizontal Accuracy:



Figure 1- 1:12,000 image from Montana. This is a representation of wetland polygons that meet TMU requirements and are mapped to meet all federal Wetlands Mapping Standards.

### Guideline 2 – Feature Exclusion:



Figure 2. Urban development has altered the stream feature represented in HRDS. Data producers should use ancillary data or fieldwork to determine if the feature has been relocated or removed from the surface flow network entirely before excluding it from the dataset.

### Guideline 3 – Obscured Features:



Figure 3. HRDS streams or rivers obscured by tree canopy, shadow, snow, etc. should be included in the polygonal dataset unless there is sufficient ancillary data to suggest the feature is no longer an active stream.

### Guideline 4 – Map to the Highest Lifeform:

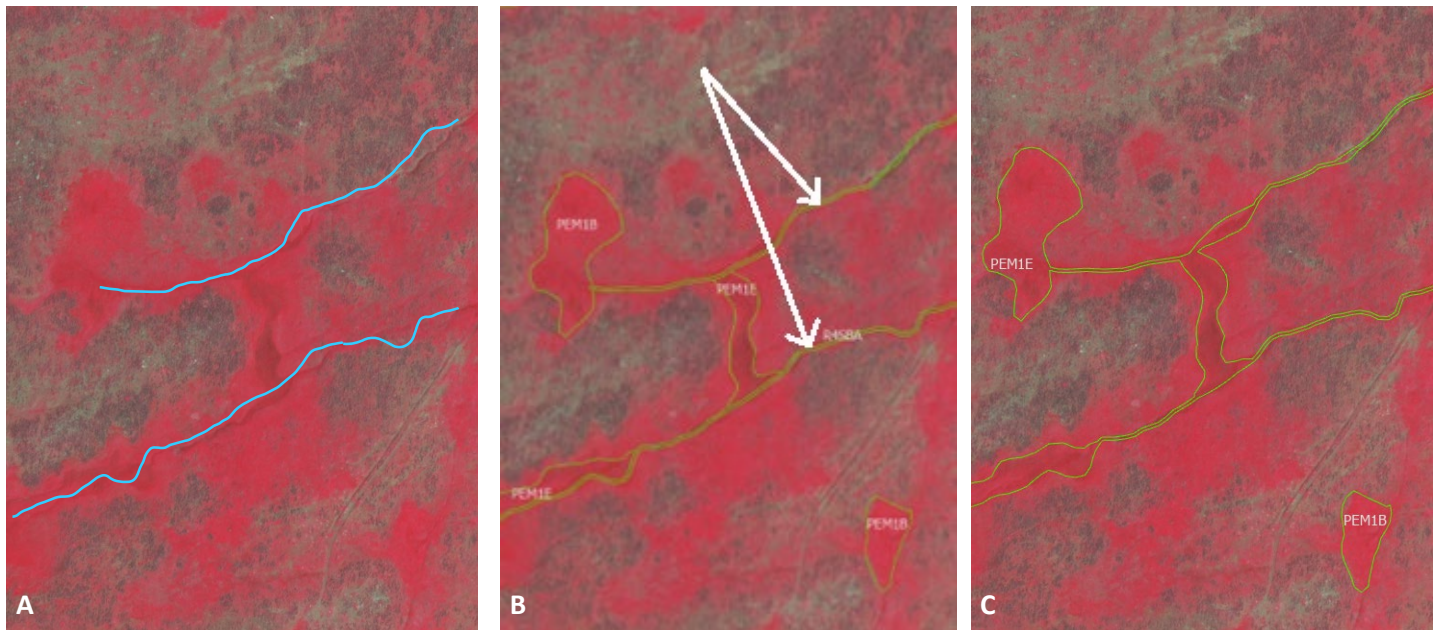


Figure 4. Palustrine features supersede riverine features on the landscape. In the example above, the riverine features are not visible but are indicated by NHD lines (A; blue lines) and were included as riverine features (B; yellow polygons) as part of NWI Version 2. Under this guidance the entire feature should be mapped as vegetated palustrine wetland (C), not as riverine wetland. This scenario is common in the Arid West where groundwater surfaces intermittently along stream channels.

