Status of Inland ENCs in the USA

Denise LaDue
US Army Corps of Engineers (USACE)

Inland ENC Harmonization Group

US Army Corps of Engineers

USACE Organizational Structure

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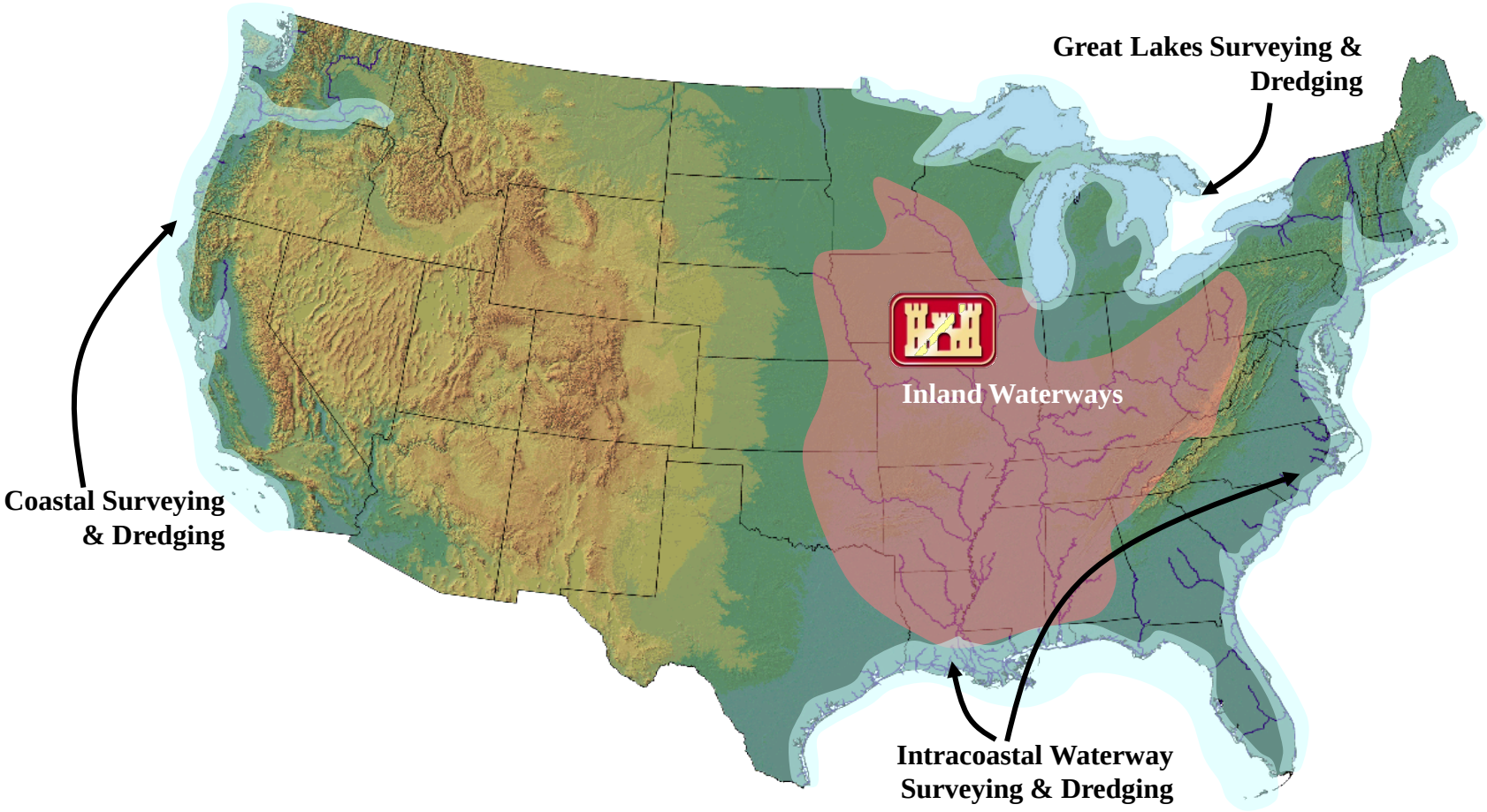
USACE Civil Works Missions

- **Dam Safety**
  - Own and operate more than 600 dams
- **Flood Control**
  - Provide a total water supply storage capacity of 329.2 million acre-feet in major Corps lakes.
- **Hydro Power**
  - Own and operate 24 percent of the U.S. hydropower capacity or 3 percent of the total U.S. electric capacity.
- **Recreation**
  - No. 1 Federal provider of outdoor recreation
- **Regulatory Permits**
  - Restore, create, enhance or preserve tens of thousands of acres of wetlands annual
- **Navigation**
  - Operate and maintain 12,000 miles of commercial inland navigation channels
  - Dredge more than 200 million cubic yards of materially annually
  - Maintain 926 coastal, Great Lakes and inland harbors

USACE Navigation Mission



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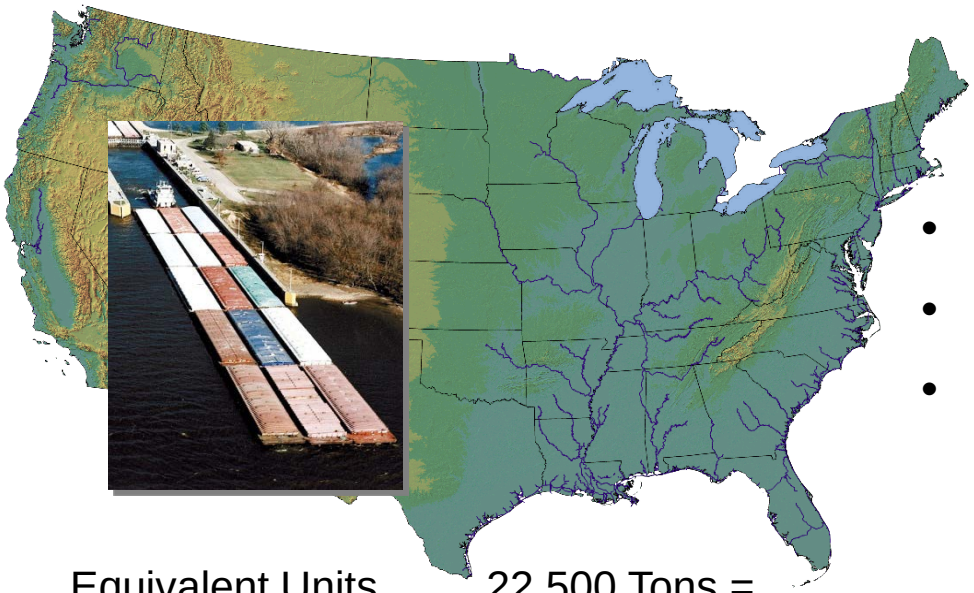
US Inland Navigation Statistics *



