

Canada-U.S. Hydrographic Data Harmonization: *IJC's International Watersheds Initiative*



Transboundary Hydrographic Data Harmonization Taskforce

Environment Canada:

USGS NHD Program:

Natural Resources Canada:

US Environmental Protection Agency:

Agriculture and Agri-Food Canada:

USGS WBD Program:

International Joint Commission:

Dave Harvey

Pete Steeves

Yves Belzile

Thomas Dabolt

Conrad Wyrzkowski

Karen Hanson

Michael Laitta



This presentation is about a US-Canadian effort to sew together –*harmonize*- their fundamental hydrographic frameworks

Bridging Technical, Interpretive and Programmatic differences that have arisen from the divergent evolution of how each Nation views, characterizes and stores Hydrographic datasets.

A Big Border

3,146 Miles of Land Boundary

2,379 Miles of Water Boundary

14 U.S. States share this boundary

7 Canadian Provinces and 1 Territory



The International Joint Commission in Brief



- A Unitary Treaty Organization
- Six Commissioners – Serve without instructions
- Decisions by Consensus
- Operates from Yukon to Gulf of Maine
- Controls Flows in Boundary Waters
- Prevents and resolves Disputes Over Shared Water and air
- Watchdog of Great Lakes Restoration
- Conducts Studies for Governments



The International Joint Commission in Brief Boundary Waters Treaty of 1909



- Treaty between the US and Great Britain with first major Canadian Role
- Necessitated by Water Disputes
- Purpose of Treaty:
 - *Prevent Disputes regarding Boundary Waters*
 - *Provide Mechanism for Resolution of Questions that Might Arise*
- Established the International Joint Commission



The International Joint Commission in Brief Operations Along the Boundary



17 International Advisory Boards
5 Current Binational Task Forces
8 Completed Taskforces and Study Boards

The map shows the US-Canada border with 17 International Advisory Boards marked by red dots. The locations are: Puget Sound, Osoyoos, Kootenay, Greater Columbia, St. Mary-Milk, Souris, Red River, Rainy Lakes, Upper Great Lakes, Great Lakes, Missisquoi, Lake Ontario, and St. Croix. The map also shows the Great Lakes and the St. Lawrence River.



1. Why do we want harmonized hydrographic data
2. Target Hydrographic Datasets
3. Coordination of Hydrographic Harmonization-*basic process*
4. Who are the federal players, who are the local players
5. What is the role of the International Joint Commission
6. Binational status



Why do we want harmonized hydrographic data

- **Assist border** communities with the development of integrated and sustainable **decision making tools**
- **Reduces redundancy** in the reporting and tracking of legal and policy issues
- **Strengthens** and formalizes federal, regional and local stakeholder **participation**
- Will allow stakeholders to look at transboundary basins and hydrography together for **real world applications and analysis**, offering a **common base structure for other adaptive management practices** to occur



Commission for Environmental Cooperation (CEC)



Atlas Scale – Cartographic (small scale data products)

North American Environmental Atlas

1: 1 million to 1: 10 million



What Hydrographic Datasets are being Harmonized

*The 'sewing together' of existing national hydrographic datasets;
setting the stage for further refinements.*

Framework Hydrographic Datasets:

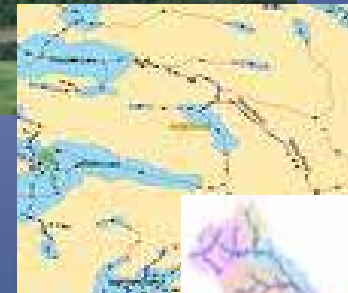
➤ CANADA:

National Hydro Network (NHN)
Refined Fundamental Drainage Areas (FDA)
Prairie Farm Rehab. & Env. Gross Areas (PFRA)



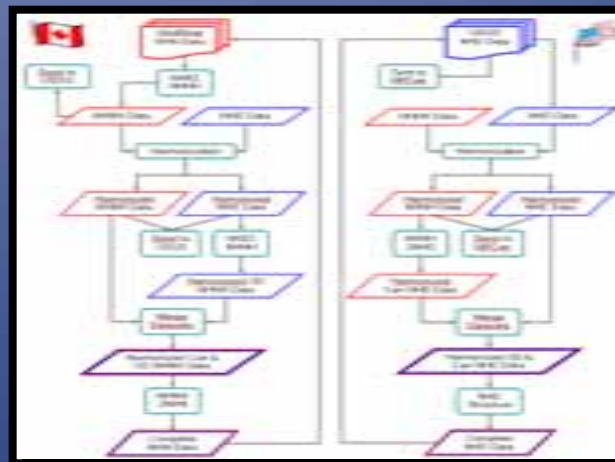
➤ U.S.:

National Hydrographic Dataset (NHD)
Watershed Boundary Dataset (WBD)



Basic Harmonization Process Description: Drainage Areas and Hydro 4 step process

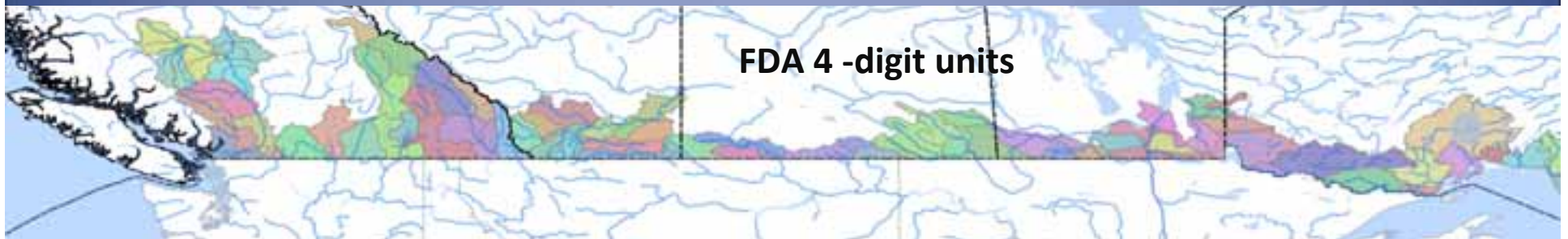
1. Establish a common BASE LINE DRAINAGE AREA LIMIT
2. Harmonize these drainage area units where possible
3. Assess the stream, rivers and water bodies; establish flow path continuity
4. Coordinate a regional/local Hydrographic Data Harmonization Workshop to refine hierarchical drainage areas



Basic Harmonization Process Description

Drainage Areas and Hydro

1. Establish a common BASIN LEVEL DRAINAGE AREA LIMIT



*Transboundary Hydrographic Data Harmonization Task Force
in collaboration with USGS, NRCAN, PFRA&E and EC*

