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2018 Salish Sea Ecosystem Conference (Seattle, Wash.)

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Bringing high resolution land cover products to the Puget Sound region and U.S.

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Bringing High Resolution Land Cover Products to the Puget Sound Region and U.S.

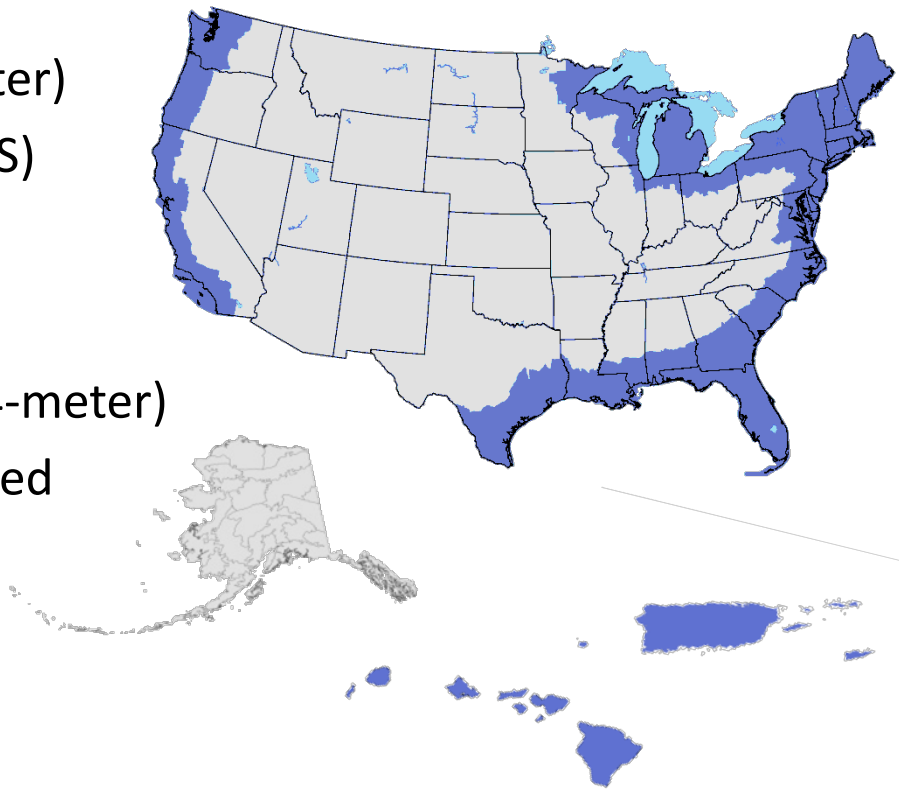
Melissa Rosa
West Coast Geospatial Specialist
NOAA Office for Coastal Management

2018 Salish Sea Ecosystem Conference

NOAA's National Land Cover Monitoring

Coastal Change Analysis Program (C-CAP)

- Regional Land Cover Products
  - Based on Landsat Imagery (30-meter)
  - 25% of the contiguous U.S. (CONUS)
  - Coastal expression of the NLCD
- High Resolution Land Cover
  - Based on imagery and Lidar (1 to 4-meter)
  - Pacific, Caribbean, and project based
  - Change not produced everywhere
  - Multiple dates in Pacific and USVIs
- Updated every 5 years
- Consistent, Accurate Products
  - FGDC National Geospatial Data Asset



Coastal Land Cover Classes

Developed
- Impervious
- Developed, Open Space

Agricultural
- Cultivated Crops
- Pasture/Hay

Rangeland
- Grassland and Herbaceous
- Scrub / Shrub

Forest Land
- Deciduous Forest
- Evergreen Forest
- Mixed Forest

Barren Land
- Barren Land
- Perennial Ice/Snow

Wetlands

Woody Wetlands
- Palustrine Forested Wetland
- Palustrine Scrub/Shrub Wetland
- Estuarine Forested Wetland
- Estuarine Scrub/Shrub Wetland

Herbaceous Wetlands
- Palustrine Emergent Wetland
- Estuarine Emergent Wetland

Palustrine Aquatic Bed

Estuarine Aquatic Bed

Unconsolidated Shore

Water
- Open Water

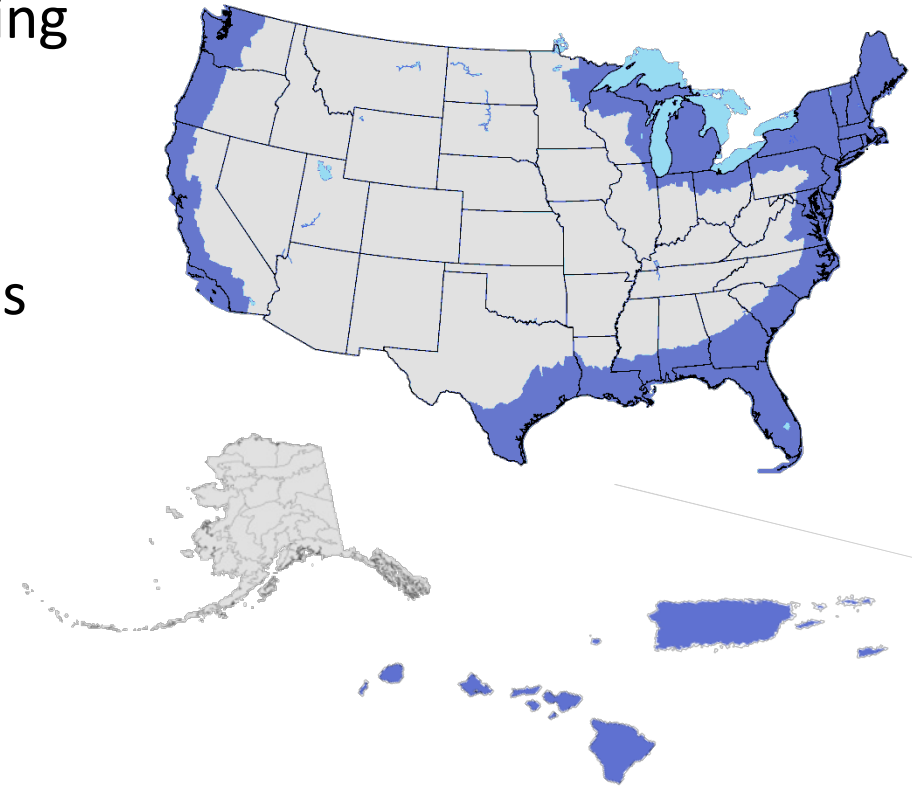
C-CAP High Resolution Land Cover Vision

Down Payment on the Future

- Starting with our current, 2016 update cycle
- Moving away from native 30-meter mapping
- Moving towards 1-meter mapping

- Cannot afford all at once
- Transition will be done in phases
- Over multiple update cycles

- May not be able to afford alone
- Able to offer partner cost share



1-meter Land Cover Production

Phase 1 (Baseline)

- 6 categories: Impervious, Bare, Grass, Shrub, Forest, and Water
- Based on 2015/2016 NAIP and available Lidar and ancillary data
- Limitations to accuracy and quality
- Restricted licensing (NOAA use only)

Phase 2 (Pilots)

- Refine limitations of above and add additional C-CAP categories
- Foundation for full high resolution future products

