# A Collaborative Approach to NHD Stewardship

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**February 2013 – Alaska Survey and Mapping Conference**


I'm going to discuss the National Hydrography Dataset and why its important in AK.

I'll also discuss the collaborative approach to NHD stewardship based on a federal-state-University partnership.

But before getting into my talk, I want to point out that the stewardship model that I will be discussing is an extension of the services provided by the Southeast AK GIS library.

# Southeast Alaska GIS Library

- The Southeast Alaska GIS Library is a geospatial resource for regional resource management and GIS professionals
- Founded in 2001 as a collaboration between the USF&WS and the USFS Tongass National Forest
- Now includes ADF&G, TNC, UAS, USF&WS, USFS, USGS, ADNR, ADEC & NOAA and operates under a MoU
- Hosted on an enterprise GIS solution at UAS
- http://seakgis.alaska.edu

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- The GIS Library provides an array of data and data services to students, public, and agency partners in southeast Alaska
- The GIS Library is funded and directed through a partnership consisting of 9 federal and state entities.
- The GIS Library has been around for a while now, since 2001. We got a big facelift in 2010 with significant IT improvements including a new website and deployment of a scalable enterprise GIS solution on a multi-tiered server and SAN environment.
- The GIS Library is now formally the GINA Node within SE Alaska.
- Encourage all to visit the website

# Collaborative Approach to NHD Stewardship in Alaska

- Why NHD?
  - Enhances partnerships
  - Promotes scientific collaboration
  - Leverages resources
- NHD Applications
  - Watershed Assessment, Tracking and Environmental ResultS (WATERS) *(EPA)*
  - Fish Passage Decision Support System *(U.S. Fish & Wildlife Service)*
  - StreamStats – *(USGS & EPA)*
  - Natural Resource Information System *(USDA Forest Service)*
  - The National Map – *(USGS)*
  - US Topo – *(USGS)*

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The National Hydrography Dataset, or NHD, is the nationally recognized database of record for hydrography data.

- Its commonly recognized as the 'blue lines' on USGS topographic maps and consists of mapped surface water features such as streams, lakes, glaciers, intertidal areas, etc.
- NHD is also the framework for a large suite of ancillary information for data themes such as aquatic species inventories, impaired waters, and various biological and physical observations
- NHD is also the framework for a number of applications developed by various agencies including the EPA's WATERS application and the USGS's National Map.
- The Forest Service is particularly interested in NHD as many of its natural resource information system applications (i.e. NRIS applications) are built on and around the NHD.

# Background of Hydrographic Data in southeast Alaska

- State of hydrography data ~ 10 years ago
  - Tongass National Forest provided their data to USGS for initial NHD development
  - Tongass National Forest provided their data to ADF&G Southeast Sport Fish Division at the same time
    - Divergence of the 3 datasets since
  - ADF&G Anadromous Waters Catalog
    - Separate, non-integrated data set

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Despite the importance of the NHD to some of the major land and resource management agencies within Alaska, NHD stewardship in the state has broadly been neglected - I'd like to touch on some reasons for that here.

- NHD within Alaska was launched over 10 years ago primarily using 50 year old data generated during USGS's production of Alaska's initial topo maps. That data was very course in resolution and often spatially inaccurate.

- Since that time, the adoption of NHD by agencies in Alaska has been modest. Some agencies continue to maintain their own hydrography data instead of updating NHD for several reasons including:
  1. Complexity and expense utilizing USGS's NHD editing tools
  2. Inability of the NHD to meet local business needs
  3. Lack of statewide coordination on NHD stewardship

<u>Summarizing the situation in southeast Alaska</u>:

- the Tongass National Forest provided their stream data to the USGS over 10 years ago for incorporation into the then burgeoning NHD.

- At the same time, the Tongass also provided their stream data to the ADF&G's southeast Sport Fish Division.

- The Tongass and ADF&G Sport Fish Division datasets diverged over this 10 year time period as each agency updated their own versions of the data - primarily updates were a result of focused mapping efforts during project planning and implementation.

- The authoritative NHD dataset, meanwhile, has remained mostly unchanged during this time period.

- In trying to address these issues on a fairly board scale, the USFS started to look at regional collaboration with the ADFG and others in SE AK. Those interagency discussions eventually led to a program of work called the Southeast Alaska Hydrography Project.


The Southeast Alaska Hydrography Database – or SEAK Hydro – project was implemented in 2010 and designed to address the factors that have prevented the adoption of NHD in southeast Alaska.

SEAK Hydro provides critical local attributes, such as anadromous fish habitat and channel type information, within a simple localized database while ensuring that the NHD gets updated with reliable geometry for local and national use.

