NOAA's Use of High-Resolution Imagery

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One NOAA

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            NOAA                  NOAA                  NOAA
            National              Oceans &              Program
            Weather               Coasts                Planning &
            Service               Service               Integration
              NWS                   NOS                    PPI

                   NOAA                  NOAA                  NOAA
                   Fisheries             Research              Satellite &
                   Service                                     Information
                                          OAR                  Service
                     NMFS                                        NESDIS
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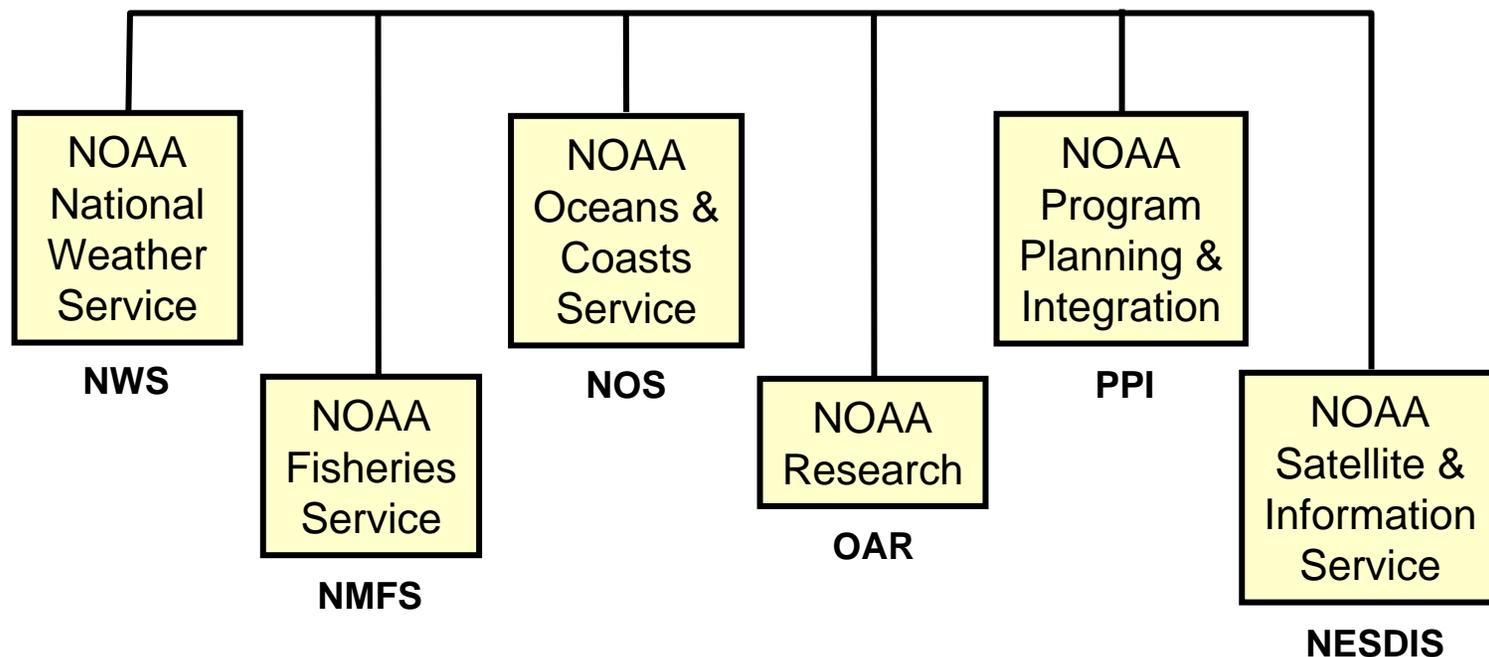
Mission: To understand and predict changes in the Earth's environment and conserve and manage coastal and marine resources to meet our nation's economic, social, and environmental needs.
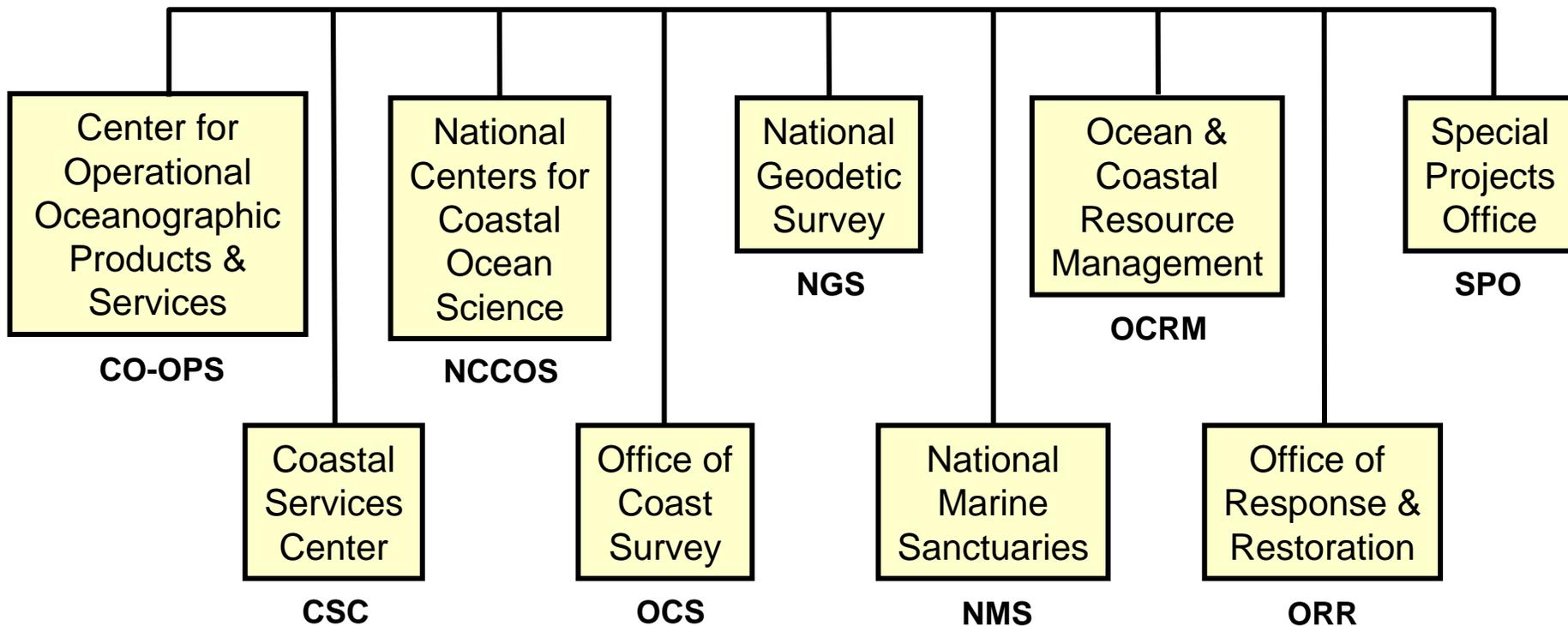
NOAA Mission Goals