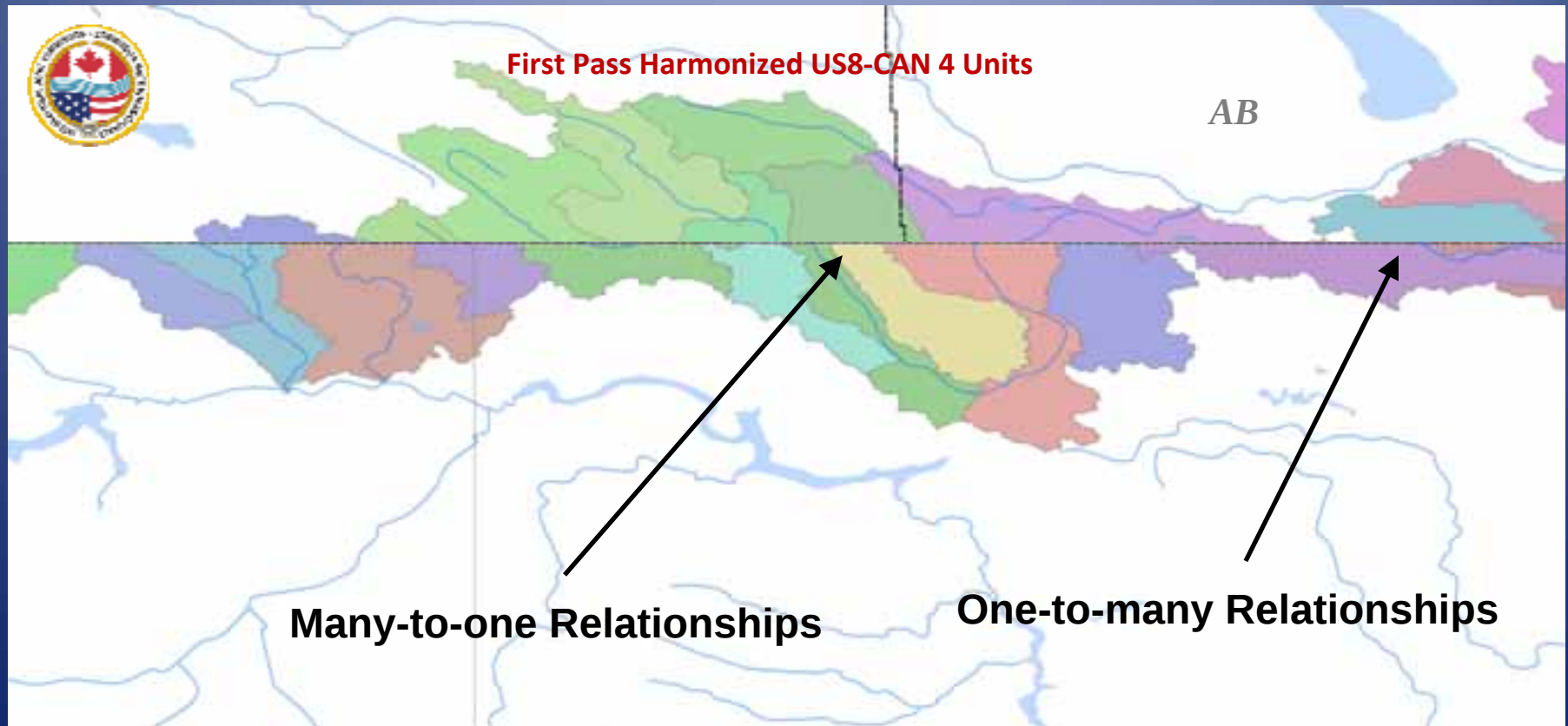


Basic Harmonization Process Description

Drainage Areas and Hydro

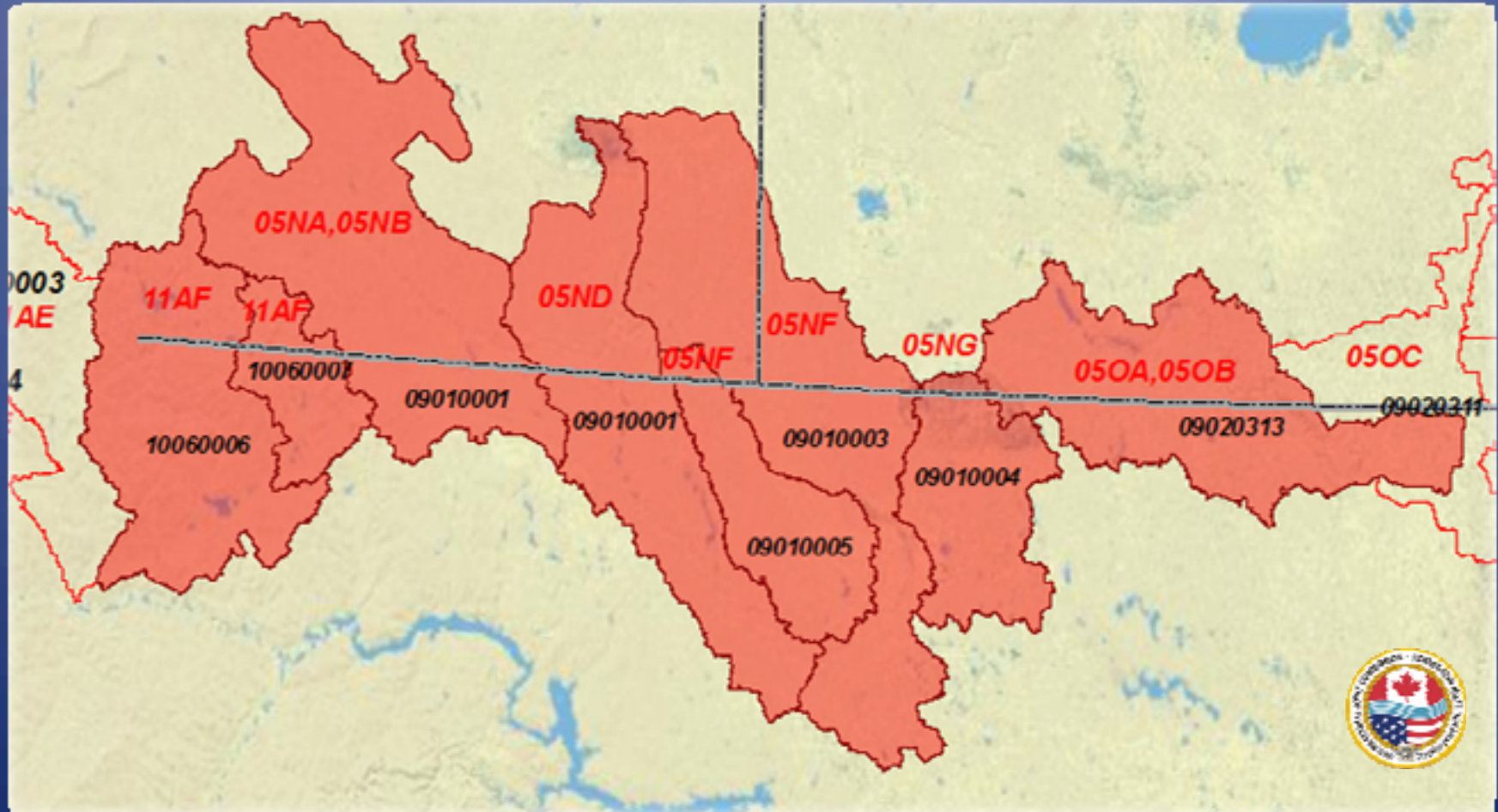
2. Identify the logical, non-complex 1 to 1 relationships then harmonize drainage perimeter (the divide) and attribution –

RESULT: *US8-CAN4* Drainage Area Units



*In Process: 85% complete by the Transboundary Hydrographic Data Harmonization Task Force
in collaboration with USGS, NRCAN, PFRA&E and EC*

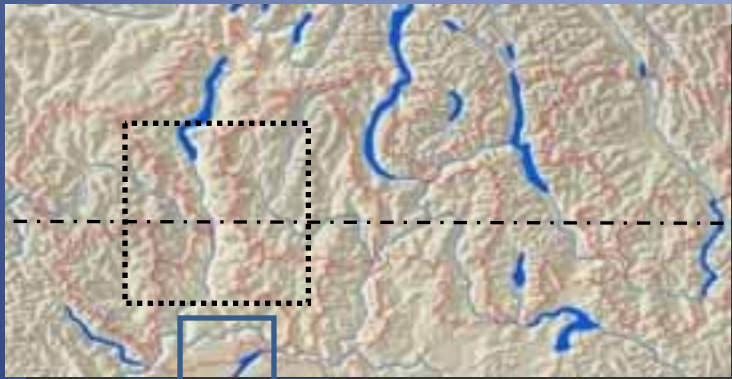
RESULT: Harmonized US8-CAN4 Hydrographic Drainage Areas –Ready
For First Pass Hydro Flow



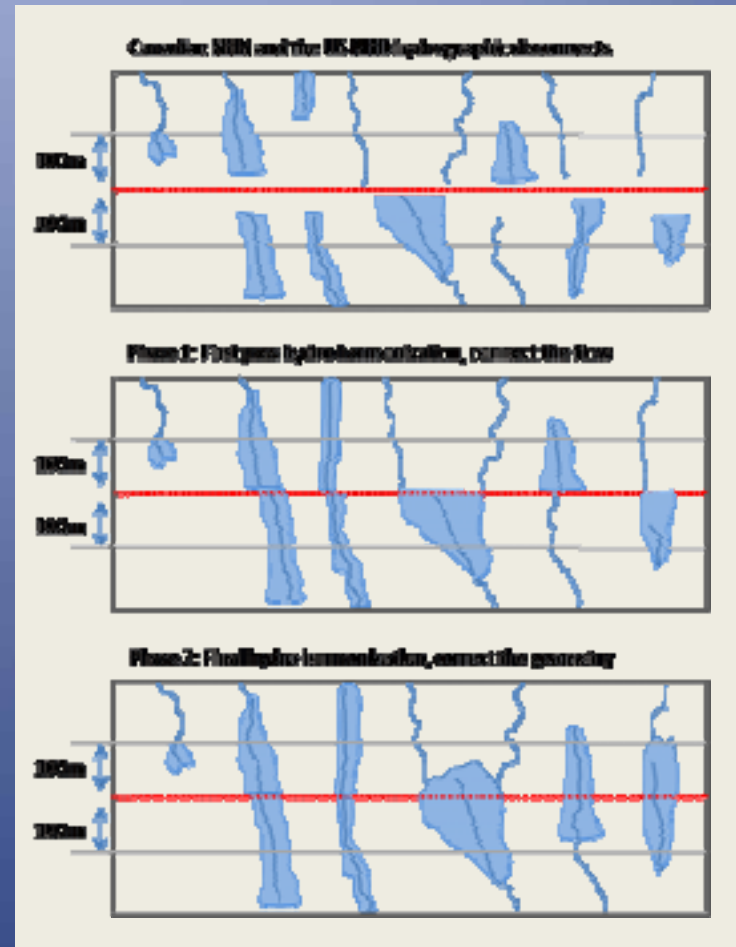
Basic Harmonization Process Description

Drainage Areas

- Individual **US8-CAN4** drainage units are then sent to NRCAN and USGS for first pass hydro harmonization – *connecting flow paths*



12 US8-CAN4 Units currently in first pass hydro harmonization ; 4 of which are located in the Columbia Basin



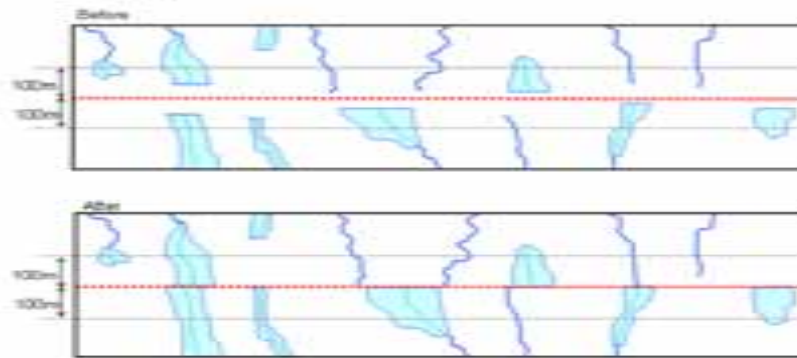
USFY 10

TBD



Hydro (NHN-NHD) Harmonization Guidelines

- The NHN model is used in the harmonization process for Canadian hydro data.
- The NHD model is used in the harmonization process for USA hydro data.
- A common 250-meter denormalized International Boundary is used in the harmonization process.
- Entities (including NHN/NHD NLF Interest, NHD Artificial Paths and isolated lakes) located within a 100-meter buffer zone on each side of the International Boundary are adjusted to snap to the denormalized boundary, except for:
 - Linear watercourses with no possible match in the other dataset.
 - Regular shape water bodies that do not appear to have been cut to a previously used boundary.



Watercourse Displacement

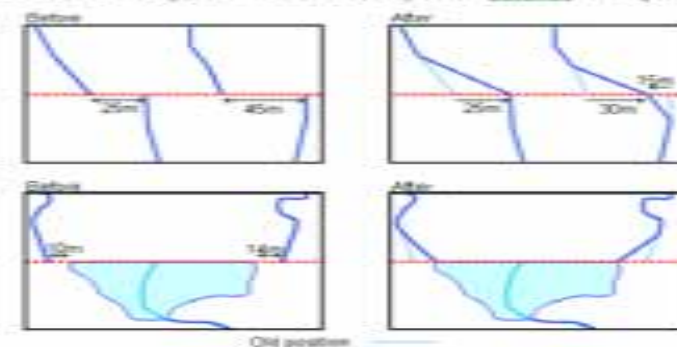
Applicable when distance between common cross-border watercourses (or watercourse and water body) is less than combined NHN/NHD features planimetric accuracy value.

First or last vertex (along Int. Bdy) of entity with worst planimetric accuracy is displaced first, up to the entity's planimetric accuracy value.

First or last vertex (along Int. Bdy) of entity with better accuracy is displaced second, up to the entity's planimetric accuracy value, on same vertex as first entity, only if displacement of first entity not sufficient.

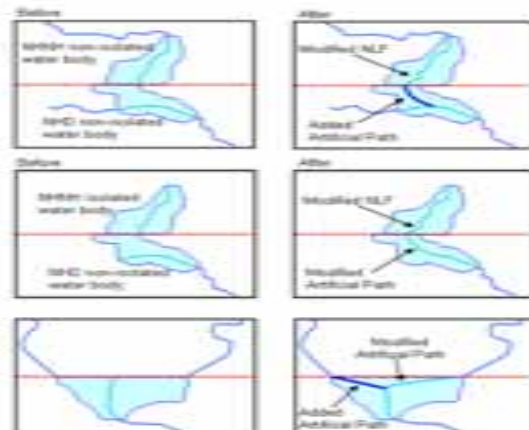
Cartographic license may be used for watercourse harmonization.