Since the project's inception, 10 years worth of stream edits by the Tongass and ADF&G's southeast Sport Fish Division have been reconciled into one database hosted at UAS.

- So, both agencies now collectively edit, manage, and maintain the SEAK Hydro dataset.
- Having the data at UAS is advantageous as it allows both agencies to work on the same dataset independent of firewall and agency-specific IT restrictions.

In 2011, ADF&G's Anadromous Waters Catalog group in Anchorage, which provides the state database governing regulatory salmon streams, engaged in order to incorporate the State's AWC geometry into the NHD.

Paramount to this process is the update of NHD from SEAK Hydro data which is provided as a service by UAS to the partner agencies – which means that the USFS and ADF&G don't have to double handle data updates or struggle with the USGS editing tools and incur the high cost of NHD maintenance – the technical skills required to perform the NHD tasks are performed by trained University staff.

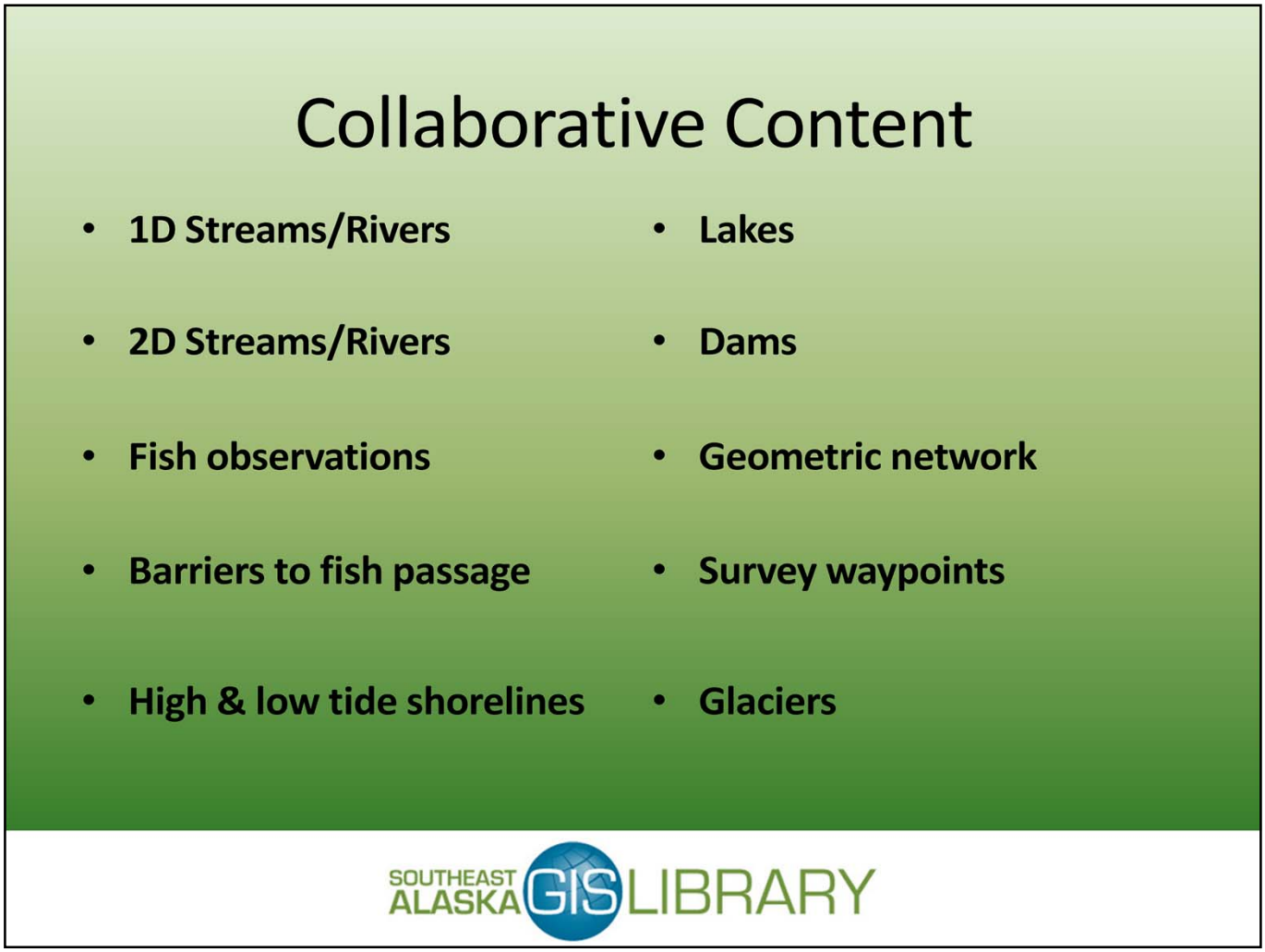
In 2012, the project extended its area of focus with the development of a collaborative database covering south central Alaska as defined by the AWC's south central AK extent.