- **Ecosystems**

- **Climate**

- **Weather and Water**

- **Commerce and Transportation**

NOAA Ocean Service

- Center for Operational Oceanographic Products & Services — **CO-OPS**
- National Centers for Coastal Ocean Science — **NCCOS**
- National Geodetic Survey — **NGS**
- Ocean & Coastal Resource Management — **OCRM**
- Special Projects Office — **SPO**
- Coastal Services Center — **CSC**
- Office of Coast Survey — **OCS**
- National Marine Sanctuaries — **NMS**
- Office of Response & Restoration — **ORR**

High-resolution use and expertise is concentrated in NOS

Importance of Imagery

- Coastal hazards and flooding
- Coastal uplands and wetlands
- Ecosystem management
- Shoreline mapping
- Aids to navigation
- Coastal erosion
- Benthic habitats

Shoreline
Mapping

- Coast and Shoreline Change Analysis Program (CSCAP)
- Aerial and satellite image sources
- Shoreline delineation, addition/removal of piers, etc.
- Update NOAA nautical charts – including Electronic Navigational Charts (ENC)
- Key coordination groups
  – National Geodetic Survey, Office of Coast Survey
- Primary NOAA office: National Geodetic Survey

NOAA goal relevance: Commerce and Transportation

Shoreline

Houston, Texas

Electronic Navigational Chart (ENC)

Coastal Uplands
Mapping

- Land cover: Coastal Change and Analysis Program (C-CAP)
  - 22 category land cover classification derived from Landsat Enhanced Thematic Mapper (ETM)

- Next generation C-CAP
  - Land cover classification derived from high-resolution sensors

- Key coordination groups
  - Multi-Resolution Land Characteristics (MRLC) Consortium, federal and state agencies

- Primary NOAA office: Coastal Services Center

NOAA goal relevance: Ecosystems

Coastal Uplands
Mapping

C-CAP high-resolution prototypes

- IRS ResourceSat-1
  - 23.5m multispectral
  - 5.8m multispectral
- SPOT5
  - 10m multispectral
  - 2.5m pan-sharpened
- IKONOS
  - 4m multispectral
  - 1m pan-sharpened
- Quickbird
  - 0.67m pan-sharpened
- UltraCam
  - 0.5m multispectral