NHN data accuracy 30m NHD data accuracy 20m Combined accuracy 50m



Virtual Water Flow Paths

- Where adjacent NHN (isolated or non-isolated) water bodies and NHD non-isolated water bodies:
 - Virtual water flow paths (NHN NLF Interest or NHD Artificial Paths) are added or modified to provide logical continuity of water flow.



Water Body Displacement

NHN and NHD water bodies are harmonized only if the distance between them is less than combined NHN/NHD features planimetric accuracy.

- Vertices of entity with worst planimetric accuracy value is displaced first, up to the entity's planimetric accuracy value.
- Vertices of entity with better planimetric accuracy value is displaced second, up to the entity's planimetric accuracy value, only if displacement of first entity not sufficient.
- If distance between water bodies is greater than combined NHN/NHD features planimetric accuracy, no water body harmonization is carried out.

Harmonize water bodies are fully or partially aligned.

- Common segments along the denormalized 250-meter Int. Bdy share the same vertices.
- Partially aligned water bodies share same vertices on a minimum 4-meter segment.

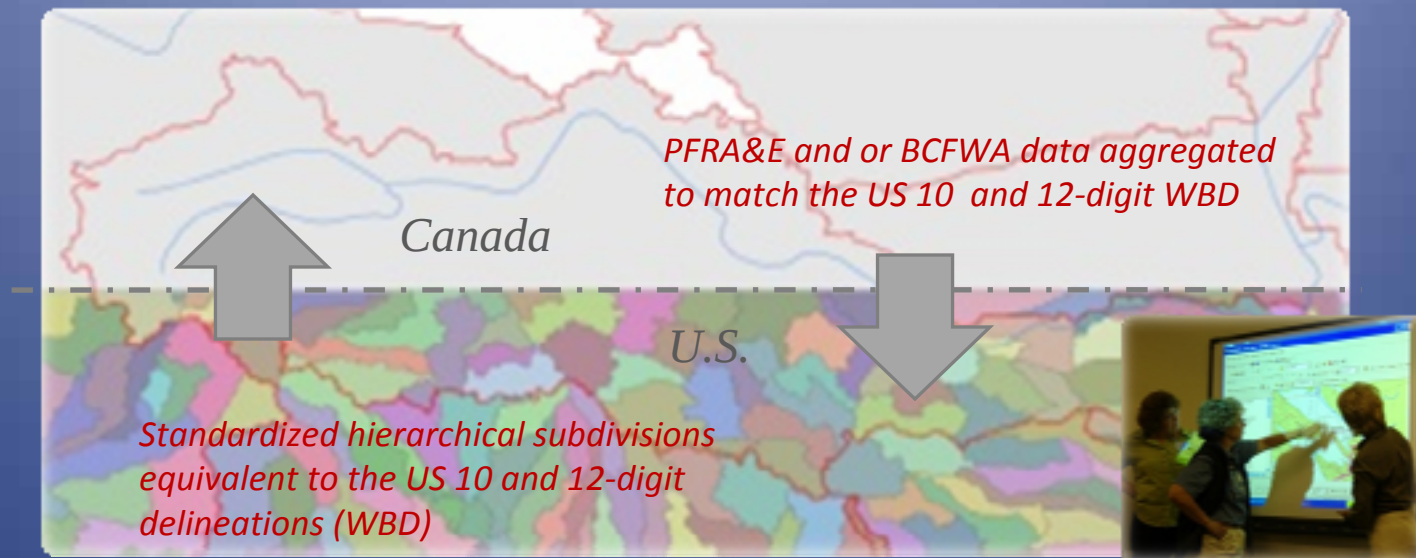


NHN data planimetric accuracy 30m
NHD data planimetric accuracy 20m
Combined planimetric accuracy 50m

Basic Harmonization Process Description

Drainage Areas and Hydro

4. Harmonized **US8-CAN4** drainage units and corrected hydro flow paths are then used in conjunction with appropriate base layers to refine and harmonize higher resolution hierarchical watersheds.



***This step requires local participation in the form of a local
Data Harmonization Workshop Meeting***



Canadian and U.S. Federal Participation



International Coordination:

The Transboundary Hydrographic Data Harmonization Task Force:

Environment Canada:

USGS NHD Program:

Natural Resources Canada:

US Environmental Protection Agency:

Agriculture and Agri-Food Canada:

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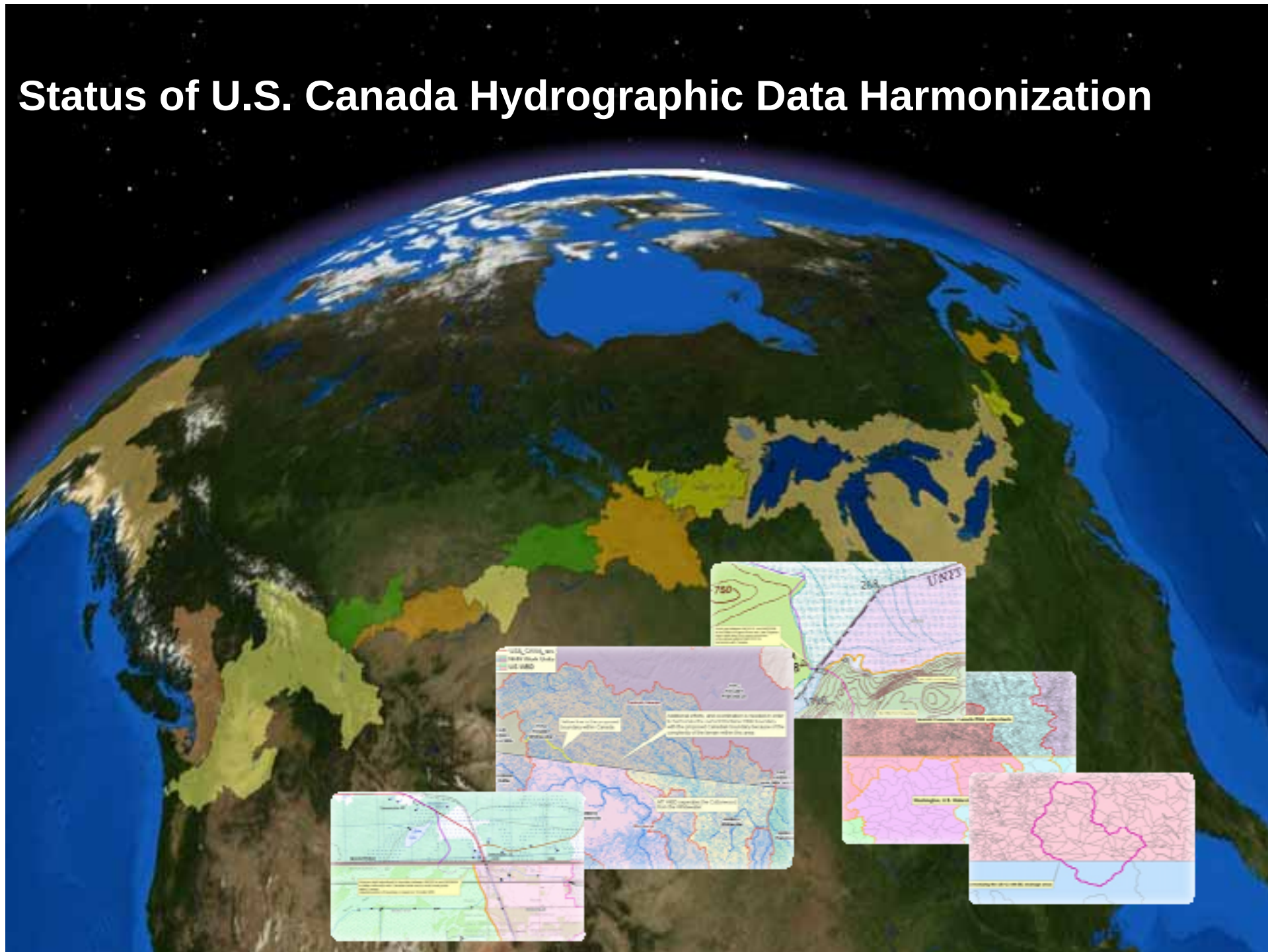
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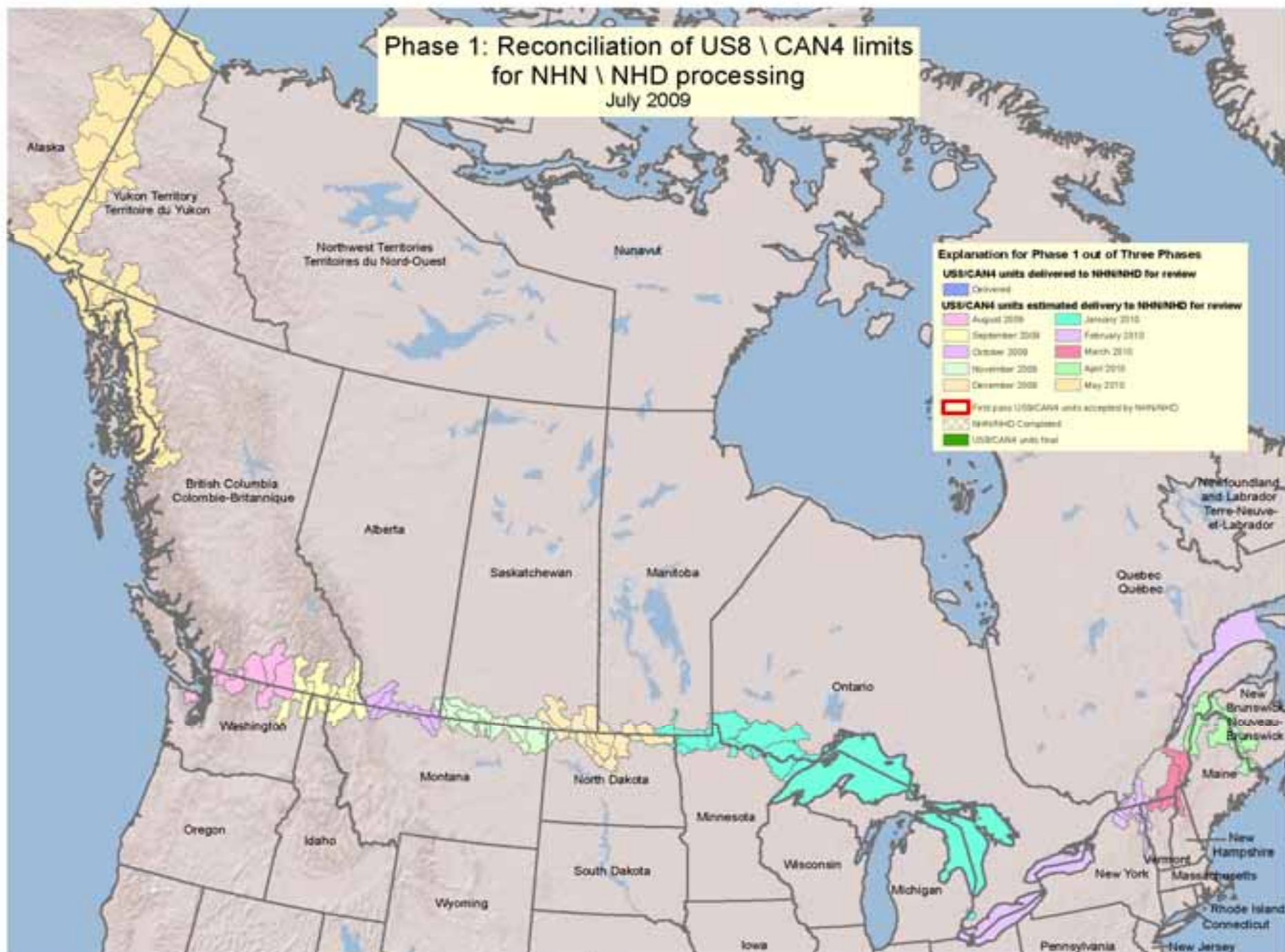
*Coordination, guidance, technical and
collaborative support*