- 8,200 mi (13,197km) of inland waterways
- 158 lock chambers
- 589 million tons of commodities
  - 31% coal / coke
  - 25% petroleum
  - 18% other raw materials
  - 12% food & farm products
  - 8% chemicals
  - 6% manufactured products

Equivalent Units — 22,500 Tons =

One 15 Barge Tow

225 Railroad Cars

900 Large Semi Trucks

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* from the Navigation Data Center “TRANSPORTATION FACTS”, Dec. 2009

History Behind US Inland ENCs

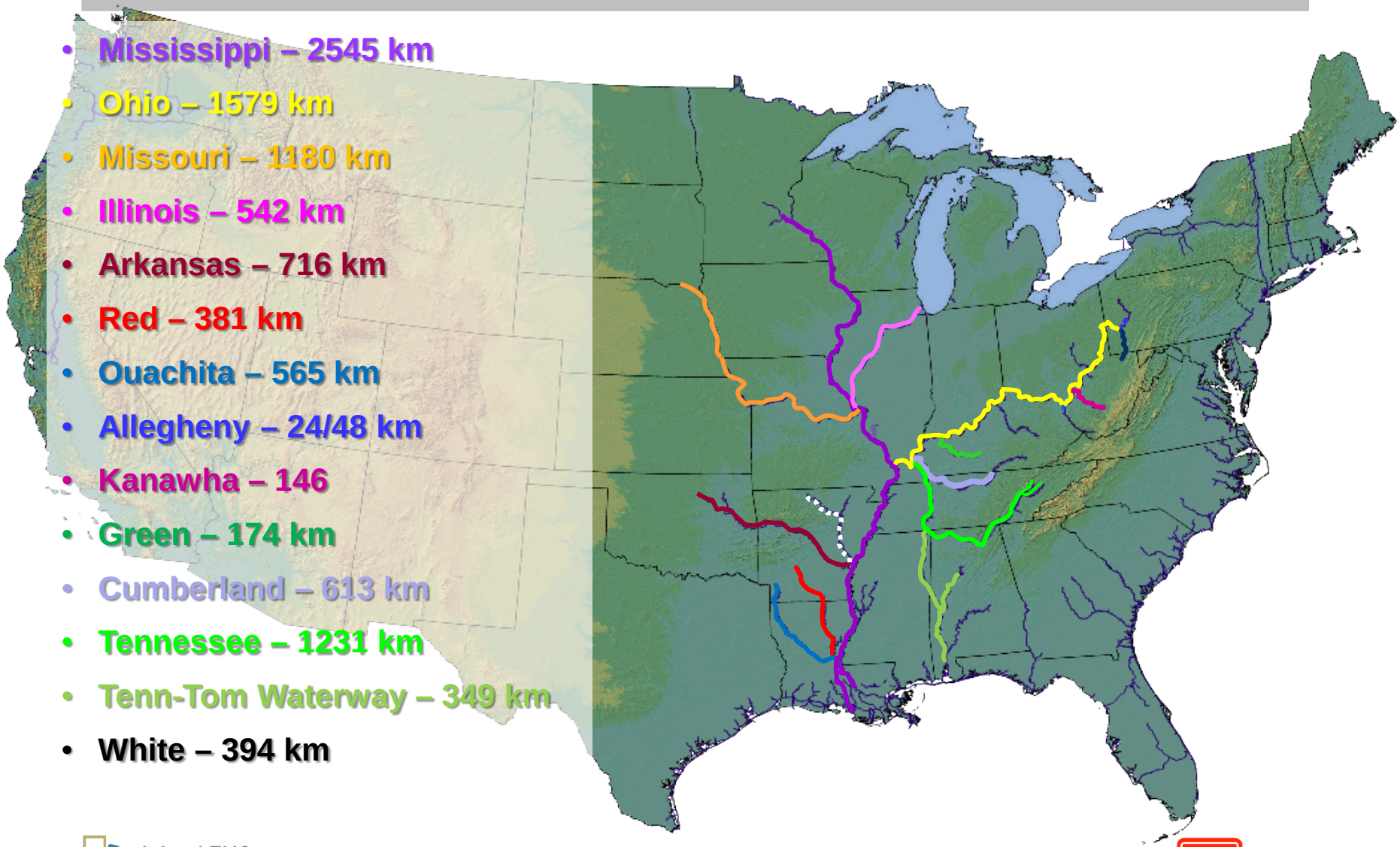
Disaster at Big Bayou Canot, 22 September 1993

- A towboat pushing six barges, lost in the fog, struck the Big Bayou Canot bridge near Mobile, AL causing the track to misalign by approximately 3 feet.
- Eight minutes later, AMTRAK *Sunset Limited* derailed on the railroad bridge and plunged into the waterway, killing 47 and injuring 103.

An electronic chart system on the towboat could have prevented the accident.

US Army Corps of Engineers

Inland Waterways in the USA



- Mississippi – 2545 km
- Ohio – 1579 km
- Missouri – 1180 km
- Illinois – 542 km
- Arkansas – 716 km
- Red – 381 km
- Ouachita – 565 km
- Allegheny – 24/48 km
- Kanawha – 146
- Green – 174 km
- Cumberland – 613 km
- Tennessee – 1231 km
- Tenn-Tom Waterway – 349 km
- White – 394 km

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Status of Inland ENCs in the USA

S-57 Standard Edition 3.1 (USACE Encoding Guide 4.0)

- 2001 – US Congress tasks USACE to produce IENCs
- 2001 – present – USACE produced & maintains106 IENC cells, covering 19 waterways