While very similar in structure and content to SEAK Hydro, the South Central database (or SCAK Hydro) is designed to address specific regional business requirements, while providing the same collaboration and stewardship aspects provided by SEAK Hydro.


This slide shows the extent currently available within the AK Hydro stewardship model.

Note, the regions depicted in this graphic are as described by the ADF&G and used for state regulatory activities such as the State's Anadromous Waters Catalog.

While the regions don't match exactly to the WBD HUCs used for NHD Stewardship, they match pretty closely and are thus quite useful for accommodating both State and NHD stewardship requirements.

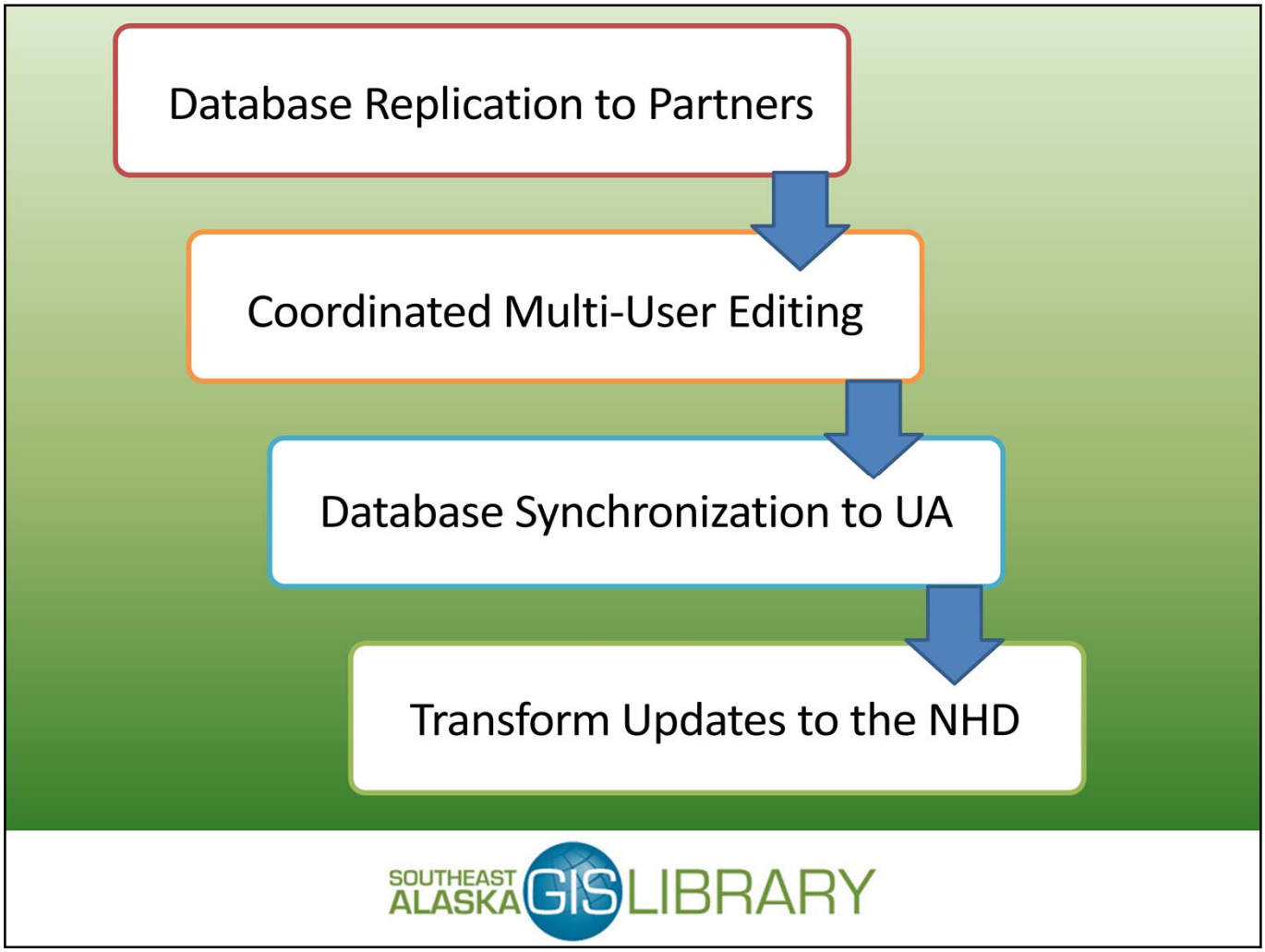



So this is the data that's available in the SCAK and SEAK Hydro databases.

