**NHD DATA SUPPLY PLAN**

**Background**

The National Hydrography Dataset (NHD) is a shared geospatial framework for hydrography data.  The database is housed by the USGS NGP.  The data model has been jointly developed with Federal, state, and local stakeholders.  Content is added, improved, and maintained by NGP, other Federal agencies (primarily U.S. Forest Service), designated stewards and sub-stewards, and other agencies working through the above.

The stewardship model for the NHD relies on the value of the dataset (content, data model, tools) to the steward exceeding the cost (labor, software, training) of content maintenance.  Hydrography differs from elevation and imagery in that there is both a continuous maintenance process as features change (compared to punctuated updates for the other themes), and a significant component of continuous product improvement – better resolution, more attribution, and correction of data errors.

A fundamental assumption of the stewardship model is that the local steward is more aware of geometric and attribute changes than a cartographer in a national center, and that the local steward is more capable of accurately resolving discrepancies than a cartographer in a national center.  Although this is broadly true of basic 1:24,000 scale geometry and names, the local steward is vastly more capable of adding the attribute and engineered feature content (diversions, storm water infrastructure, dams) than a national steward because of the local knowledge required.

In past years, geographic priorities for partnership funding have been driven by the needs of the US Topo mapping program. All areas of the conterminous U.S. have now been through the US Topo process at least once, and most twice, therefore it is likely that any major issues that are apparent on 1:24K topo maps have been corrected. Therefore hydrography data and stewardship planning no longer needs to tightly align to the US Topo schedule, except for Alaska.

Late in FY14, an effort to produce and maintain High-Resolution NHDPlus was initiated. This year our hydrography data and stewardship priorities will shift to supporting our High-Resolution NHDPlus efforts. A key end user of HiRes NHDPlus, and therefore likely interested in partnering with NGP, is the USGS Water Mission Area’s StreamStats program. The table below indicates program interest and general priorities from the StreamStats program. The partners generally would be the USGS Water Science Center (WSC) for the state; the WSC may in turn bring in local partners. The areas indicated are not exclusive; projects in all other areas will be considered.

In general, the requested NGP funding should make up no more than 50% of the total project costs, including partner in-kind contributions.

Because of the substantially different issues and stewardship environment, NHD projects for Alaska are described separately in the Alaska data supply plan below.

**Securing current, accurate data**

This data supply plan emphasizes three broad types of activities.

* Campaigns conducted by the National Geospatial Technical Operations Center (NGTOC) staff to refine and improve the database at a national level.
* Building stewardship by providing funding to help offset staff costs and develop capacity for stewardship in states.
* Building value by providing support for adding content or tools to the NHD to improve the value of the dataset, thus improving the value proposition to stewards and users.

*National Campaigns*

* During FY15, the NGTOC will begin production of NHDPlus products, including Value-Added Attributes and catchments for the high-resolution NHD similar to those that have been produced for the medium-resolution (100K) NHDPlus Version 2.  Software tools will be adapted from those used for 100K NHDPlus and set up internally in NGTOC. Initial production will be done by a contractor, with the goal to establish production and “refresh” capability within NGTOC.
* NGTOC will continue to ensure the integrity of the “end to end” process from editing through delivery.
* A focused effort will be undertaken to improve the quality and completeness of the Hydrographic Category attribute. This may involve targeted work with stewards and other partners in areas where problems with this attribute are noted.
* Supporting the Open Water Data Initiative (OWDI) by developing a Hydro Event Data Catalog and by further developing and improving data delivery through web services.

*Building stewardship*

For 2015, emphasis will be placed on building stewardship for states/territories in which stewardship activity has been lacking or has stalled. Training on the new stewardship tools will be a priority.  In states where stewardship has been difficult to develop or maintain, or where existing stewards have been forced to curtail stewardship activities for budgetary reasons, opportunities for steward or sub-steward arrangements with other entities should be explored.  Examples include National Forests, National Parks, Regional Planning Agencies, and USGS WSCs.

USGS also would like to explore whether additional stewards might be attracted if we provide coordinated editing support through NGTOC, with the stewards providing local content knowledge. We are interested in identifying such partners with whom we can experiment to develop procedures or tools for them to provide local knowledge about the hydrography, while we take on the responsibility of applying the edits to the database.

