

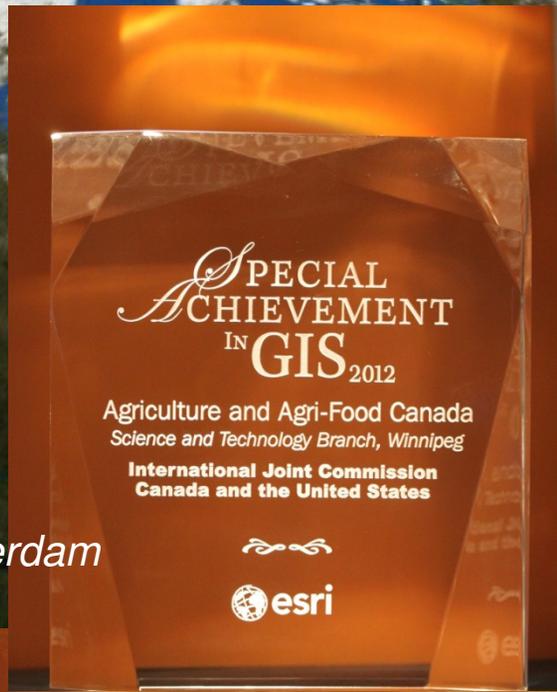
The Harmonization of Hydro Data
Between US and Canada

Vermont Watershed Forum, 2014

US Geologic Survey,
Agriculture and Agri-Food Canada
US Environmental Protection Agency
Environment Canada
Natural Resources Canada



2012 Geospatial World Forum, Amsterdam



2012 Special Achievement In GIS, Ottawa



2012 Special Achievement In GIS, San Diego



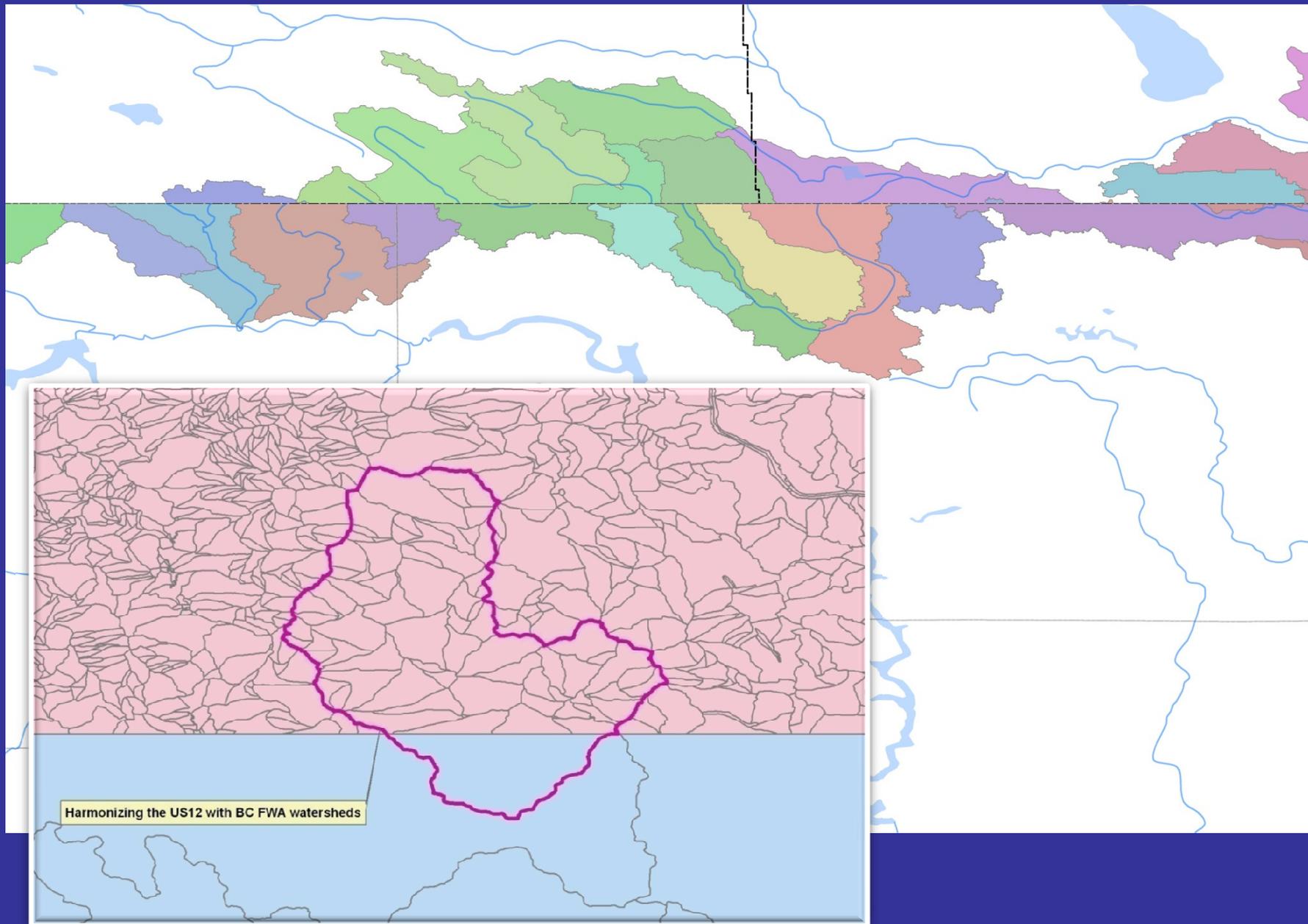
*2012 International GIS
User Conference, San Diego*

PRESENTATION OVERVIEW



- Update on the Hydrographic Data Harmonization Initiative
 - Watershed boundaries
 - Hydrography
- Status of where we are in this complex process
- What we intend on completing in the near term
- Challenges as we move forward toward a seamless paradigm for Canada-U.S. geospatial collaborations
- Long-term role of the Task Force

WHAT WE STARTED WITH



PROCESS



Phase I: Matching and reconciliation of U.S. 8-digit hydrologic WBD units together with Canada Sub-sub-drainage areas