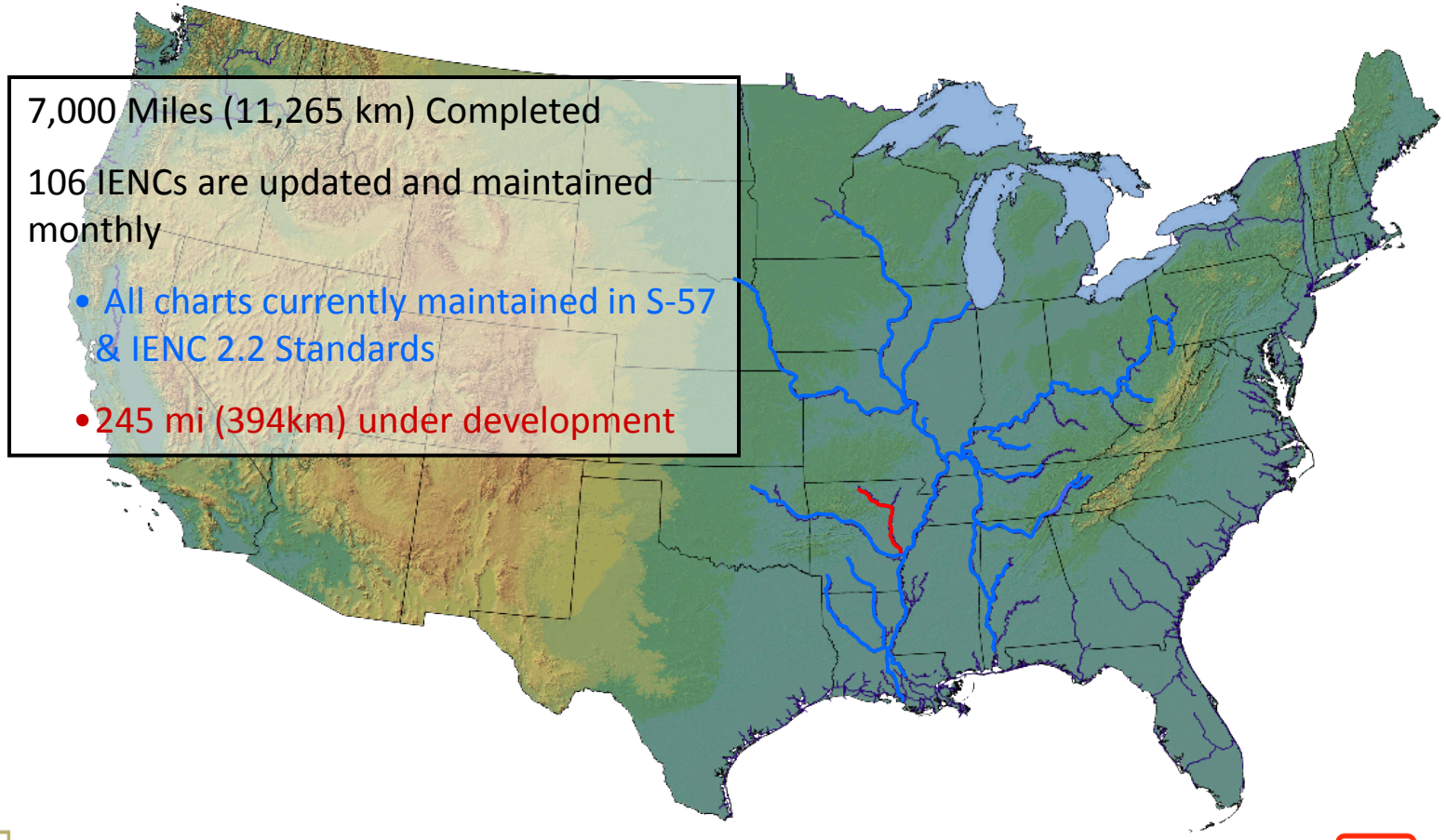
IENC Standard Edition 2.2 (Encoding Guide 2.2.0)

- 2010 – Decision made to produce new waterways to Inland ENC standards (3 rivers produced to IENC 2.1)
- 2011 - Conversion of charts from S-57 & IENC 2.1 to Inland ENC 2.2 started
- 2012 – Migration of all charts to IENC 2.2 Completed
- 2014+ – Conversion of IENC cells to IENC 2.3

Status of IENC Production in the USA

http://www.agc.army.mil/echarts/

7,245 mi (11,660 km) of inland waterways are scheduled for Inland ENC coverage



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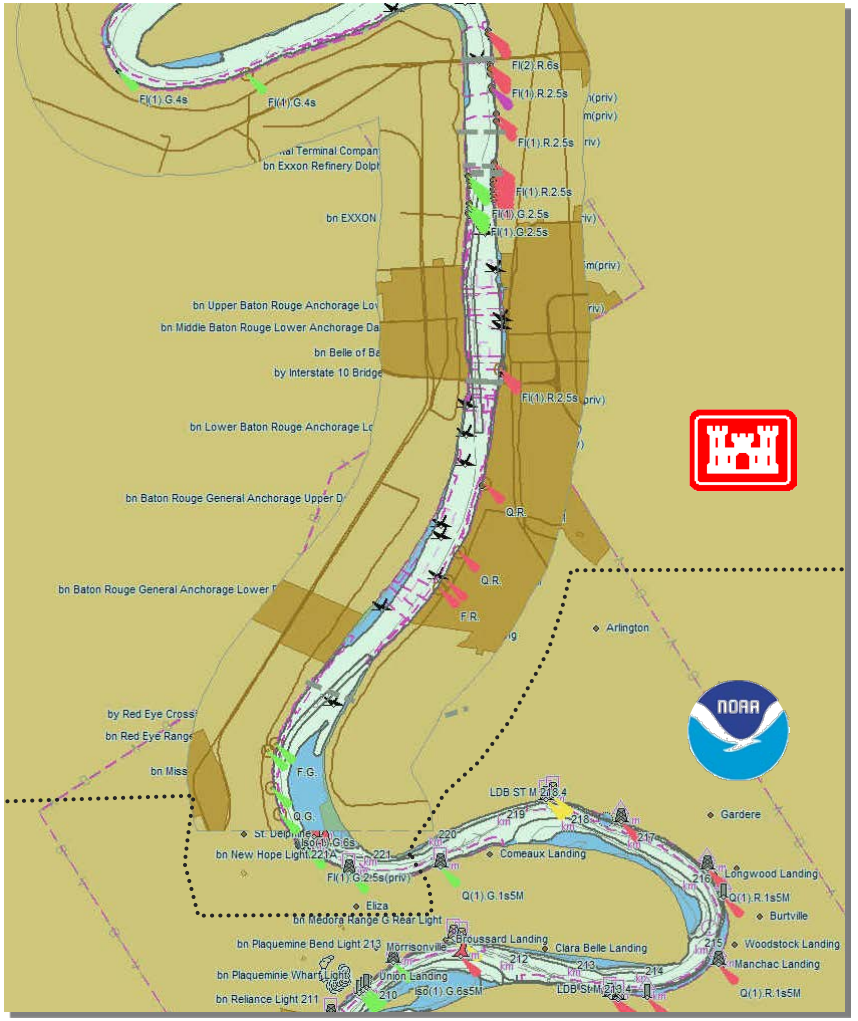
Implementation of Inland ENCs in the USA

River / Waterway	Miles	Kilometers	Inland ENC 2.2
Allegheny River	30	48	Published
Arkansas River	445	716	Published
Atchafalaya River	118	190	Published
Black Warrior River	235	378	Published
Cumberland River	381	613	Published
Green River	108	174	Published
Illinois Waterway	337	542	Published
Kanawha River	91	146	Published
Kaskaskia River	36	58	Published
Lower Mississippi River	715	1,151	Published
Missouri River	733	1,180	Published
Mobile / Tombigbee Rivers	217	349	Published
Monongahela River	129	208	Published
Ohio River	981	1,579	Published
Ouachita River	351	565	Published
Red River	237	381	Published
Tennessee River	765	1,231	Published
Tenn-Tom Waterway	225	362	Published
Upper Mississippi River	866	1,394	Published
White River	245	394	Planned 2013
Total	**7,245**	**11,660**	