*Building value*

In states with active stewards, the emphasis will be on improving the value of the NHD to users. This may be accomplished in one of three ways: 1) Data quality Improvements at current scale, 2) Improvements to the scale/resolution/level of detail as compared to current NHD, using lidar or other means, and 3) Event data referenced to NHD, particularly those that affect the network framework, connectivity or flows (see below).

Data Quality Improvements **at current scale**, especially those timed to make HR NHDPlus better either by data edits ahead of NHDPlus production processing or to make corrections following NHDPlus processing:

* Network connectivity and direction
  + isolated lines connected or left isolated, as appropriate for normal (average) flows, based on credible evidence of direct connections.
  + flow direction corrections
  + storm sewer/underground connections (not via groundwater infiltration)
  + sinks in closed water bodies, topographic depressions, noncontributing areas
  + karst connections when backed up by field studies
* other data quality improvements at current scale such as WBD updates as a result of the NHD Plus HiRes or NHD updates
* Priority areas--6 Hydro Regions being processed in FY15 (01, 02, 06, 12, 14, 15), priority regions for FY16 (TBD). StreamStats has an interest in states not yet implemented and states needing data updates. See table below.

Improvements to scale/resolution/level of detail as compared to current NHD, using lidar or other means

* preference is given to areas that currently aren’t well represented, such as low relief, complex manmade channels, urban deserts, etc.
* preference is given to methods that ensure proper treatment of embankments, such as where roads cross streams
* preference is given to projects determining presence of channels thru observation, either in the field or via remote sensing of channel character and presence. Modeling approaches used in conjunction with field observations will be considered.
* projects must at least conflate current P/I/E classifications from NHD or topos. Should not enter channels based on simple drainage area thresholds without P/I/E attribution (Note: A team is working on clarifying and perhaps modifying standards with regard to this attribution. Projects must maintain awareness of the progress on these issues and be prepared to implement the recommendations.)
* conflation using commercial off-the-shelf (COTS) tools is of high interest, and proposals based on a COTS approach are encouraged, provided the results meet USGS conflation standards and requirements. A report outlining the approach and results would be a project deliverable, in addition to the conflated data.

Events--data referenced to NHD, particularly those that affect the network framework, connectivity or flows, such as the following

* dams - improved or additional dams, especially large ones
* diversions
* culverts/bridges
* monitoring sites
* major withdrawals or discharges, points from SWUDS water-use database
* other themes identified by the Subcommittee on Spatial Water Data as priorities for the Open Water Data Initiative

Other projects may be considered at the option of the Hydrography Acquisition Team (HAT).

*Liaison Role*

National Map Liaisons provide programmatic support to these efforts.  Within the outlines described above, Liaisons are primarily responsible for working with partners to develop projects that either build stewardship capacity or build value in the dataset by improving the content and features.  Liaisons will work with POCs to make sure sufficient technical support capacity exists to support the activity.

**Summary of status and approach suggestions**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **State** | **Trained on new tools** | **Steward Status** | **Steward/user interests/issues** | **Notes/Recommended action** |
| MI |  |  | High StreamStats interest; New implementation | Current SS project in early stages |
| IL |  |  | High StreamStats interest; Update | Current data poorly integrated, very interested in update using HR NHDPlus |
| SC |  |  | High StreamStats interest; New implementation | Trying to do SS with lidar data, generating stream network from lidar. Toby Feaster PC, Jimmy Clark, GIS. Follow up with SC POC and see what they’re doing with NHD stewardship |
| NE |  |  | Medium StreamStats interest; New implementation | SS project in early stage, Rick Wilson is project chief |
| WV |  |  | Medium StreamStats interest; New implementation | NHD editing going on at WVU, focusing on SW WV where the topography has been changed due to mountain top removal. |
| KS | Yes | Active Steward | Medium StreamStats interest; New implementation | Funded SS project; currently waiting for ESRI to reprocess NHDPlus V2 (100K) data |
| MO |  |  | Medium StreamStats interest; New implementation | Funded SS project; St. Louis area with lidar, currently developing HiRes data for rest of state. PC: Rodney Southard |
| TX | No | Active Steward | Medium StreamStats interest; New implementation | WSC has not been enthusiastic about StreamStats; R12 HR NHDPlus data completion due late FY15 |
| NV |  |  | Medium StreamStats interest; New implementation | Previous interest in state SS proposal |
| WY |  |  | Medium StreamStats interest; New implementation | Now in combined WSC with MT, may be interested in a pilot using R14 HR NHDPlus data (completion due late FY15) |
| PA | No | Active Steward | Medium StreamStats interest; Update | Many SS data problems need fixed. Given the heavy use in the state, there may be some WSC interest in program development to deal with the GIS data issues, especially if HR NHDPlus program can help by providing improved base data |
| LA |  |  | Medium StreamStats interest; New implementation | Previous interest in 100K NHDPlus, but data quality not sufficient |
| FL |  |  | Medium StreamStats interest; New implementation | Active NHD stewardship, but WSC doesn’t have GIS person available |
| PR | No | No Steward | Medium StreamStats interest; New implementation | NHDPlus V2 completed using HiRes data; previous cooperator interest in SS proposal, but ultimately was  not funded |
| MN | Yes | draft | Possible StreamStats interest; Update | Needs a SS update, numerous data problems need fixed. Early HR NHDPlus pilot area. |
| OR |  |  | Possible StreamStats interest; Update | SS based on 100K NHDPlus V1; wants to update with HR NHDPlus |
| WA |  |  | Possible StreamStats interest; Update | SS based on 100K NHDPlus V1; needs updated |
| CA |  |  | Possible StreamStats interest; Update | SS based on 100K NHDPlus V1; many data problems need fixed; new peak flows regression equations available |
| MS |  |  | Possible StreamStats interest; New implementation | Developed HR SS data previously, but never implemented StreamStats |