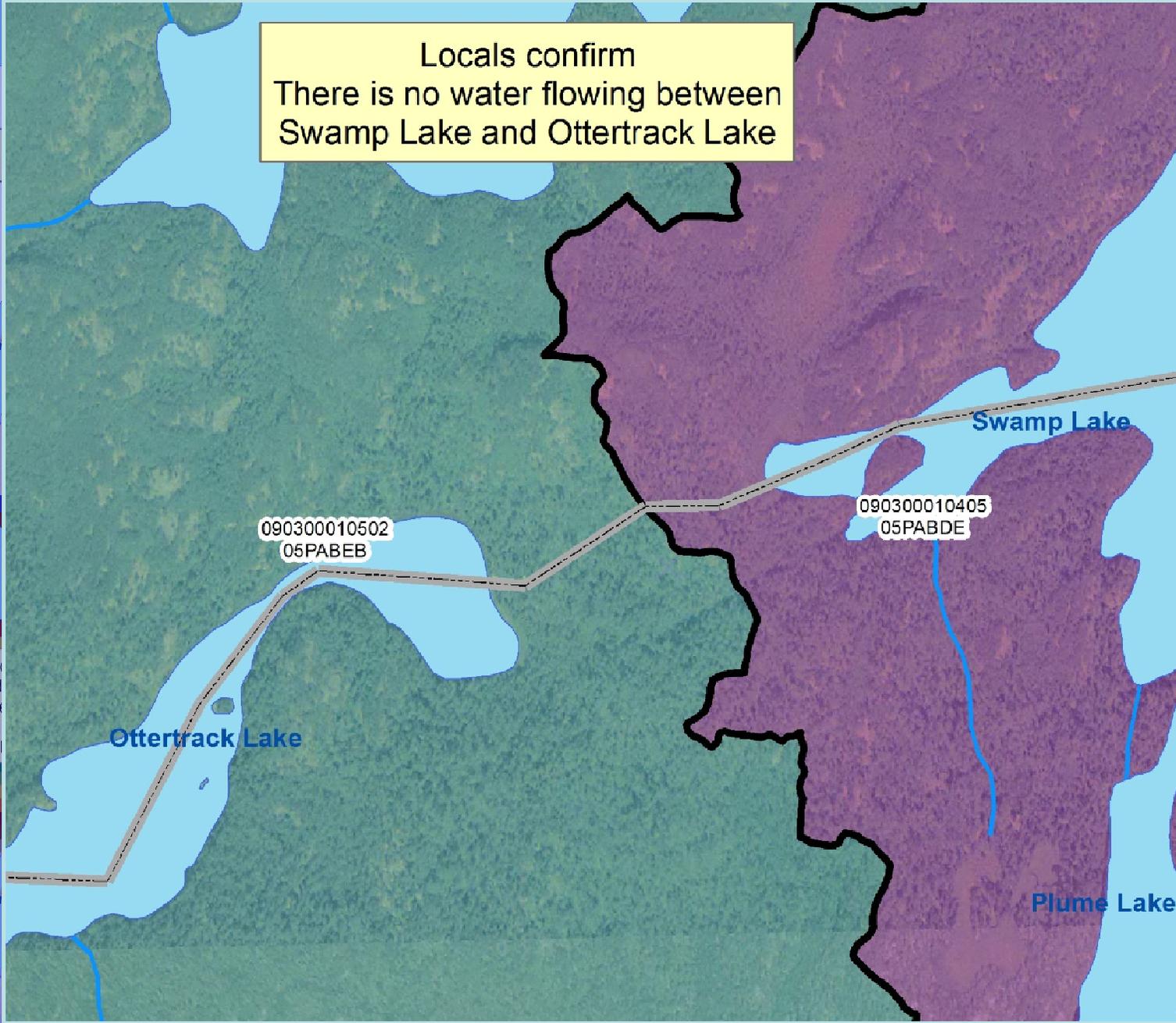
Phase II: Connecting, synchronizing and cross-stepping U.S. NHD hydrography with Canada NHN hydrography

Phase III: Delineating harmonized Drainage Areas at the U.S. 10- and 12-digit hydrologic WBD unit level (new WSC 6th level and 7th level in Canada)

Locals confirm
There is no water flowing between
Swamp Lake and Ottertrack Lake

Initial US
middle of

from
p
e with
finish
Ontario



Ontario and
elevation of
ridgeline be
Swamp La
Ottertrack

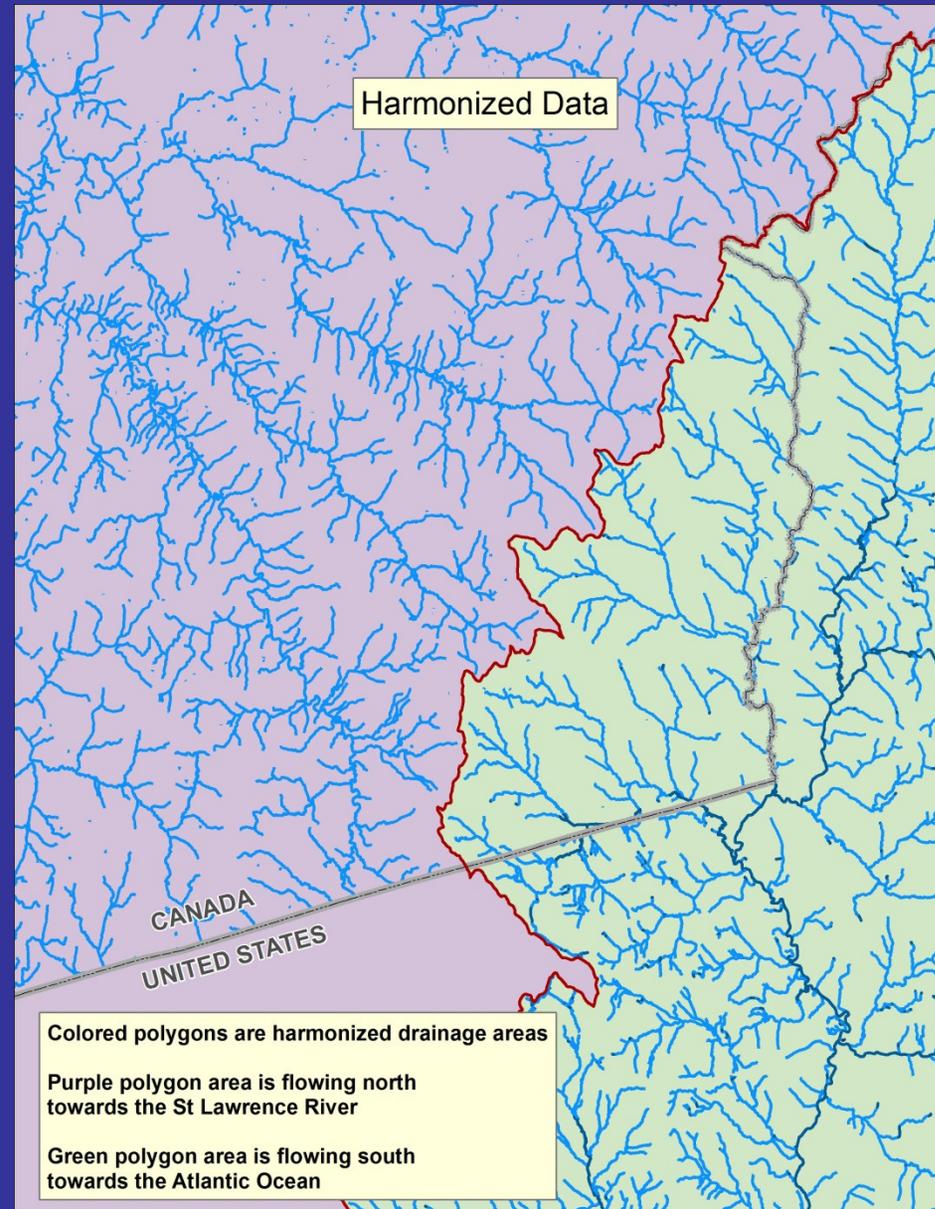
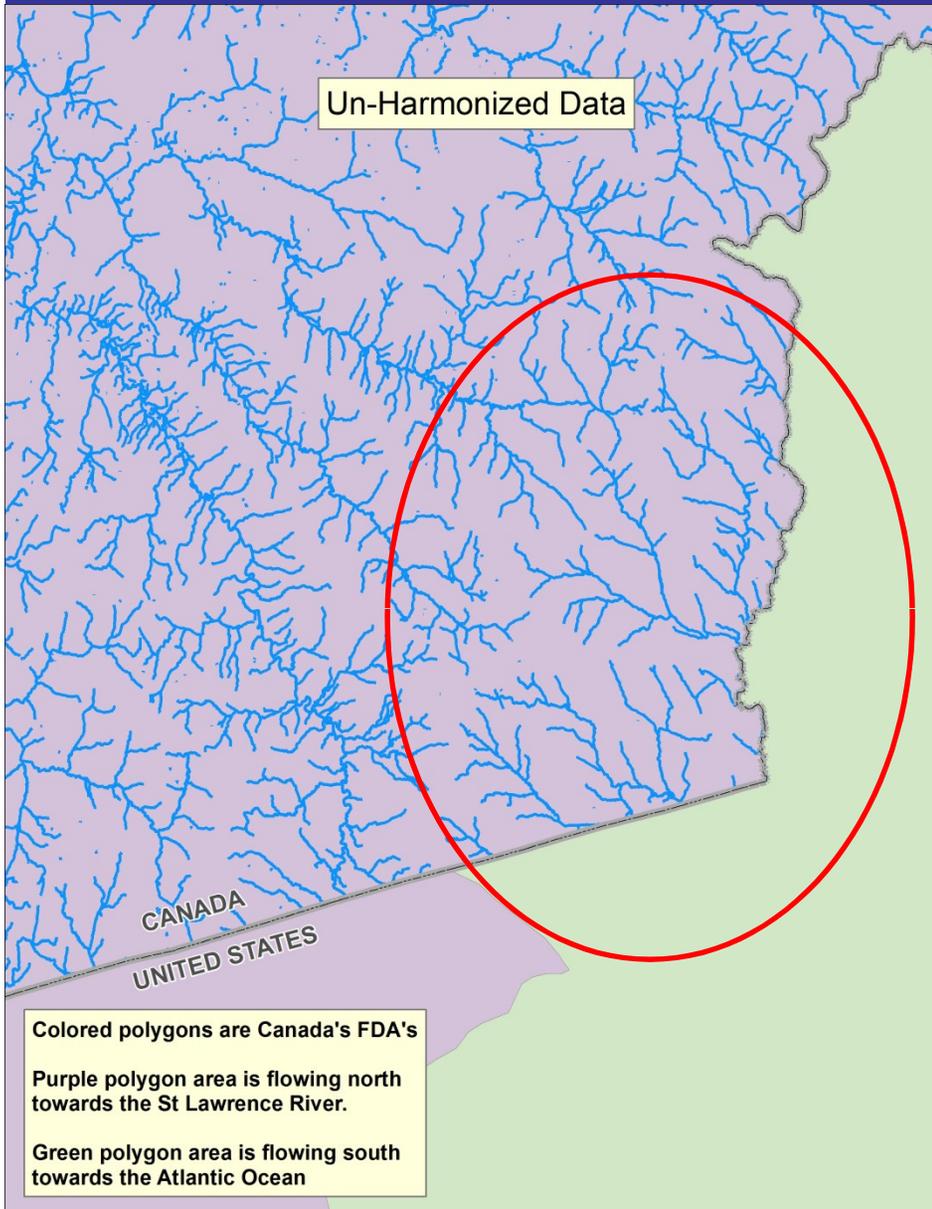
Lake

