



ORTHOS LIDAR REMOTE SENSING ELEVATION MODELS CONTOURS INFRARED DATA CONVERSION ANALOG & DIGITAL MAPPING 3D MODELS GROUND BASED LASER MAPPING TRAINING



C-CAP High Resolution Product Line Maui County

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Geotools

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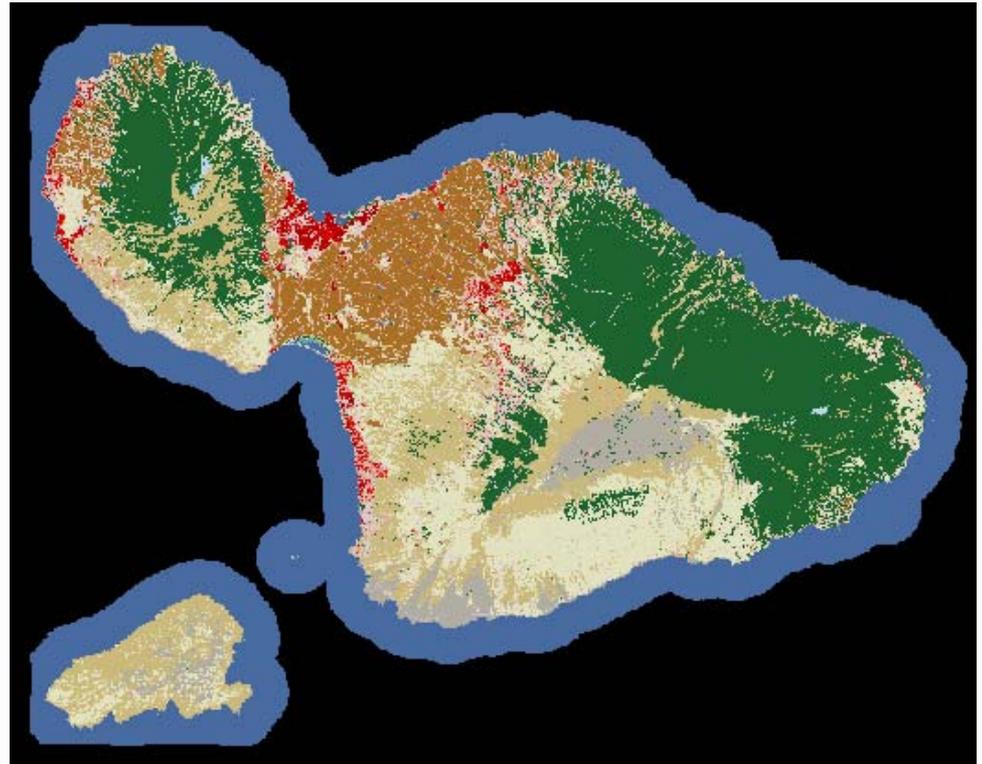
Andrew Brenner - Sanborn

Overview

- Reasons for moving to a higher resolution land cover product
- Technical approach for NOAA Coastal Change Analysis Program high resolution
 - Technique
 - Impervious
 - Boundaries
 - Classification Refinement
- Project Examples and Applications
 - Maui County
 - Other Examples
- Conclusions

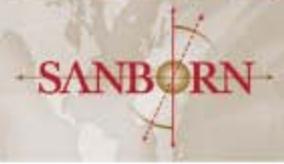
C-CAP

- C-CAP has produced a high quality medium resolution land cover data sets over the coastal zone
- Consistent
- Measured quality
- Defined specifications
- 1995 – 2001 – 2006
- Overall coastal watersheds