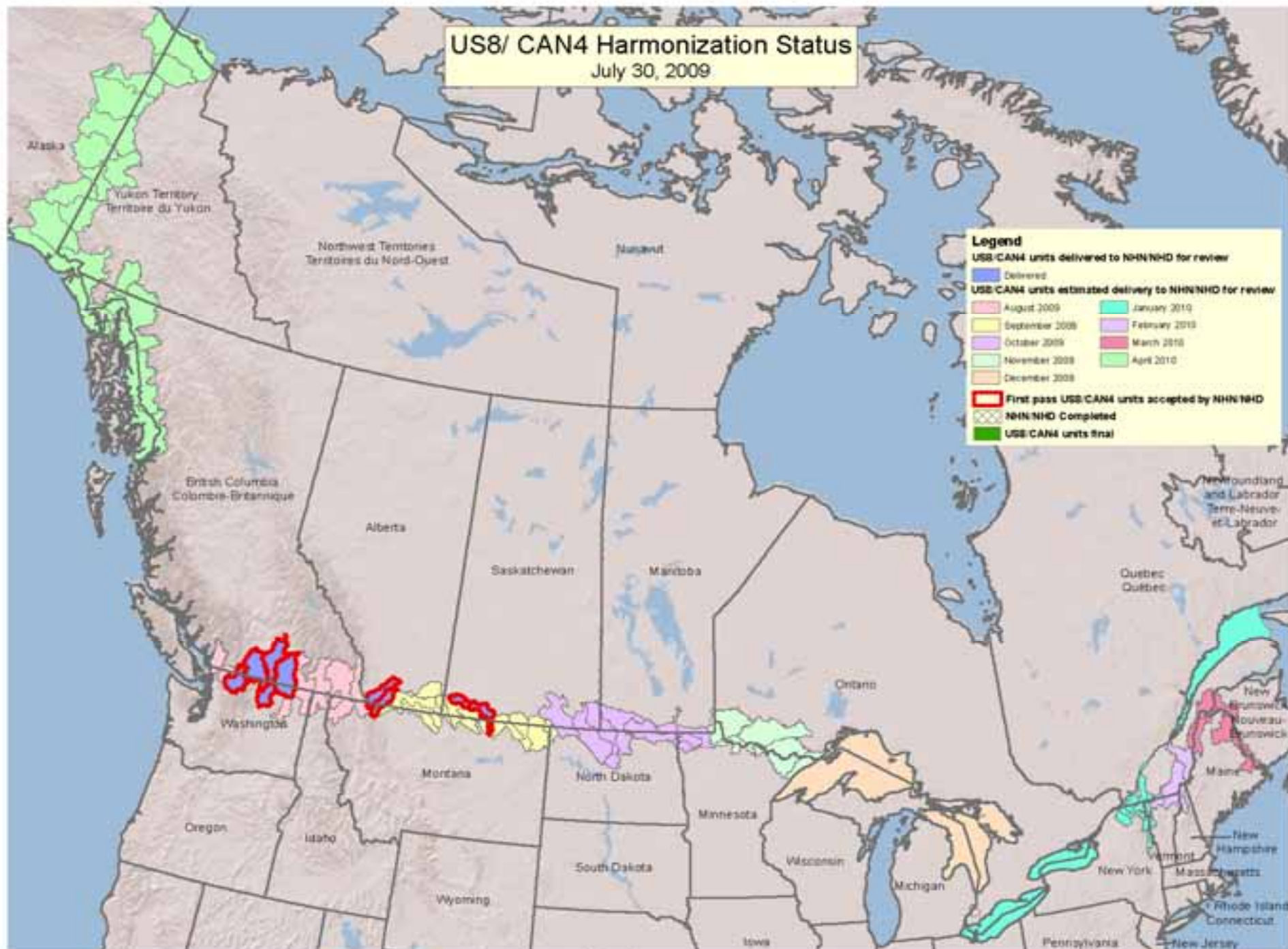
Status of U.S. Canada Hydrographic Data Harmonization



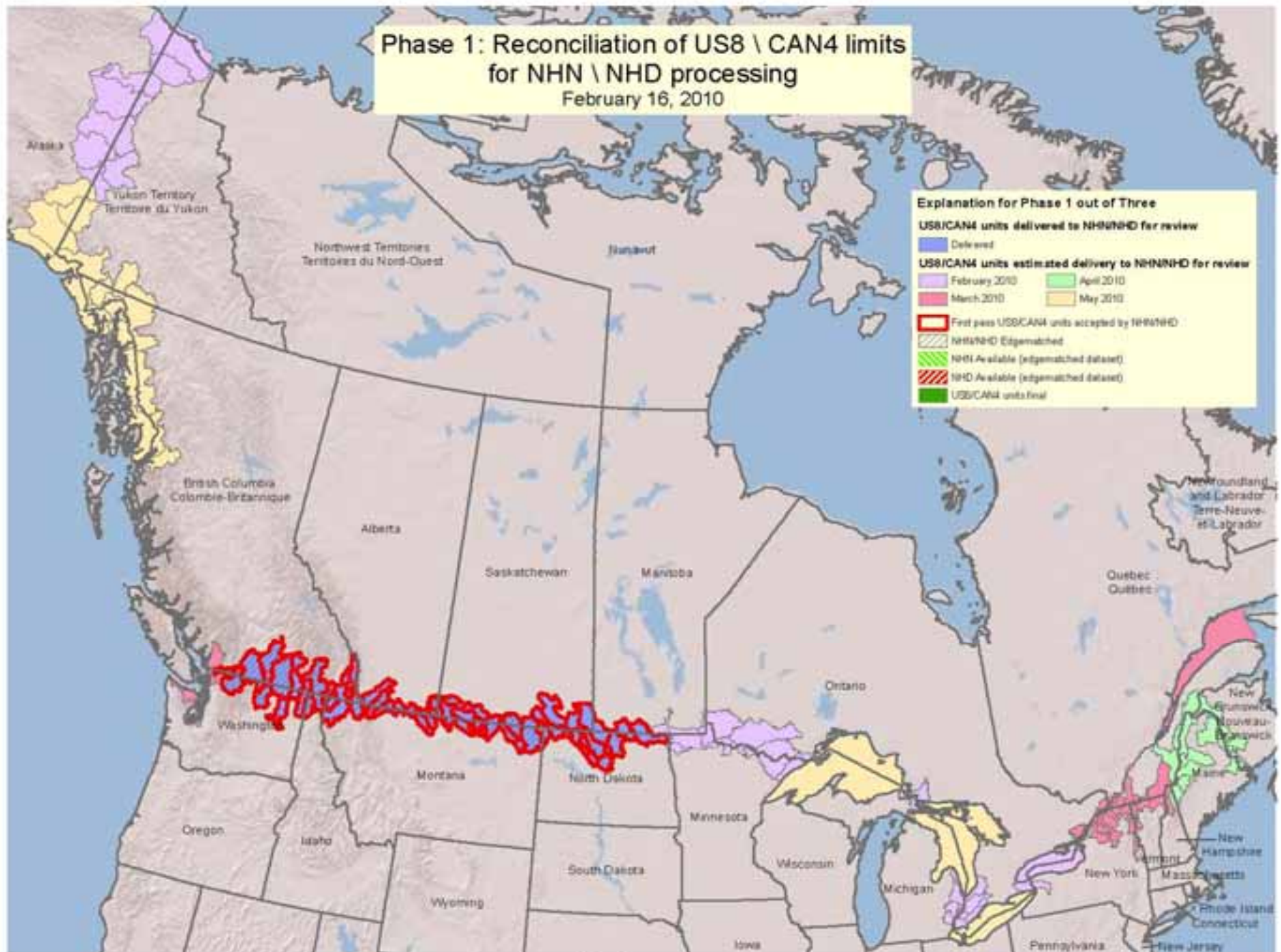
**Phase 1: Reconciliation of US8 \ CAN4 limits
for NHN \ NHD processing
July 2009**