ume Lake

Lake

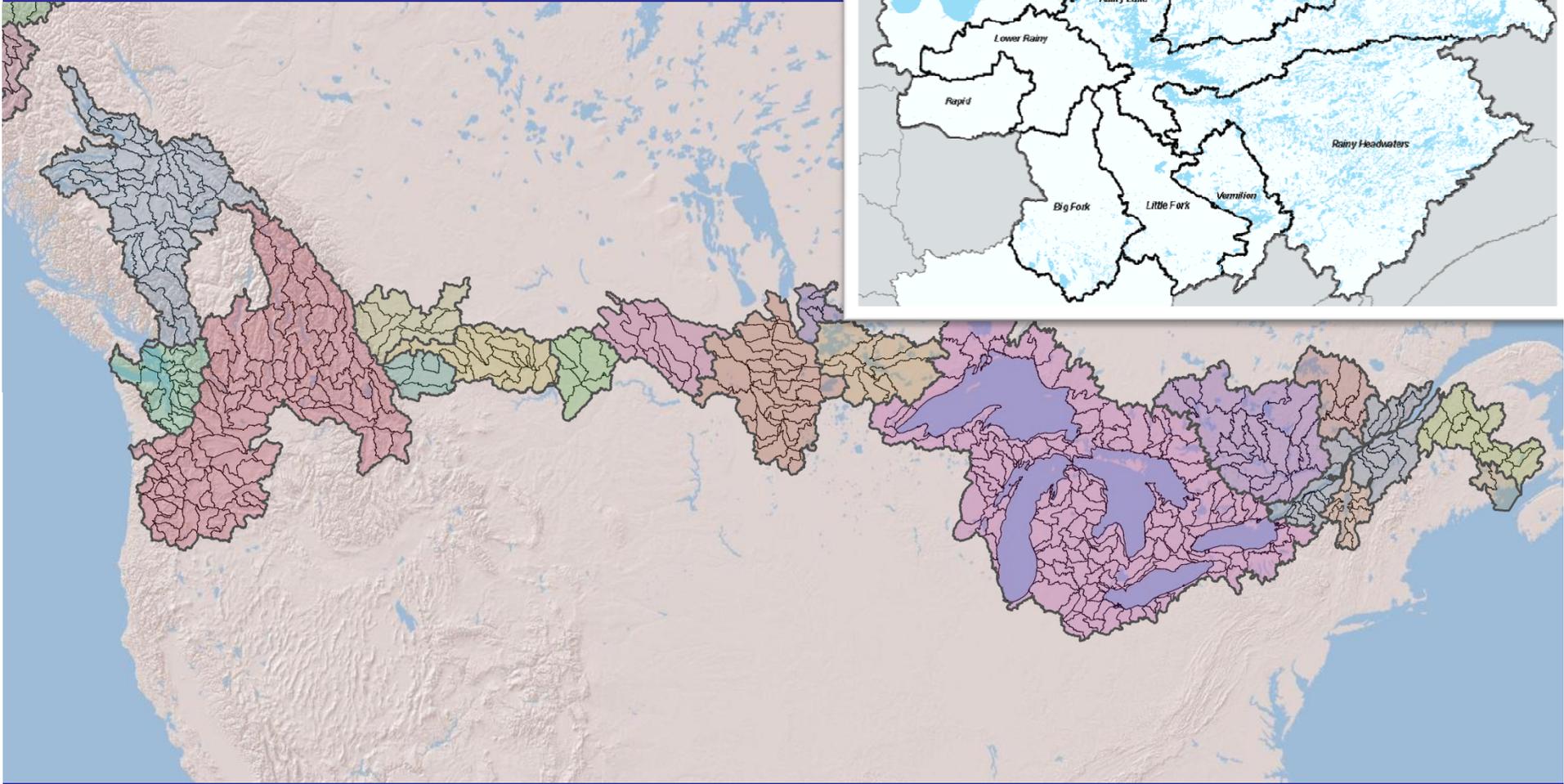
Plume Lake

Ashdick Lake

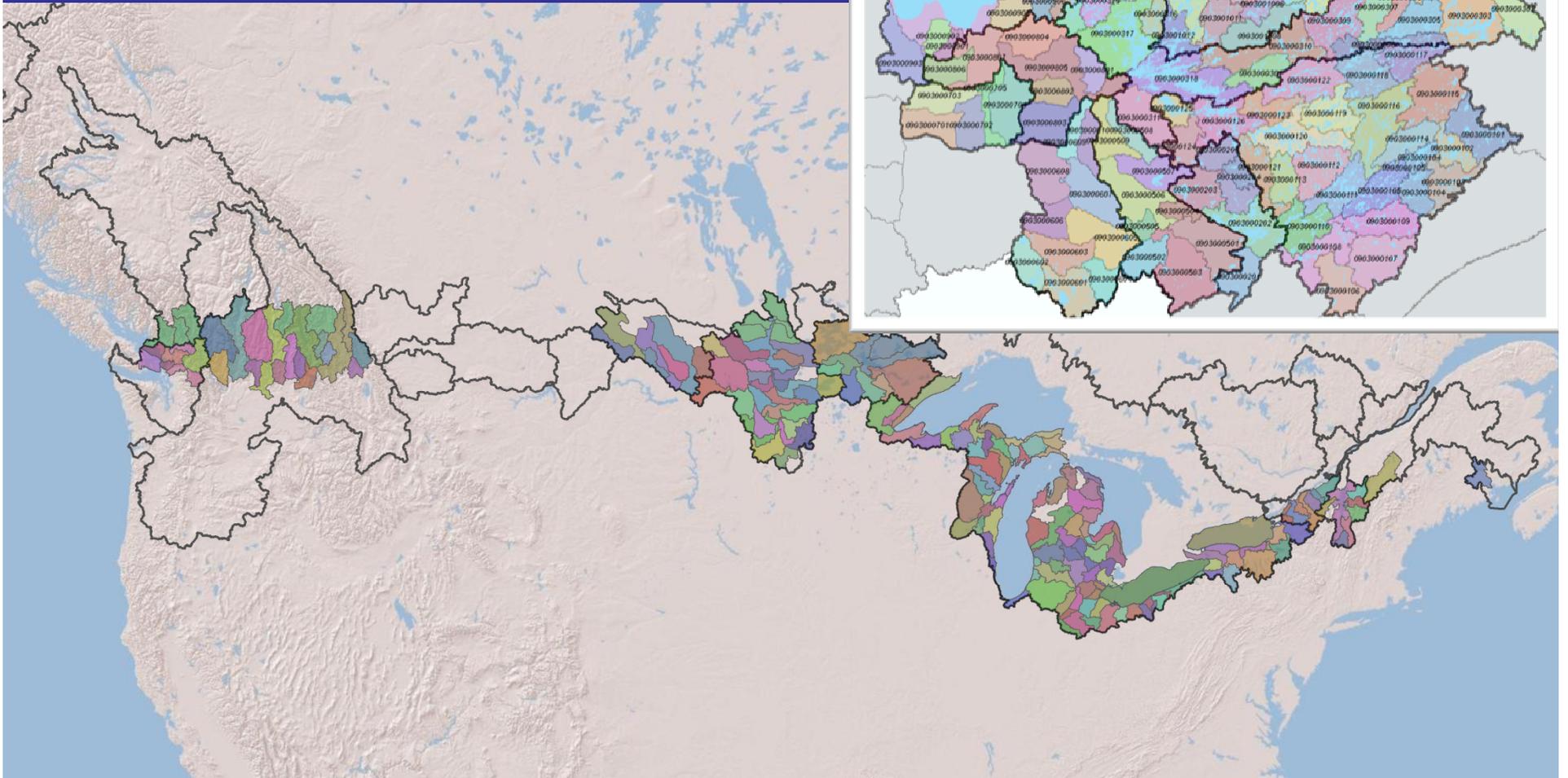




Phase I:
Completion of all 135 ,8-digit cross border
units

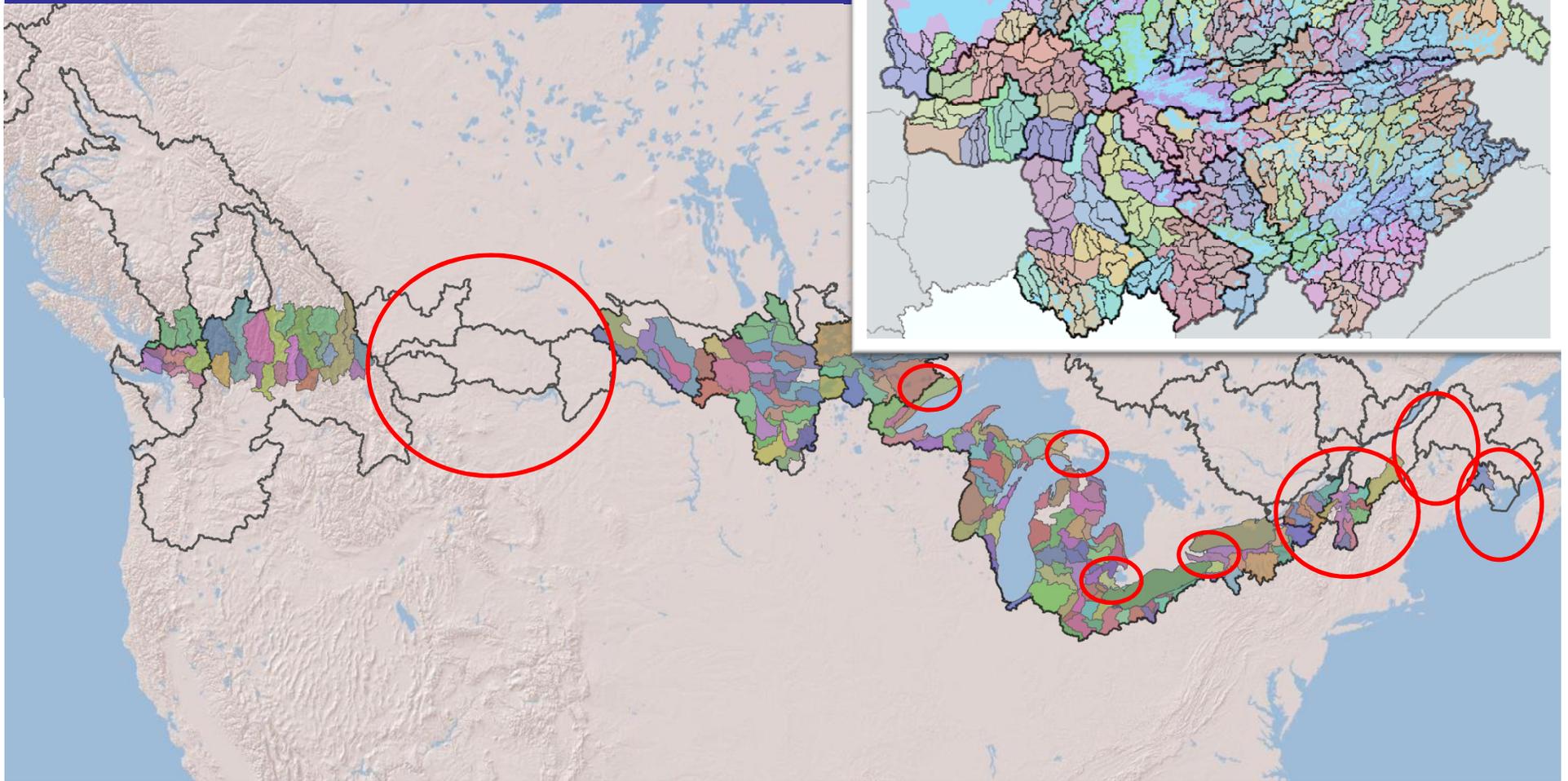


Phase III: One-third completion of 10- and 12-digit

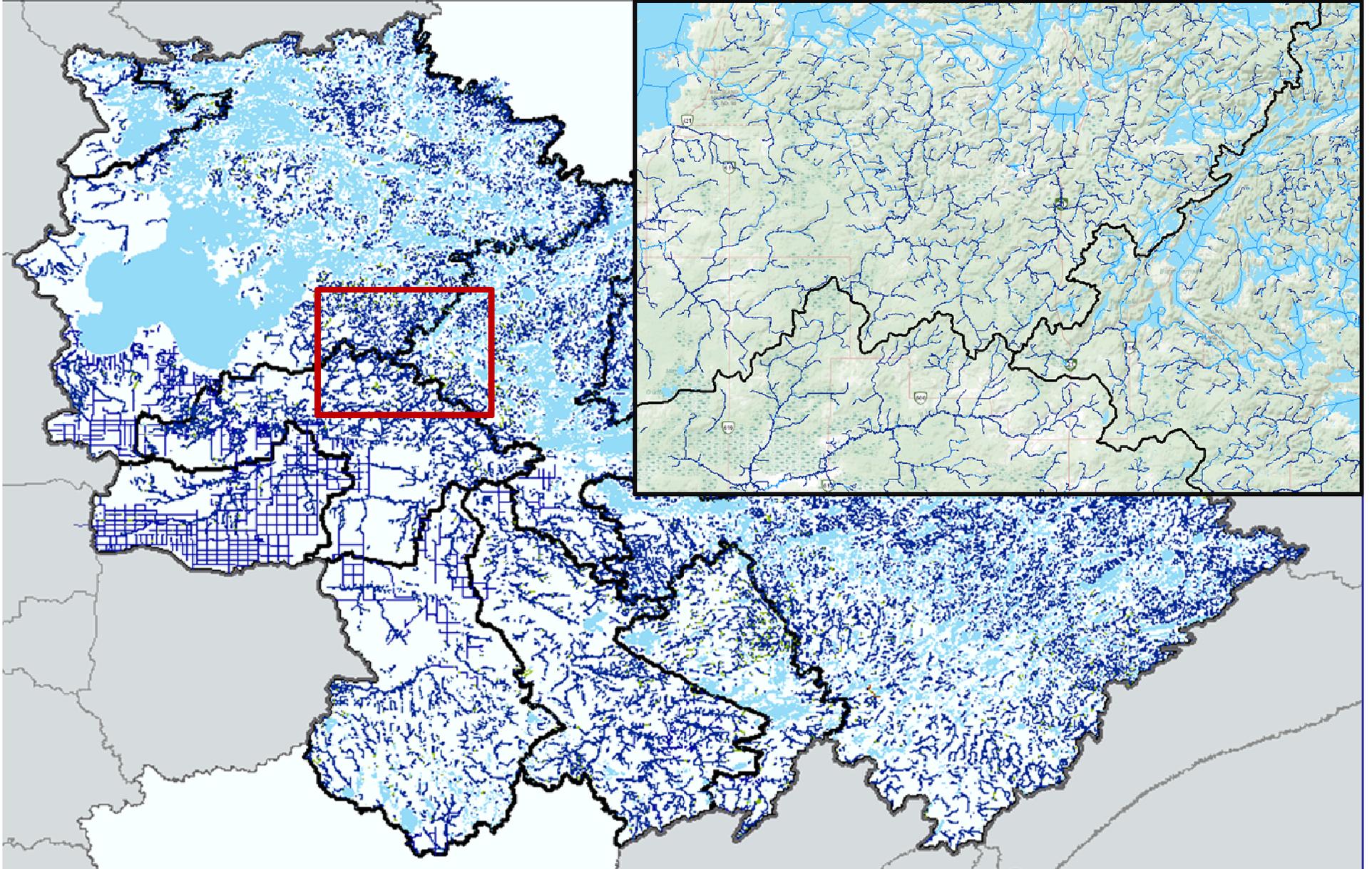


460, 10-digit units have been developed and/or harmonized

Phase III: One-third completion of 10- and 12-digit

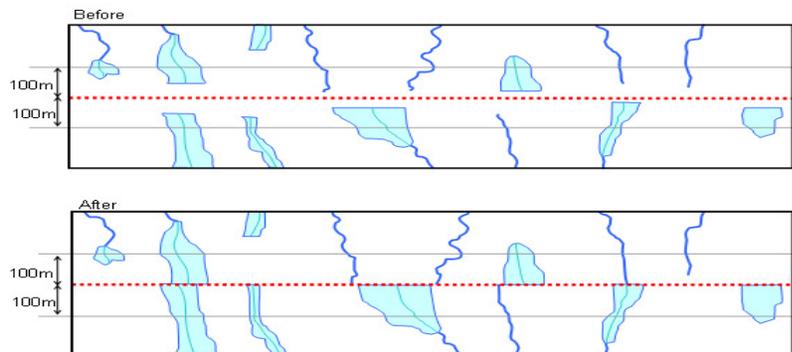


2,595, 12-digit units have been developed and/or harmonized



Hydro (NHN-NHD) Harmonization Guidelines

- The NHNH 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 densified International Boundary is used in the harmonization process;
- Entities (including NHNH NLF Inferred, 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 densified 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

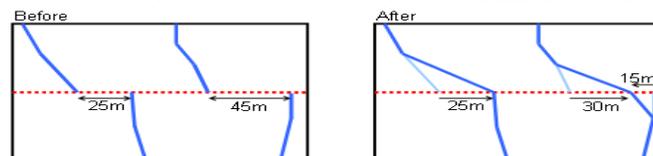
Applicable when distance between common cross-border watercourses (or watercourse and water body) is less than combined NHNH/NHD features planimetric accuracy value;

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.

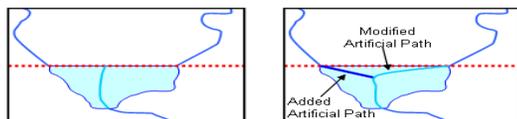
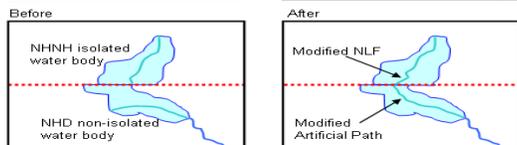
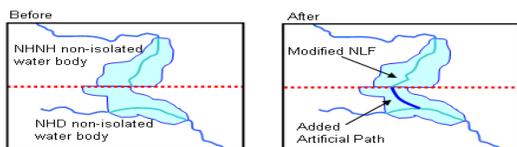
NHNH data accuracy: 30m NHD data accuracy: 20m Combined accuracy: 50m



Old position

Virtual Water Flow Paths

- Within adjacent NHNH (isolated or non-isolated) water bodies and NHD non-isolated water bodies:
 - Virtual water flow paths (NHNH NLF Inferred or NHD Artificial Paths) are added or modified to provide logical continuity of water flow;



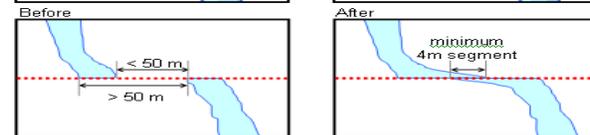
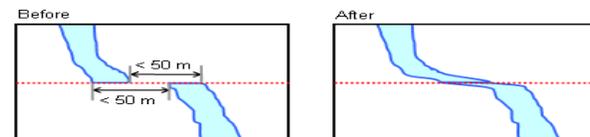
Water Body Displacement

NHNH and NHD water bodies are harmonized only if the distance between them is less than combined NHNH/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 NHNH/NHD features planimetric accuracy, no water body harmonization is carried out;

Harmonize water bodies are fully or partially aligned;

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



NHNH data planimetric accuracy: 30m
NHD data planimetric accuracy: 20m
Combined planimetric accuracy: 50m

Hydro Harmonization Flow Direction

Microsoft Excel - Table_correlation_NHNH2NHD.xls

File Edit View Insert Format Tools Data Window Help Adobe PDF

Type a question for help

100%

Arial 10

withdigitized

	A	B	C	D	E	F	G	H	I	J
1	Water_definition	Network_Flow_Type	Flow_Direction	Level_priority	Permenancy	Isolated	NHD Class	NHD-FTYPE	FLOWDIR	FCODE
3	Watercourse	Observed	Unknown Not applicable	All	Permanent	N/A	NHDFlowline	Stream/River	uninitialized	Perenial
4	Watercourse	Observed	Same direction	All	Intermittent	N/A	NHDFlowline	Stream/River	withdigitized	Intermittent
5	Watercourse	Observed	Unknown Not applicable	All	Intermittent	N/A	NHDFlowline	Stream/River	uninitialized	Intermittent