Guideline 5 – Feature Connectivity:

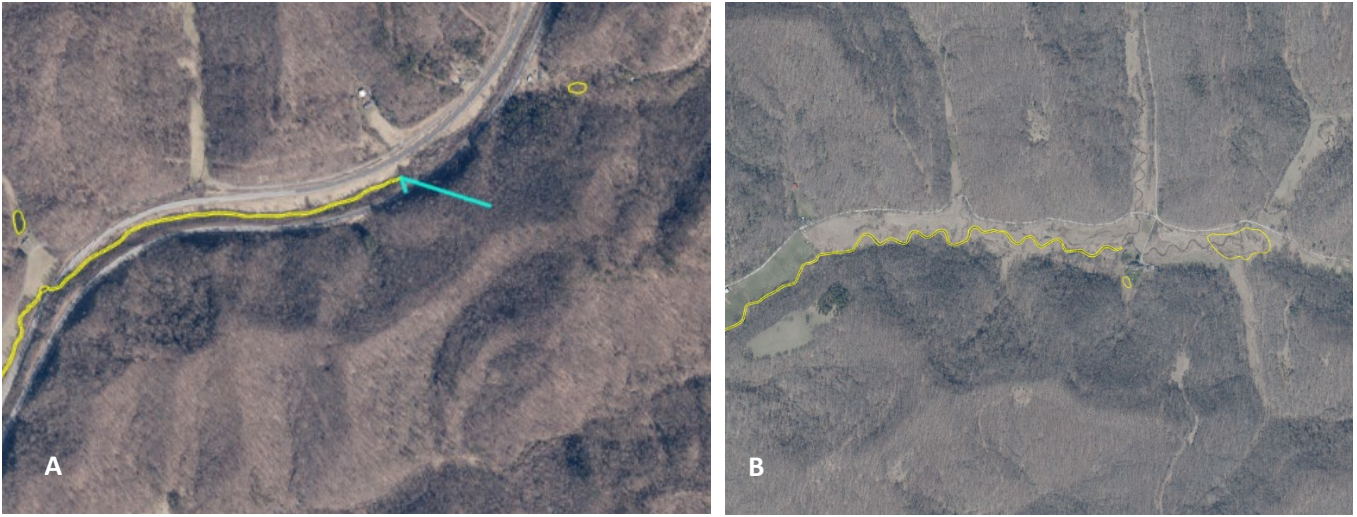


Figure 5. Example of a mapped riverine feature that ends mid-reach (A); the feature should be continued until the next logical stopping point, such as a confluence or impoundment. In example B, the mapping was stopped at a confluence but there is a palustrine feature mapped just upstream that is a more logical stopping point for the mapping, especially since the stream is visible in the imagery.

