Creating the Spatial Framework for National Aquatic Resource Surveys (NARS)

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NARS Sample Frames

- NARS sample frames produced for:
  - Rivers and Streams
  - Lakes
  - Coastal Waters
  - Wetlands

- Sample frame is GIS representation of the target population
- Target population is explicit definition of aquatic resource being monitored
- Sample frames must include sufficient identifying criteria for survey design requirements
<table>
<thead>
<tr>
<th>Sample Frame</th>
<th>Target Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rivers and Streams</td>
<td>Streams and rivers in 48 contiguous US states with flowing water April/May – September, excluding reservoirs, tidal rivers to head of salt</td>
</tr>
<tr>
<td>Lakes</td>
<td>Lakes, reservoirs and ponds in 48 contiguous US states greater than 1 hectare that are permanent, non-saline waterbodies – excludes aquaculture, disposal-tailings, sewage treatment, other disposal use waters</td>
</tr>
<tr>
<td>Coastal Waters</td>
<td>Coastal waters of US from head-of-salt to confluence with ocean, including inland waterways / major embayments</td>
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</tbody>
</table>
NARS Framework

- Continual process of refinement and improvement of sample frame based on previous frames, results of sampling and analysis, and incorporation of local information
Primary input for NARS frames

- NHD primary input for lake frame and rivers and streams frame
- Extract a subset of features from NHDPlus
- Add attributes required for design – either from NHDPlus or other sources
- Several sources were used for coastal frame
From NHD waterbodies we use features defined as lakes or reservoirs and drop things like playa, ice field, swamp for frame.

Further define features using hydrographic category in NHD (intermittent / perennial) and feature type (i.e. tailings pond, aquaculture, disposal, storage).
NARS Sample Frames – Lakes

- Assign lakes to states and identify border lakes
- Assign lakes ecoregion categories
- Assign lakes to urban / non-urban categories based on US census urban areas
- Assign ownership categories to lakes, USGS HUCs, EPA region
- Get lake elevations
NARS Sample Frames – Rivers and Streams

- From NHD flowlines we use all features except coastline and pipelines for frame
- Further define features using hydrographic category (intermittent / perennial) in NHD and ‘flow’ type (i.e. stream / river, canal / ditch, artificial path, connector)
NARS Sample Frames – Rivers and Streams

- Assign reaches to states (to stratify frame) and identify all state border rivers in US
- Identify all ‘major’ rivers in US for frame category
- Assign stream reaches to urban / non-urban categories based on US census urban areas
- Assign ownership categories, USGS HUCs, EPA region, Strahler order
NARS Sample Frames - Coastal

- Derived from National Coastal Assessment frame developed by ORD Gulf Breeze Ecology Division

- Enhanced as part National Coastal Monitoring Network design by including NOAA’s Coastal Assessment Framework, National Estuary Program and major coastal systems
Refinement Process

- Improved definition of perennial / intermittent based on existing medium resolution NHD stream lines
- Improved representation of surface water based on state or local GIS frames (imagery, high-res NHD)
- Improved feature naming – default is Geographic Names Information System (GNIS) for lakes, rivers and streams, we add improved local name information whenever we have it
Sample Frame Refinement - Lakes

- Improvement of lake features (combining or splitting features, re-delineating lake boundaries) through desktop evaluation and field sampling during surveys
- Information fed back to NARS lake frame and then to NHD / NHDPlus
Sample Frame Refinement – 
Rivers and Streams

- Fold in improved hydrologic categories for some states where improved information exists
- Need to improve intermittent / perennial for entire rivers and streams frame
Sample Frame Refinement – Coastal

- 2010 Replaced GED frame with local organization frames where provided (i.e. Delaware Bay, Chesapeake Bay, Puget Sound, South Carolina.
- Great Lakes harbors and embayments
- Source for 2015 Coastal Frame? Modify GED frame or meld with a new GIS source for sample frame?
Summary

• Key challenges:
  • Matching sample frame to target population
  • Making sure sample frame contains all desired features in target population
  • Better defining feature categories in sample frame
  • Sample frames for all surveys are not and never will be perfect representations of target population
  • Sample frame over-coverage and under-coverage of target population
  • Consistent feature assignment through consecutive surveys
Challenges and Improvements

HUC 1707
Midwest

NHD 1:24,000

NHD 1:100,000

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Questions?