6	Watercourse	Observed	Same direction	All	Unknown	N/A	NHDFlowline	Stream/River	withdigitized	4600
7	Watercourse	Observed	Unknown Not applicable	All	Unknown	N/A	NHDFlowline	Stream/River	uninitialized	4600
8	None	Observed	Same direction	All	Permanent	N/A	NHDFlowline	Stream/River	withdigitized	Perenial
9	None	Observed	Unknown Not applicable	All	Permanent	N/A	NHDFlowline	Stream/River	uninitialized	Perenial
10	None	Observed	Same direction	All	Intermittent	N/A	NHDFlowline	Stream/River	withdigitized	Intermittent
11	None	Observed	Unknown Not applicable	All	Intermittent	N/A	NHDFlowline	Stream/River	uninitialized	Intermittent
12	None	Observed	Same direction	All	Unknown	N/A	NHDFlowline	Stream/River	withdigitized	4600
13	None	Observed	Unknown Not applicable	All	Unknown	N/A	NHDFlowline	Stream/River	uninitialized	4600
14	None	Inferred	Same direction	Primary	N/A	N/A	NHDFlowline	AFP	withdigitized	
15	None	Inferred	Unknown Not applicable	Primary	N/A	N/A	NHDFlowline	AFP	uninitialized	
16	None	Inferred	N/A	Secondary	N/A	N/A	NHDFlowline	Not used		
17	None	Constructed	Same direction	Primary	N/A	N/A	NHDFlowline	Connector	withdigitized	
18	None	Constructed	Unknown Not applicable	Primary	N/A	N/A	NHDFlowline	Connector	uninitialized	
19	None	Constructed	N/A	Secondary	N/A	N/A	NHDFlowline	Not used		
20	Ditch	Observed	Same direction	All	N/A	N/A	NHDFlowline	Canal/Ditch	withdigitized	3360
21	Ditch	Observed	Unknown Not applicable	All	N/A	N/A	NHDFlowline	Canal/Ditch	uninitialized	3360