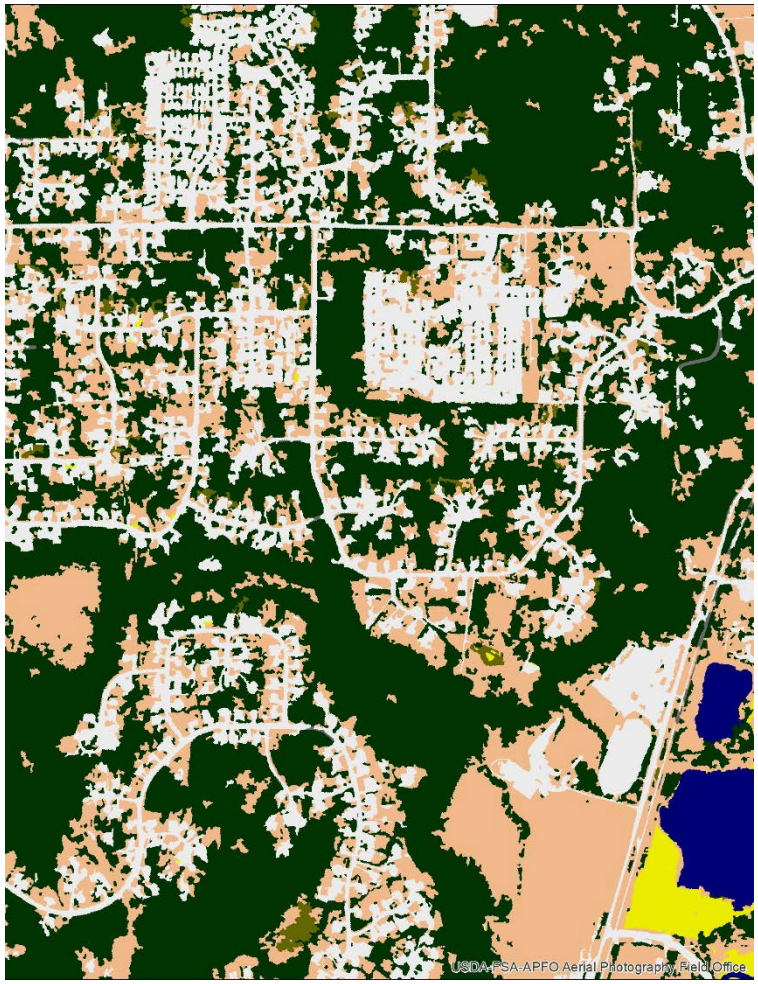
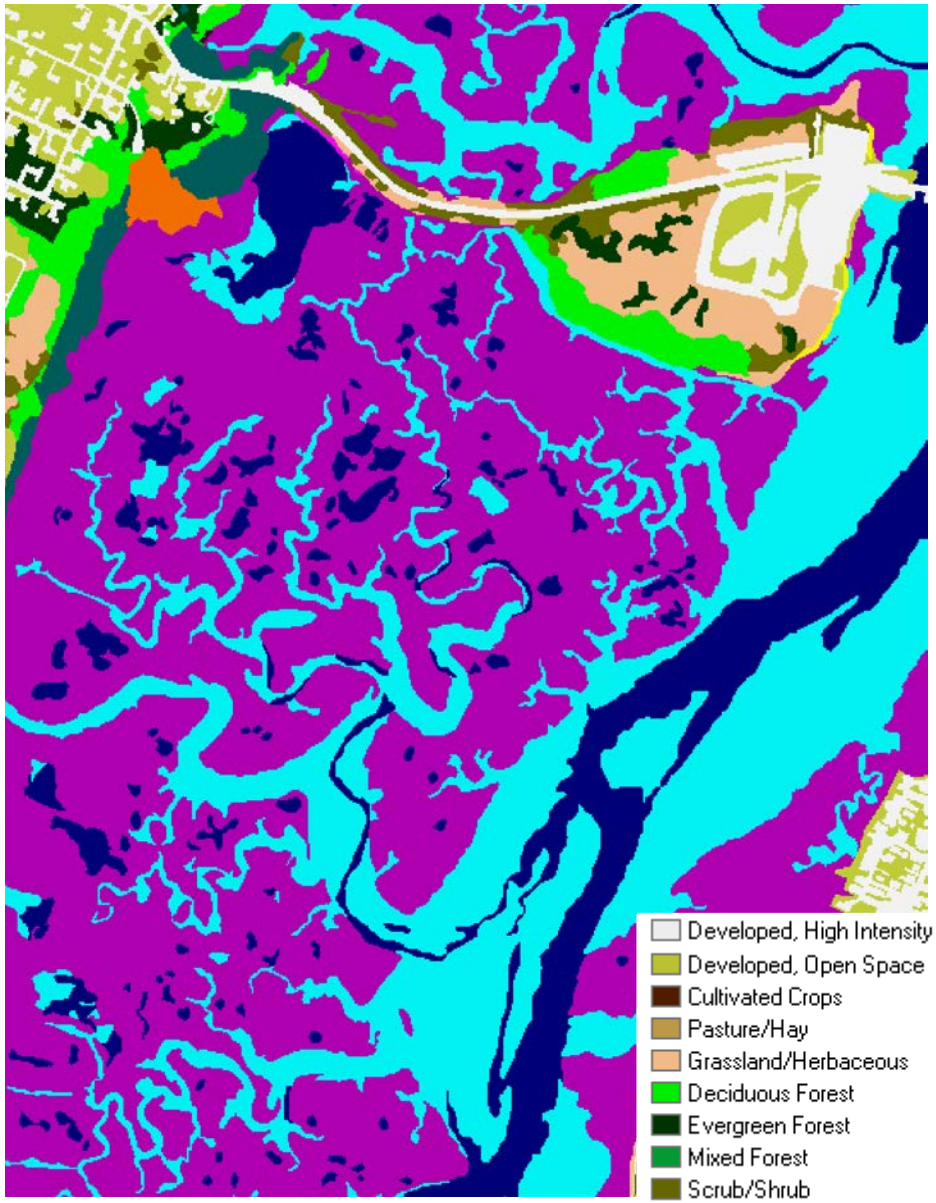
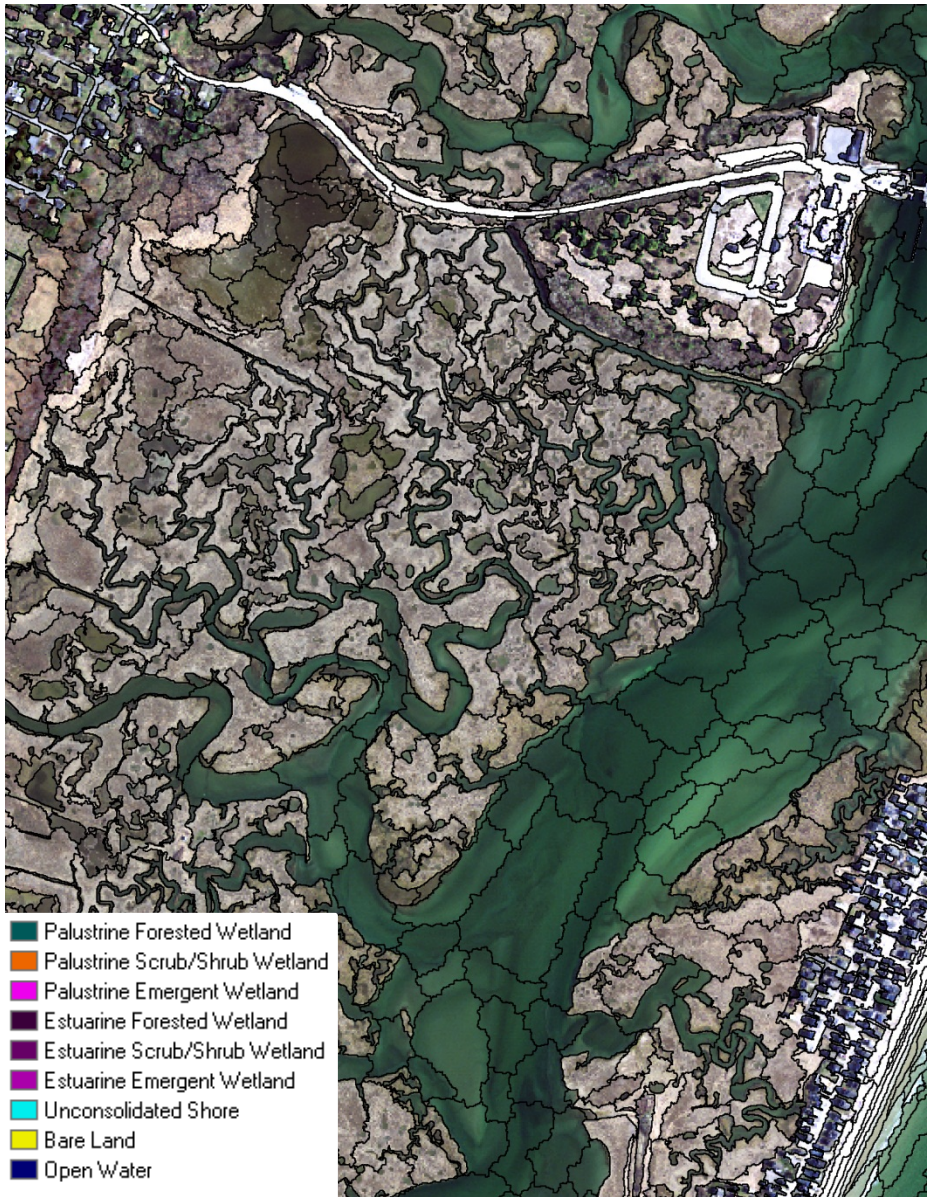