Coastal Uplands

30 meter
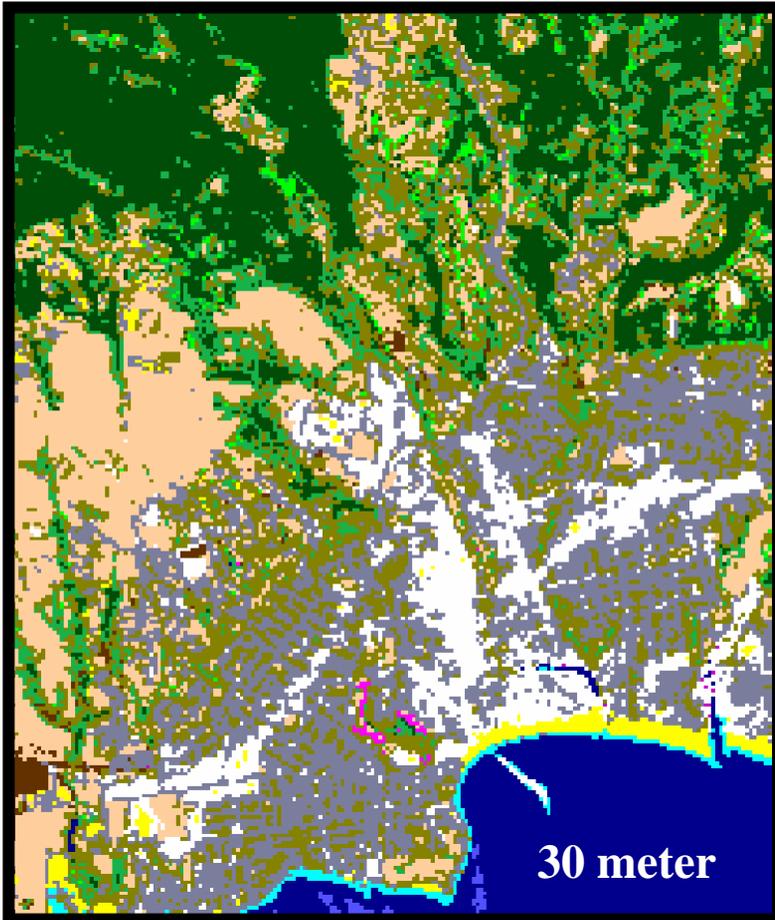
Landsat ETM C-CAP product


4 meter
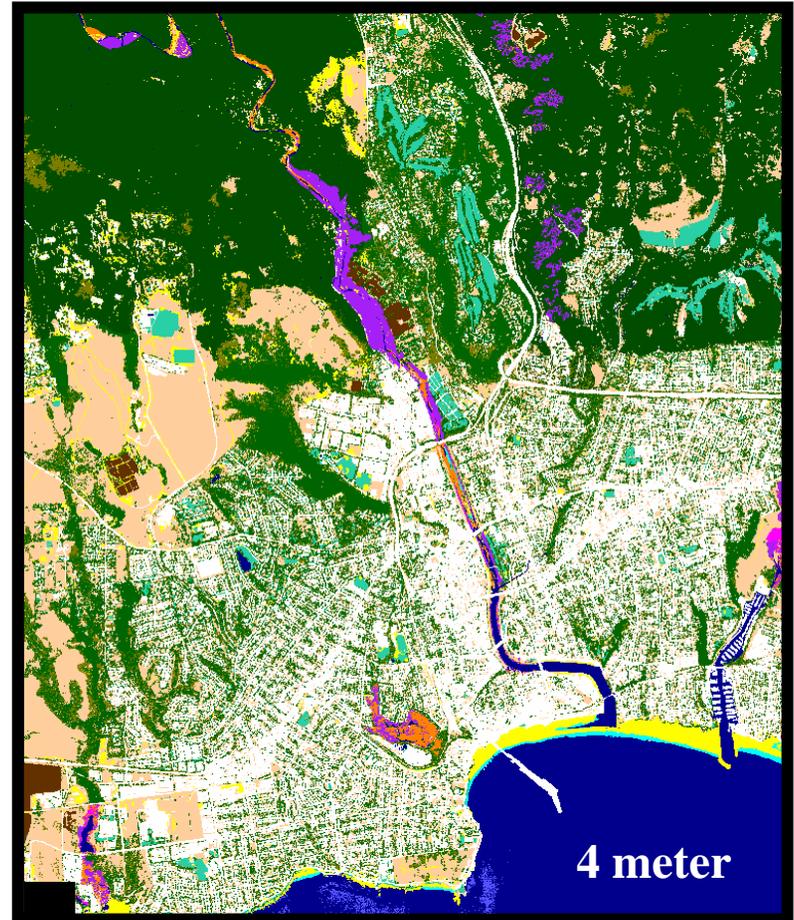
IKONOS high-resolution land cover

Benthic Habitat
Mapping

- Geography: coastal zone
- High-resolution aerial imagery
  - Intertidal Oyster Habitat
  - Submerged aquatic vegetation (SAV)
- Sources
  - Frame cameras
  - Digital cameras (ADS-40, Ultracam, OMC, etc.)
- Key coordination groups
  - State agencies, NOAA
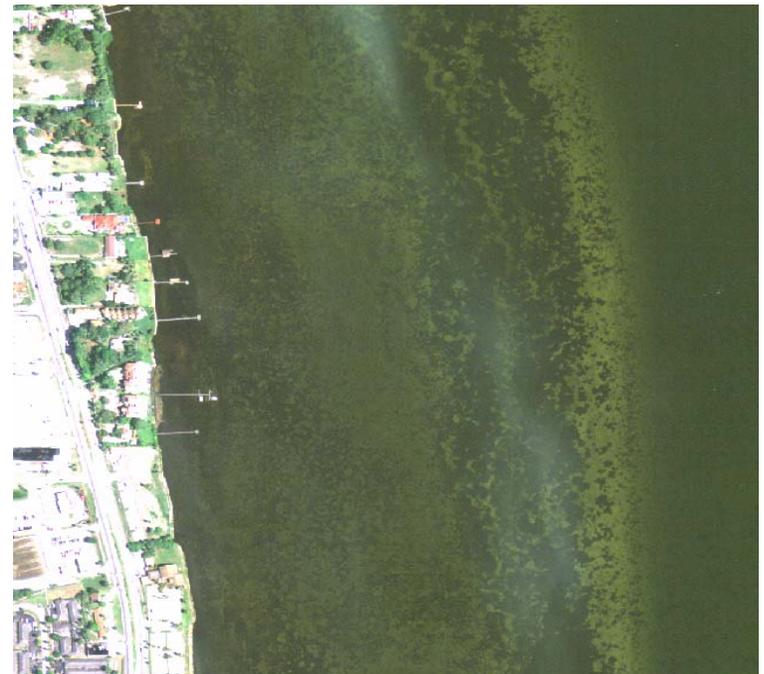- Primary NOAA office: Coastal Services Center