Waterbody_2 \ Network_Linear_Flow_1 / Island_2 / ManMade_0 / ManMade_1 / ManMade_2 / Obstacle_0 / Obstacle_1 / Obstacle_2 / Coastline /

Ready NUM





The International Watersheds Initiative (IWI)

The U.S. and Canada share 3,146 miles of land boundary and 2,379 miles of water boundary

Promote a watershed approach to the study and management of shared water resources along the U.S.-Canadian border. The International Joint Commission (IJC) will carry this out on behalf of the governments from both the U.S. and Canada

Give local, regional and Federal governments the tools to address current and emerging issues in their areas of interest

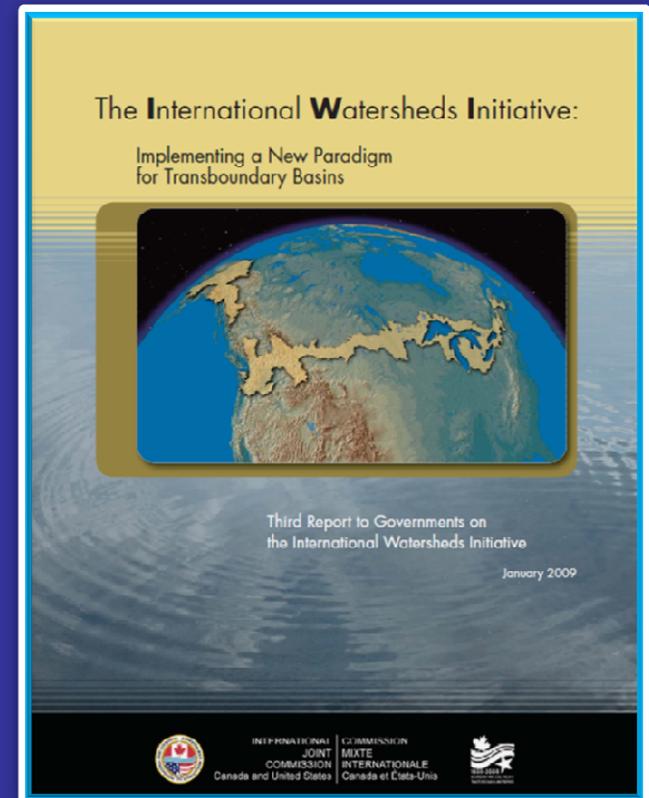
Intensified population growth and urbanization

Global climate change

Changing uses of water

Pollution from air and land

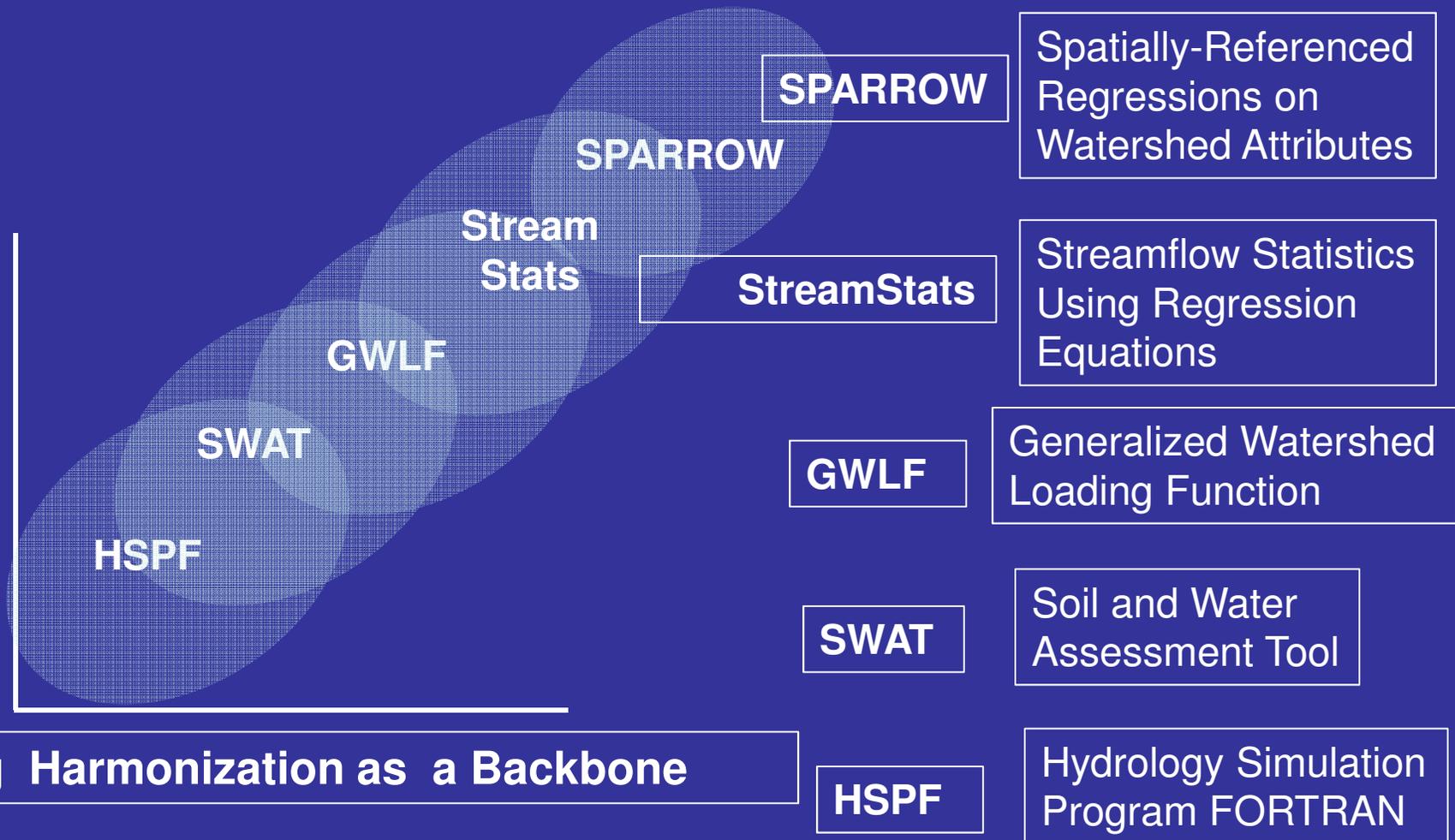
Introductions of exotic species



Business cases for Harmonized Hydrography and Watersheds along the International Border

- Determination of streamflow statistics such as flood recurrence intervals, and stream discharge
- Hydrologic modeling of watersheds that cross international borders will improve our hydrologic, hydraulic and water quality modelling capabilities
- Establishing water rights
- Estimation of hydropower potential
- Planning of infrastructure projects
- Fire management
- Invasive plant management
- Fisheries management
- Hydrologic processes, sediment transport, runoff, snowpack
- Glacier monitoring
- Cultural migration patterns
- Estuary classification
- Habitat conservation
- **Climate change variables**
- Characterizing ecological services to streams and habitat
- **Mapping fish habitat and accurately mapping fish barrier locations**
- Fisheries research, management and prioritization
- Improve our understanding of transboundary streams by facilitating the identification and classification of these streams
- Increasing our ability to characterize watersheds will maximize available information for decision making associated with industrial, hydroelectric, fishery, tourism and other sector applications
- Help our web users/clients to better understand the size/scale of watersheds
- **Eliminate duplication of effort**
 - Yukon Water Board is working on an initiative called COIN (Co-ordinated Online Information Network) that will be mapping all watersheds in Yukon