Image Objects and Classification

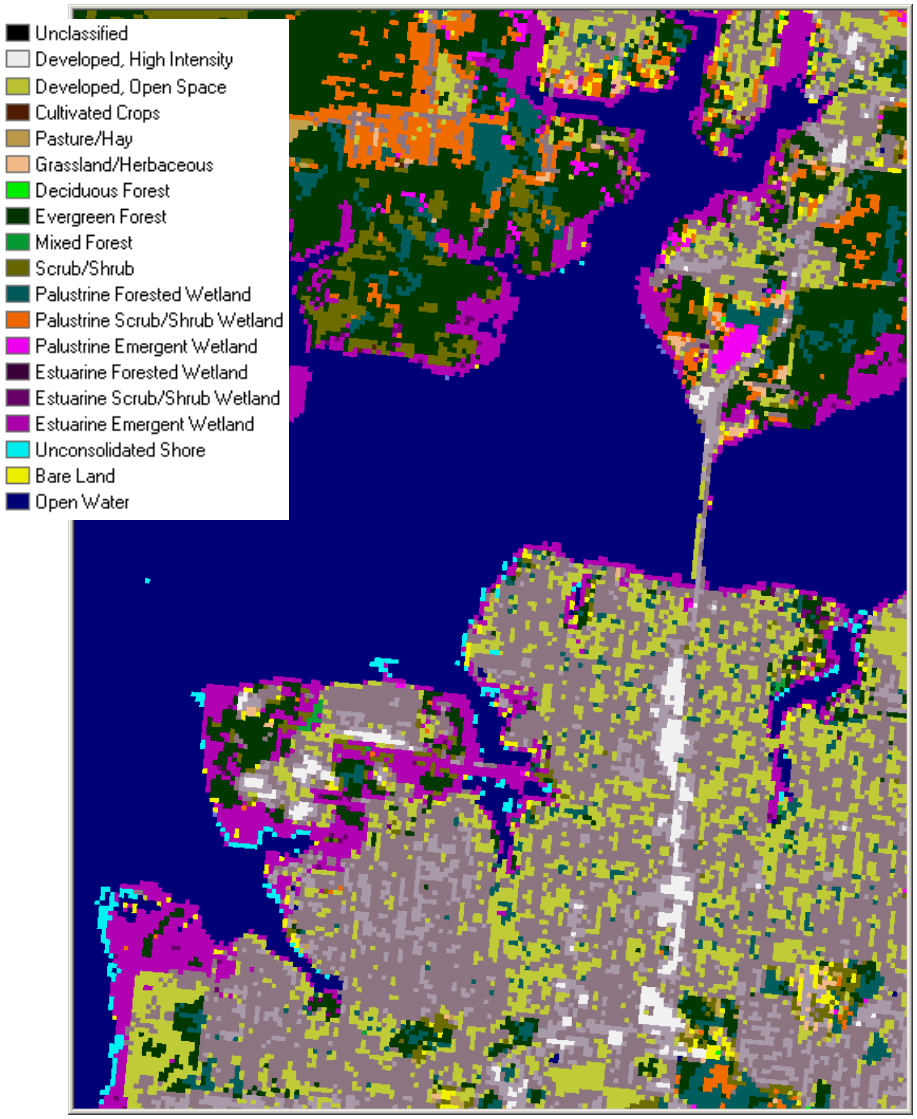
Wells NERR, Maine



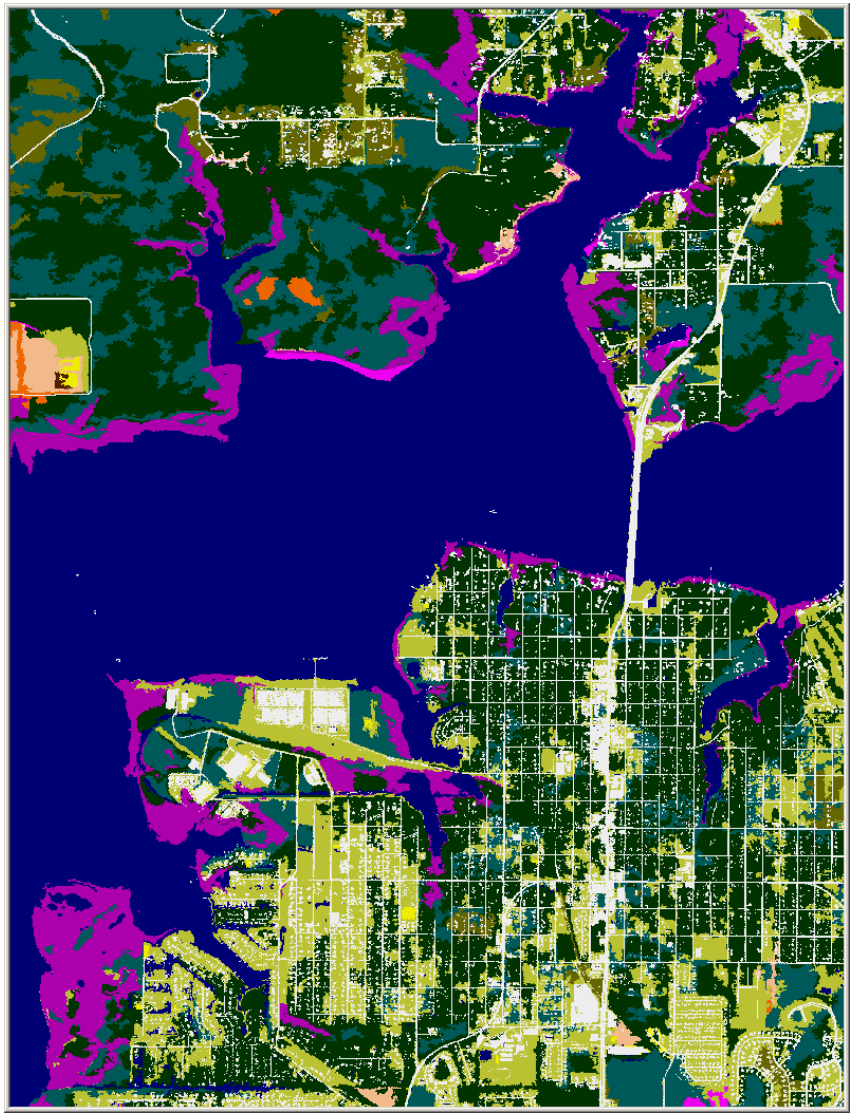


Comparison of C-CAP Product Lines

Bay County, Florida (Panama City)



