NOAA’s Use of High-Resolution Imagery

Erik Hund
NOAA Coastal Services Center

March 14, 2006
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
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
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

Submerged aquatic vegetation

Oyster reefs mapped at low tide
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

Molokai Island, Hawaii

4.0 meter IKONOS

Habitat structure map
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)
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

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
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
For more information

Erik Hund

www.noaa.gov

www.nos.noaa.gov