Updates & Maintenance of US IENCs

- One hundred-six (106) Inland ENCs, totaling 7,000 miles (11,265 km) covering 19 waterways have been produced
- All cells are updated and maintained on a monthly basis
  - 46 in-house, 60 by contractor
  - charts are checked and cleared through the USACE Chart Center prior to release
- IENCs are updated & maintained in Inland ENC 2.2



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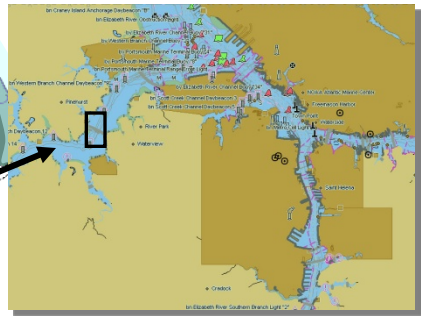
Partnering: NOAA (Coordination & Data Sharing)

NOAA, Coastal and Great Lakes

More consistent and reliable channel data from Corps for NOAA charts

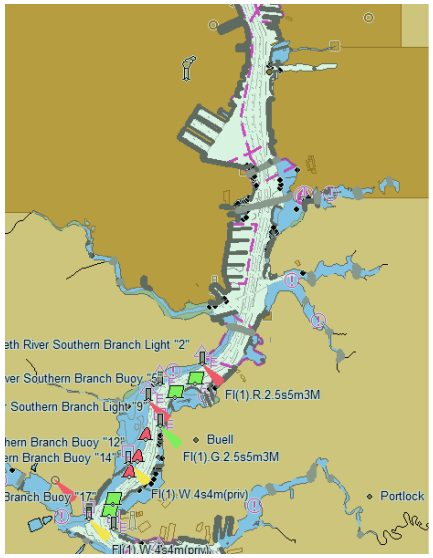
Coordination of adjoining charts for seamless use by chart systems



Inland ENC Harmonization Group

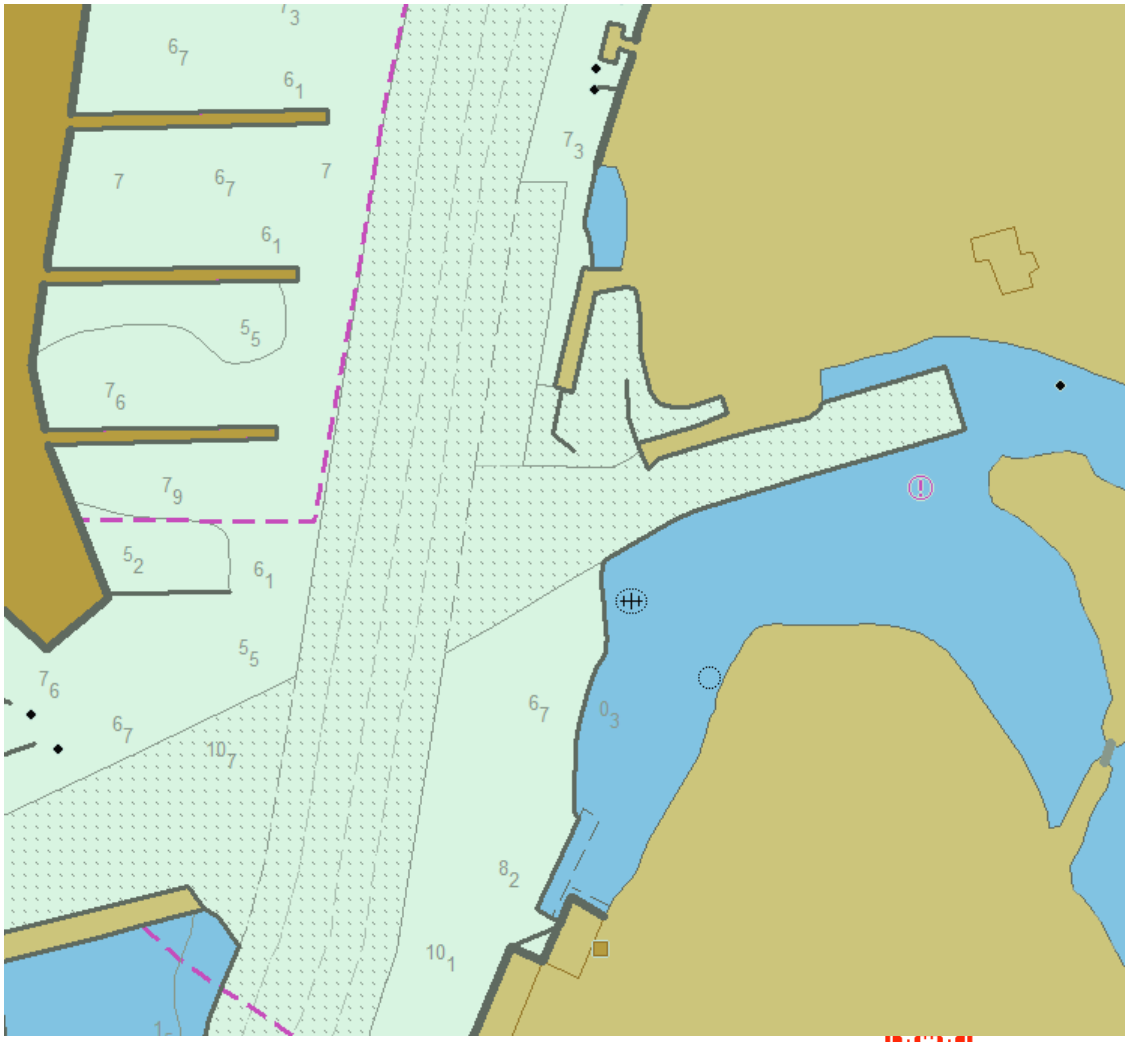
US Army Corps of Engineers

Partnering: NOAA (Coordination & Data Sharing)