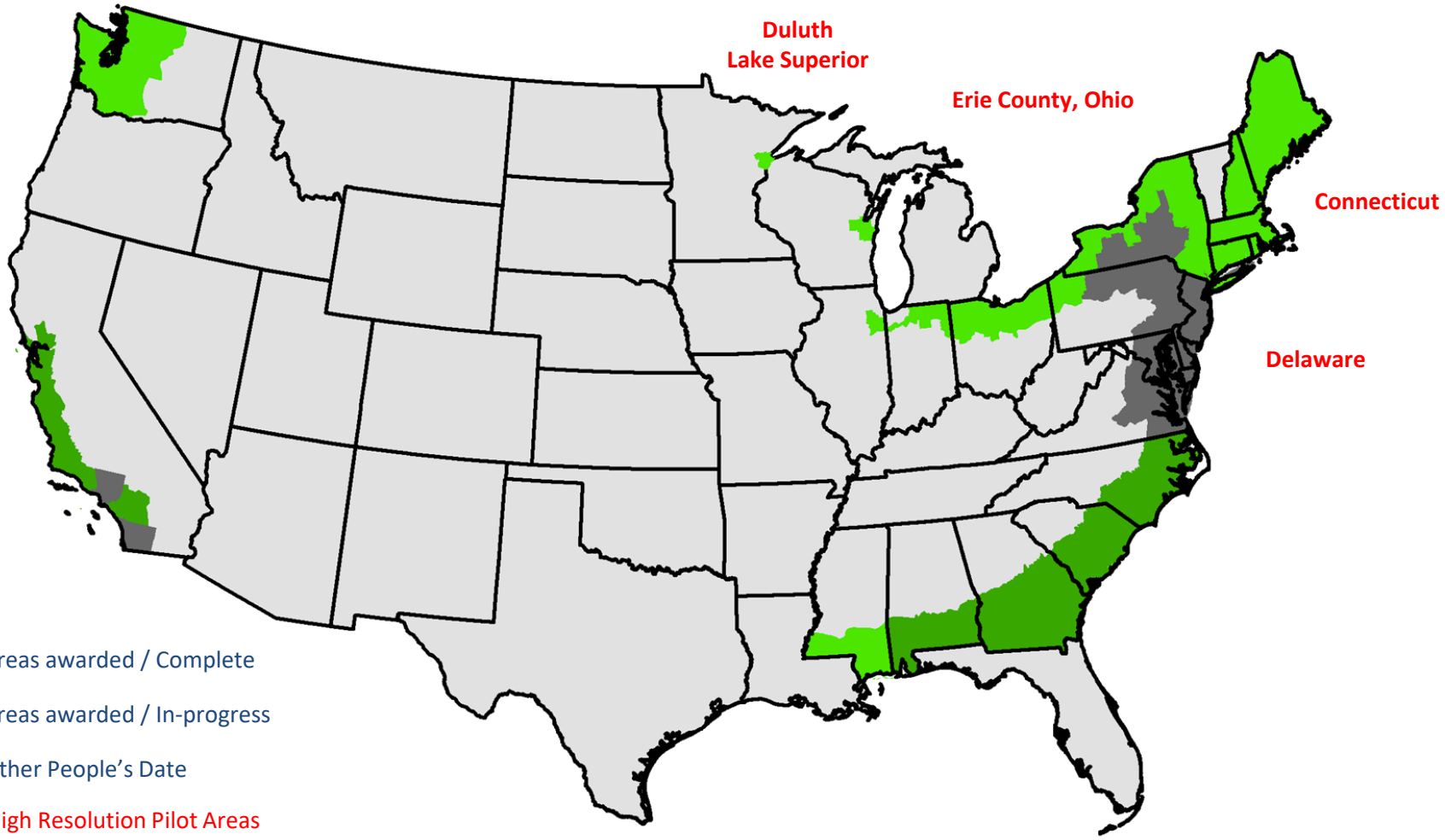
Regional



High Resolution

Baseline Status

4-5 Counties Washington
Snohomish, Island, San Juan, King, and Skagit



Areas awarded / Complete

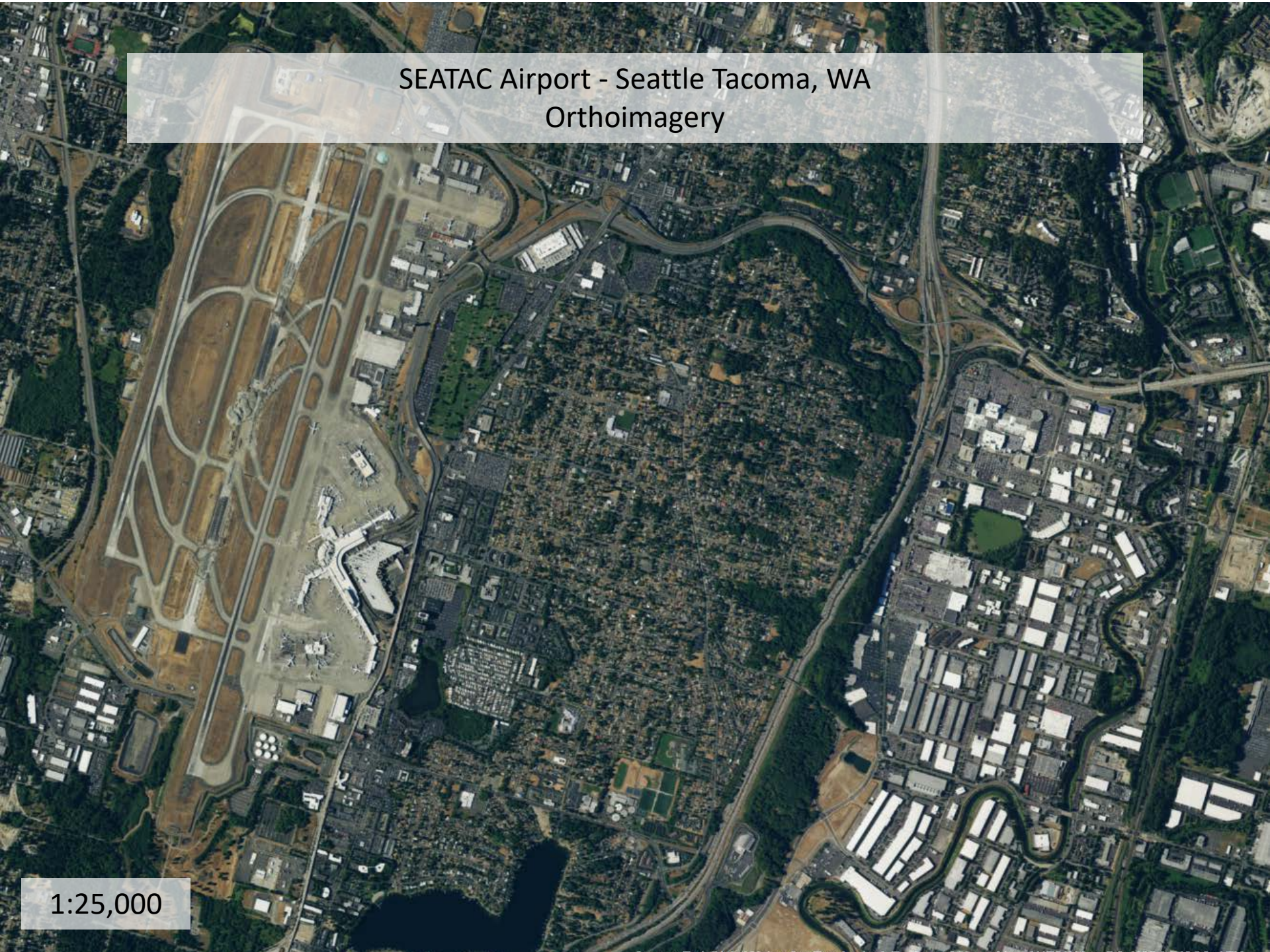
Areas awarded / In-progress

Other People's Date

* High Resolution Pilot Areas

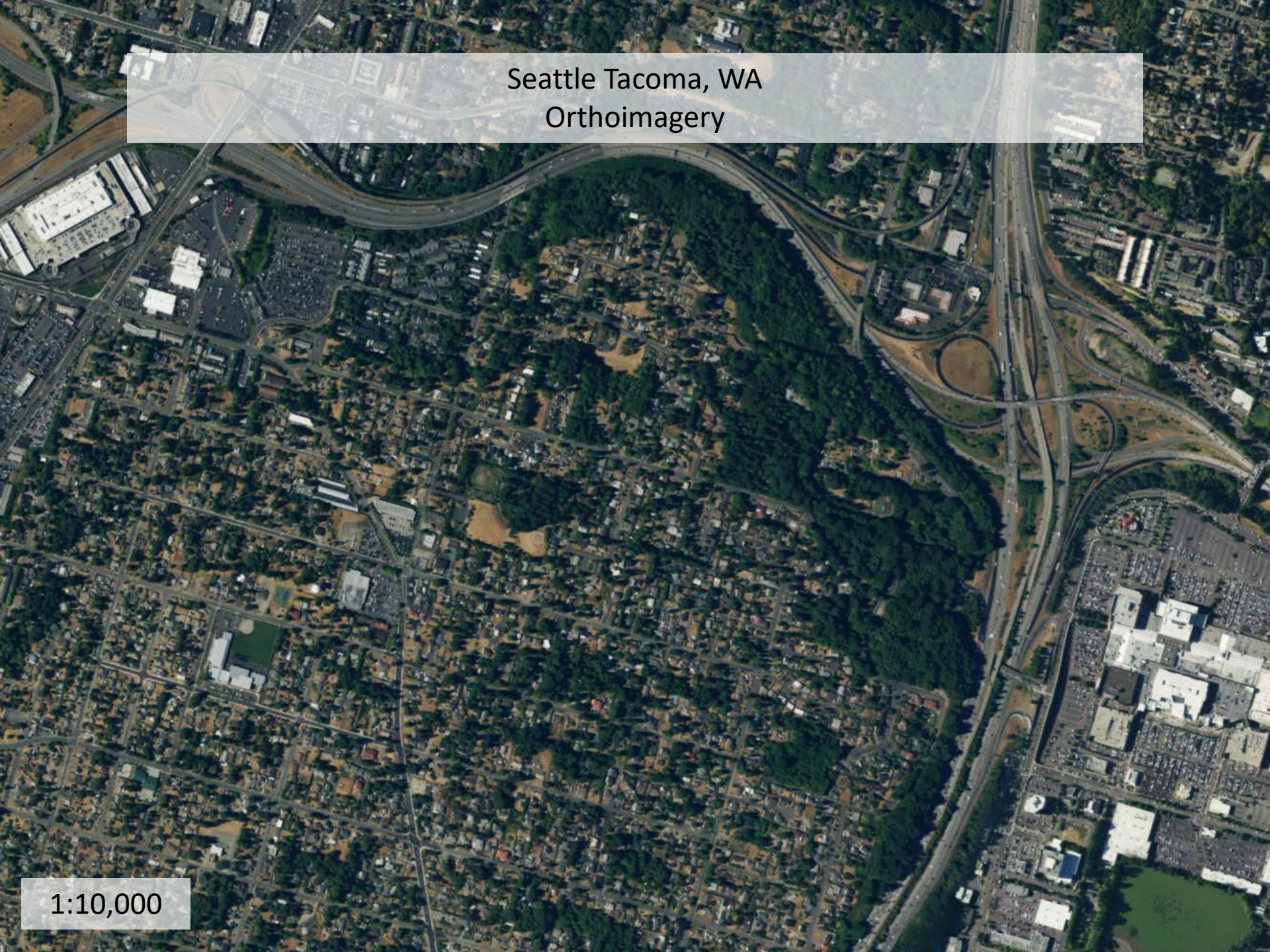
Washington State Example

36,000 square miles


SEATAC Airport - Seattle Tacoma, WA
Orthoimagery
1:25,000

SEATAC Airport - Seattle Tacoma, WA
1 meter Baseline Land Cover - Draft
Developed / Impervious
Grassland / Herbaceous
Forest / Tree
Scrub / Shrub
Bare Land
Water
1:25,000