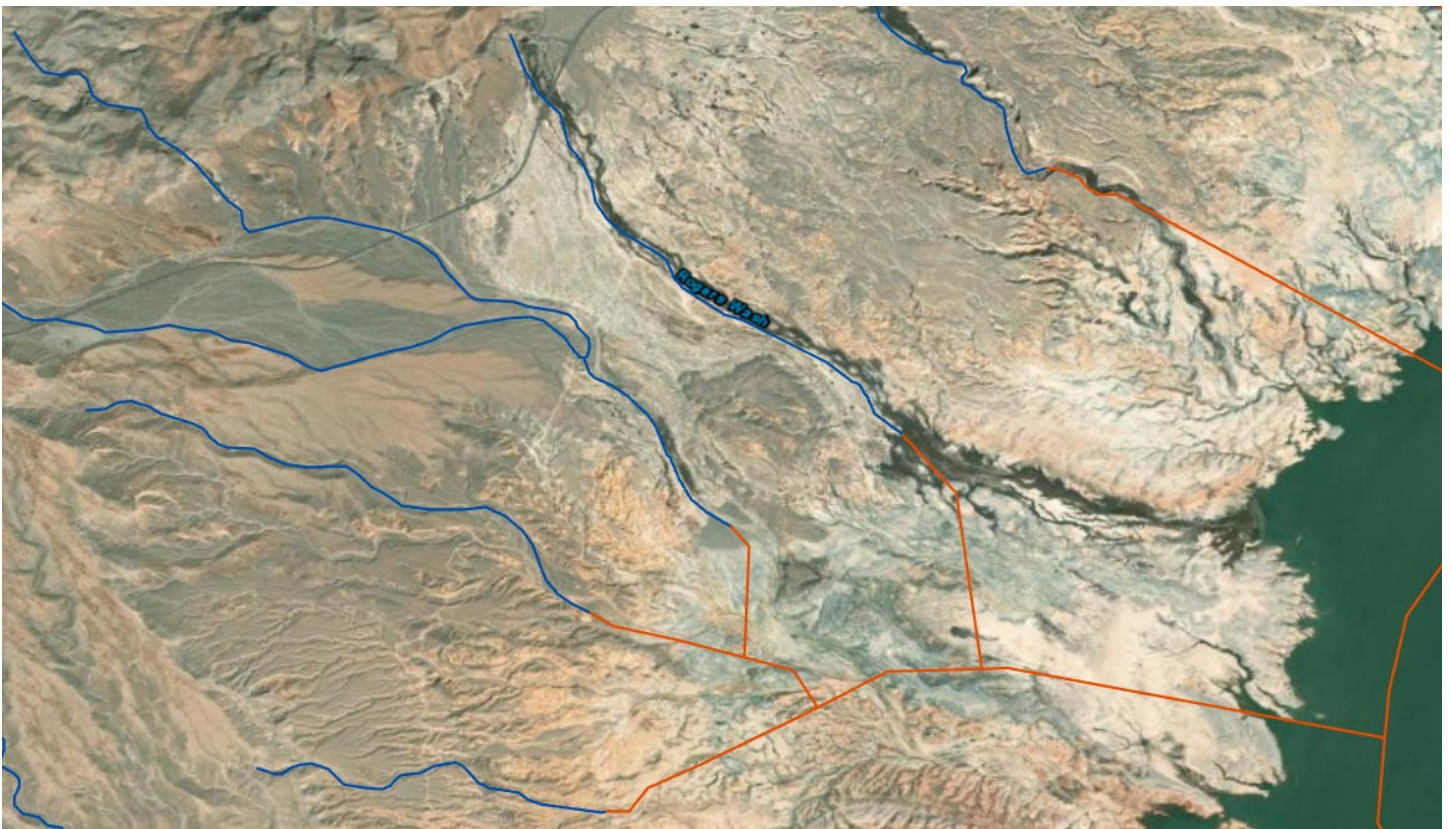


Figure 6. Example of riverine features (blue lines) that end at Artificial Connectors (orange lines). Stream/River features should be continued to the next logical endpoint, such as a confluence or other wetland feature (in this example the reservoir, not mapped), using base imagery and/or elevation data to inform mapping decisions.