NOAA chart with channel embedded

NOAA's data consists of 80% USACE data



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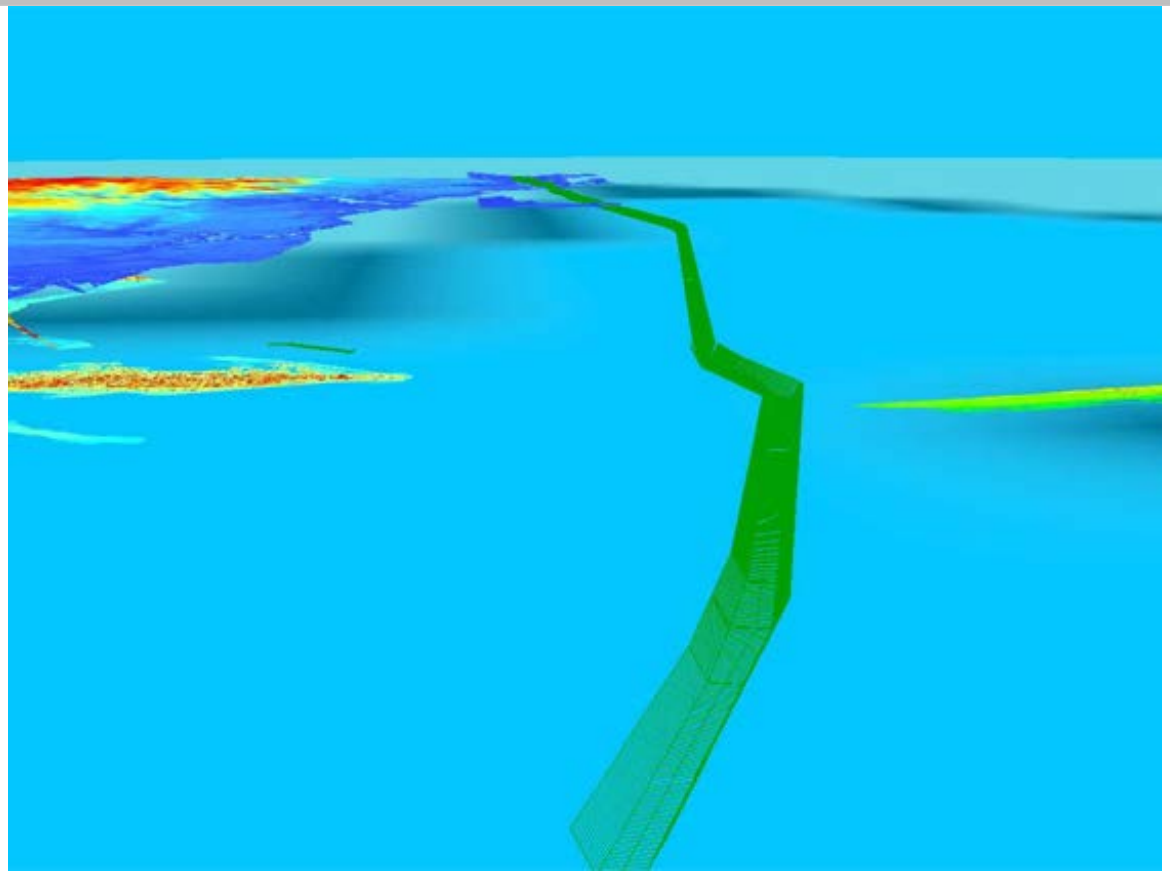
Partnering: NOAA (Channel Framework Data)



- A coastal data project
- Contracted through mobile District
- Partnering Success with NOAA

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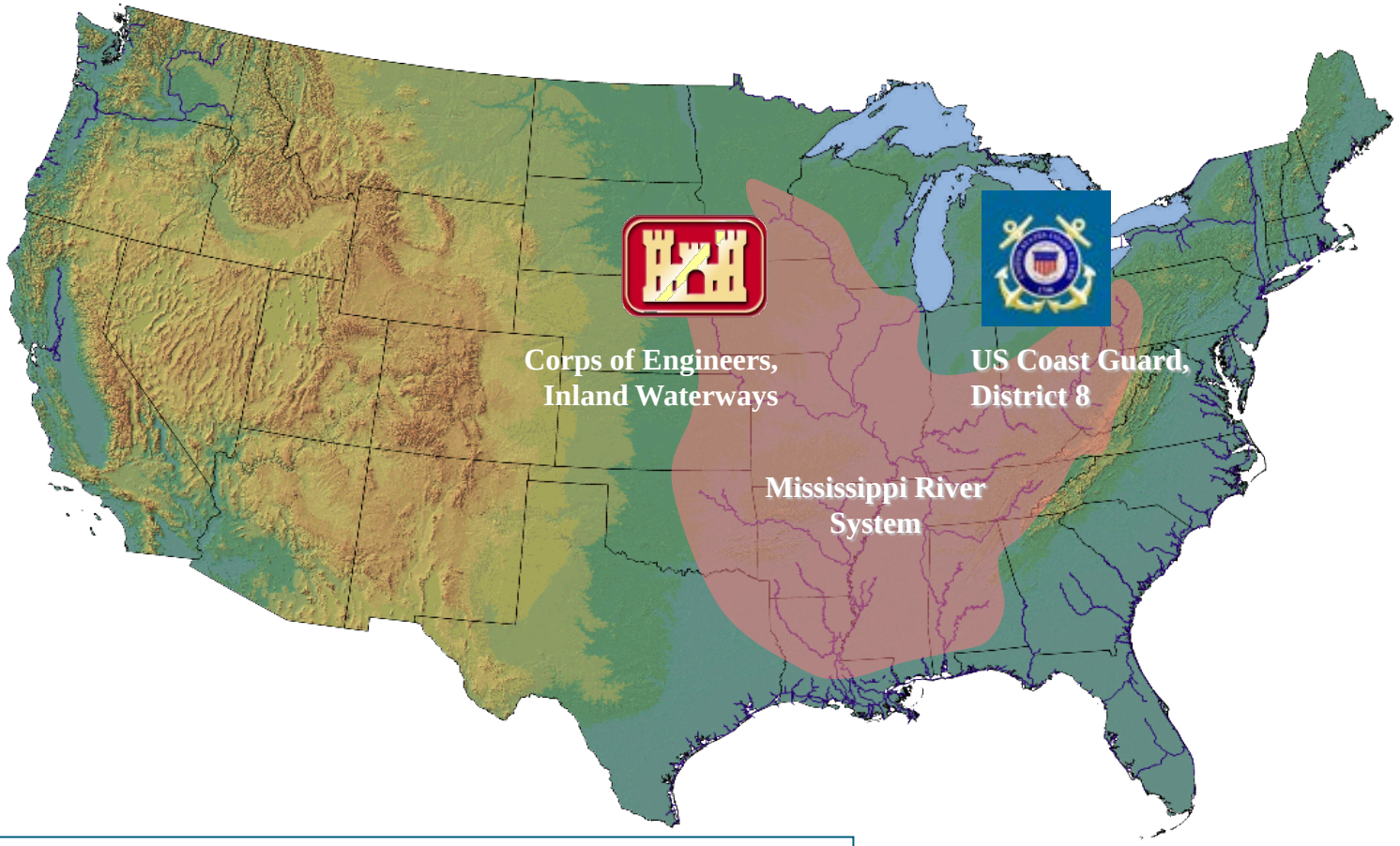
Partnering: NOAA (Channel Framework Data)

- Waterway road map
- Beginning point for moving USACE into an enterprise GIS program for managing the navigation business line
- Link between OMBIL projects and the spatial representation of those features
- Foundation for organization of navigation and dredging data across USACE.
- Basis for USACE data to update NOAA ENC
- Baseline feature for spatially updating the IWR waterway network
- Tracks channel history through authorized, maintained, and any changes in channel dimensions

Partnering: US Coast Guard (Buoy Placement)



USACE → USCG Survey Data for “problem” areas.