SEATAC Airport - Seattle Tacoma, WA
30 meter Existing C-CAP
1:25,000


Seattle Tacoma, WA
Orthoimagery
1:10,000

Seattle Tacoma, WA
1 meter Baseline Land Cover - Draft
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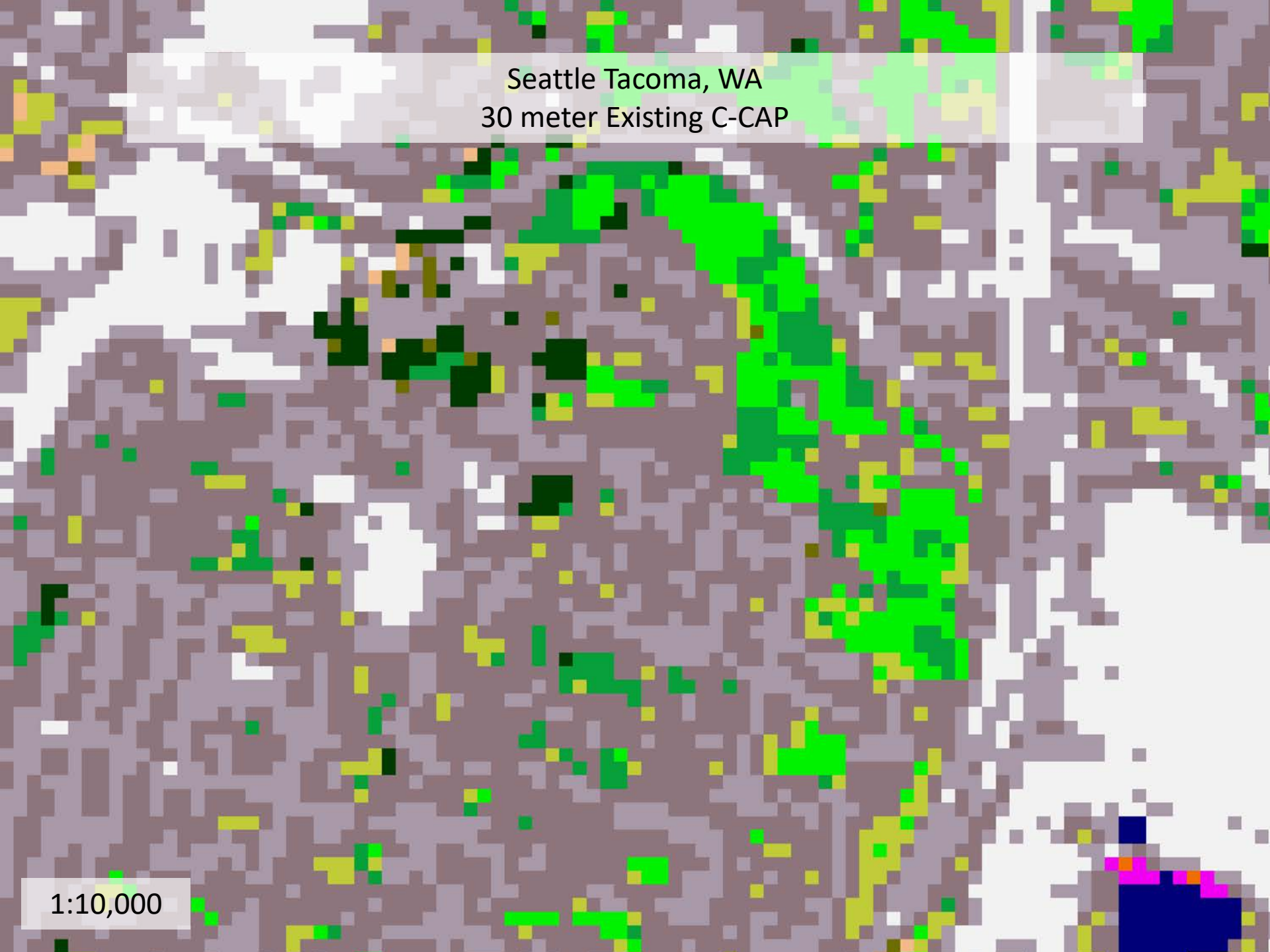
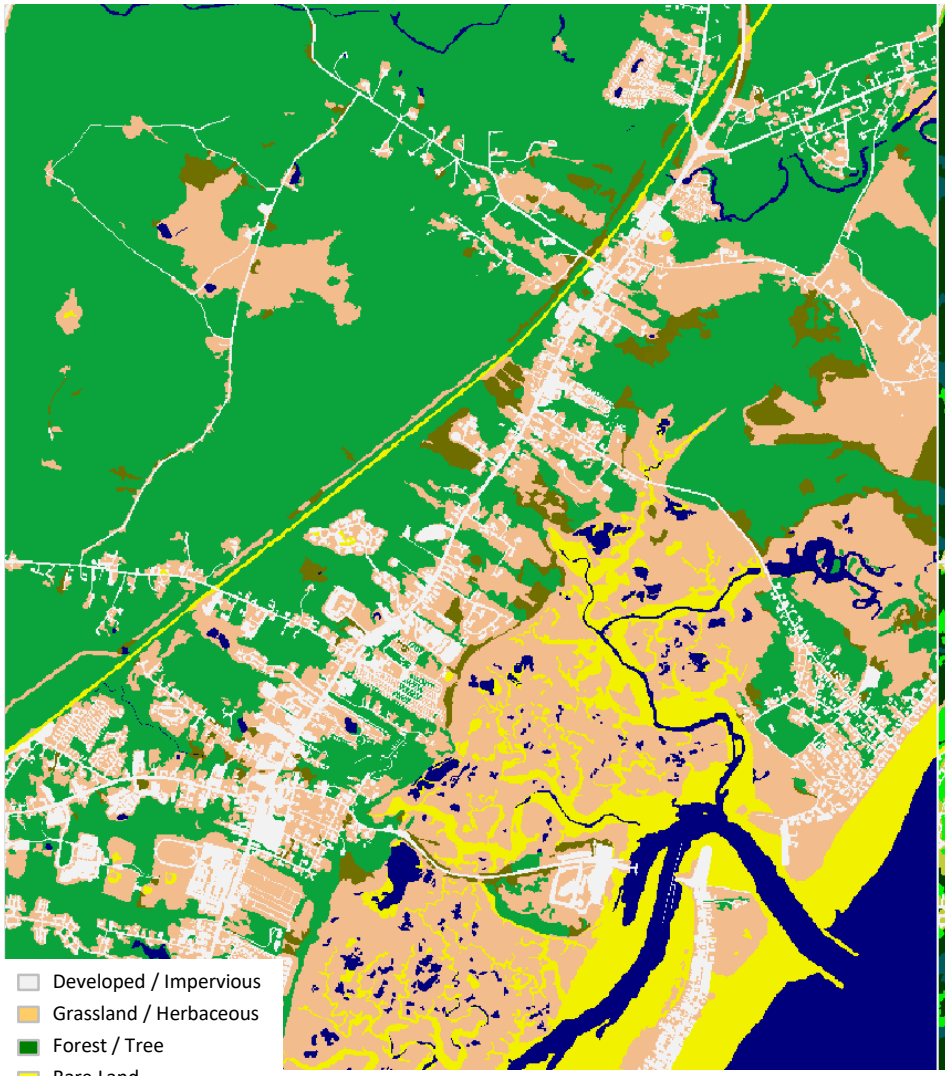