Data meeting local business needs that is difficult to attain with the NHD model includes:

- fish observations
- the state Anadromous Waters Catalog
- within the streams data there contains channel type mapping of geomorphological features
- multiple shorelines – high, mean and low (our stream geometry extends to the low tide shoreline, since intertidal stream channels can be critical habitat for pink and chum salmon).

Plus the stream data has directionality and is networked to model things such as downstream effects of pollutants or upstream effects of a fish barrier.

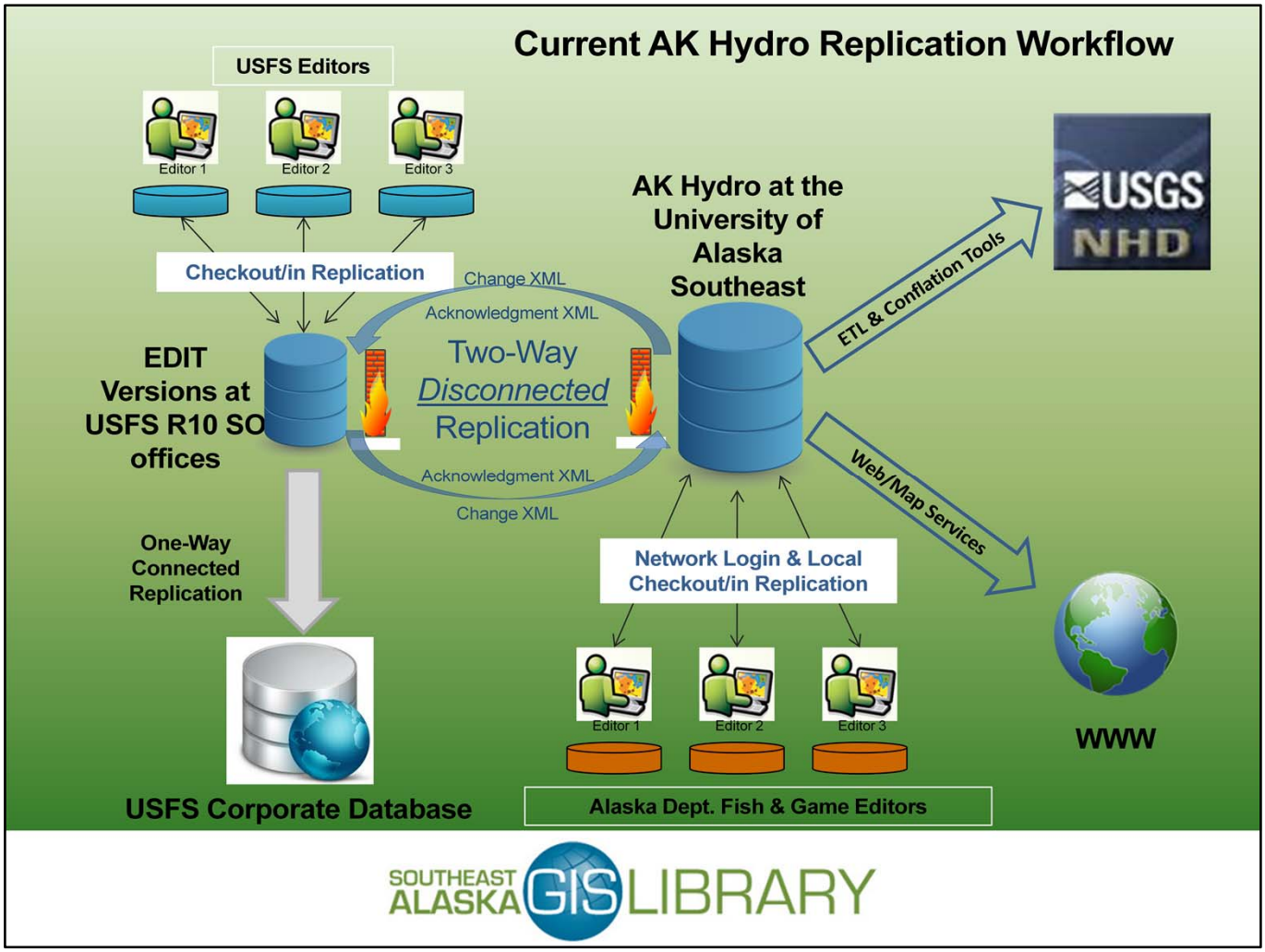



This slide depicts an generic illustration of the core steps involved in the SCAK and SEAK Hydro processes/workflows.