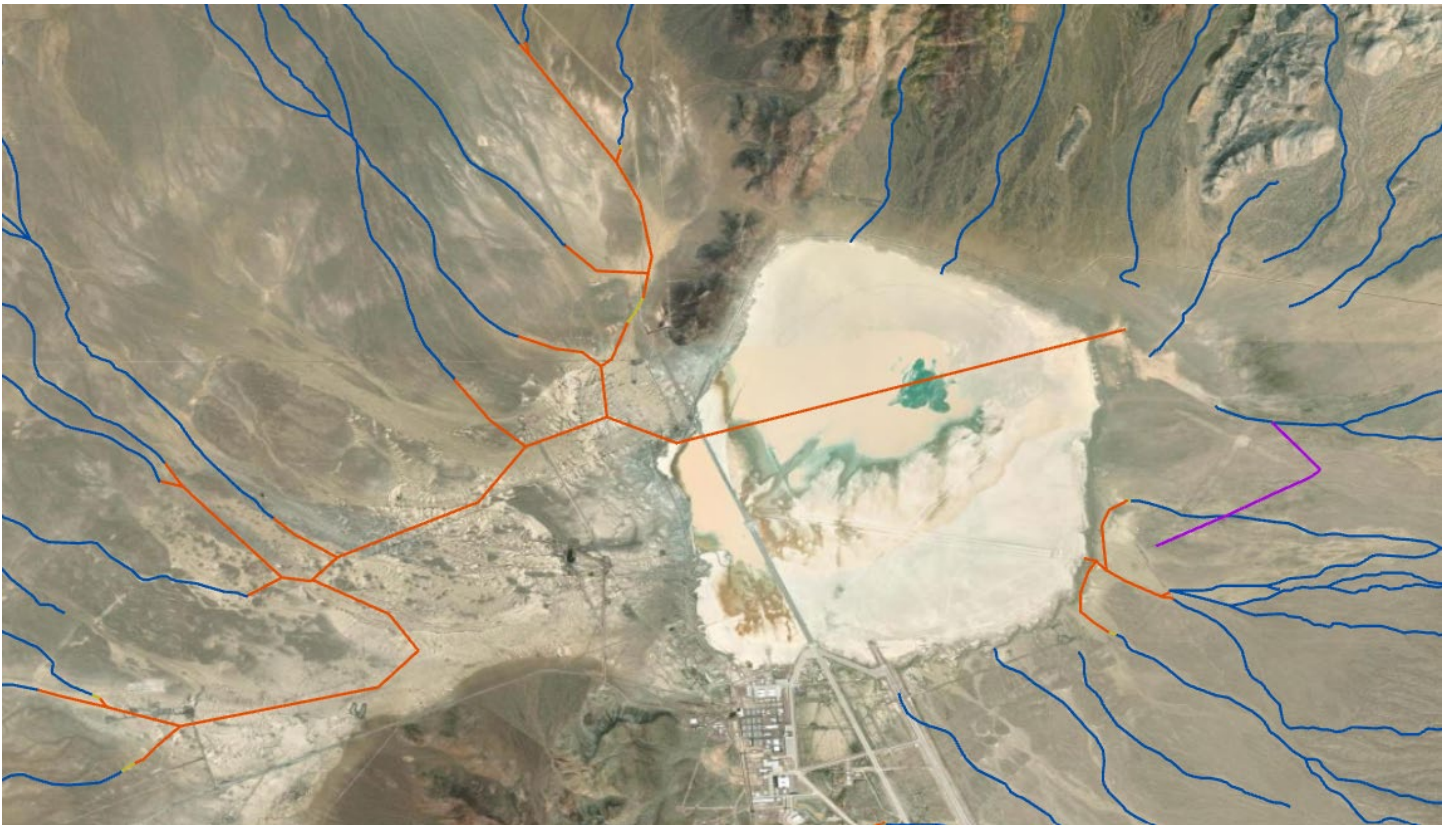


Figure 7. NHD Artificial Connectors (orange lines) may not accurately represent surface water connection in alluvial fans or playas in the Arid West. Ancillary data and fieldwork are required to identify when stream features (blue lines) must be connected to another wetland feature. In some cases, there may be no mapped wetland feature, and the feature may terminate where the imagery reasonably suggests surface water connection is lost.