Seattle Tacoma, WA
30 meter Existing C-CAP
1:10,000

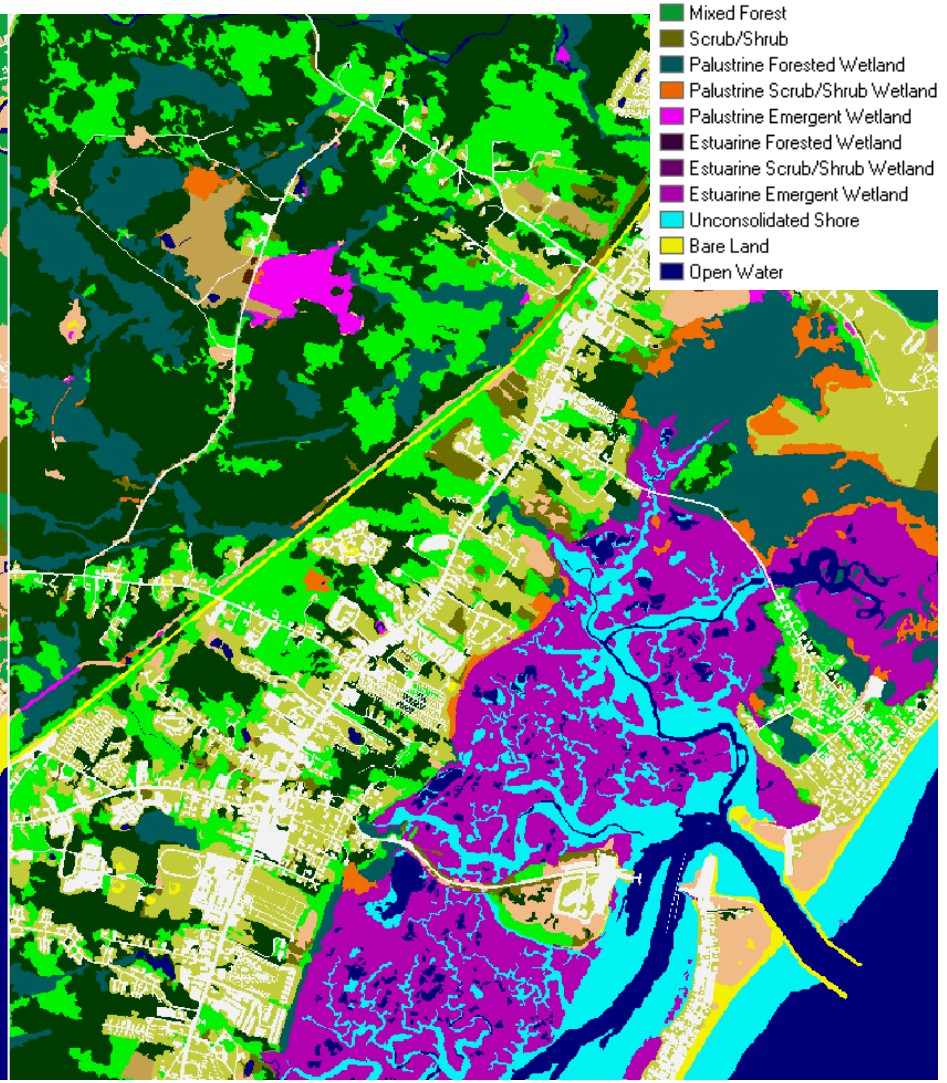
Pilot Status

- Initial baseline work has gone exceedingly well
  - No delays or quality concerns.
  - While not perfect, achieving accuracy of 90+%.
  - Each geography improves upon previous.
- Refinement pilots have been a bit of a struggle
  - All pilots are behind schedule.
- NOAA has taken on more of this work ourselves
  - Washington counties being completed in-house.
- First products expected in Spring (Snohomish, WA)
  - Subsequent products expected in the fall.

Example C-CAP Refinement



6 Category "Baseline" Land Cover

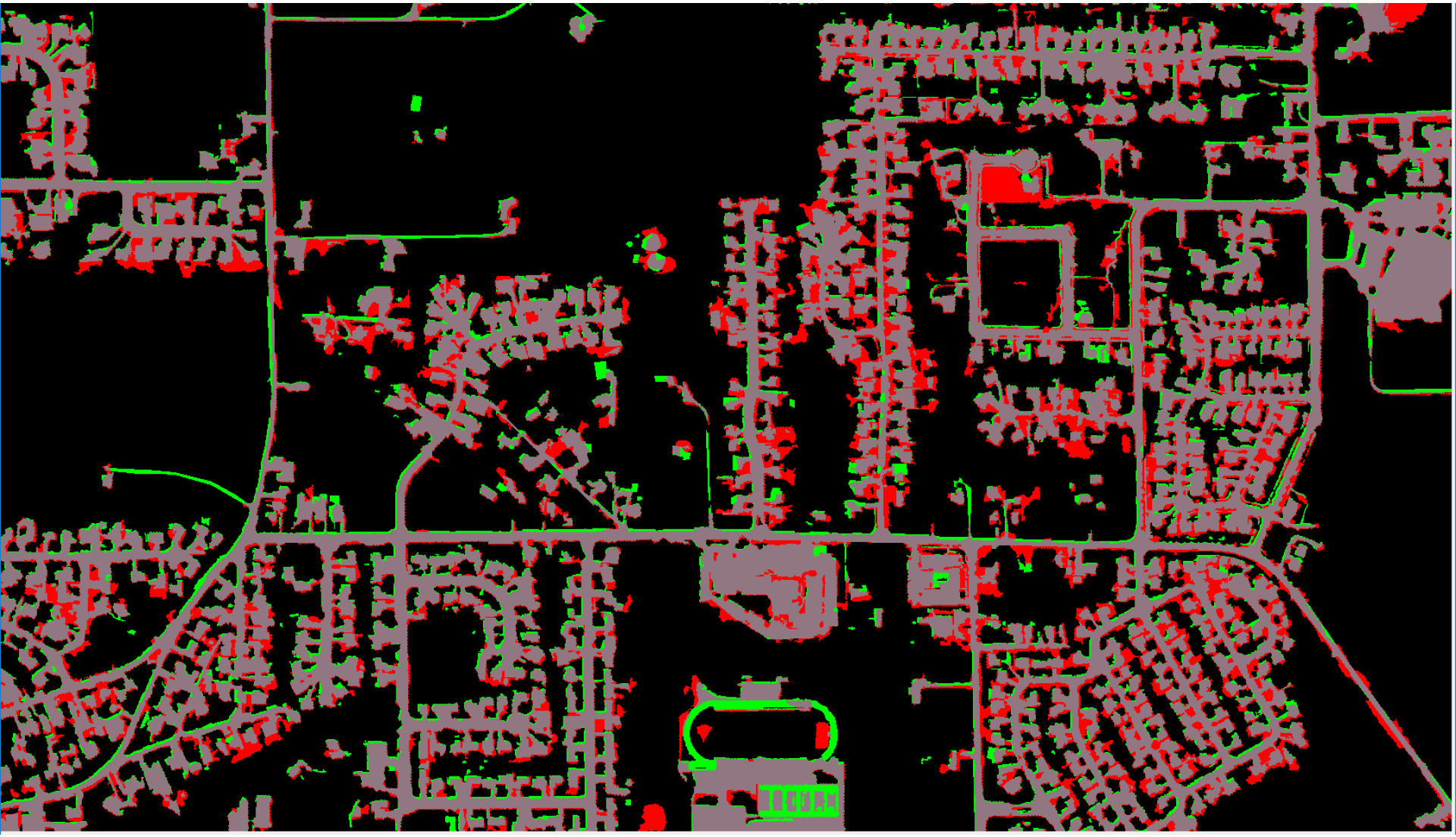


C-CAP Full Classification Scheme

Findings from In-house Work

- 90% of area unchanged from baseline output
- Area of edits focused on:
  - Vegetation corrections: 75-80%
  - Impervious feature clean-up: 15-20%
  - Bare/Water/Other: 5-10%
- Time of edits
  - Impervious feature clean-up: 65%
  - Vegetation corrections: 20%
  - Bare/Water/Other: 15%