NOAA goal relevance: Ecosystems

Benthic Habitat

Oyster patch reef
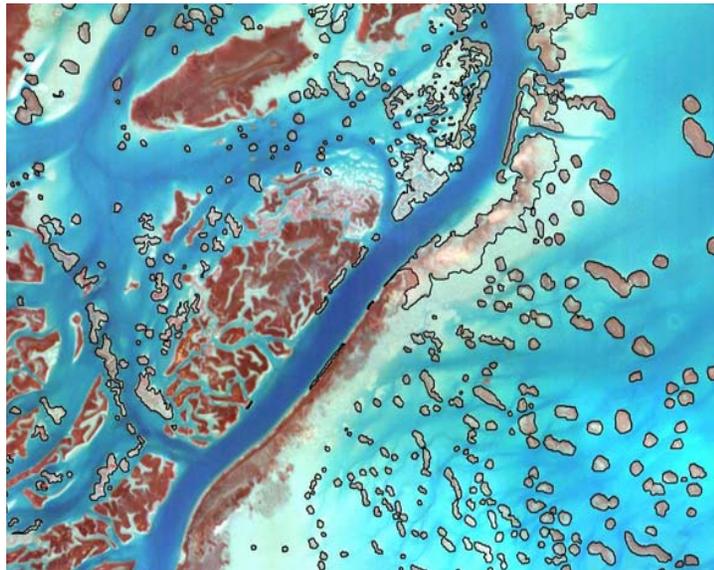


Oyster reefs mapped at low tide

Submerged aquatic vegetation

Benthic Habitat
Coral Mapping

- Geography
  - Hawaii (main islands and northwestern Hawaiian Islands), Florida, Guam, American Samoa, Northern Marianas, Puerto Rico, U.S. Virgin Islands, other U.S. flag islands

- Sources and classification categories
  - 4 meter and 1 meter IKONOS imagery
  - 13 habitat structure types
  - 21 habitat cover types

- Key coordination groups
  - State of Hawaii, University of Hawaii, territorial agencies, NOAA