The key point is that the collaborative hydro model is formatted in an editor friendly database that contains items essential to local business processes – content and information that the NHD data model does not support; however, the collaborative hydro database is synchronized to the more complex NHD through tools and services provided by UAS.

While the workflows that I'll to be discussing for the remainder of this presentation are currently only available within SE and SC Alaska, we see the collaborative data maintenance model as something that can be extended to other regions within the state.

We also believe this model can be applied to other business areas such as transportation, cadastral boundaries, soils and vegetation mapping.




This slide depicts an overview of the workflow that has been implemented so that both ADF&G and the USFS can update the shared database hosted at UAS.

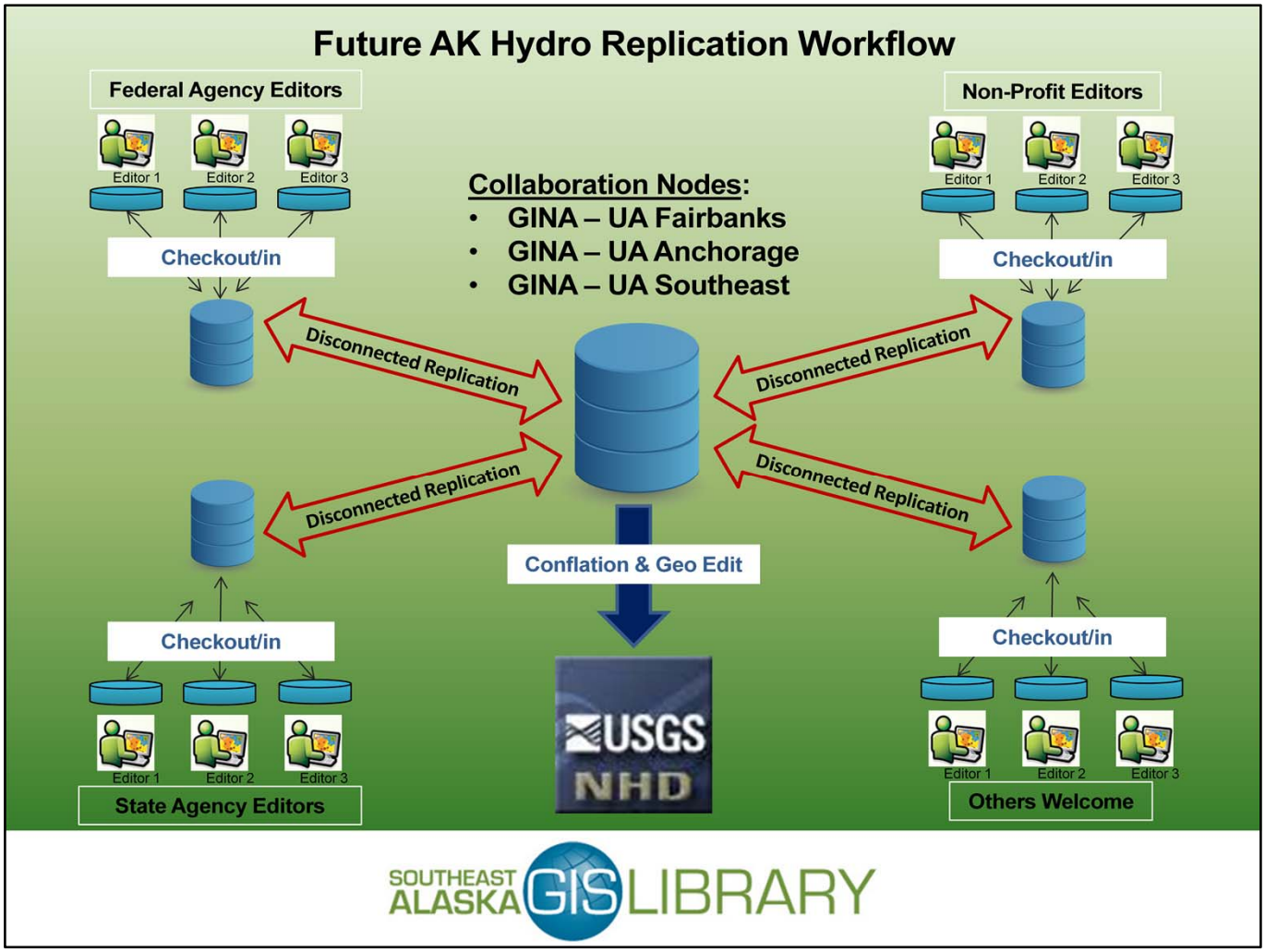
The critical points in this diagram include:

- Demonstrating that data flow both ways to and from the USFS and ADF&G database replicas to the transactional database at UAS
- Primary data replication and reconciliation of edits between the USFS child replica and the parent database at UAS is being done via XML file transfer (fairly responsive and an easy way to avoid complex firewalls and network issues)
- Use of a combination of both a customized tool set and the standard USGS toolset to get updates into the NHD (Hank Nelson will be talking about the USGS NHD toolset extensively following my presentation).