Neighborhoods and Houses



Impervious Removed

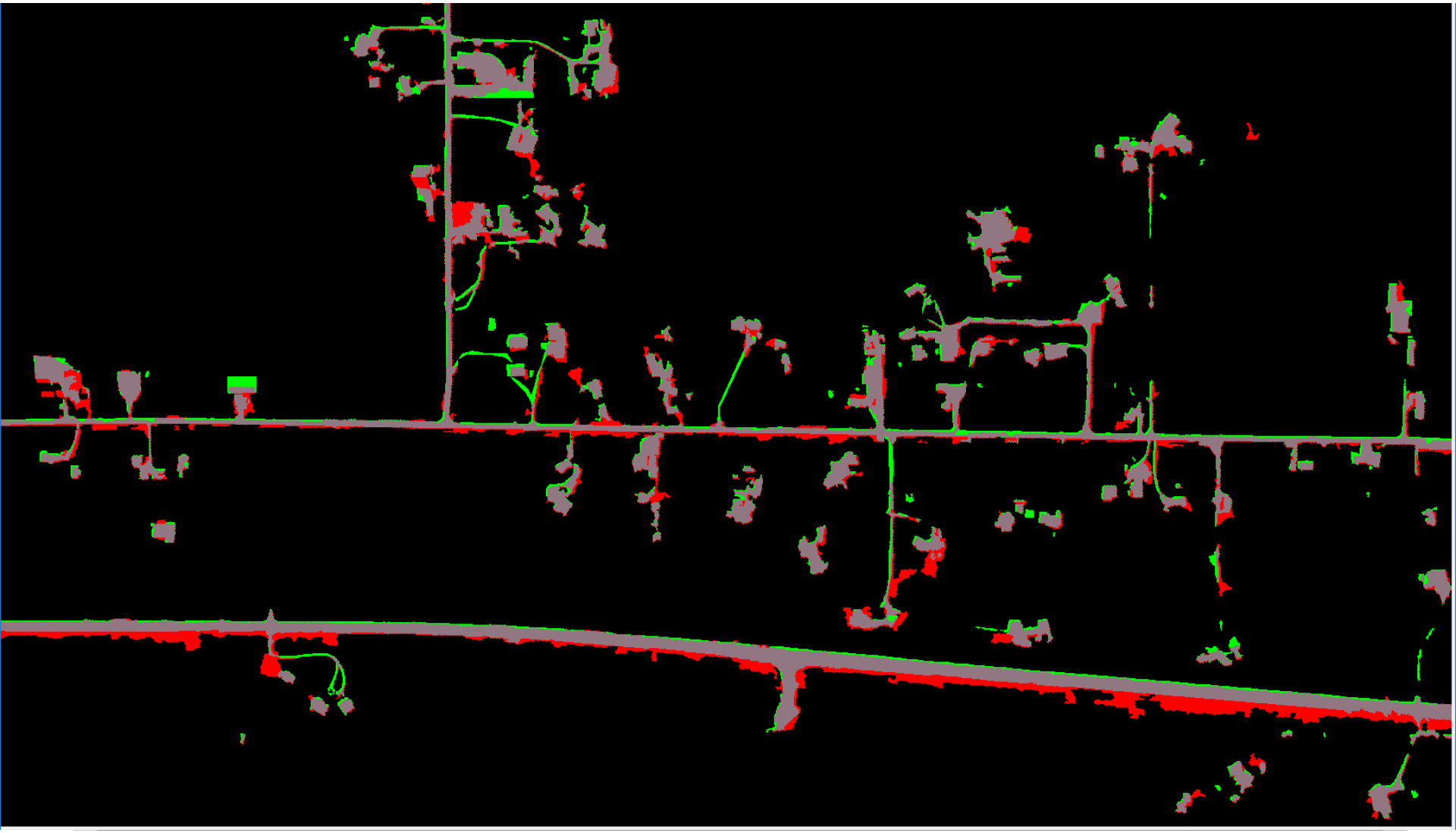
Impervious Added

OFFICE FOR COASTAL MANAGEMENT

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Neighborhoods and Houses

Roads and Driveways



Impervious Removed

Impervious Added

OFFICE FOR COASTAL MANAGEMENT

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

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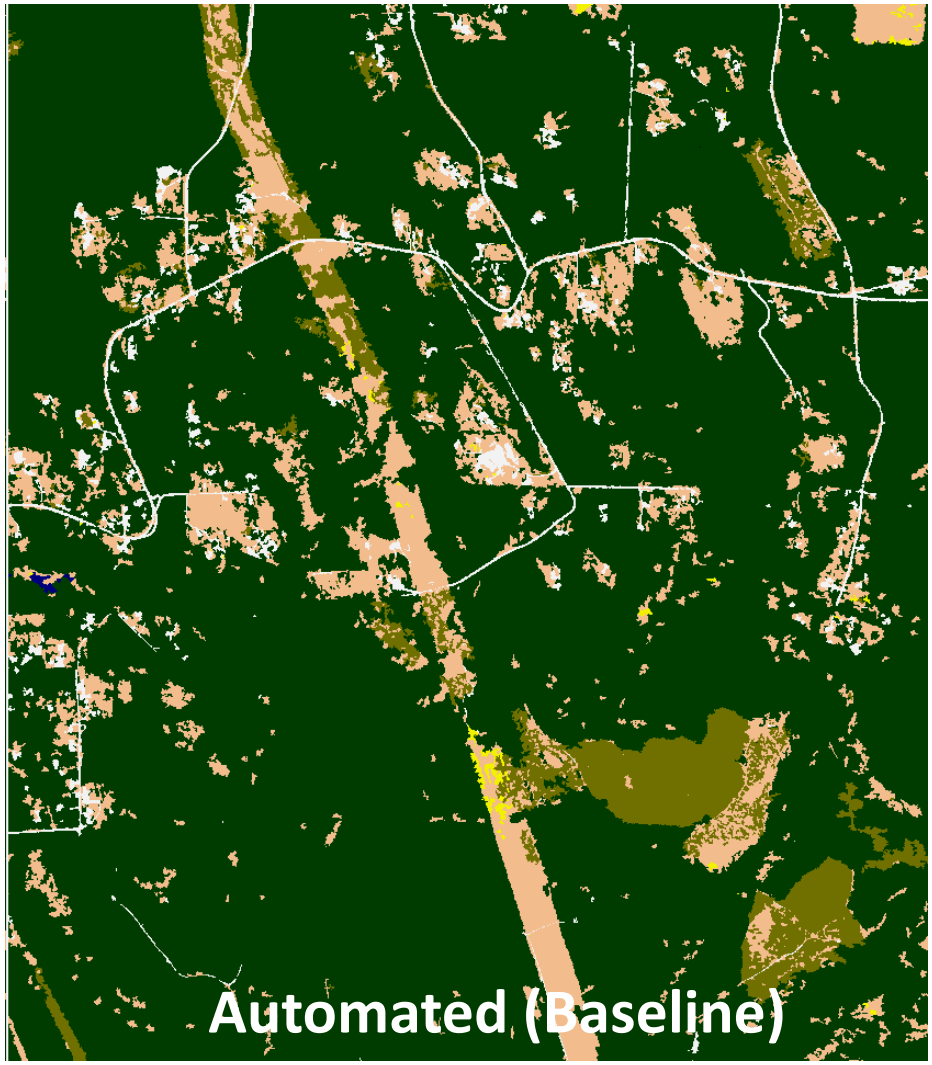
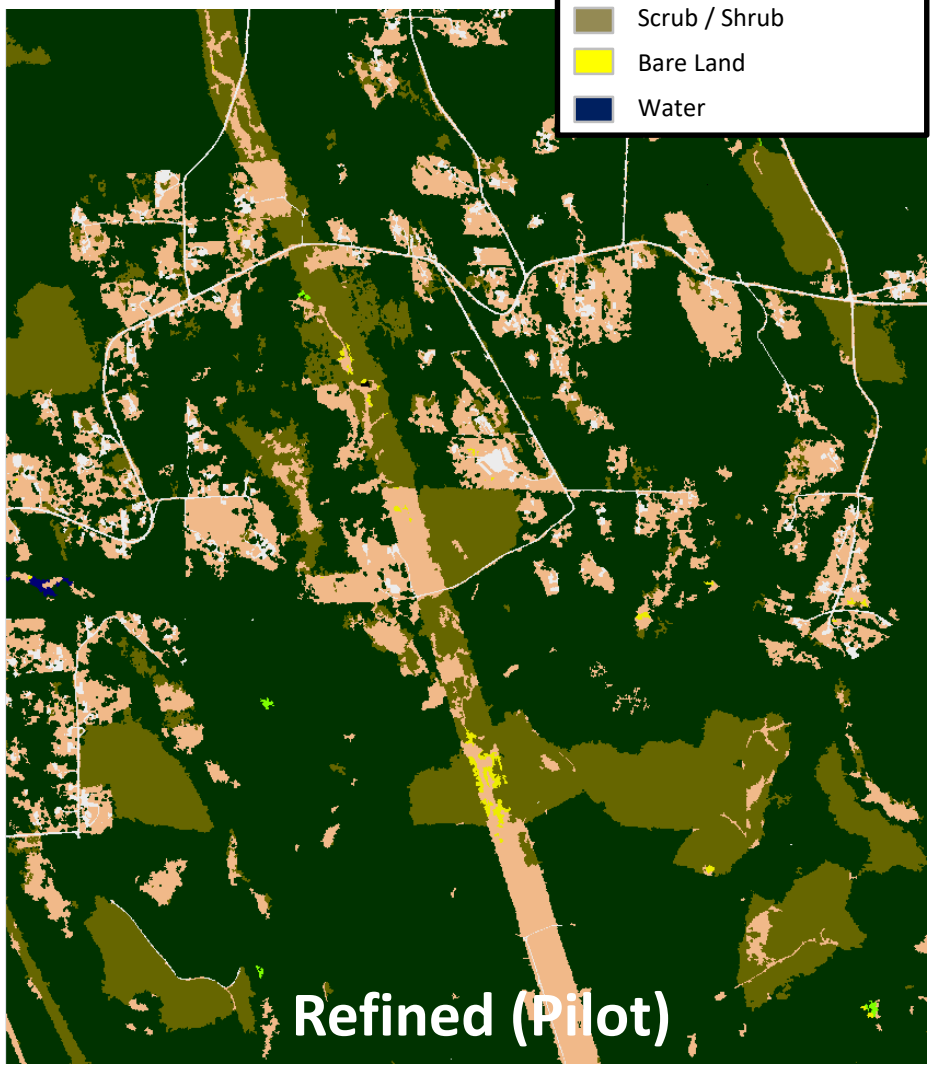
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Vegetation Corrections





Developed / Impervious
Grassland / Herbaceous
Forest / Tree
Scrub / Shrub
Bare Land
Water

Notes on Costs

- Image quality is important
  - Shadows have been a big impact in Washington
  - Multiple dates/seasons of imagery helpful
- Up-to-date LiDAR coverage is a HUGE advantage
  - Imagery cannot pull out height in the same way
  - Differences in date are problematic
- Ancillary data can save you a lot of refinement time
  - Impervious, land use, agricultural
  - Updating/fixing existing is cheaper than starting over

NOAA's Partnership Opportunities "Pitch"