- Primary NOAA office: National Centers for Coastal Ocean Science

NOAA goal relevance: Ecosystems

Benthic Habitat
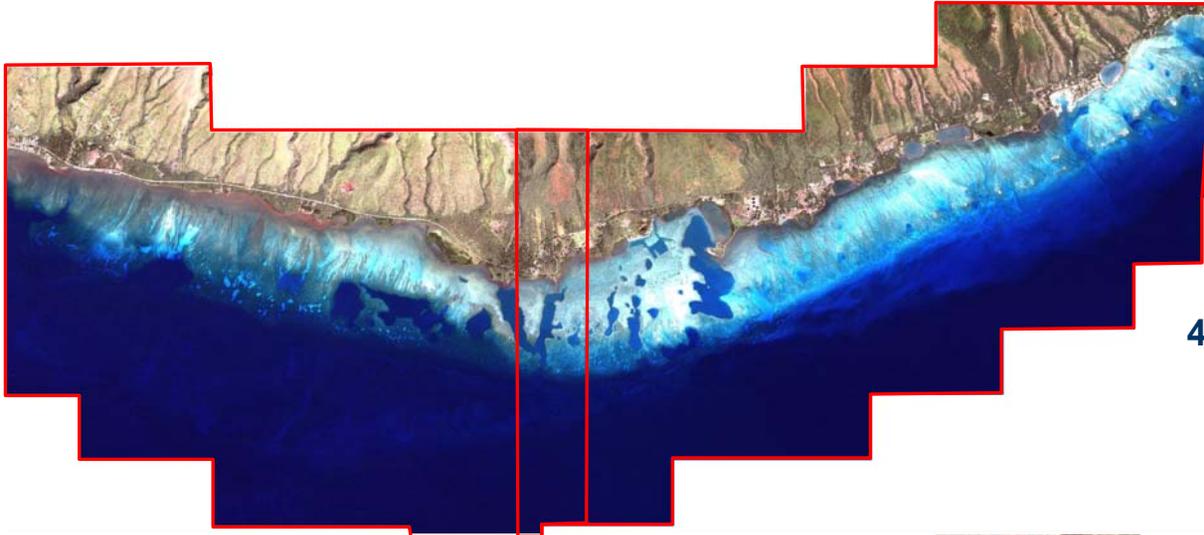
4.0 meter IKONOS

Habitat structure map

Molokai Island, Hawaii

Disaster Response

- Post-storm damage assessment
  - Support to NOAA's homeland security and emergency response requirements
  - Oil and HAZMAT spills, Barrier Island breaches, hazards to navigation, structural damage
- Disaster events
  - Hurricanes Camille, Frederick, Isabel, Ivan, Dennis, Katrina, Ophelia, Rita
  - Earthquakes and oil spills
  - World Trade Center
- Key coordination groups:
  - FEMA, U.S. Coast Guard, U.S. Army Corps of Engineers, NOAA
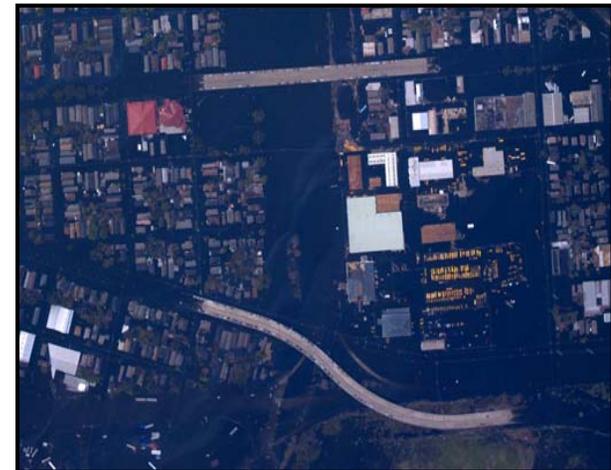- Primary NOAA office: National Geodetic Survey

NOAA goal relevance: Ecosystems, Climate, Weather and Water, Commerce and Transportation

Disaster Response

- NOAA sensors

  - Emerge/Applanix Digital Sensor System (DSS)

  - Optec Lidar Airborne Topographic Mapper System (ALTM 2050)

  - Itres Compact Airborne Spectrographic Imager-2 (CASI-2)
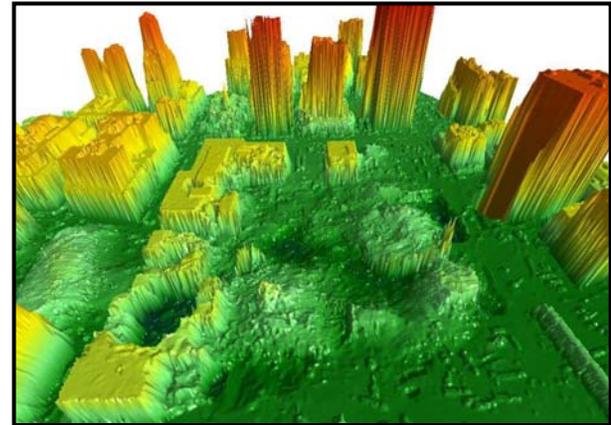
World Trade Center

Hurricane Katrina

Disaster Response

Hurricane Isabel

Hurricane Ivan

Coastal Wetlands
New Applications

- Project goal
  - Investigate the utility of using lidar data in wetland vegetation mapping
  - Develop standardized methodology for species level mapping in coastal wetlands, targeting *phragmites*

- Sources
  - 0.5 meter ADS-40 color infrared
  - 1.0 meter posting lidar elevation data

- Key coordination groups
  - University of Connecticut – Center for Land Use Education and Research (CLEAR), NOAA