**WBD DATA SUPPLY PLAN**

**Background**

The Watershed Boundary Dataset is the second shared geospatial framework for hydrography data.  The database is jointly managed by the National Resource Conservation Service and is hosted and maintained at the U.S. Geological Survey (USGS).  The data model has been jointly developed with Federal, state, and local stakeholders.  Content is added, improved, and maintained by NGP, other Federal agencies (primarily NRCS), designated stewards and sub-stewards, and other agencies working through the above.

The approach for building and maintaining the WBD closely parallels the NHD, but in many cases is separate.  The WBD stewardship initiative has been overall highly successful.

**Securing current, accurate data**

This data supply plan emphasizes three broad types of activities.

* Internal maintenance conducted by Utah Water Science Center and NGTOC staff to refine and improve the database at a national level.
* Building stewardship by providing assistance for stewardship in states.
* Building value by providing support for adding capability to the WBD to improve the value of the dataset, thus improving the value proposition to the steward.  This work will be oriented towards supporting OWDI.

*Internal maintenance*

At a national level, UT WSC and NGTOC staff are working to identify and address ongoing refinements to the WBD including updates to boundary lines and attribute corrections/improvements.

*Building stewardship*

For 2015, stewardship will be applied nationally since WBD is not yet used on US Topo.  Emphasis will be placed on those states with particularly significant issues.  In many cases, a key part of building stewardship is building awareness and interest in the WBD.  WBD workshops, particularly related to WaterSMART, will be coordinated by the Water COU Liaisons in collaboration with the Water Science Centers and Regions.

*Building value*

In states with active stewards, the emphasis will be on improving the value of the WBD to both the stewards and internal users.  Similar to the approach described above, projects that improve resolution of the WBD (to 14- or 16-digit resolution), refinement of more accurate representation of the boundaries, or further geometric integration with NHD may be considered.  Projects that add diversion information to the WBD may also be considered.

*Liaison Role*

National Map Liaisons ~~in the Areas~~ provide programmatic support to these efforts.  Within the outlines described above, Liaisons are primarily responsible for working with partners to develop projects that either build stewardship capacity or build value in the dataset by improving the content and features.  Liaisons will work with POCs to make sure sufficient technical support capacity exists to support the activity.

**ALASKA DATA SUPPLY PLAN**

Alaska NHD was initially digitized from the 1:63,360-scale map series for Alaska, and many of the source maps for NHD generation were created in the 1960’s. Alaska NHD is thus in need of a great deal of attention to improve the accuracy and densification of current holdings to support scientific application of the data and USGS and partner efforts to remap all of Alaska at 1:25,000 scale. Also, many of the NHD sub-basins in Alaska have not undergone the full range of quality control processing that was performed on NHD in the continental United States, so multiple flow and connectivity errors are present in the data and have to be corrected even before any image integration or densification editing can begin. Internal NGTOC resources are being used to perform minimal blunder corrections over geographies where no stewards are currently working. However, there is a strong movement by multiple stewards in Alaska, organized under the Alaska Hydrography Technical Working Group, to correct and densify many sub-basins in AK that are associated with critical ecological areas and partner lands. NGP goals for Alaska include a broad range of efforts in Alaska to improve basic NHD geometry, content, and networking issues inherent in much of the current Alaska NHD holdings. Corrections will prepare data for improved scientific analysis and mapping requirements immediately, and for future HiRes NHDPlus generation for Alaska.