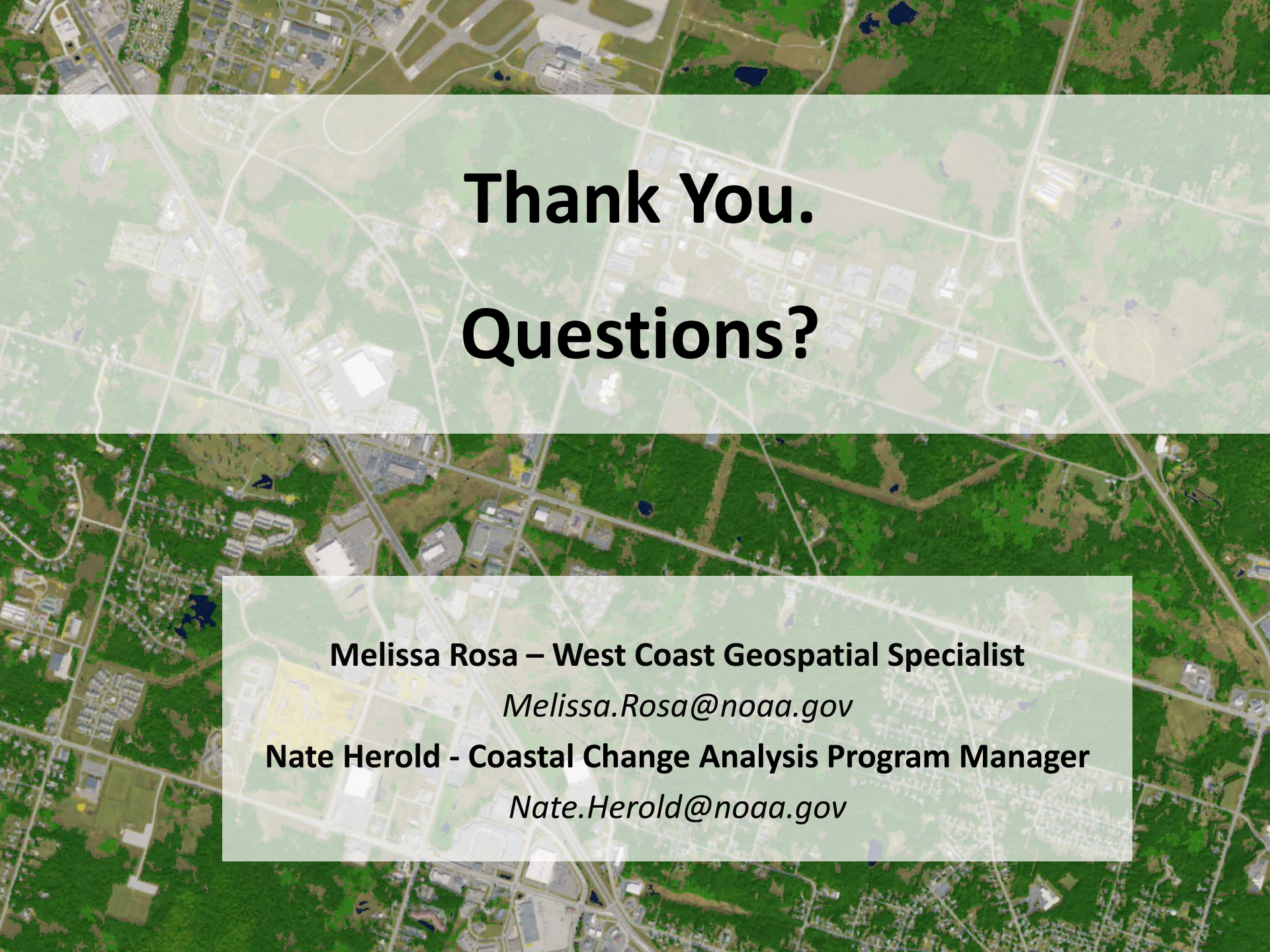
Ways Others can Leverage NOAA's Investment

- Utilize publicly available C-CAP data
  - 2016 regional update
  - High resolution pilot areas
- Help NOAA realize our vision faster
  - Share the cost of baseline licensing and/or C-CAP level development
  - Obtain land cover data at significantly reduced price
- Go statewide
  - Obtain statewide products
  - Volume discounts could still apply
- Add categories of specific interest
  - Customize products for specific need (salt marsh species mapping, buildings/roads/other impervious classification, etc.)

Next Steps

Short-term

- Snohomish, Island, and San Juan Counties, WA
  - Finalize final baseline (6 class) edits
  - Complete expanded C-CAP (wetland) class modeling/edits
  - Rollout final products at 2018 Washington URISA conference
- King and Skagit Counties, WA
  - Baseline editing (grass, shrub, forests)
  - Most of time on impervious
  - Draft stage at end of May
  - Looking for feedback from reviewers



Thank You.

Questions?

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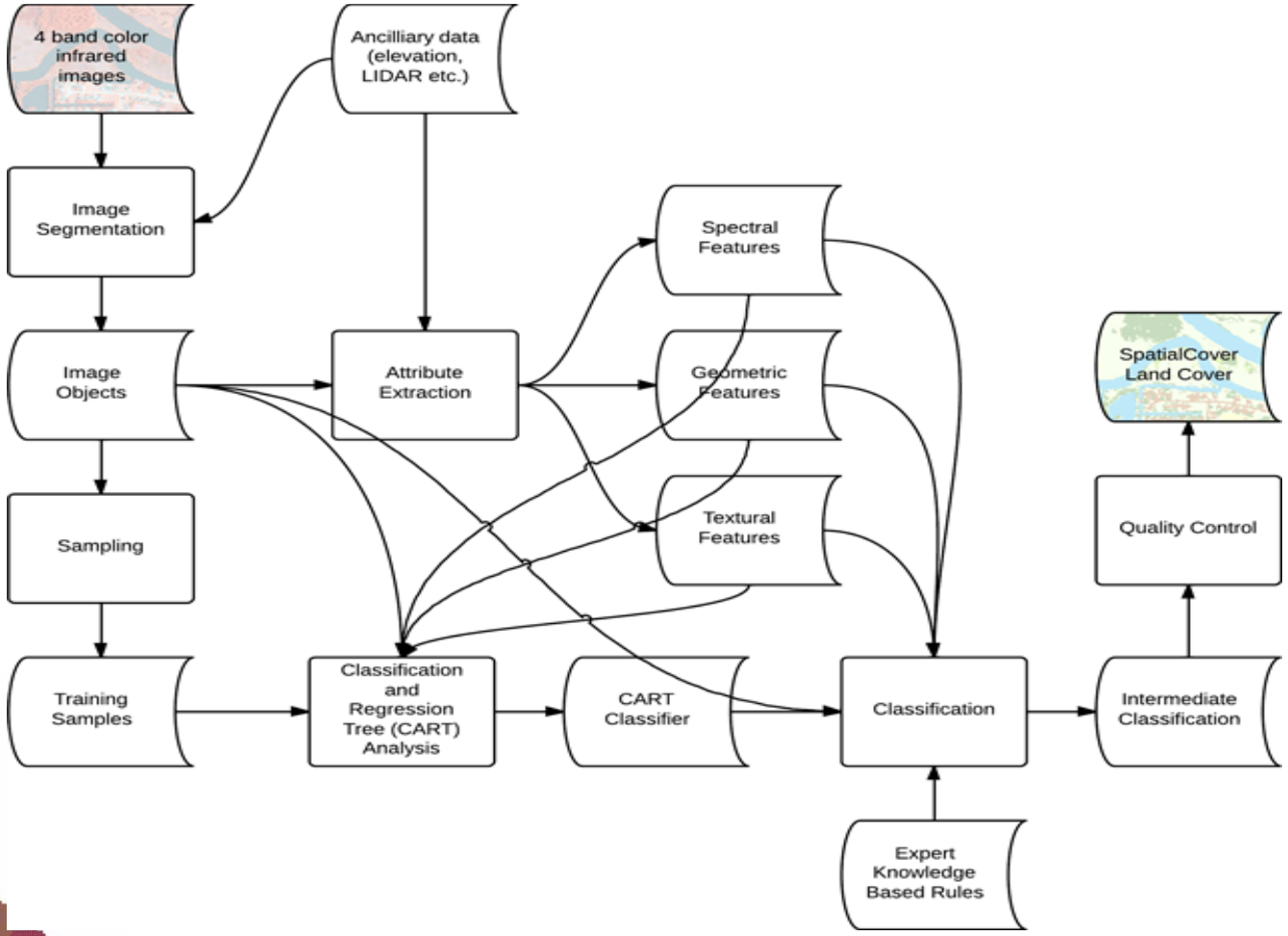
High Resolution Baseline Classification Approach



Example Training Regions (California)

Going Beyond 6 Categories

6 Baseline Categories

C-CAP Categories

	Impervious	Grassland	Forest	Scrub/Shrub	Bare	Water	Note
Impervious	X						based on impervious classification
Open Space Developed	X	X					
Cultivated		X					detail added to grassland category
Pasture/Hay		X					
Grassland		X					
Deciduous Forest			X				based on spectral information (if avail)
Evergreen Forest			X				
Scrub/Shrub				X			direct from 6 class
Palustrine Forested Wetland			X				based on wetland ancillary data and/or additional classification
Palustrine Scrub/Shrub Wetland				X			
Palustrine Emergent Wetland		X					
Estuarine Forested Wetland			X				
Estuarine Scrub/Shrub Wetland				X			
Estuarine Emergent Wetland		X					
Unconsolidated Shore					X	X	
Barren Land					X		direct from 6 class
Open Water						X	direct from 6 class
Palustrine Aquatic Bed		X				X	based on wetland data or classification
Estuarine Aquatic Bed		X				X	