- Primary NOAA office: Coastal Services Center

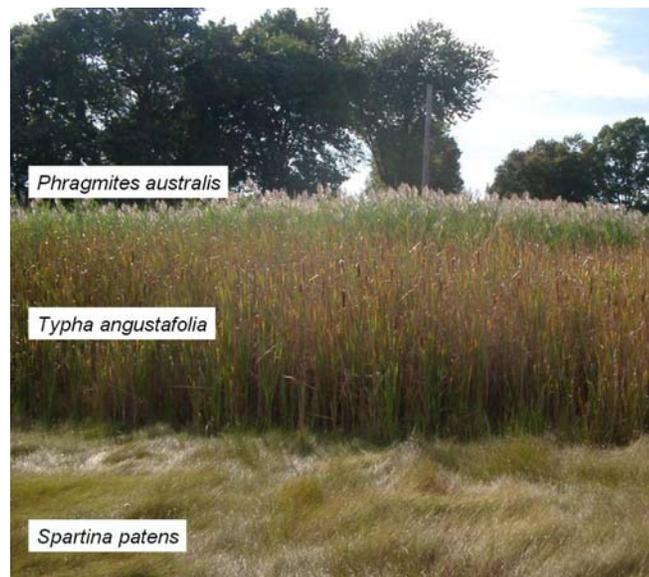**NOAA goal relevance: Ecosystems**

Coastal Wetlands
New Applications

Wetland categories

- *Phragmites australis* (invasive)
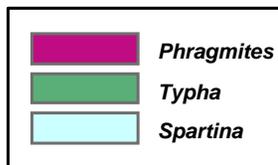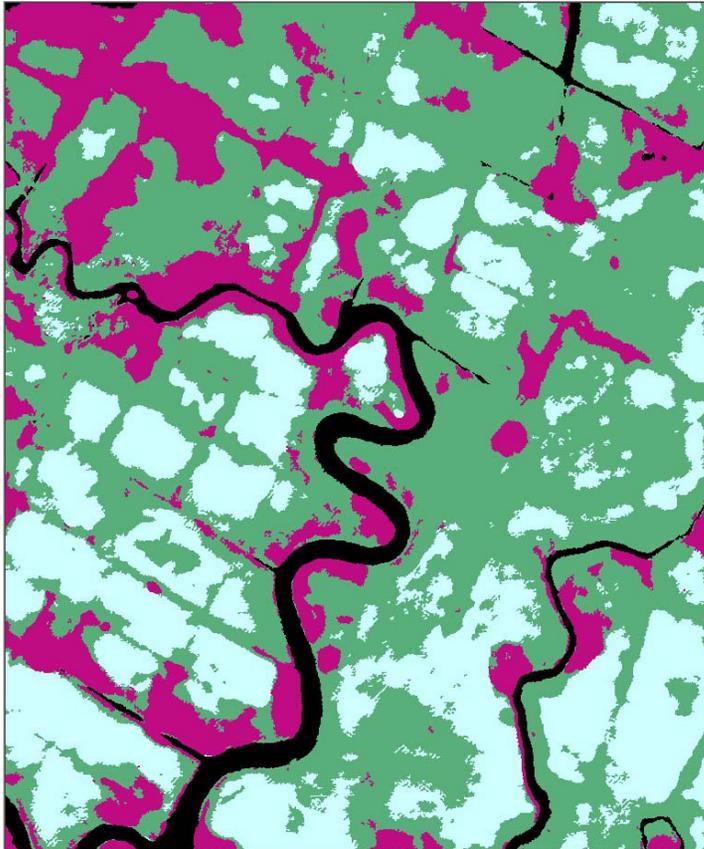- *Typha angustifolia*
- *Spartina patens*

Methods and software

- Supervised classification
- eCognition
- Feature analyst

Coastal Wetlands

Phragmites
Typha
Spartina

0.5m ADS-40 Imagery

Imagery Support to Coastal Programs

- Project goal
  - Assist state and U.S. territory coastal programs with image collection within the coastal zone
  - Hawaii, Pacific Islands, Florida, Connecticut, Louisiana, Mississippi
- Sources
  - ADS-40 digital camera
  - IKONOS, Quickbird
- Key coordination groups
  - State agencies, universities, nongovernmental organizations, NOAA
- Primary NOAA office: Coastal Services Center

NOAA goal relevance: Ecosystems

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NOAA's Use of High-Resolution Imagery

- Shoreline mapping and nautical chart revision
- Coastal land cover mapping
- Benthic habitat mapping
- Disaster response
- Imagery collection and support for coastal programs

NOAA'S **NATIONAL OCEAN SERVICE**

For more information

Erik Hund

www.noaa.gov

www.nos.noaa.gov