US8/ CAN4 Harmonization Status July 30, 2009



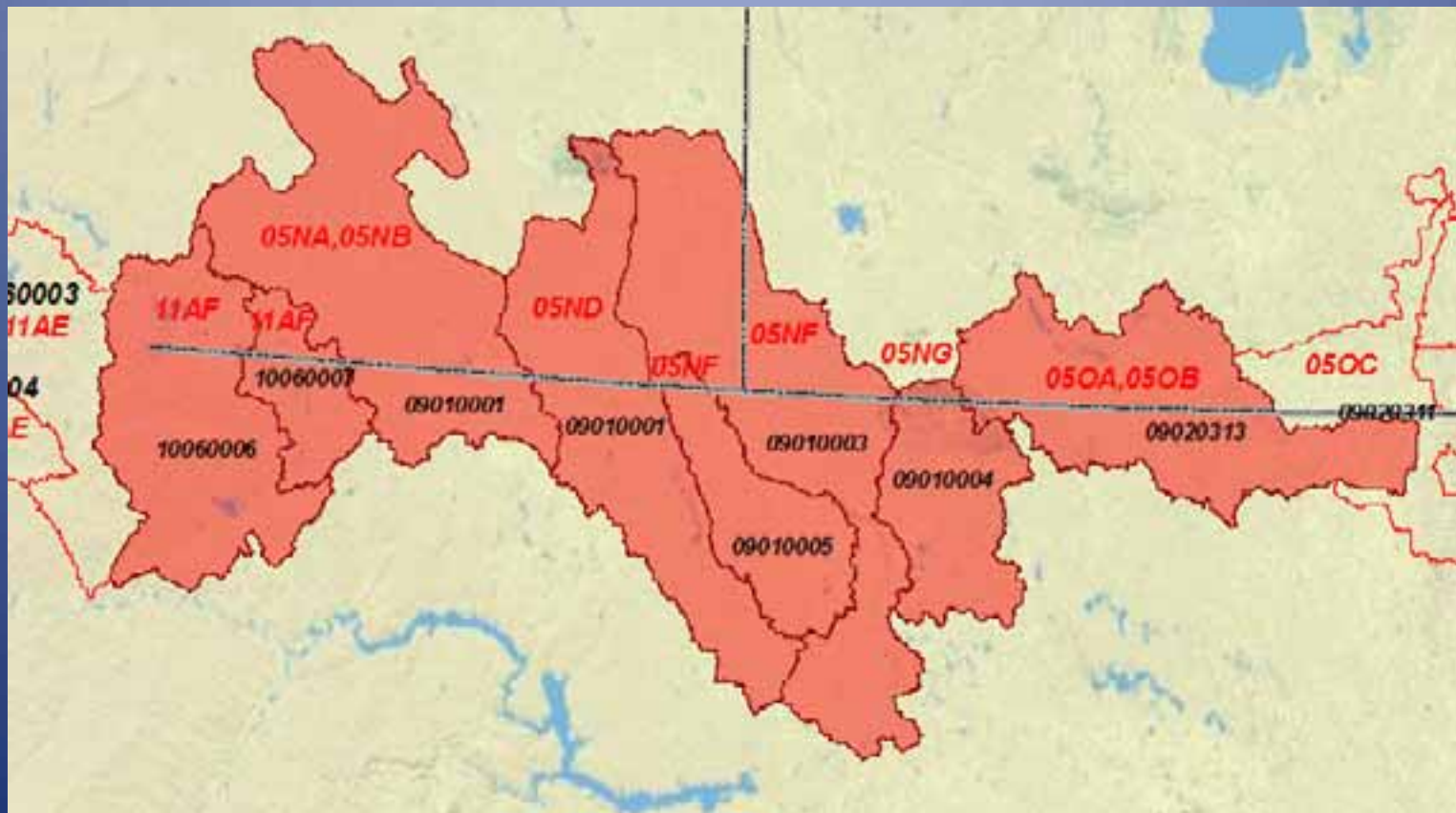
Phase 1: Reconciliation of US8 \ CAN4 limits for NHN \ NHD processing February 16, 2010



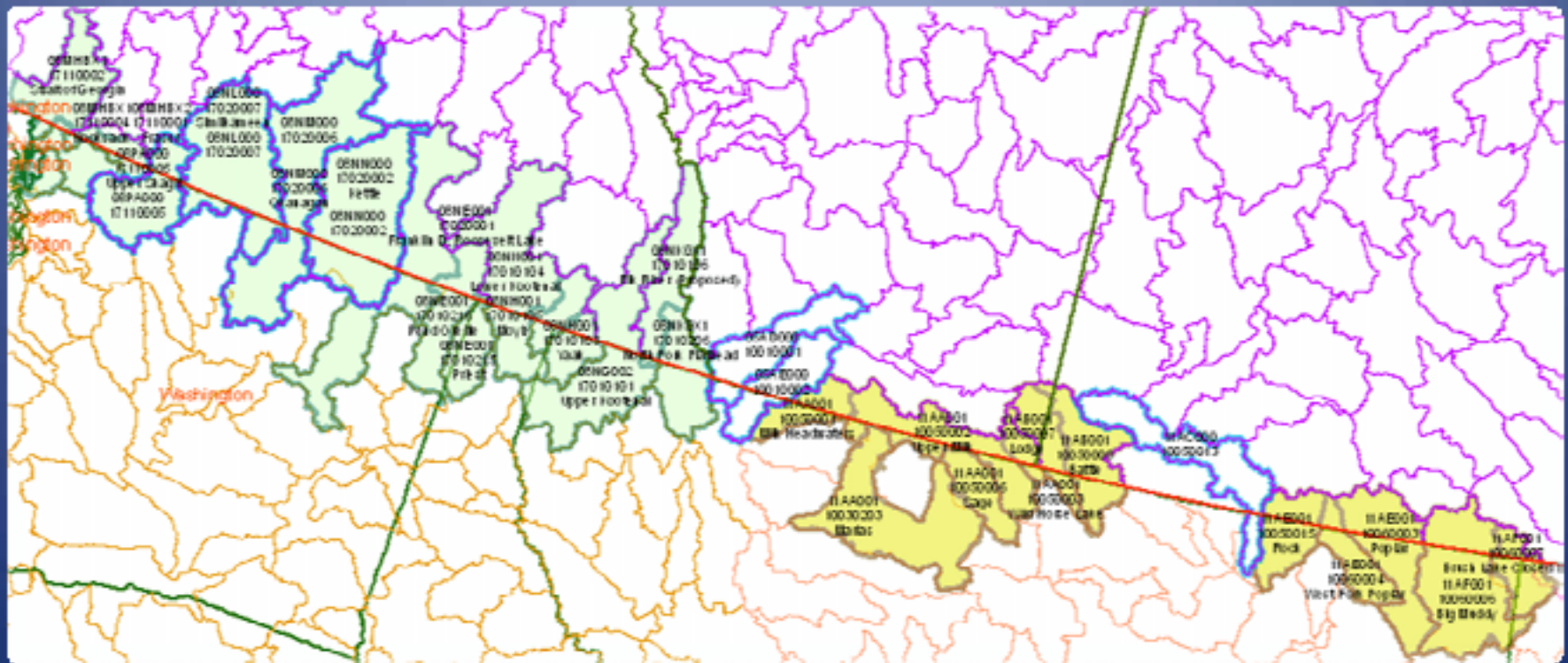
Regional Status: Ready for Harmonization Workshop

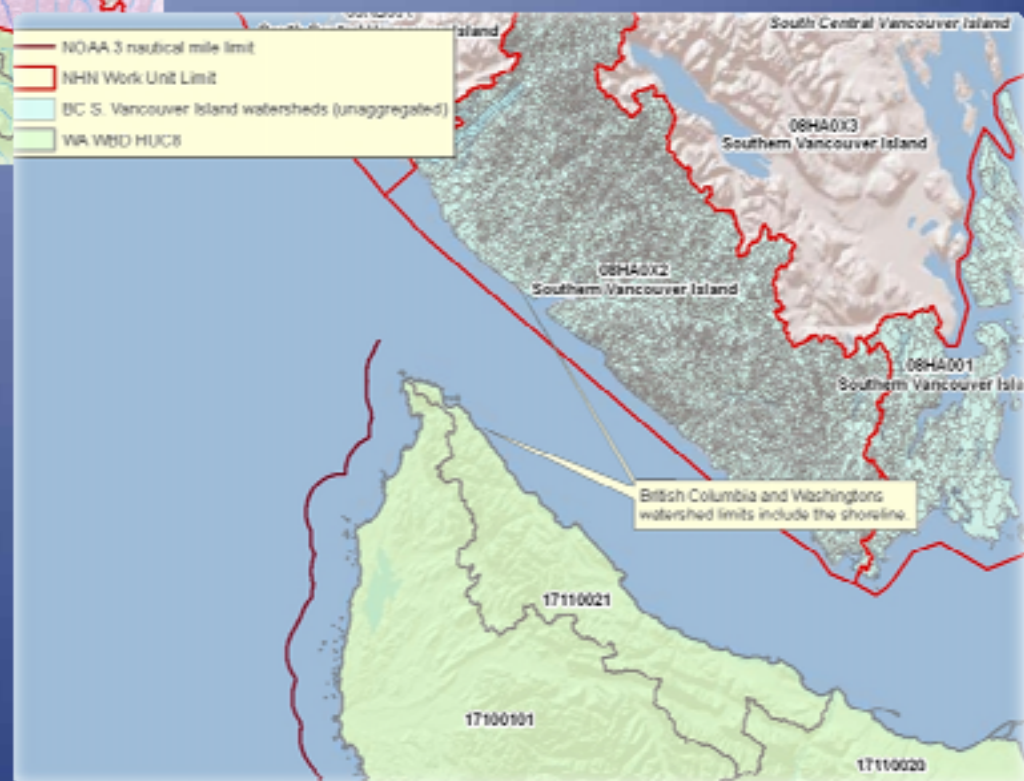
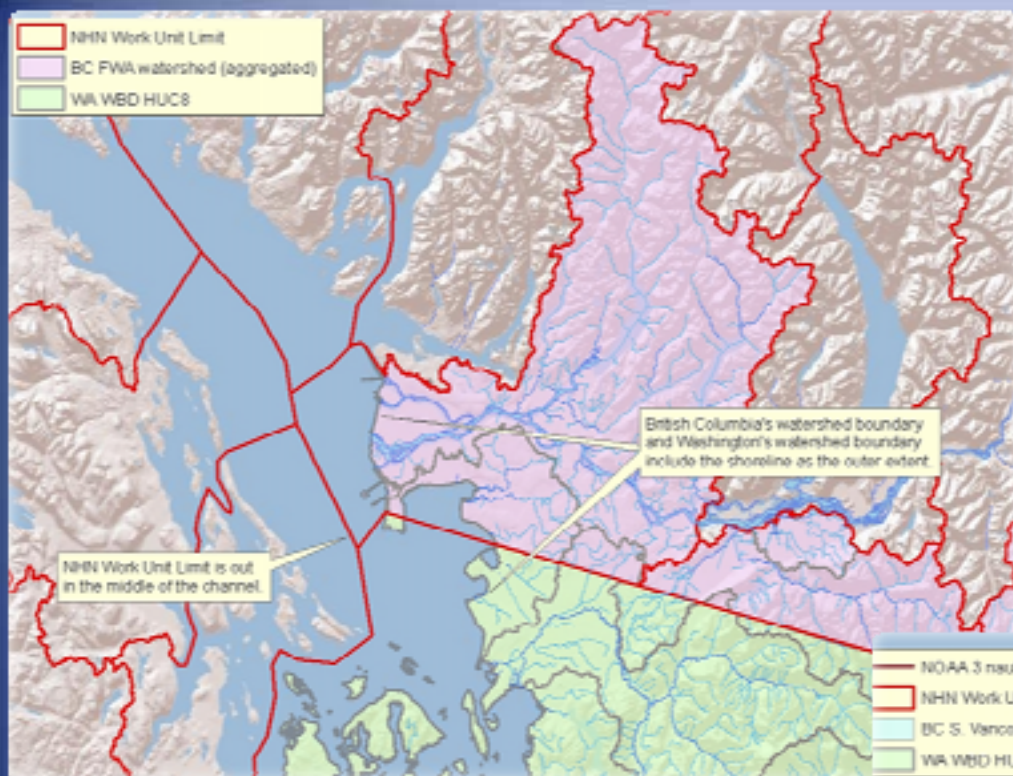
**US8-CAN4 drainage units
in review**