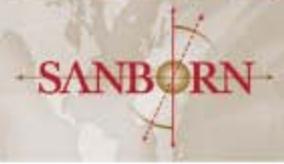
NLCD c.2001

Medium Resolution C-CAP



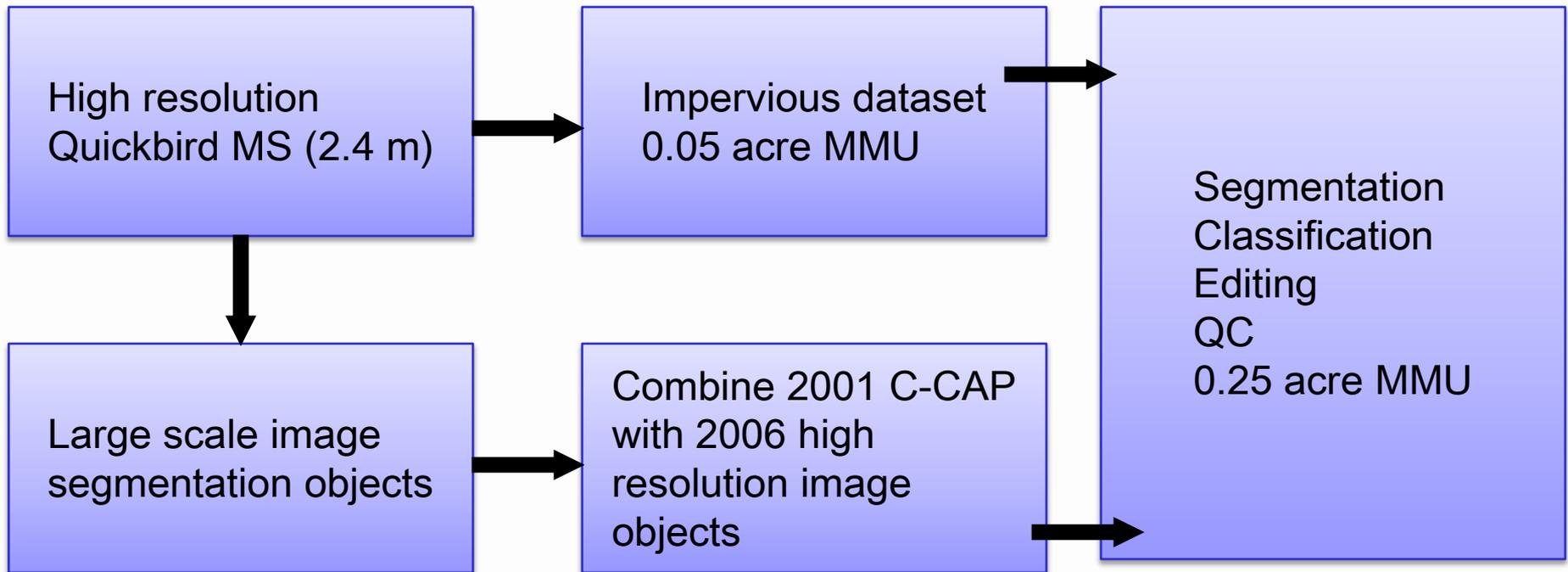
- Users
 - State agencies
 - Local environmental agencies
 - Academic agencies
- Applications
 - Wetland identification
 - Watershed management
 - Habitat management
 - Forest inventory and change analysis
- Strategic decision making and monitoring

Changing Needs

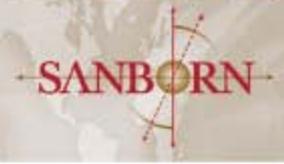


- There is a need for higher resolution data for
 - Operational Decision making
 - Where to put in buffer strips
 - Where to preserve and where to develop
 - Modeling of hydrology
 - Land use planning
 - Specific habitat and ecological modeling
 - Can be used at the local government rather than state government level
 - Diversify from Landsat
 - Landsat 5 not expected to last past 2009
 - Landsat continuity not expected until 2011
 - SPOT and IRS may take its place
 - High resolution product should leverage off work done at the C-CAP level