**Guideline 6 – Minimum Requirements:**

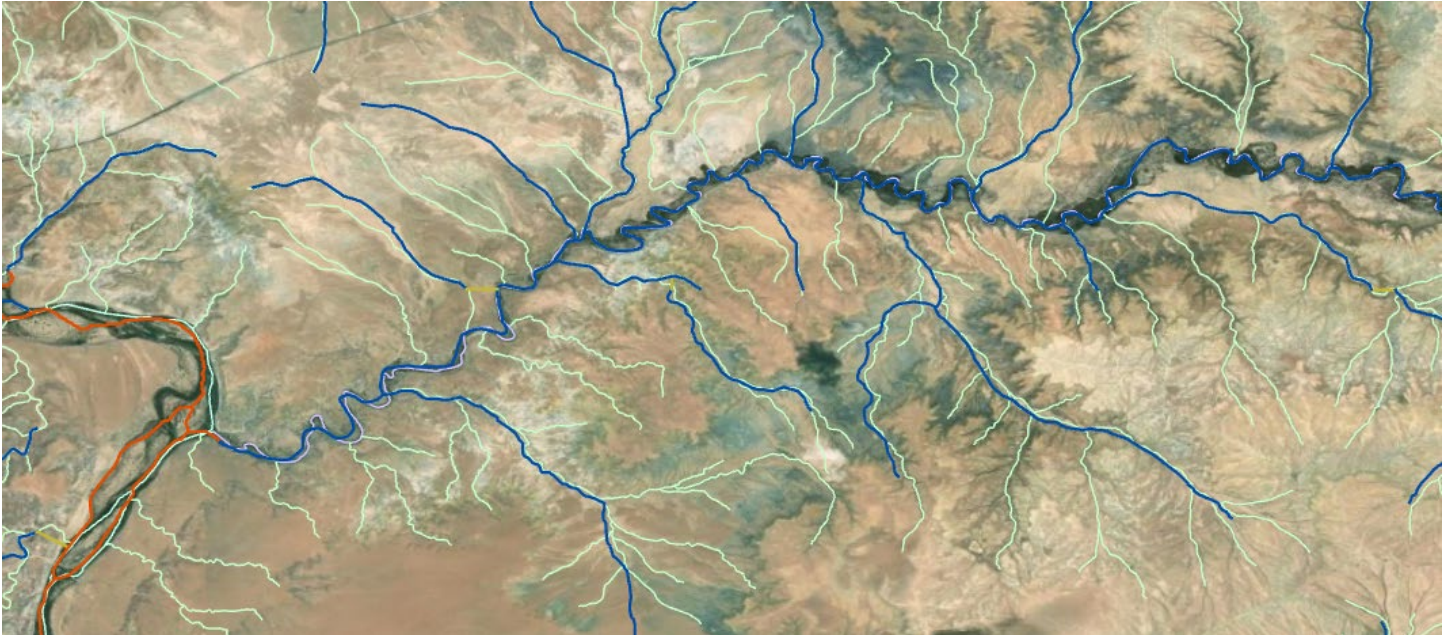


Figure 8. The HRDS reference layer (blue and red lines) is the minimum requirement for stream and river density represented in the NWI polygonal dataset. Additional streams may be added at the discretion of the data funder or data producer (green lines = High Resolution NHD).

## Additional Guidelines to Aid Mapping of Riverine Features:

- **Culverts:** Spatial continuity of hydrologic features is important, but not required, to accurately represent wetlands and deepwater habitats. Imagery can provide evidence that a connection via a culvert or other anthropogenic feature is present. The assumption of a connection may be made if there is no evidence on an image to suggest that water flow is being impeded or slowed. Decisions to connect features through roads or other uplands will be left up to the data producer depending on project objectives.
- **Ditches:** Ditches can provide important connections and habitat. Representation of ditches and other man-made features within NWI data is consistent with the FGDC Wetlands Classification Standard (FGDC 2013). *Ditches are considered excavated streams and must adhere to the same standards as all NWI wetlands.* **Bridges:** Non-vegetated wetlands and riverine features that connect under a bridge that does not impede water exchange should be represented as one continuous polygon. Imagery and ancillary data sources can be used to differentiate between bridges (elevated with connected water flow underneath) and causeways (typically of compacted earth and rocks impeding water flow).
- **Alluvial Fans/Braided Streams:** The HRDS does not represent all features of braided streams in the Arid West and standard-compliant mapping does not require the inclusion of additional braided channels if they are not in the HRDS provided with the project checkout GDB. Project objectives should be considered when discussing with NWI staff how to represent alluvial fans and braided streams. Braided streams in the arid southwest are bound by the banks forming the outer limits of the depression within which the braiding occurs (FGDC 2013). An example of standard and non-standard compliant mapping of braided streams is shown in Figure 9.



