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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**

<table>
<thead>
<tr>
<th>Developed</th>
<th>Wetlands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impervious</td>
<td>Palustrine Forested Wetland</td>
</tr>
<tr>
<td>Developed, Open Space</td>
<td>Palustrine Scrub/Shrub Wetland</td>
</tr>
<tr>
<td></td>
<td>Estuarine Forested Wetland</td>
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<td></td>
<td>Estuarine Scrub/Shrub Wetland</td>
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<table>
<thead>
<tr>
<th>Agricultural</th>
<th>Woody Wetlands</th>
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</thead>
<tbody>
<tr>
<td>Cultivated Crops</td>
<td>Palustrine Forested Wetland</td>
</tr>
<tr>
<td>Pasture/Hay</td>
<td>Palustrine Scrub/Shrub Wetland</td>
</tr>
<tr>
<td></td>
<td>Estuarine Forested Wetland</td>
</tr>
<tr>
<td></td>
<td>Estuarine Scrub/Shrub Wetland</td>
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<table>
<thead>
<tr>
<th>Rangeland</th>
<th>Herbaceous Wetlands</th>
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</thead>
<tbody>
<tr>
<td>Grassland and Herbaceous</td>
<td>Palustrine Emergent Wetland</td>
</tr>
<tr>
<td>Scrub / Shrub</td>
<td>Estuarine Emergent Wetland</td>
</tr>
<tr>
<td></td>
<td>Palustrine Aquatic Bed</td>
</tr>
<tr>
<td></td>
<td>Estuarine Aquatic Bed</td>
</tr>
<tr>
<td></td>
<td>Unconsolidated Shore</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Forest Land</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deciduous Forest</td>
<td>Open Water</td>
</tr>
<tr>
<td>Evergreen Forest</td>
<td></td>
</tr>
<tr>
<td>Mixed Forest</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Barren Land</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Barren Land</td>
<td></td>
</tr>
<tr>
<td>Perennial Ice/Snow</td>
<td></td>
</tr>
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</table>
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)
Baseline Status

Areas awarded / Complete
- 4-5 Counties Washington
  Snohomish, Island, San Juan, King, and Skagit
- Duluth
  Lake Superior
- Erie County, Ohio
- Connecticut
- Delaware

Areas awarded / In-progress

Other People’s Date

* High Resolution Pilot Areas
Washington State Example

36,000 square miles
SEATAC Airport - Seattle Tacoma, WA
30 meter Existing C-CAP
Seattle Tacoma, WA
Orthoimagery
1:10,000
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
Roads and Driveways

Impervious Removed

Impervious Added
Vegetation Corrections

Automated (Baseline)

Refined (Pilot)
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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Nate Herold - Coastal Change Analysis Program Manager
Nate.Herold@noaa.gov
High Resolution Baseline Classification Approach

Example Training Regions (California)
# Going Beyond 6 Categories

## 6 Baseline Categories

<table>
<thead>
<tr>
<th></th>
<th>Impervious</th>
<th>Grassland</th>
<th>Forest</th>
<th>Scrub/Shrub</th>
<th>Bare</th>
<th>Water</th>
<th>Note</th>
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<tr>
<td>Impervious</td>
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<td>based on impervious classification</td>
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<td>Cultivated</td>
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<td>detail added to grassland category</td>
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<td>Grassland</td>
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<td>based on spectral information (if avail)</td>
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<td>Unconsolidated Shore</td>
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<tr>
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<td>Palustrine Aquatic Bed</td>
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<td>based on wetland data or classification</td>
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<tr>
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