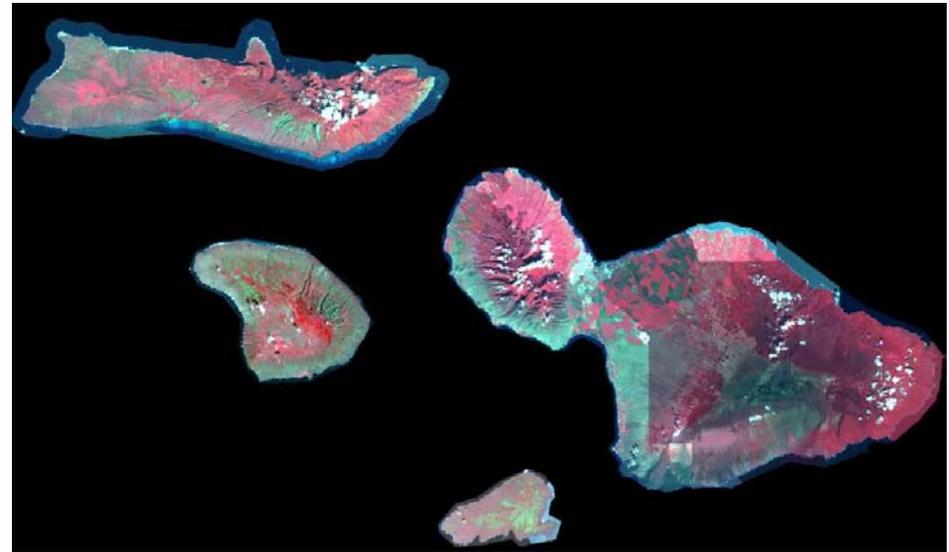
Technical Approach: Overview



Maui County, Hawaii

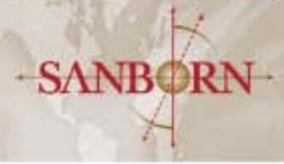


- Create high resolution CCAP map for islands of Maui County
 - Quickbird imagery as base data
- Leverage existing data sets
 - CCAP
 - Ownership
 - NWI
- Use
 - high resolution imagery to create detailed land cover boundaries
 - then label polygons using information from imagery and ancillary data sets