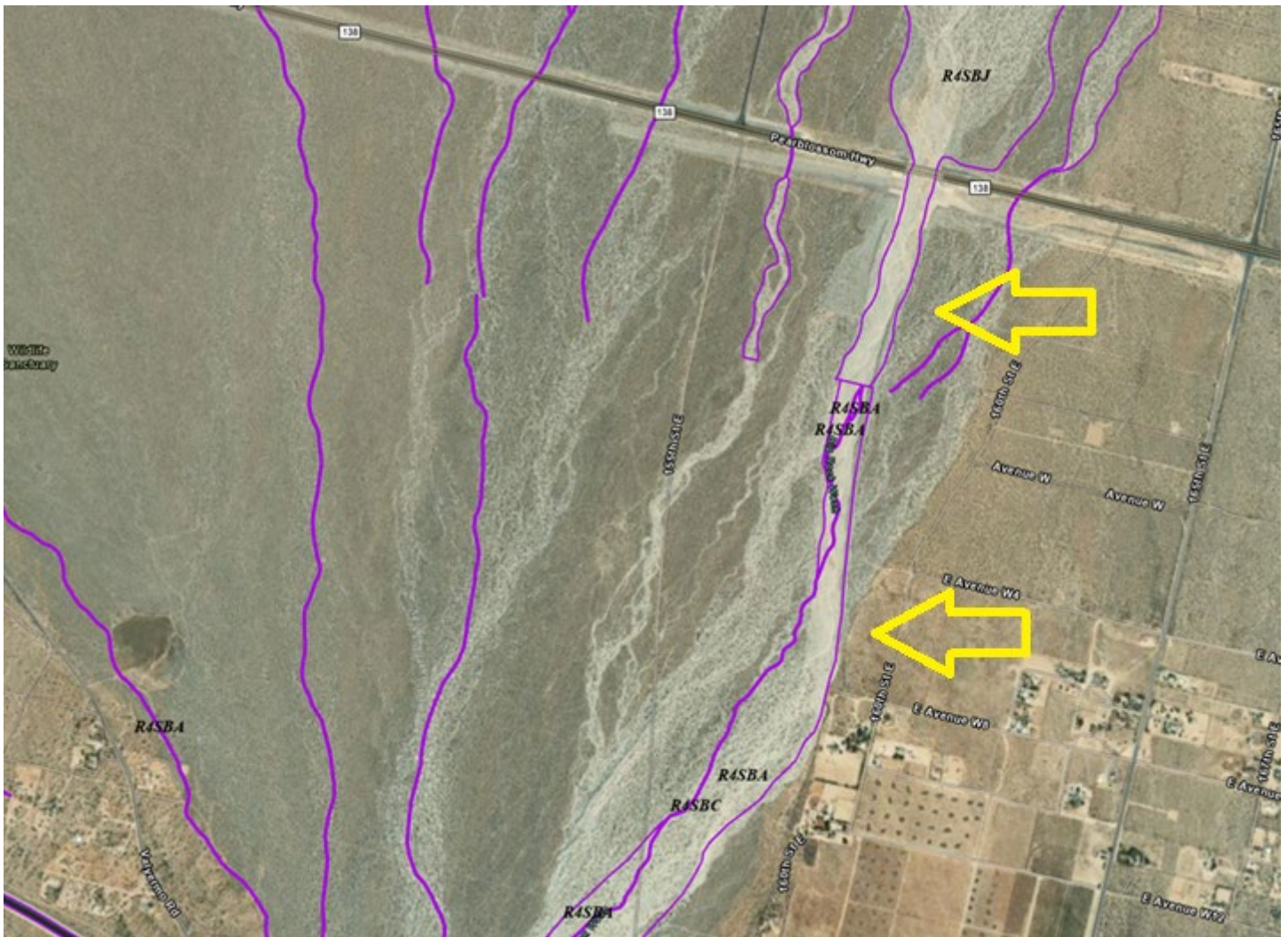


Figure 9. Braided streams should be defined and represented as one large polygon. Communication with NWI staff is essential to understanding how best to represent features in a way that is standard compliant. In the example above, the features were mapped by different mappers at different times, and while variation in flood frequency and changes to spatial extent is not unexpected. In cartographic terms, the representation of the feature indicated by the top arrow is correctly captured, while the feature indicated by the bottom arrow is incorrectly mapped.

## Examples of Hydrologic Reference Data Set Conflicts:



Figure 10. The HRDS features represented in this example illustrate several mapping considerations as described in the guidelines above: 1) improper alignment—if the HRDS feature is buffered as is, the resulting polygon will not meet horizontal standard requirements; 2) disconnected features—the riverine feature should connect to another wetland feature unless there is sufficient ancillary data to show there is no surface water connection; and 3) feature obscurity—features obscured by tree canopy should remain in the dataset unless there is sufficient ancillary data to support their removal.

## References

- Federal Geographic Data Committee FGDC Wetlands Subcommittee. 2013. *Classification of Wetlands and Deepwater Habitats of the United States*, 2<sup>nd</sup> ed. FGDC-STD-004-2013. U.S. Geological Survey, Reston, VA.
- Federal Geographic Data Committee FGDC Wetlands Subcommittee. 2019. *Wetlands Mapping Standard*. FGDC-STD-015-2009. U.S. Geological Survey, Reston, VA.

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