1) Many NHD stewards in Alaska are using a generic, ArcGIS-based editing system known as AK Hydro to correct and densify basic NHD features. This program was developed to support multiple data models managed by various agencies across Alaska and to move large, existing updates to stream geometry directly to the NHD. Many of these models manage features not maintained in NHD, and this alternative editing system supports the wide range of hydrography data users in the state. This editing system can be used to add all required features regardless of model, and outputs data into the various models as required. All edits being performed in Alaska under this program are to be transformed to the NHD data model and conflated back into the NHD, to ensure that the NHD is maintained as edits are performed. This conflation process can be complex, so Alaska uses a primary corps of experts to perform the conflation, allowing the stewardship base to focus on editing. It is important to ensure that the burgeoning amount of hydrography edits across the state are conflated to the NHD in a timely manner. Conflation of these data updates is especially critical across central and southeast Alaska to support FY16 and FY17 US Topo production plans. Several large sub-basins in these regions are known to contain edits that have not been conflated to NHD, and it should be a priority to move these edits into NHD.

2) NHD stewards are reporting that it takes them 40 to 80 hours of work to clean up ‘Severity 1’ class errors any time they download and run initial quality control checks against NHD sub-basins that have not seen recent update activity. Alaska sub-basins did not go through all of the extensive quality control checks that was performed by USGS on sub-basins in the continental United States, so sub-basins that have not already been downloaded and worked by stewards or NGTOC require significant clean up prior to editing content. A priority goal is to clean up NHD 'Quality Control' checks that result in 'Severity 1' errors that are still inherent in many AK Catalog Units, allowing for faster conflation of edits into the NHD when sub-basins are ready.

3) Stewards in Alaska are preparing to edit NHD sub-basins across the State. Due to the great need for editing much of the Alaska NHD, any partner editing that will result in improved Alaska NHD data is to be encouraged. However, a priority will be placed on editing that meets the following criteria: 1) integrates ifsar and/or lidar for improved match to updated elevation data, 2) results in NHD that meets as near as possible 1:24,000-scale accuracy and content standards, or the standards proposed by the Alaska Hydrography Technical Working Group and agreed to by NGP, and 3) produces updated NHD over the western half of Arctic Alaska and the Seward Peninsula, and over southcentral and southeast Alaska, where ifsar data are available and US Topo mapping will be performed in FY16 and FY17.

4) The significant amount of NHD editing happening in Alaska has resulted in many areas where the updated NHD now do not align properly with the Watershed Boundary Dataset. New NHD editing efforts in interior and coastal Alaska, and efforts to harmonize NHD data across the US-Canadian boundary, will expose additional areas where realignment will be needed. Activities to update WBD for AK using improved base information, to further synchronization with NHD, and to complete edits required in order to harmonize 10- and 12-digit line work and attribution with Canada are encouraged.

5) Currently, the AK Hydro stewardship model is only available in Southcentral, Southeast and Southwest Alaska. The remaining two regions of the state, Arctic and Interior, are yet to be made available for edits and updates through this successful and time-saving stewardship model. In order to facilitate improved NHD stewardship in Alaska a goal will be to expand the AK Hydro databases and stewardship model to include Interior and Arctic Alaska.

In summary, NGP hydrography data goals for Alaska include the following:

1. Use of the AK Hydro data model to facilitate NHD stewardship and ensure that local users’ data sharing and coordination needs are met, while providing good quality data into NHD.
2. Cleaning up severity 1 quality control check errors to facilitate improved and timely stewardship of NHD.
3. Integrating ifsar and/or lidar in priority areas to generate high-quality NHD data meeting agreed-upon standards and supporting US Topo production.
4. WBD updates based on improved elevation and hydrography data and to harmonize the 10- and 12-digit line work and attribution along the border with Canada.
5. Expanding coverage of AK Hydro databases to facilitate and improve NHD stewardship efforts in Alaska