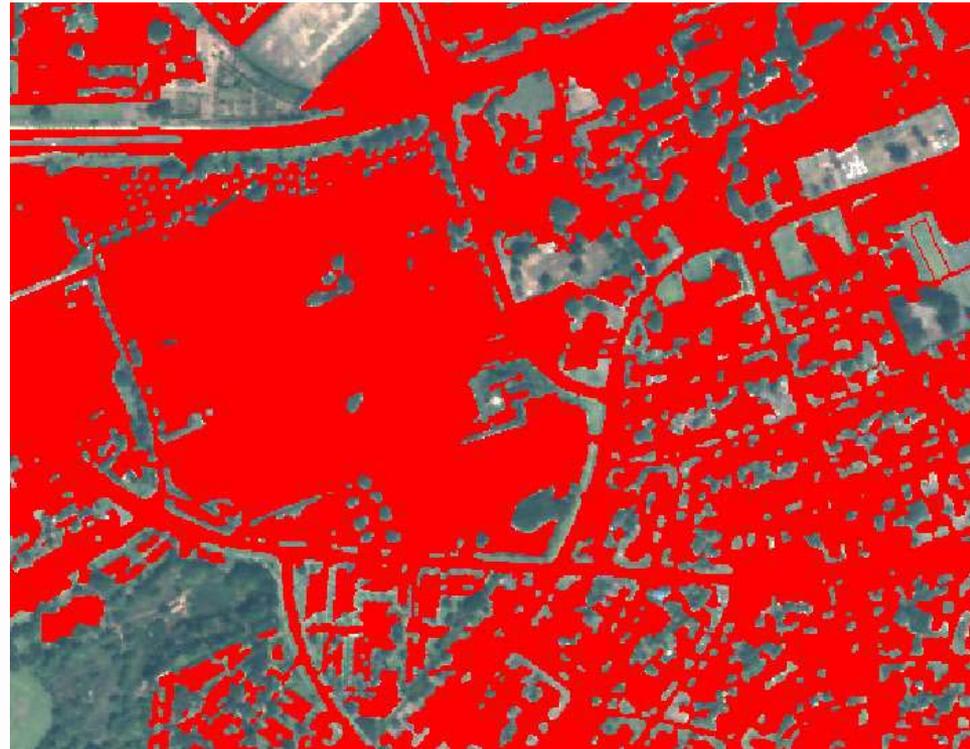


Project Study Area

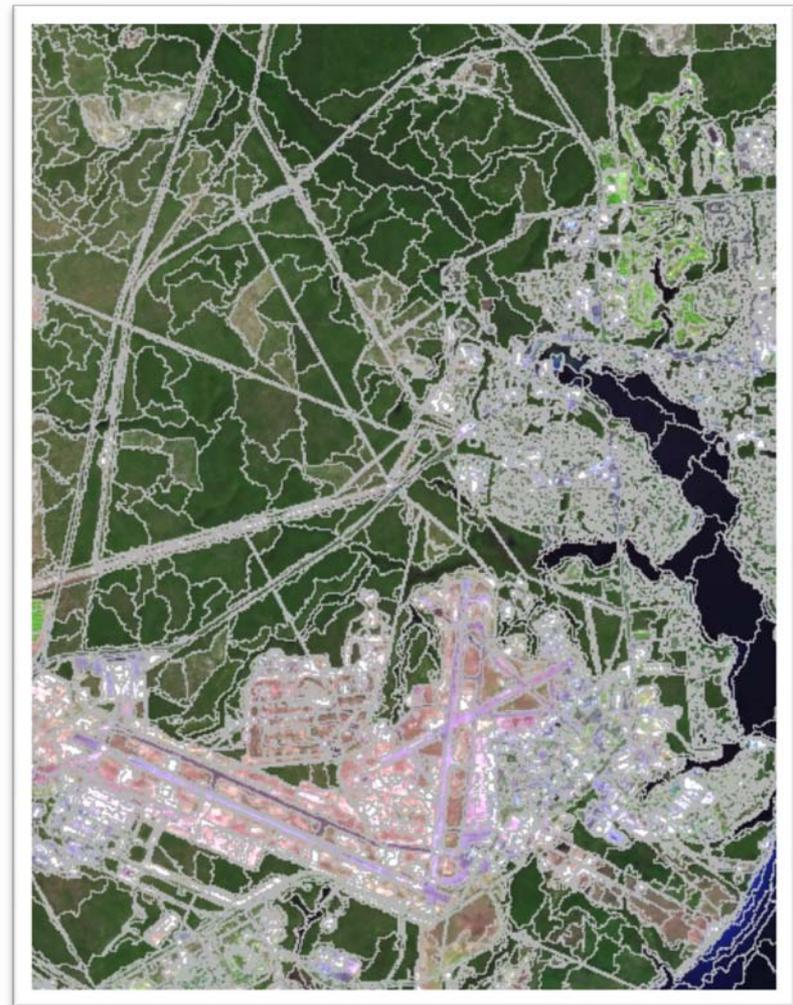
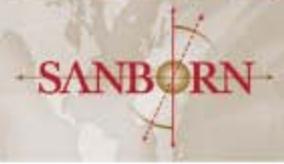
Impervious at High Resolution



- Many State and local agencies are requesting a refined impervious data set
- Highly accurate maps can be produced using pixel based techniques
- Create a binary impervious pervious map from the 2.4 meter multi-spectral Quickbird Imagery