USCG → USACE Buoy Locations from USCG Cutters

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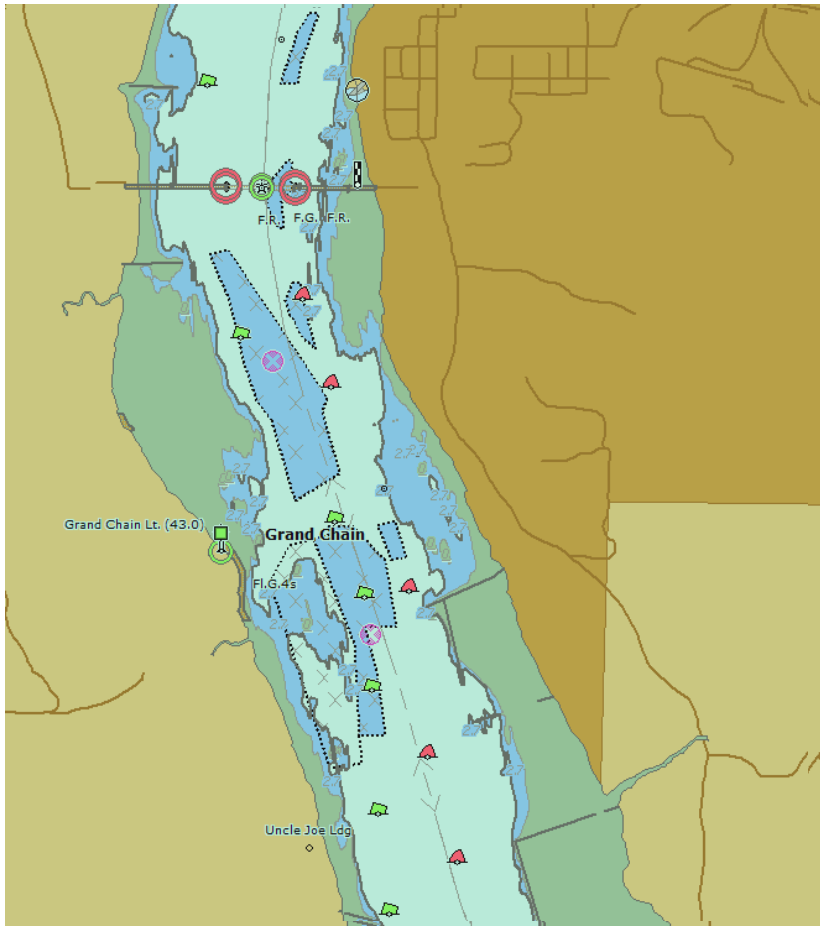
Partnering: USCG Buoy Placement During Low Water Event

- USACE Survey data → USCG for rock pinnacle area on Upper Miss River near Grand Chain
- USCG Cutters used surveys to place buoys
- USCG → Excel file with Buoy Locations
- USACE created Buoy Overlay for USCG & Towing



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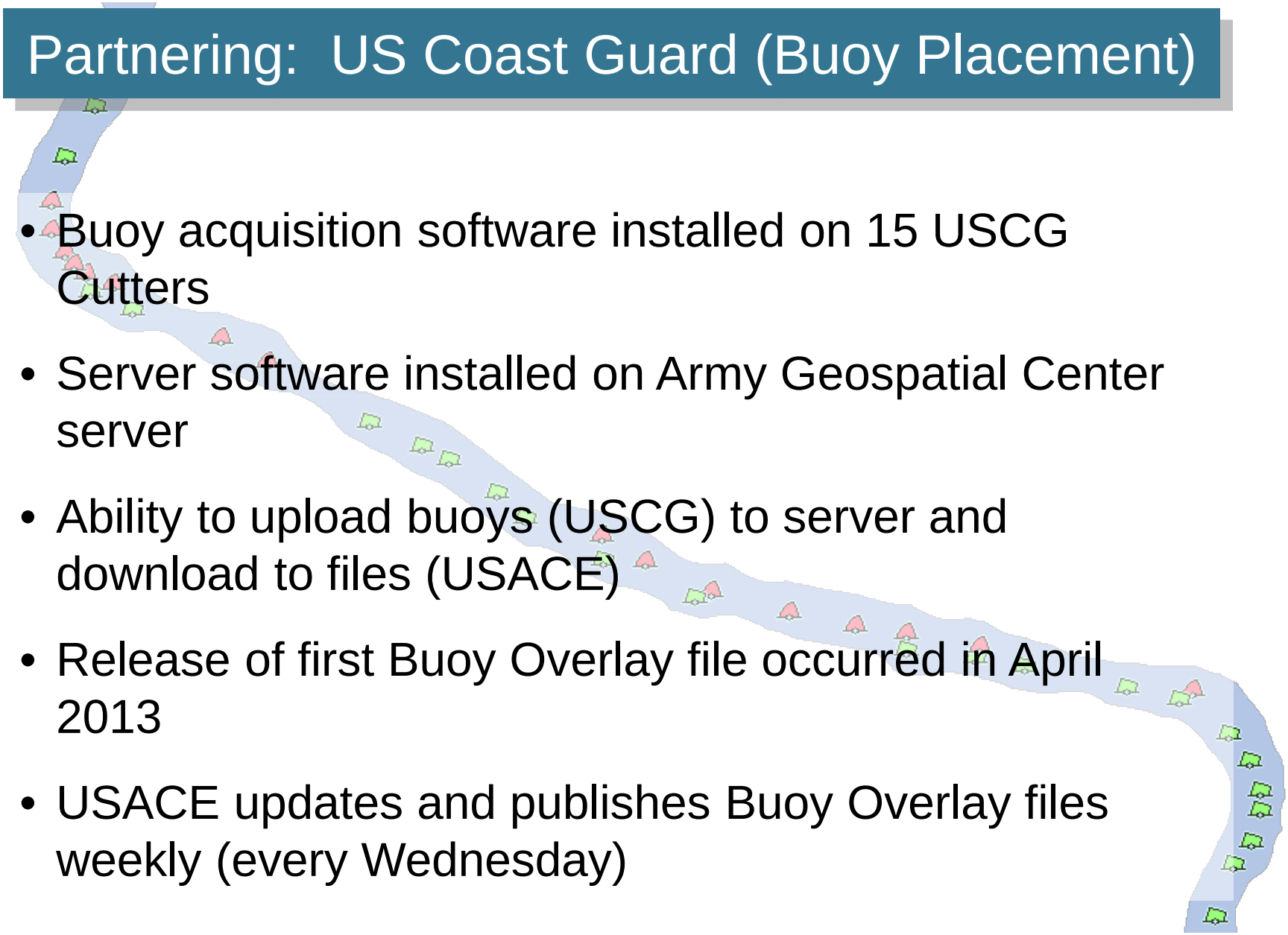
Partnering: US Coast Guard (Buoy Placement)



- Buoy acquisition software installed on 15 USCG Cutters
- Server software installed on Army Geospatial Center server
- Ability to upload buoys (USCG) to server and download to files (USACE)
- Release of first Buoy Overlay file occurred in April 2013
- USACE updates and publishes Buoy Overlay files weekly (every Wednesday)