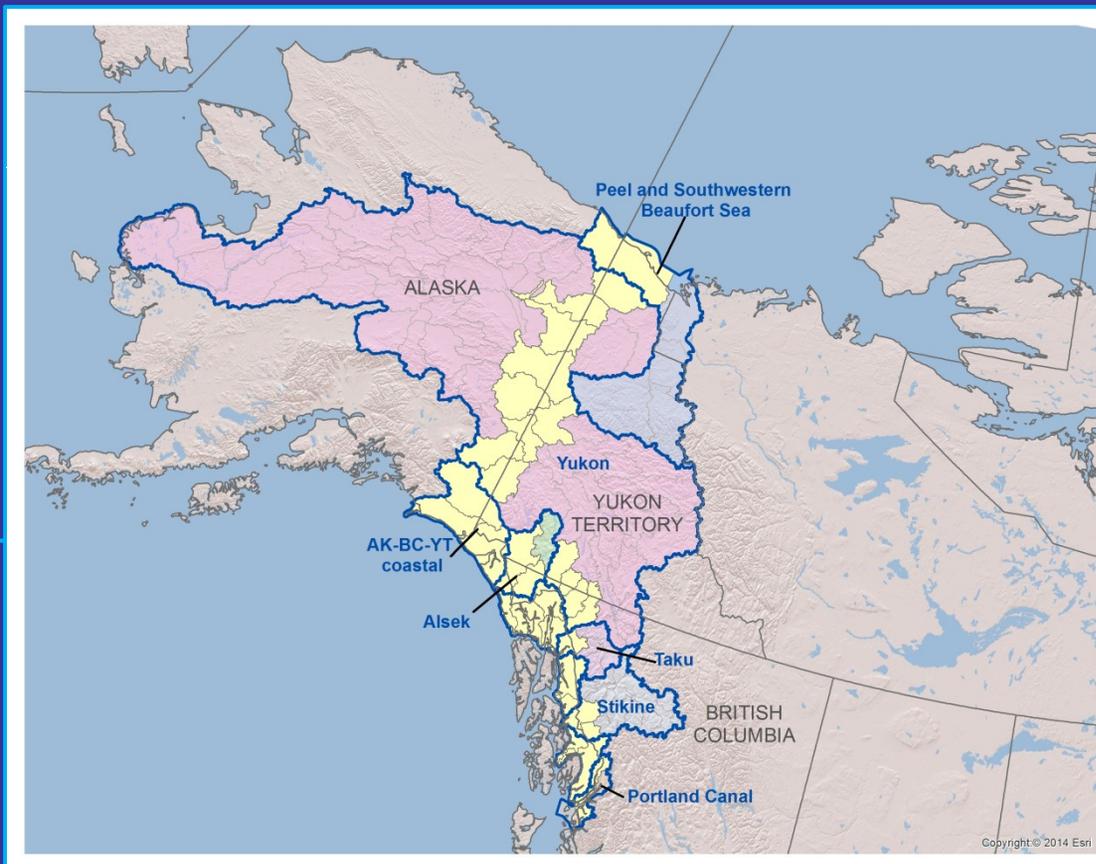
Leveraging Harmonized Hydrologic Frameworks



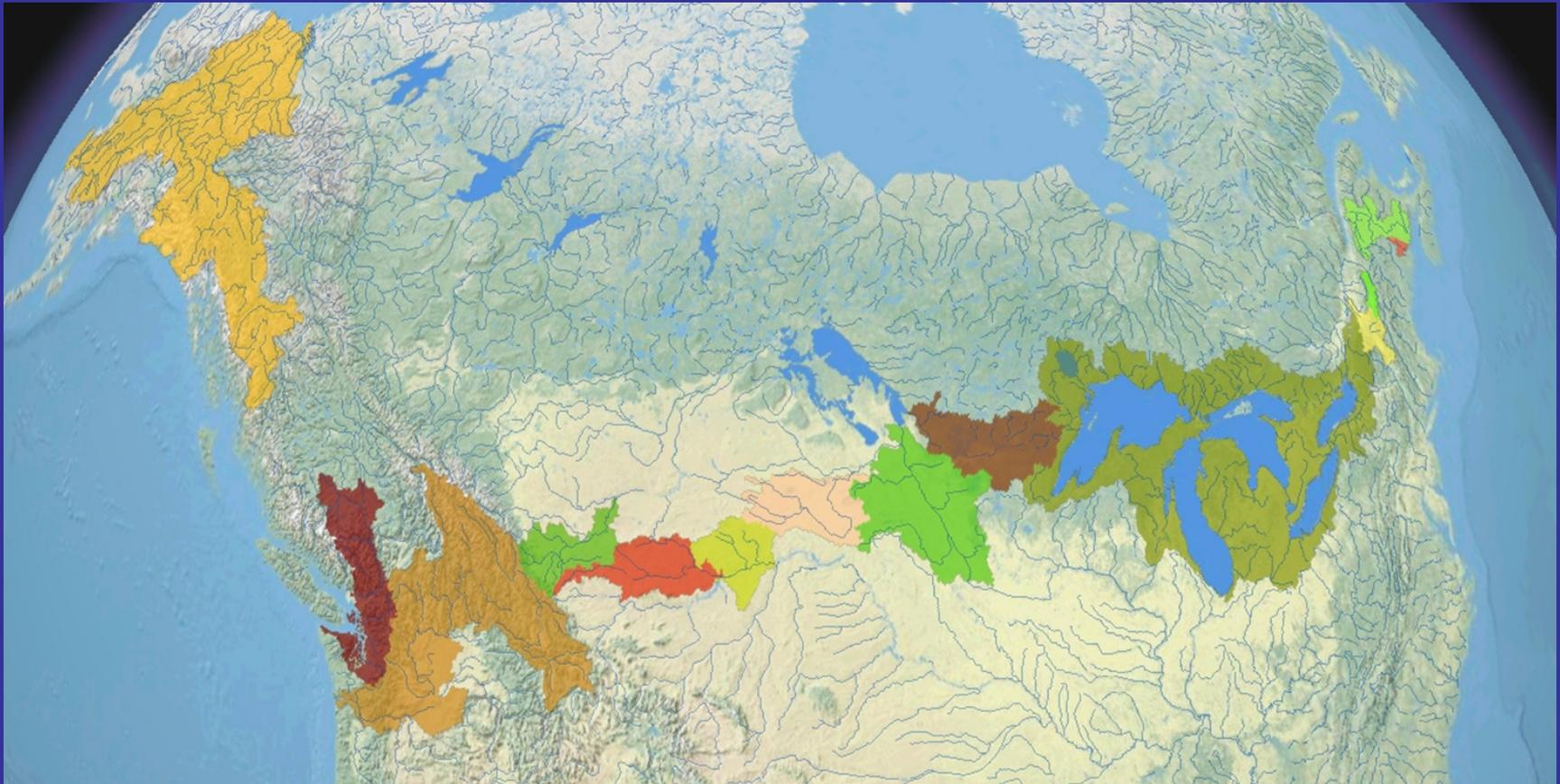
“It has always surprised me when I have inquired about GIS data for a watershed like the Stikine River that someone could just pass me the delineation to the U.S./Canada border, thereby missing about 80% of the watershed on the Canadian side without even a note because its out of their jurisdiction”

-Kathy Smikrud,

*GIS Analyst and
Steering Committee
of SEAK GIS Library,
Sport Fish Division
of the AK Dept.
of Fish and Game*