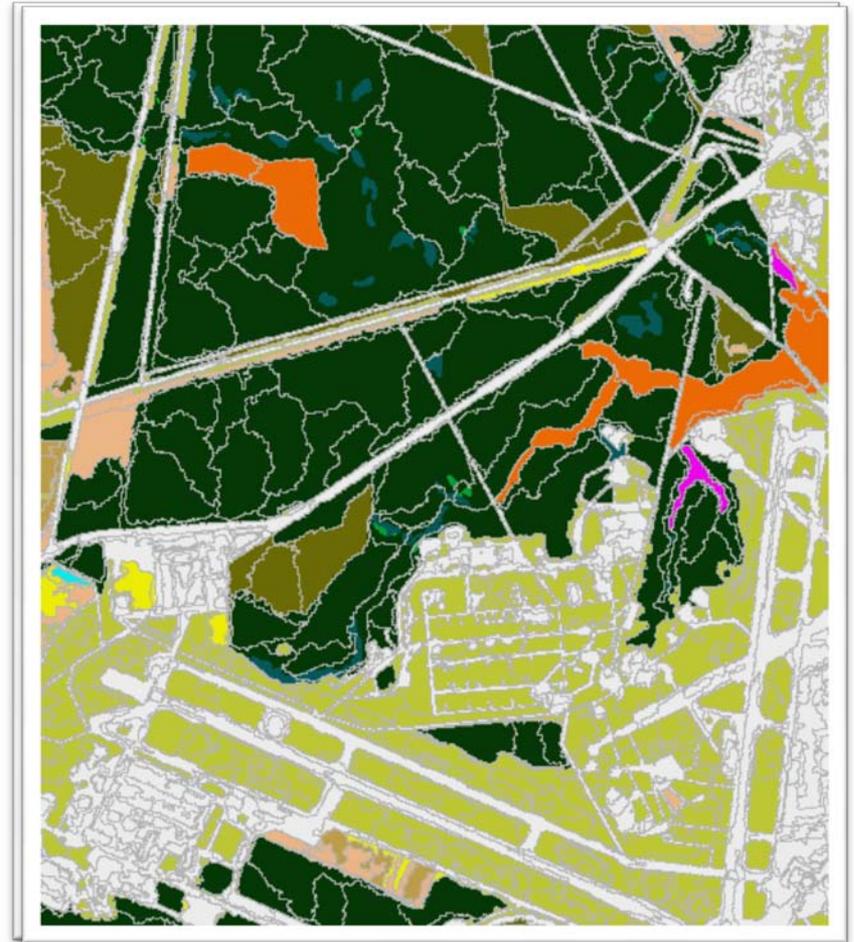
Boundary Delineation



Putting It All Together

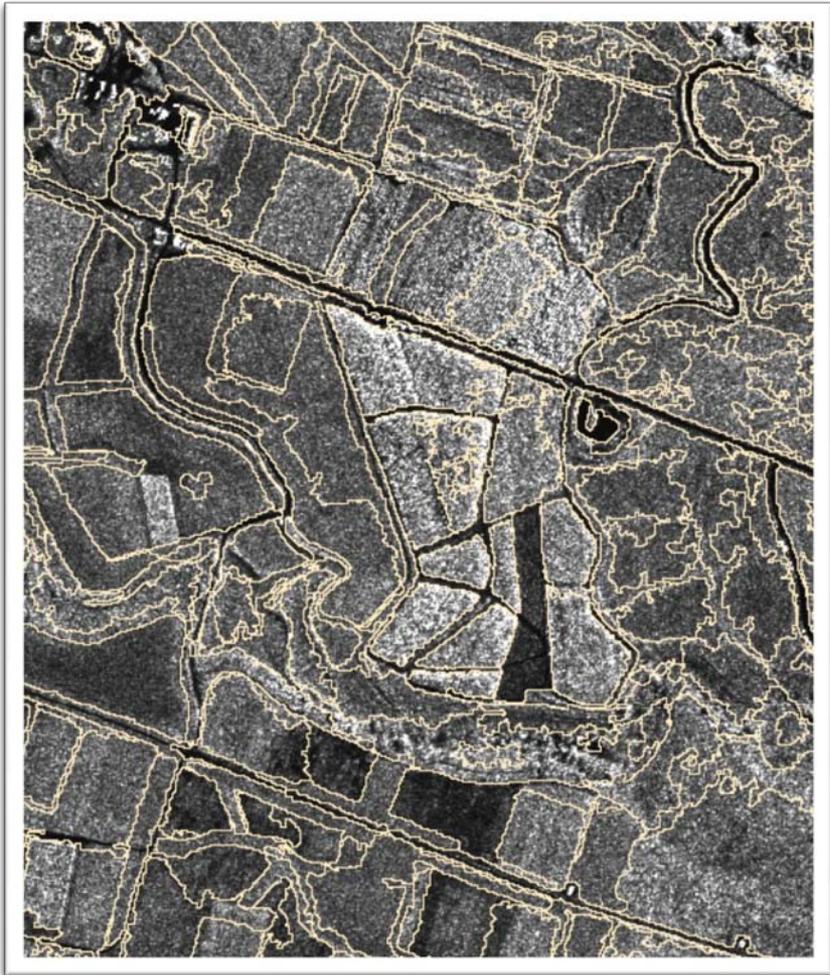


- Merging of differing resolutions is done at a high resolution boundary scale using image objects derived from segmentation (Definiens Professional software) based on 2.4 m Quickbird imagery
- Image objects are labeled using hierarchical rules based on underlying C-CAP class and their pixel composition