Partnering: USCG (Bridge Clearance Information)

- Many discrepancies between “real world” and USCG Light List
- USACE performed Vessel-born LiDAR surveys of bridges, overhead crossings & locks and dams
- Clearance information (vertical and horizontal) is provided to the USCG Bridge Department

- USCG Updates the Light List to provide more accurate bridge clearance information
- USACE IENCs match USCG Light List

Inland ENC Data Download Services

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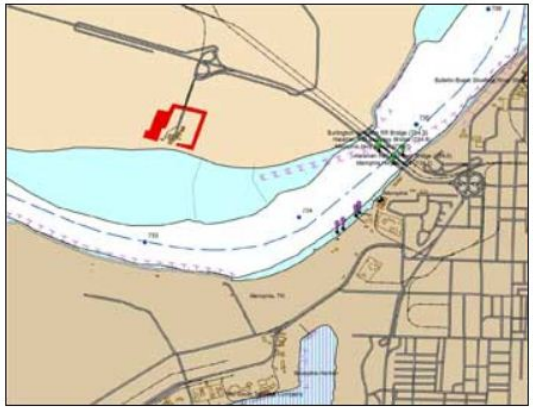
Echart Menu

- Chart Discrepancy Reports
- Inland Chart Books
- Inland Electronic Navigation Charts
- Product Downloads

IENC Program Overview



The U.S. inland navigation system consists of 8,200 miles of rivers maintained by the Corps of Engineers in 22 states, and includes 276 lock chambers with a total lift of 6,100 feet. The highly adaptable and effective system of barge navigation moves over 625 million tons of commodities annually, which includes coal, petroleum products, various other raw materials, food and farm products, chemicals, and manufactured goods (Reference Corps Navigation Data Center).The shallow draft waterways have many unique characteristics and difficulties over coastal harbor and ocean navigation; river levels can change by over 30 feet in a seasonal cycle, the navigation channel can shift significantly within the river banks, and shifting yet ever present river currents pose constant challenges in these confined waterways. Electronic chart systems can offer significant benefits to vessels including accurate and real-time display of vessel position relative to waterway features, voyage planning and monitoring, training tools for new personnel and integrated display of river charts, radar, and Automatic Identification Systems.

http://www.agc.army.mil/Missions/Echarts.aspx

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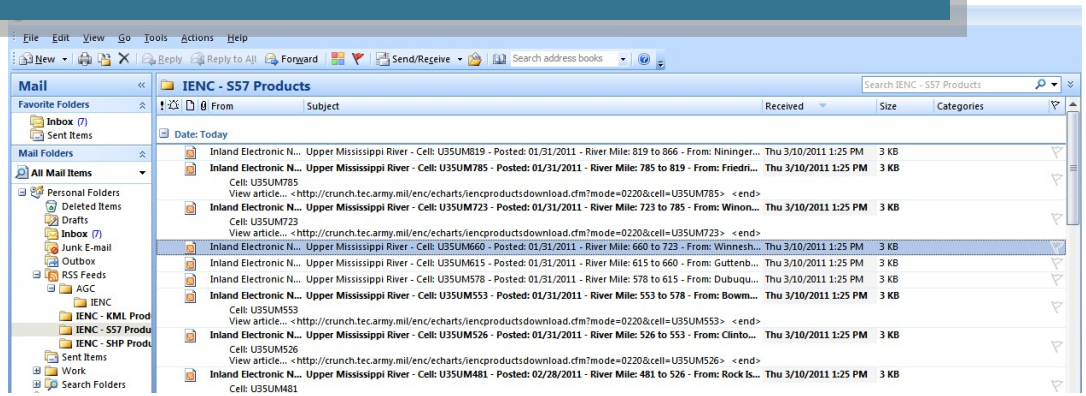
Inland ENC Data Download Services

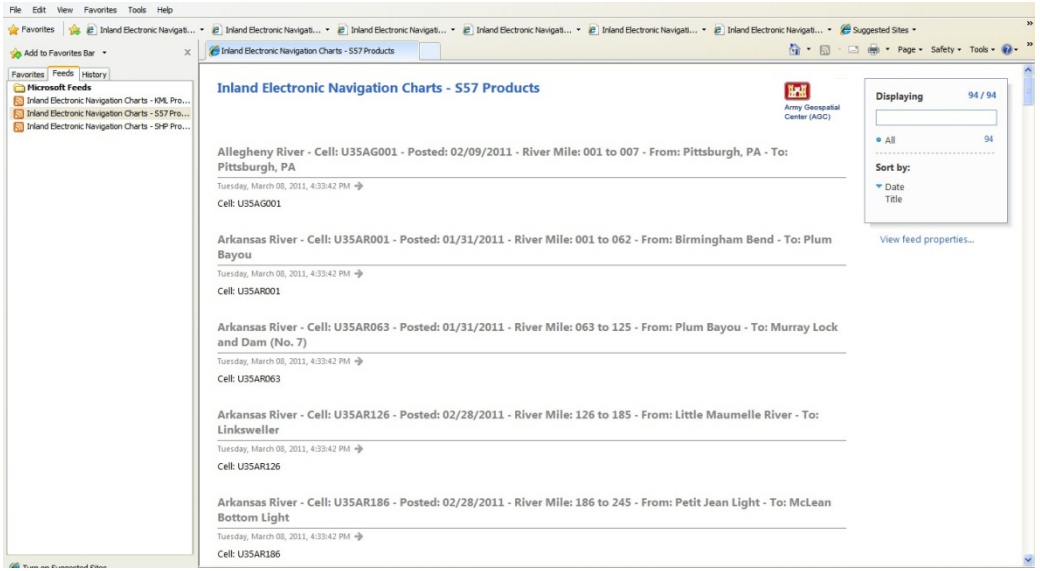
- Products Catalog
  - XML based: universal and flexible
  - Incorporates NOAA structure and attributes
  - Allows automated data updates for software clients
  - Allows automated querying of available products
  - Expandable and scalable to accommodate future products and services

Inland ENC Data Download Services

- RSS feeds
  - RSS based: universal and flexible
  - Catalog service driven
  - Automatic data status updates to users PC
  - Allows data download from users' desktops
  - Supported on a wide range of clients: browsers, free and commercial RSS readers, Outlook, and other email clients.