Not shown in this diagram is a process we use, based on spatial editing check-out extents, which ensures no two editors are concurrently editing the same streams or watershed.

- This is really important as NHD editing is based on “the last one in wins”
- Two types of collaboration:
  - Coordination of check out extents (ADEC for example)
  - Full participation on the Collaborative Hydro editing process

The replication workflow is both complex and prone to error/breakage. However, we've got redundancy for error trapping, a relationship with ESRI, good communications, and expect that this process will improve. The development of the workflow has been HUGE in that others/partners can now benefit from what we've painfully learned and avoid those same pitfalls associated with replication workflows.

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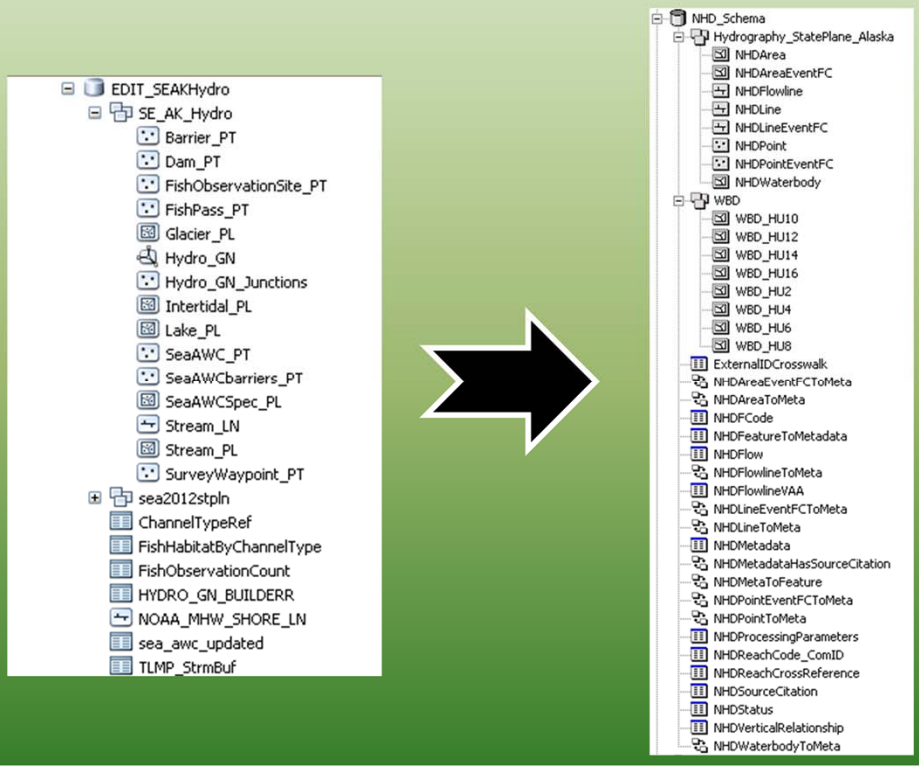
This slide demonstrates a possible workflow for state hydrography stewardship, where all editors (like the USFS now) have access to a local replica of a regional hydro database in a multi-user editing environment.

Hosted and coordinated by the University , this type of system would enable multiple agencies to collaborate on the same regional hydrography dataset, while ensuring a single users editing effort benefits everyone.

This model emulates the process currently used at the USFS for hydro stewardship, a process where all partner agencies would manage a child replica on their corporate network and utilize the disconnected workflow with multiple simultaneous editors.