Refinement

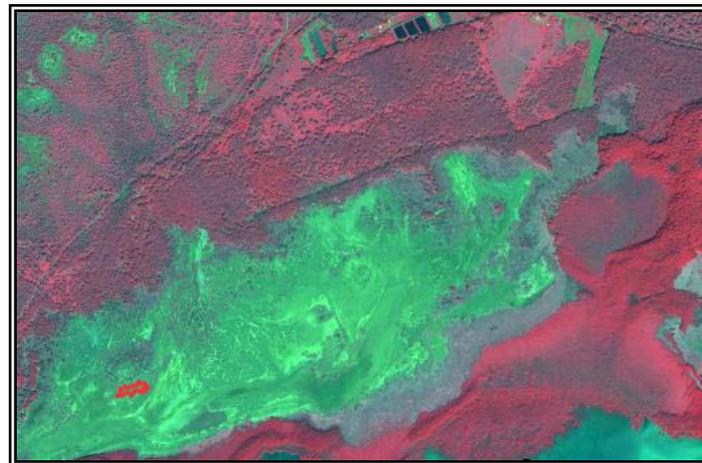
- Further refinement of the classification can be done at the image object level through analysis of the spectral data or other ancillary data layers
 - SAR, DEM and DSM, LiDAR



Refinement

- Rule set creation based on combination of datasets
 - Aspect
 - DSM
 - Slope
 - Ownership layers
 - NWI
 - Hydrology

Image Object Information	
Feature	Value
Layer Values	Mean
Aspect	185.57
DSM	1.434
ORI	38.42
Slope	6.500
Texture	6.277
Thematic object at...	NWI
CCAP	15
Relations to neigh...	Rel. border to
Bare	0.6250
Grass	0
Pasture	0



Challenges



- Method challenges
 - Features not present in the 30 m land cover data are much more difficult to extract, as their land cover call can not be “pulled through” from the existing classification
 - Elements that are long and thin are not always captured, or correctly labeled
 - Errors in the 30 m land cover will be carried through to the 2.4 m land cover
- Location challenges
 - Pasture – grassland – appearance similar – used ownership
 - Shrub forest – gradual changes cause problems
 - Used elevation/aspect – texture shadows
 - Deep shadows – use alternative imagery, estimate
- Imagery challenges
 - Cloudy area – patched in with IKONOS and aerial – presents their own problems

State of Maine

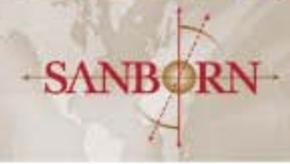
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- Maine DEP has developed tools that extract information from the land cover dataset:
- Watershed land cover extraction tool for TMDL assessment
- Watershed imperviousness computation tool for stormwater modeling
- AERSURFACE modeling tool summarizes land cover to input into atmospheric models



“The new Maine Land Cover and impervious data provided by Sanborn has gone such a long way to providing our users with better tools to make decisions. We can perform watershed analyses and do modeling at a scale and accuracy level that was never before possible.”

Kentucky Bluegrass Region



- Equestrian Games in the Bluegrass in 2010
- The Bluegrass is a listed endangered landscape.
- Need to protect the region by
 - Regional planning
 - Development needs assessment
 - Purchase of development rights
 - Purchase of cons. easements
 - Land cover change assessment
 - Watershed management
- Need to protect Royal Springs aquifer for water supply
- Extremely sensitive hydrologic features (Karst)