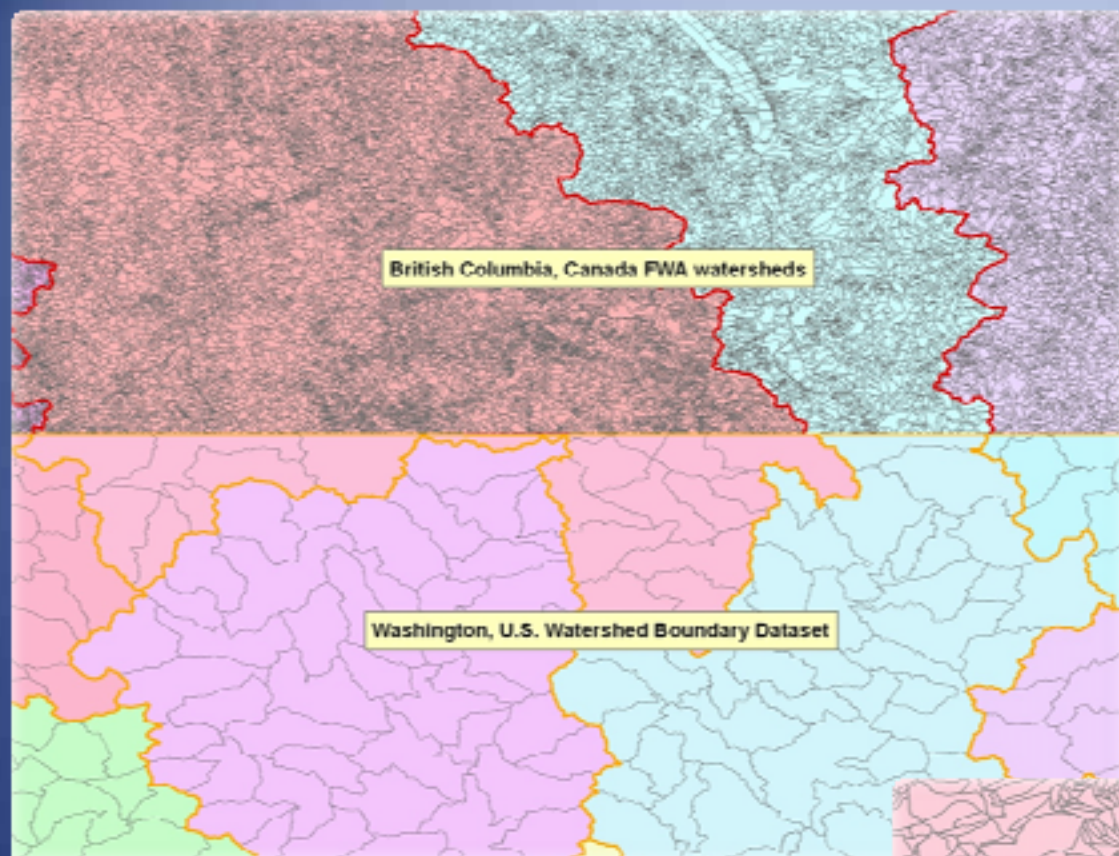
**First Pass Hydro Harmonization
in process by NRCan - USGS**



A Complex Coordination Effort







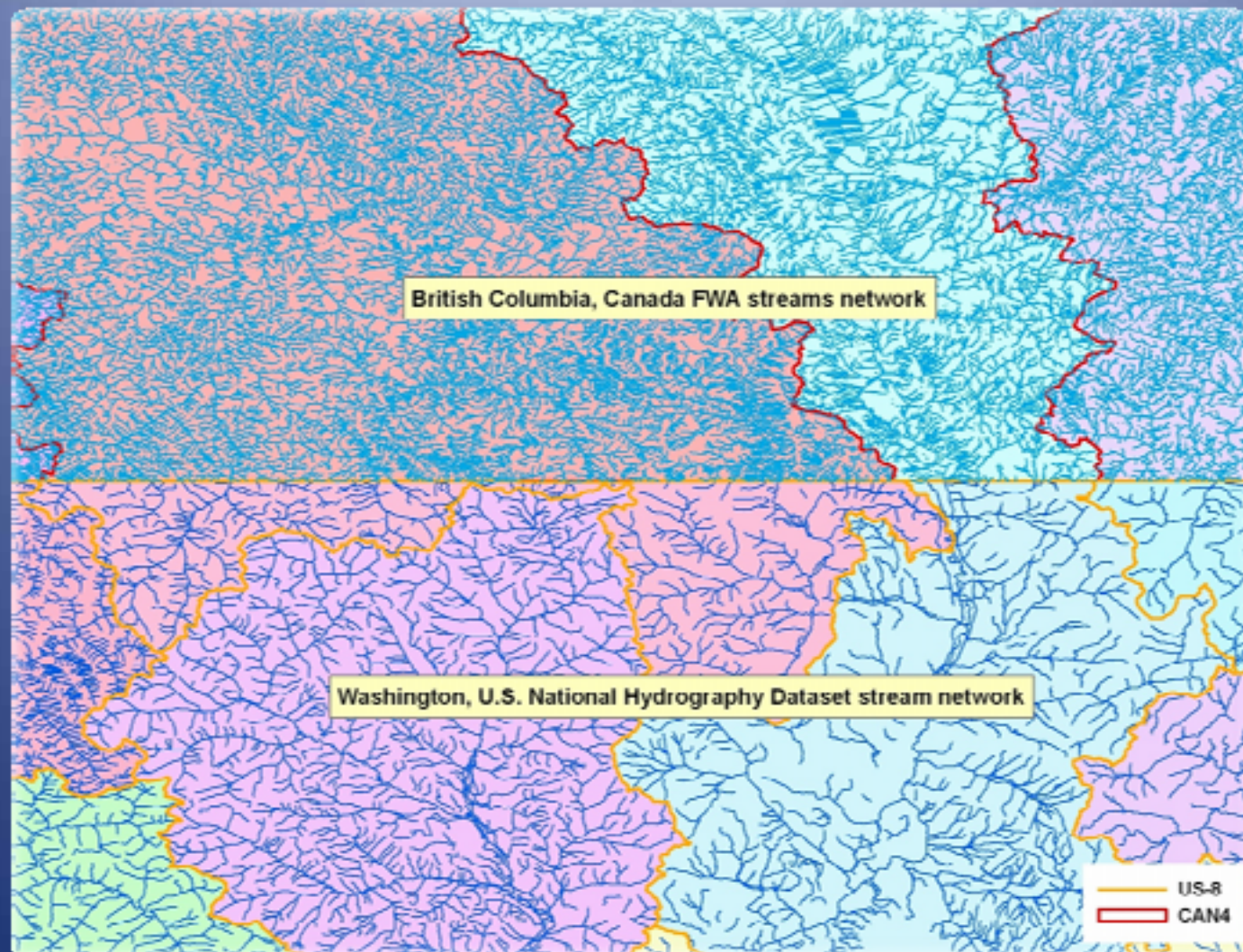
US-12 does not have a corresponding boundary in the BC Drainage Areas

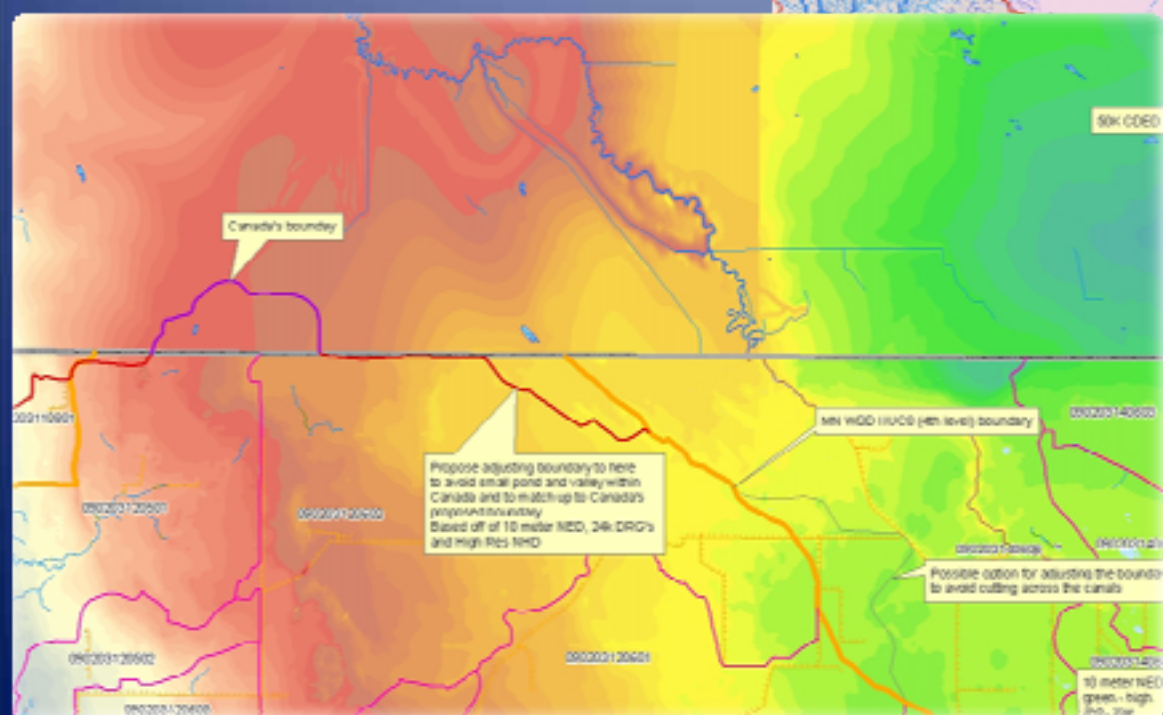
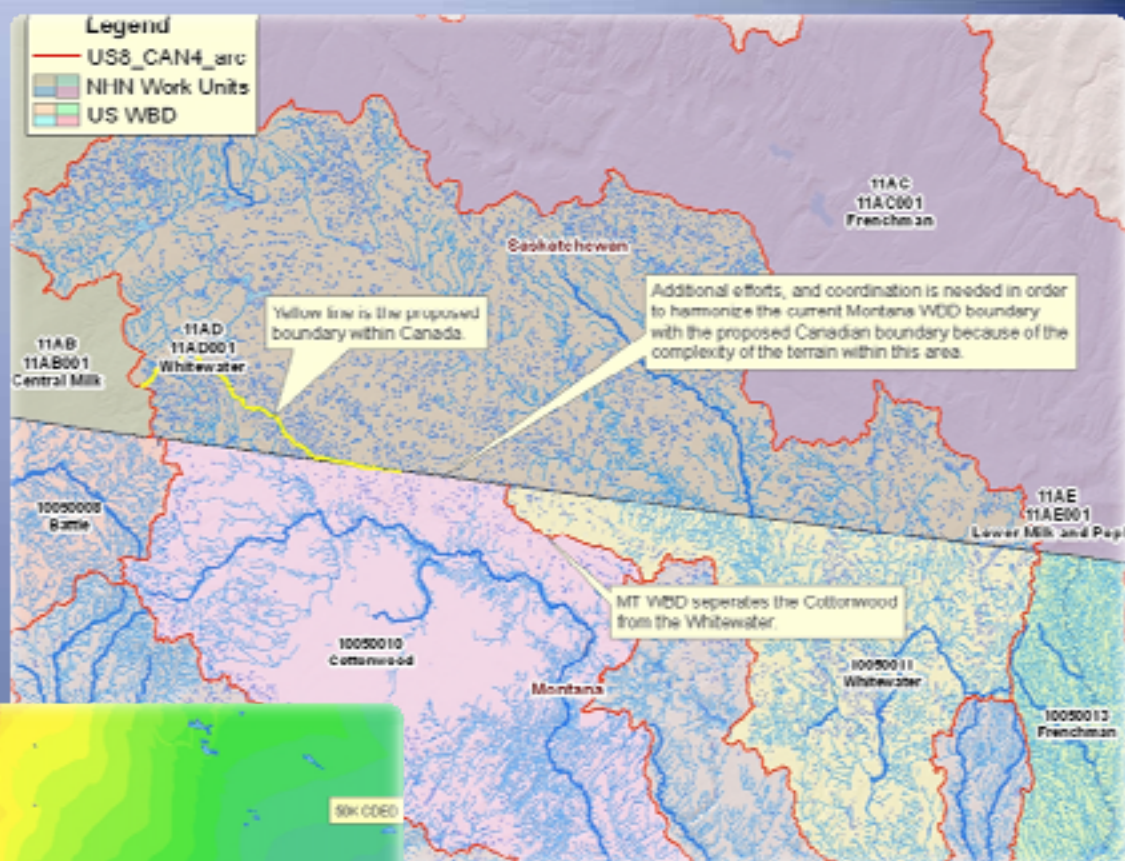
US-8 and CAN4 do not edgematch