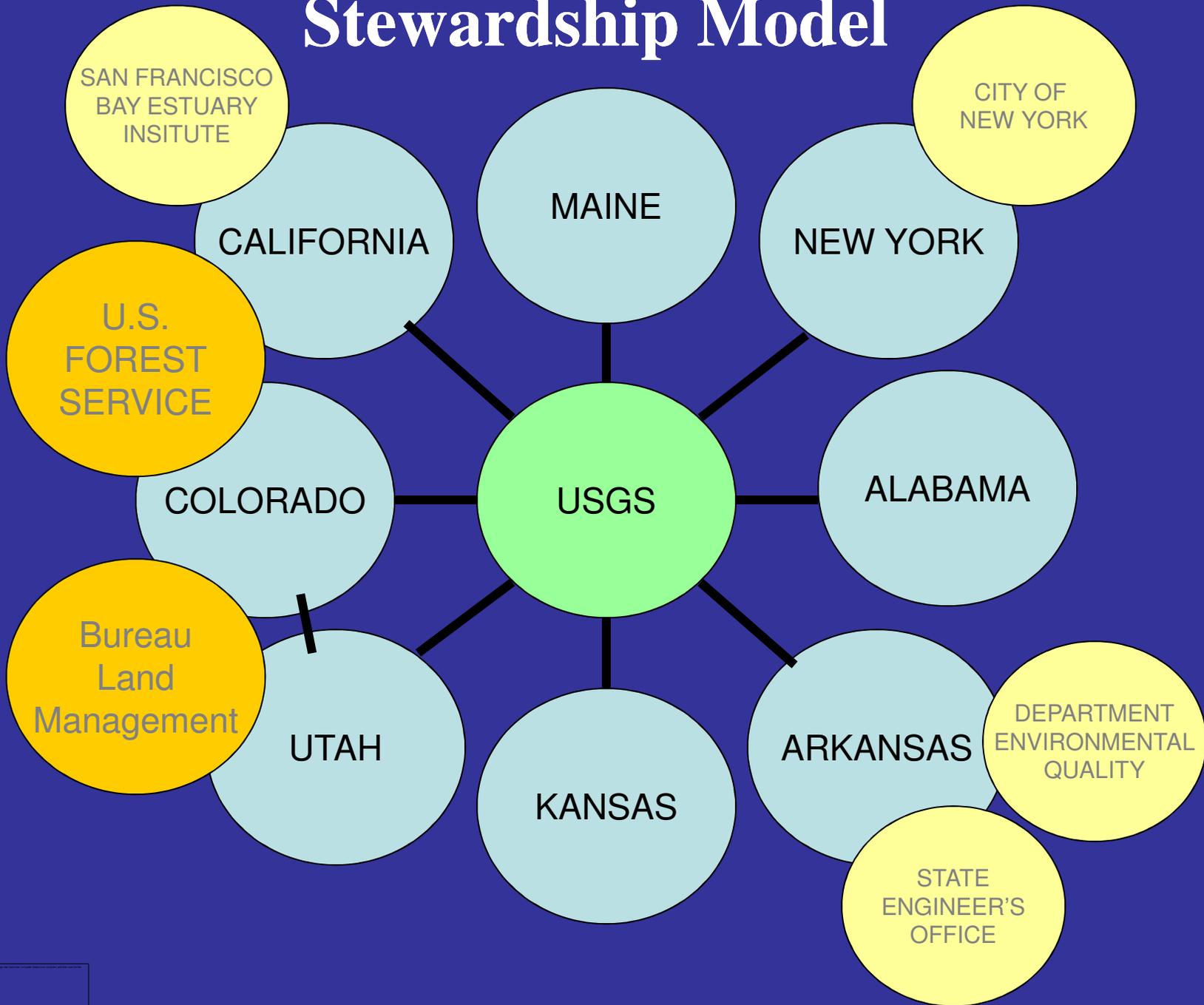
Going Forward



In the Next 3 Years

1. Finish Phase 3 of the Hydrographic Data Harmonization, including AK-YT-BC
2. Secure funding necessary for Task Force activities
3. Define and Develop a Sustainable “bi-national” Stewardship Process for the Harmonized Data

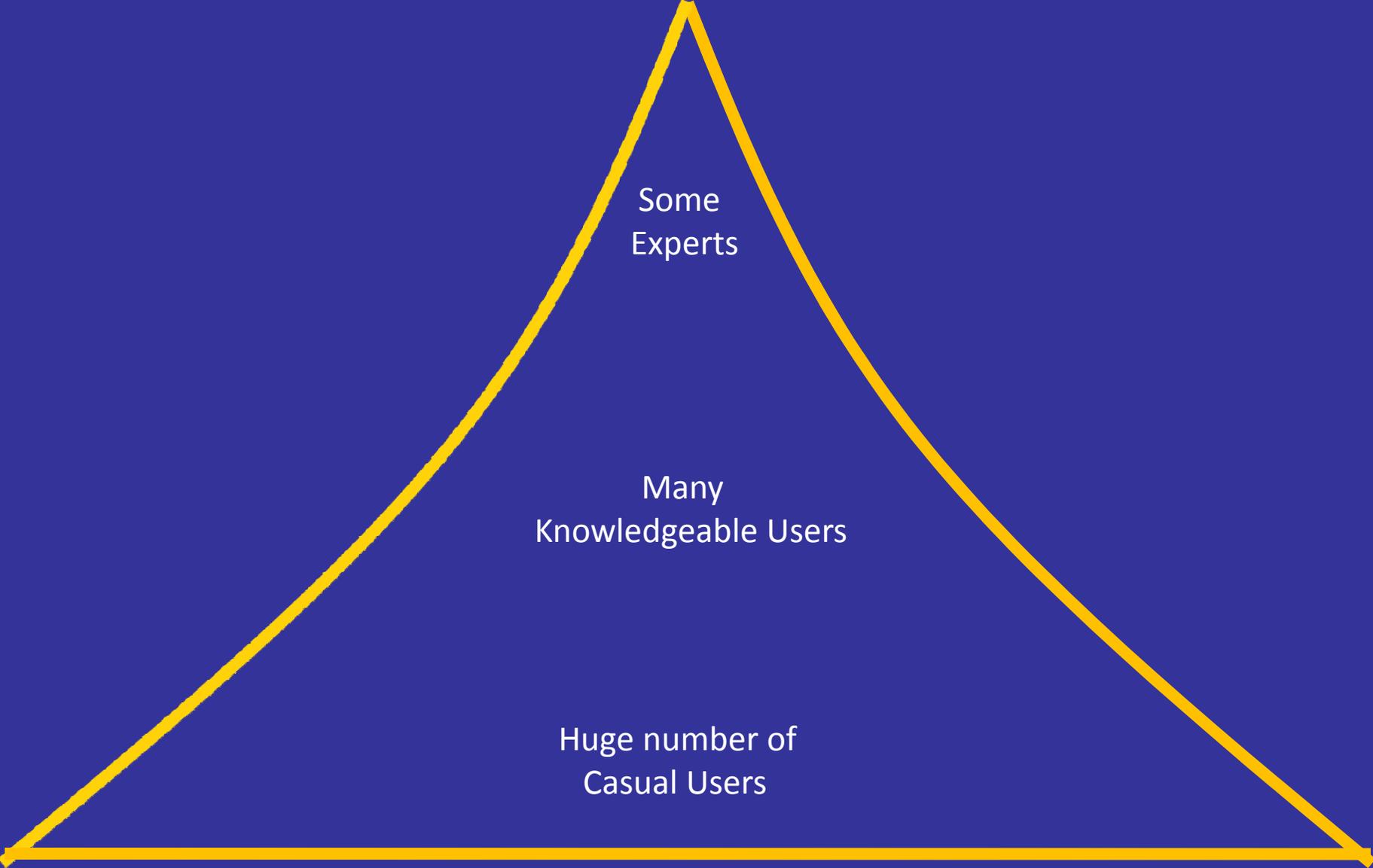
Stewardship Model



Over the Next 10 Years

1. Implement the Sustainable “bi-national” Stewardship Process
2. Keep the Transboundary Hydrographic Harmonization Task Force active in an advisory role on geospatial data issues, such as the North American “Vertical Datum” framework
3. Recognition by the user community that the IJC Harmonized Data is the authoritative data source along the US-Canada border

Hydrography User Base



Some
Experts

Many
Knowledgeable Users

Huge number of
Casual Users



Thank you