Semi Automated Land Cover Classification for Fayette County



Color	Class
Yellow	Bare rock, sand, clay
Brown	Cultivated crops
Light Green	Deciduous forest
White	Impervious
Pink	Emergent herbaceous wetlands
Dark Green	Evergreen forest
Light Green	Grasslands, herbaceous
Medium Green	Mixed forest
Orange	Pasture, hay
Dark Green	Shrubland
Light Blue	Unconsolidated Shore
Dark Blue	Water
Dark Green	Woody wetlands



Island of Oahu Hawaii

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- Track development over the Island
- Watershed modeling for maintaining coastal habitat
- Future development planning
- TMDL assessments

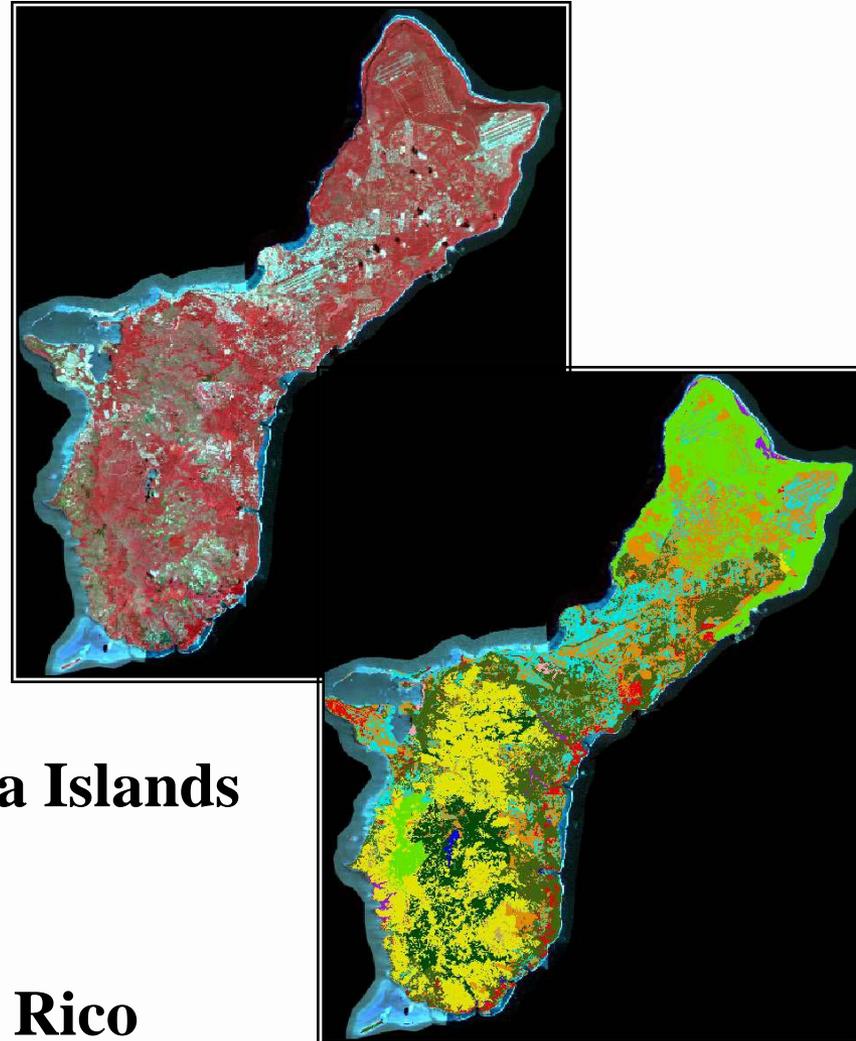


Coming Soon

Pacific and Caribbean Islands

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- Base Quickbird but uses other imagery
- Less reliance on C-CAP
- Incorporate other ancillary data to assist in the object labeling



Guam

Northern Mariana Islands

American Samoa

Virgin Islands

Jobos Bay Puerto Rico

Conclusions



- Sanborn has developed an approach in coordination with CSC for a high resolution C-CAP land cover product
- Like the medium resolution it will have a consistent
 - Resolution
 - Image base
 - Classification system
 - MMU
 - Look and feel
 - Technical approach
- This product contributes to the Digital Coast goals
- Makes the land cover products more valuable for operational decision making.

Questions?

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