Outlook Client



Browser Client

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Inland ENC Data Download Services

- Graphical Interfaces
  - Supports Multiple Clients
    - Public and Commercial (e.g. ArcExplorer, Google Map/Earth, ArcGIS, etc.)
  - All products available for download
    - IENC, KML, SHP
  - Accommodates real time navigation and data download concurrently
  - River system knowledge not required

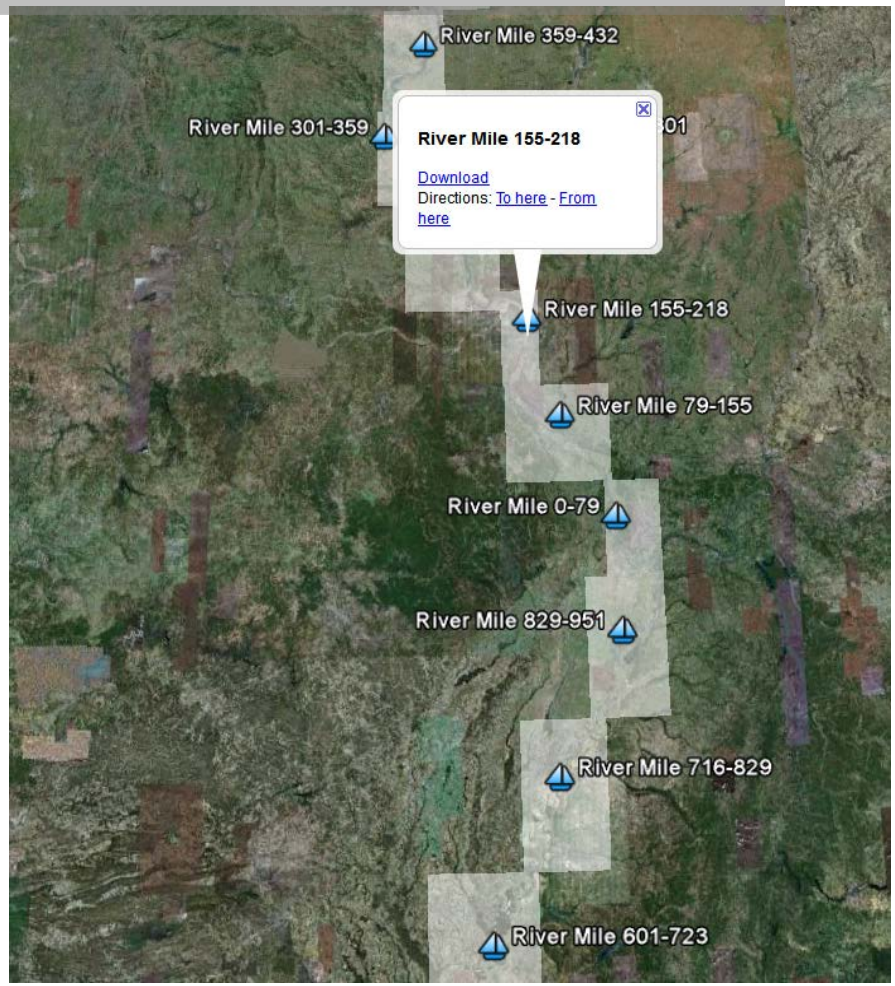

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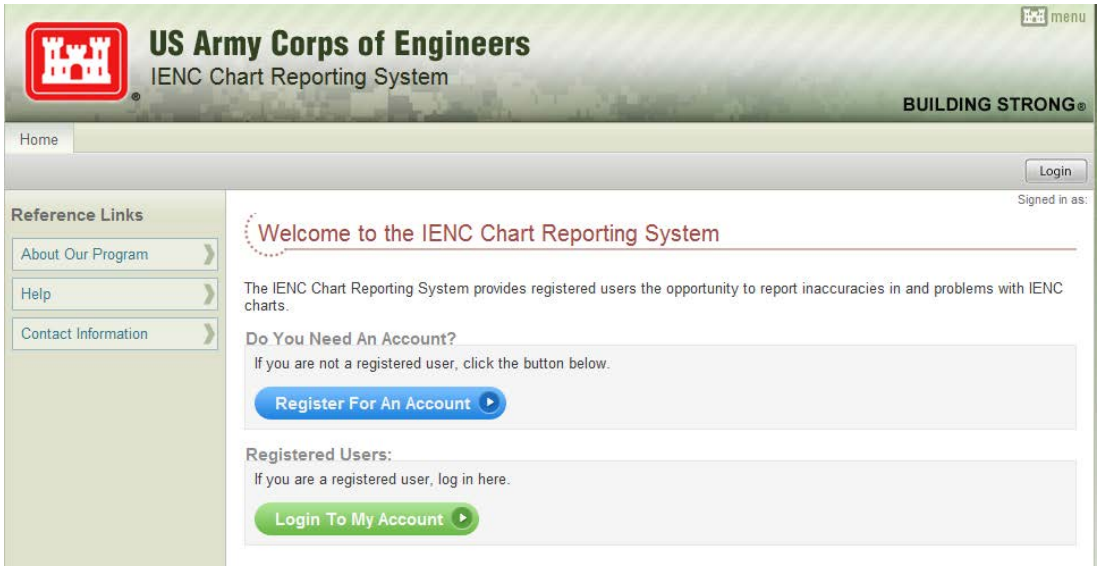
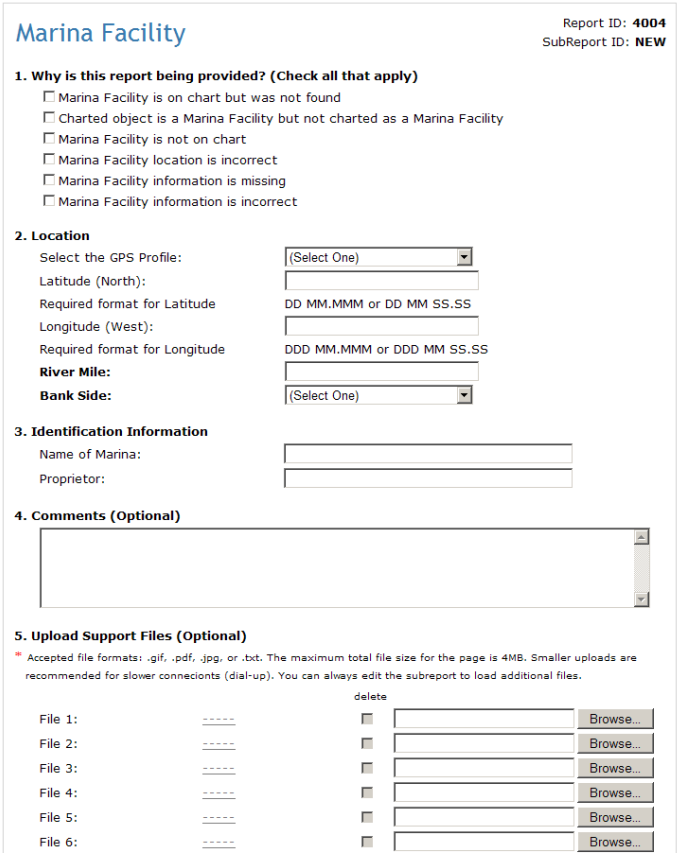
Chart Reports (Discrepancy / Error Reporting)





- Users provide feedback / report errors on IENCs
- District POC, Production and QA Manager will receive email that an error has been reported
- District determines if error is legitimate and makes correction to IENC

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Implementation of Inland ENCs in the USA

Questions ?

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