Converting Water Information to Water Intelligence

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National Water Service, NOAA
• Derived from many sources within NWS, and across NOAA
• A variety of different formats, different spatial resolutions, and developed for different applications
• Information is an ingredient to intelligence

Water Information

WEATHER
- Precipitation
- Evaporation
- Snowmelt
- Runoff
- Channel Flow
- River Flooding
- Flash Flooding
- Drought
- Storm Surge
- Tides
- Sea Level Rise

HYDROLOGY

COASTAL

Water Information
What are the criteria for Water Intelligence?

Timely, Actionable, and Credible
- NOAA Administrator Dr. Kathryn Sullivan, Nov 2014

Accessible through data services, in machine readable formats using a common data model
- Executive Order 13642, May 2014

Capable of being integrated with partner’s decision systems, thus necessitating a common geospatial framework
- ACWI Subcommittee on Spatial Water Data
Water Intelligence: Accessible

Open Water Web

Water data Catalog
- Find source data
- Create water & climate themes
- Recruit/engage partners

Water data As a Service
- Consensus standards
- Visualization and delivery
- Catalog and serve

Enriching Water Data
- Include routing
- Coupling with models
- Grounded to geofabric

Water data and tools Marketplace
- Community exercise of tools & data
- Data usage tracking
- Community-built extensions (eg map)

- For time-series community is focused on WaterML2.0
- SOAP and RESTful data services
- For geospatial data, CF-netCDF
- Bolstered by the NSF investments in EarthCube and hydro-informatic community, and through collaboration with the academic community

Reference: Subcommittee on Spatial Water Data: www.acwi.gov/spatial/owdi
- National Hydrography Data Set (NHD) Plus version 2 (NHDPlusV2)
- USGS assembled a national seamless data set in March 2015.

Water Intelligence: Geofabric

NHDPlusV2 River and Stream with Order > 3
The “National Framework” Dataset for Hydrography

Origins in the Cartography of the USGS Quad Maps

Stream Network (“blue lines”) & Waterbodies

Stable (nearly permanent) Reachcode Identifiers on Stream Network and Waterbody Features

Flow Relationships & Ordered Geometry

From Cindy McKay, Horizon System Corporation
Addressing Linear Reaches

- Each linear reach is one addressable unit – a ‘street’
- Each reach is assigned a unique Reachcode – the ‘street name’
- Addresses are proportional ‘street’ numbers 0-100 from bottom to top

From Cindy McKay, Horizon System Corporation
From node/To node

- Set of nationally unique identifiers for the node endpoints of the flowlines.
- Nodes are conceptual.
- Compact Numbers

From Cindy McKay, Horizon System Corporation
Water Intelligence: Geofabric

NHDPlusV2 River and Stream with Order > 3
Water Intelligence: Geofabric
Flood Inundation Mapping – NHDPlus-HAND Method

Catchments and Flowlines

Digital Elevation Model

NHDPlus

Height Above Nearest Drainage (HAND)
(relative elevation of land surface cell above cell in NHDPlus stream to which it flows)

Inundation map
Height above drainage < 15 ft

Water surface elevation
\( h = z + y \)

Geodetic datum
Height Above Nearest Drainage for Continental US

Source: Yan Liu and Hu Hao, University of Illinois at Urbana-Champaign

http://www.arcgis.com/home/webmap/viewer.html?webmap=70cf384091d347719e424c0e47ec9a7a
1. Forecast discharge with, official River Forecast Center forecast, or National Water Model guidance

2. Convert discharge to depth using real or synthetic rating curve

3. Convert depth to inundation using HAND
Tuscaloosa County Address Points

80,986 Address Points
2,526 Building Campsites
619 Mobile Homes
81,605 Total

TuscaloosaCo_Subdivisions_Mobile_Home_Parks
TuscaloosaCo_Lot_Building_Campsite_Numbers
TuscaloosaCo_Address_Points
TuscaloosaCo_Roads

National Water Center
Flood Mapping Computed with HAND

- Normal Conditions
- Start to Rise
- Main Flooding
- Start to Recede
- Returning to Normal
People don’t live in flooded area
People trapped by floodwaters

Area of Concern in Moundville
Flood Emergency Response Exercise for Tuscaloosa County
NATIONAL INFRASTRUCTURE

Emergency Services

HOSPITALS

PHARMACIES

EMS STATIONS

FIRE STATIONS
NATIONAL INFRASTRUCTURE

Livestock

CATTLE RANCHES & FARMS

DAIRY CATTLE FARMS

POULTRY & EGG FARMS

HOG & PIG FARMS
NATIONAL INFRASTRUCTURE
Mobile Home Parks
NATIONAL INFRASTRUCTURE
Places of Worship
Inspiring Water Intelligence: Tethys a collaborative portal

Tethys Platform has been designed to lower the barrier to water resources web app development. Convey your models and data as interactive web apps.
Inspiring Water Intelligence: Tethys a collaborative portal
Summary

- Water Intelligence benefits from the adoption of data standards and an embrace of data services.
- Geospatially linked through a common geofabric.
- Flood Inundation and extent is paramount.
- Water *Intelligence* is built from water *Information* integrated with infrastructure and socio-economic data.
- A community effort, Government, Academia and private sectors engagement is key.
Questions

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