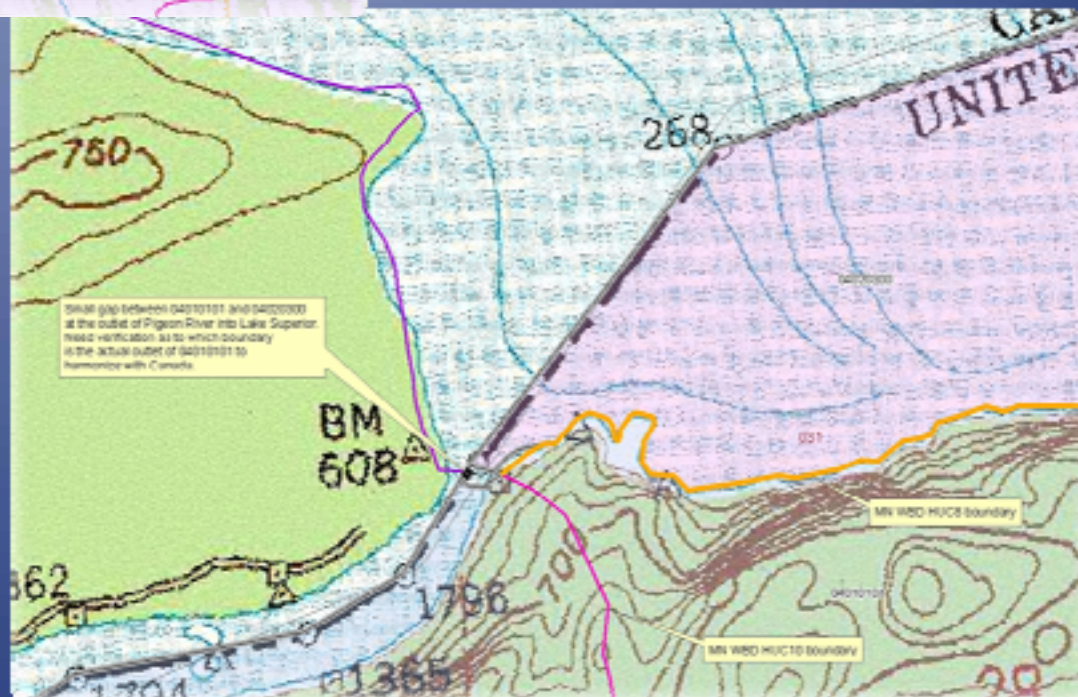
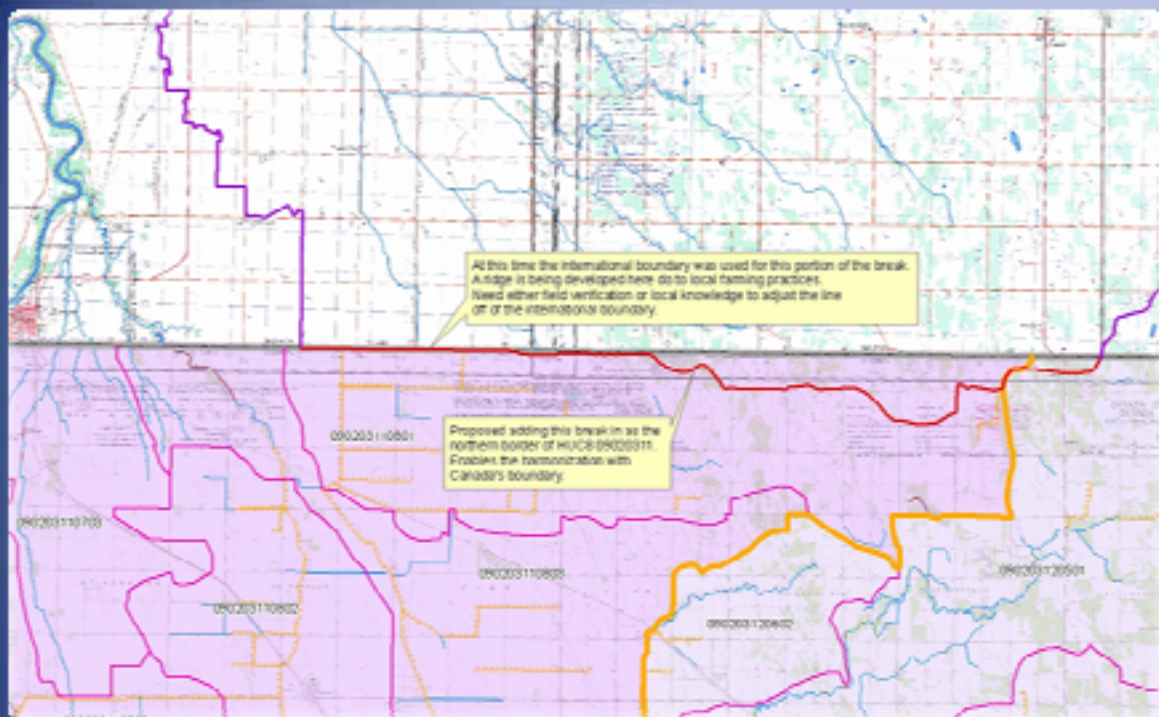
US-8 and CAN4 drainage area boundaries are not harmonized

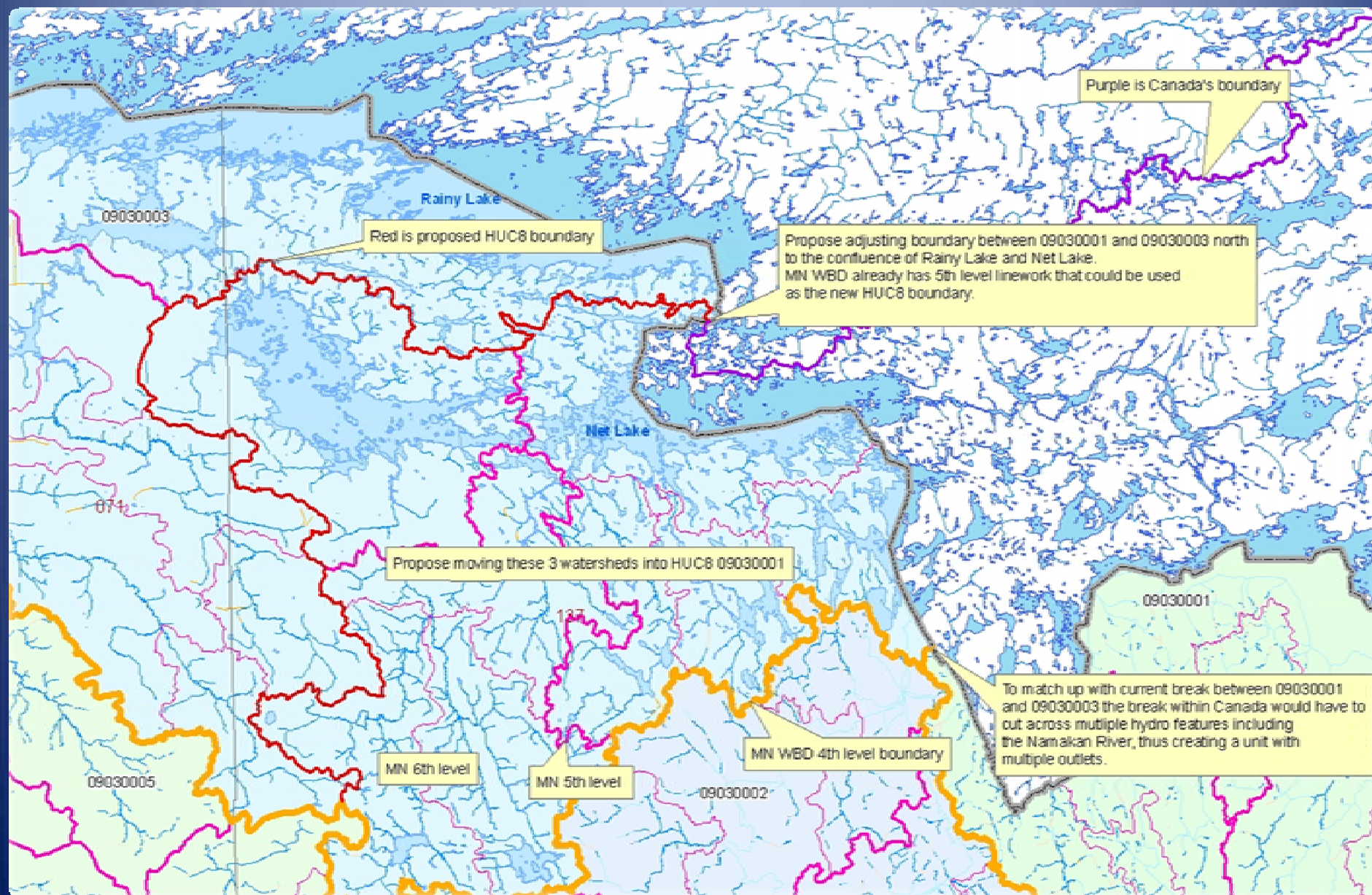
Based on hydrography the US-8 boundary in Washington should be adjusted to meet the CAN4 boundary