# Moving AK Hydro into the NHD

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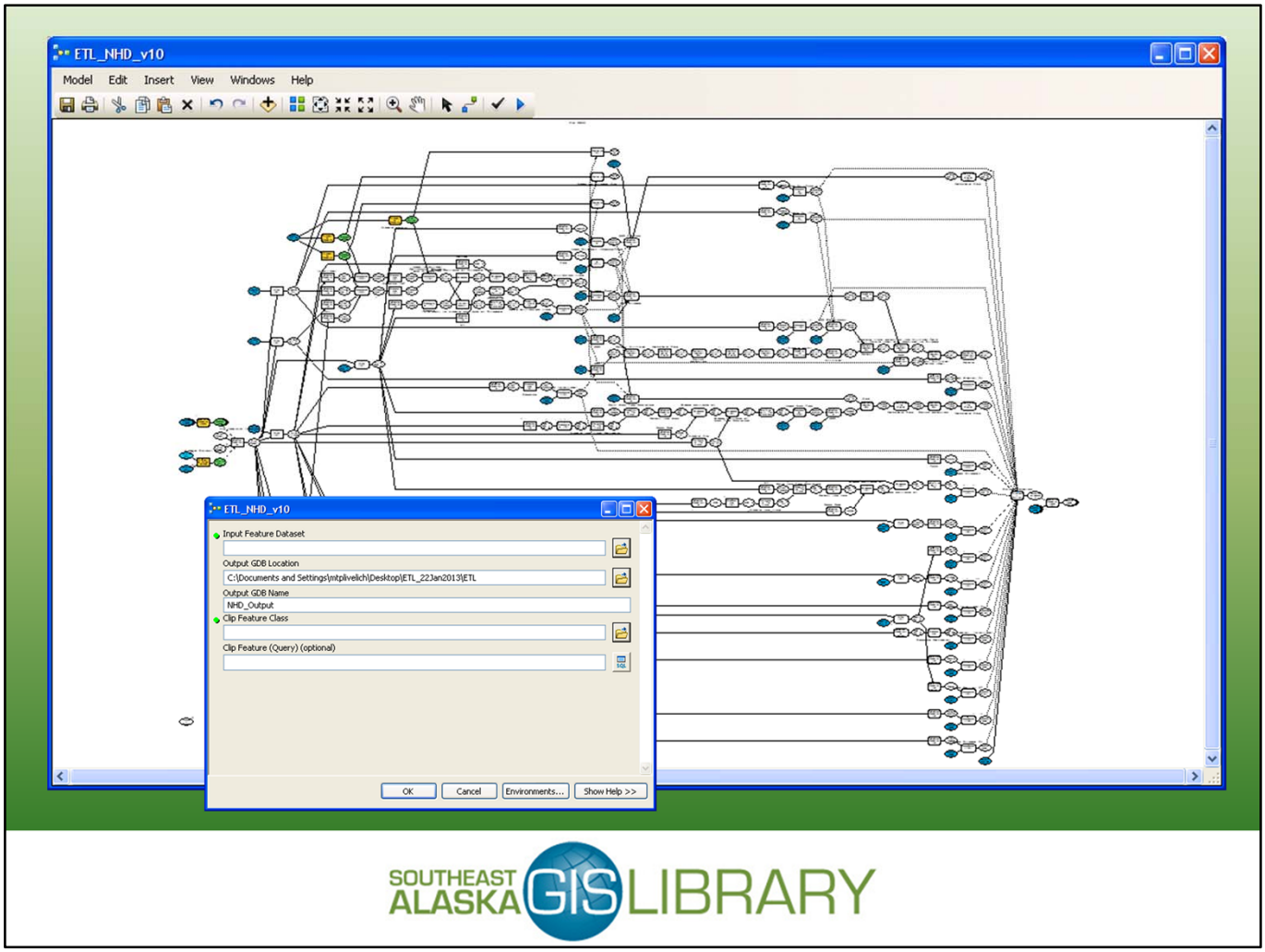
The screen capture on the left shows the relatively simple database content of the AK Hydro data model, while the screen capture on the right illustrates the fairly complex content of the National Hydrography Data model.