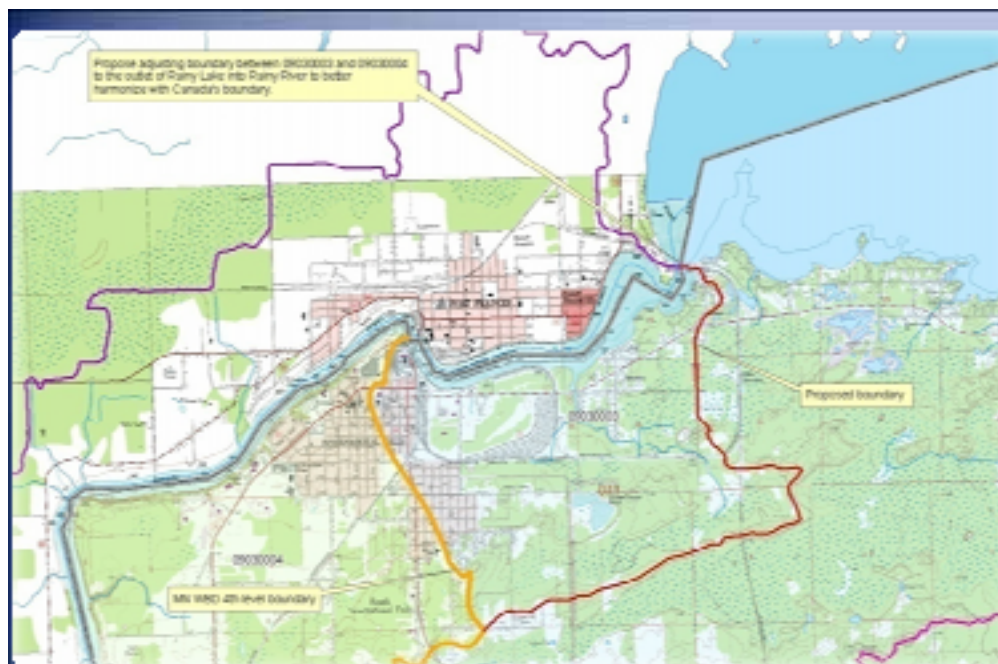
CAN4
US-8

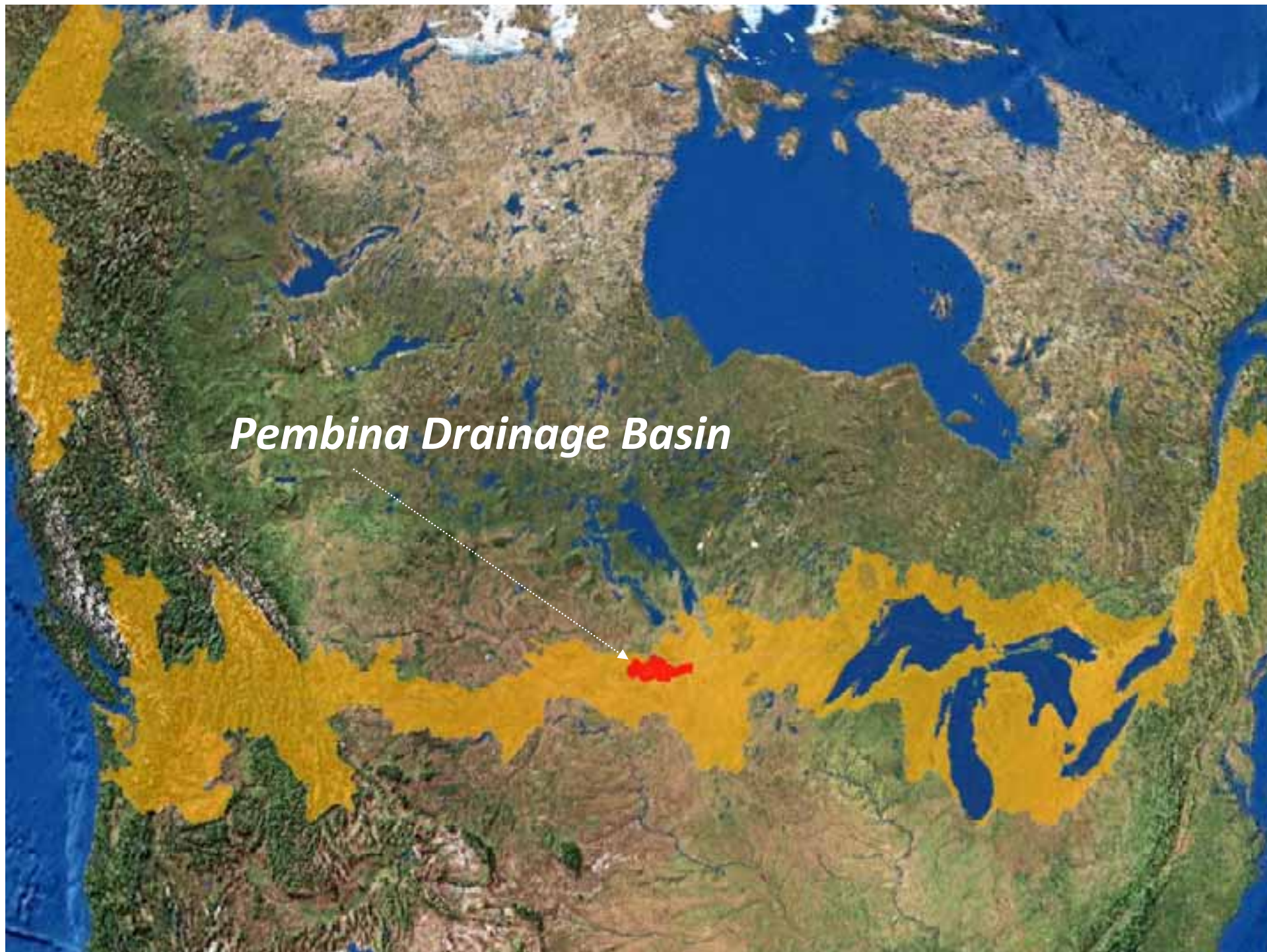






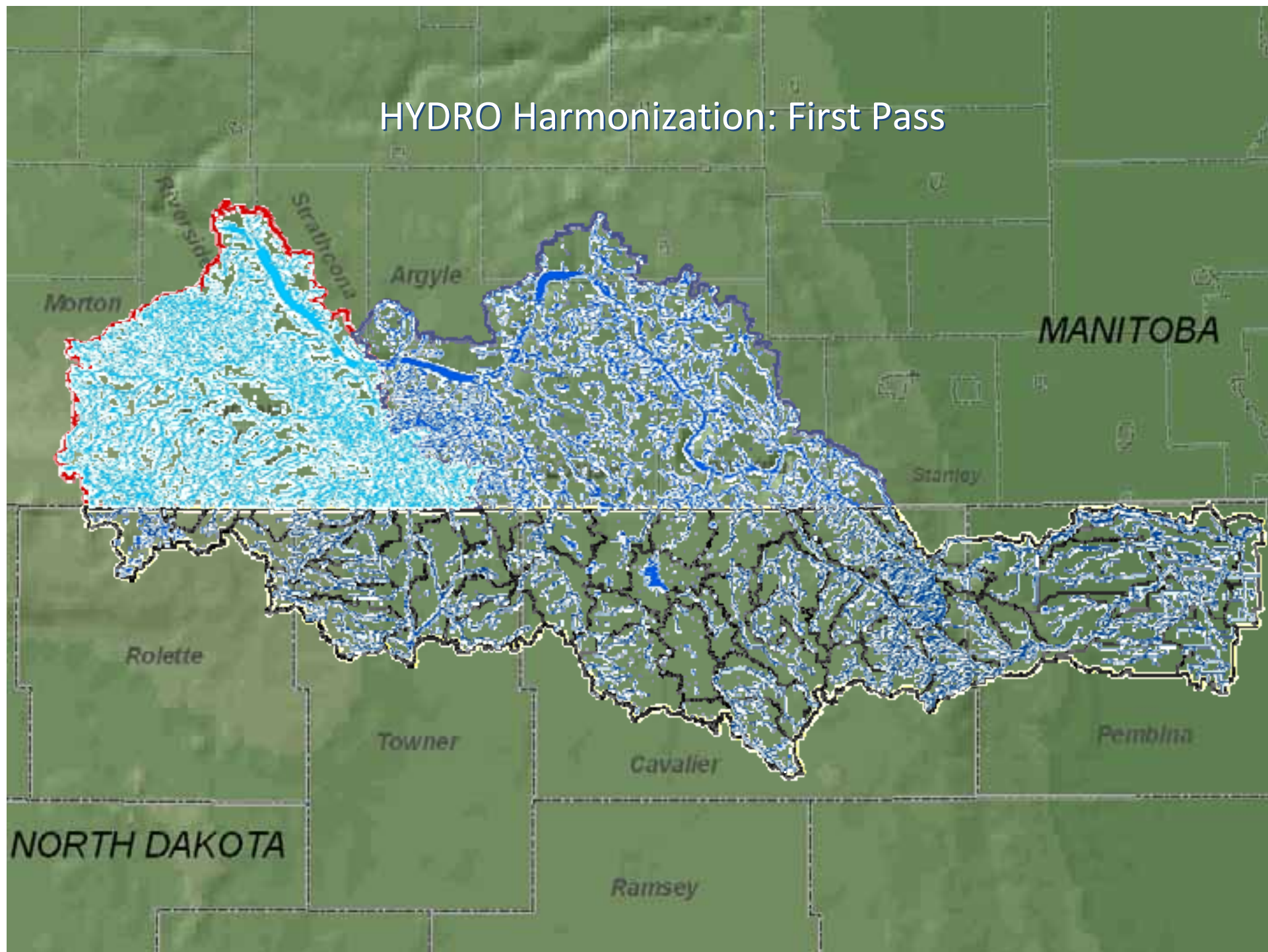






Pembina Drainage Basin

HYDRO Harmonization: First Pass



Goal of this Hydrographic Harmonization Effort

A detailed, standardized, hydrologically sound binational system of stream, river and watershed addresses.

Without harmonized federal and local data it will be difficult for the scientific and engineering communities to integrate and deliver water information along our shared border.



Benefits Hydrographic Harmonization Effort

- ***Engineering Design***—Bridges, culverts, flood-plain management, dam safety
- ***Water and Land Management***—Water rights adjudications; water & land-use planning; in-stream flow, fish passage, & habitat studies
- ***Water Quality Regulation***—Low flows, perennial vs. intermittent streams
- ***Model parameterization***—Drainage areas, basin characteristics, profiles, climate, etc.

Benefits Hydrographic Harmonization Effort

Planting the seeds for a local level, binational
stewardship framework



Next Steps

1. With Local input, determine appropriate provincial and state participants for a *Hydrographic Data Harmonization Workshop- Via the International IJC Advisory Boards*
2. Determine locations, dates and durations
3. Start scoping bi-national applications