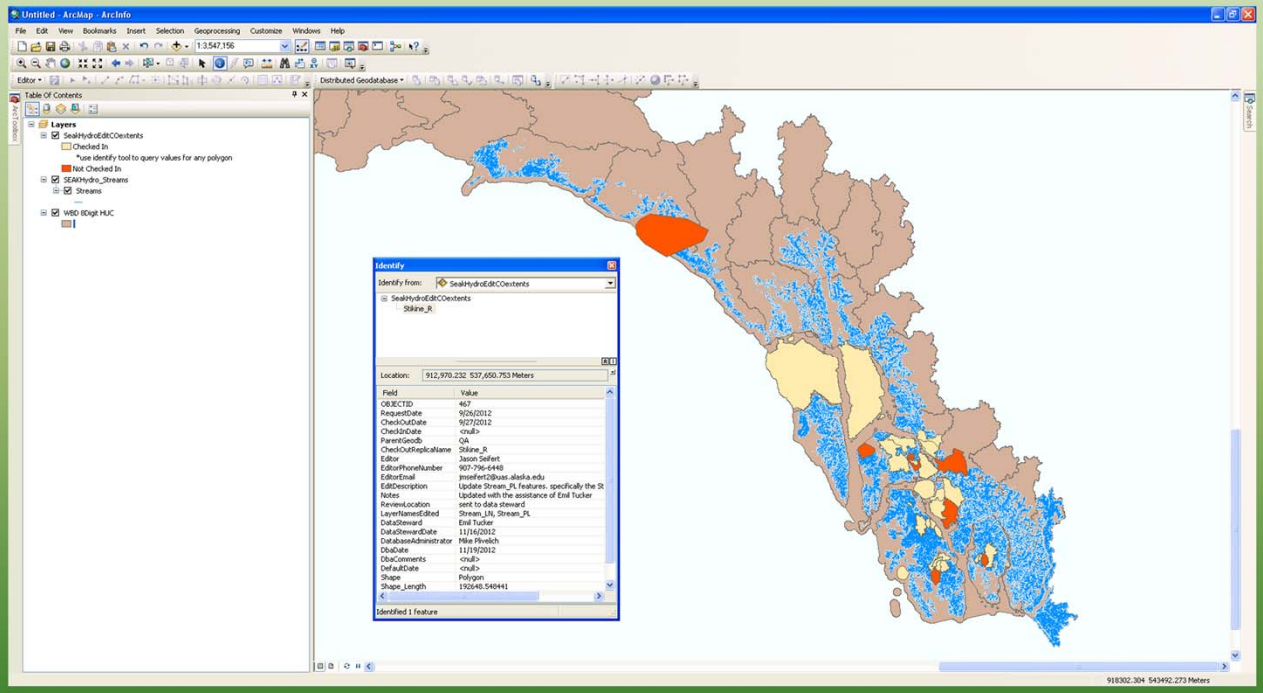
The arrow in this slide represents the **3 part process** that is used to transform AK Hydro data into NHD data

- Step 1 involves a manual process of checking pre-conflation AK Hydro data in ArcMap to ensure that it conforms to NHD geometric criteria
- Step 2 of the process involves the use of a custom built Esri geo-processing model that transforms the topologically correct SE AK Hydro data into NHD conflation ready data (shown in the next slide).
- Step 3 is running the USGS Conflation and/or GeoEdit tool.




As mentioned in the previous slide, we use a custom built geo-processing model from Esri to transform the Collaborative Hydro data into an NHD conflation ready format. The intent of the slide is not to communicate what's actually happening within the model itself, but to convey that the model ensures that all of the data we're outputting from the regional databases is standardized according to the NHD data model – its also worth mentioning that the outputs have been vetted and reviewed by NHD administrators, as well as having been successfully passed through NHD QA and Conflation toolsets.

# Map Services

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- The screen capture here shows a couple of the map services related to the Southeast hydrography database and published from the GIS Library at UAS. They beige and orange polygons in the screenshot demonstrate the map service that I referred to earlier that uses spatial editing check-out extents to coordinate editing efforts across our partnering agencies. The “blue lines’ or stream arcs demonstrate a live feed of one of featureclass within our collaborative model. Both map services are shown against the WBD 8 digit HUC boundaries for context.

- The editing extents map service contains a collection of polygons within the SEAK Hydro extent, that demonstrate areas which have either recently been edited or are currently being edited. Using the identify tool in conjunction with this map service allows users to see where others are currently editing so they can avoid conflicts, as well as get a sense of what have been recently done within an area. The service also provides contact details for folks who are either currently editing or have recently worked in an area of interest. That information saves folks from jumping through the hoops of bureaucracy to talk to one another prior to making changes in the database that have potential for conflict. The orange areas show where edits are actively occurring and the beige areas show areas where edits have occurred over the last 12 months.

- The “blue lines’ shown here are published via a data service that non-partnering users can either interact directly with the data or download a static copy for subsequent use. The ability to consume the data via a live feed enables others to use the data in their own interactive web mapping applications while ensuring that they are always displaying current data, as well as saving users from having to manage a static copy of the dataset (which could quickly get out of date).

# Special thanks to Jim Schramek

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In my final slide, I'd like to take a moment to recognize Jim Schramek for his contributions to this work. Jim's the recently retired GIS Coordinator on the Tongass National Forest and he gets the credit for nurturing this project from concept into reality. Not only did Jim provide the intellectual horsepower to figure out how this process might work, but he provided actual hands on support for most of the data synthesis to get us up and running. He was both dedicated and passionate about this work, because he could see the potential not only for his own agency's benefit, but the greater benefit to others around the state. I just learned that on the final day of his career at the USFS, instead of coasting through his final hours, he hung around until 6pm making a few final tweaks/improvements to the data model… I'm sure he's off fishing or pulling pots somewhere around Petersburg today, and deservedly so, but I'm still taking this opportunity to thank him for his efforts on our NHD stewardship model!


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