Chesapeake Bay Program
Science. Restoration. Partnership.

Land Use Methods & Metrics Development Outcome

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LUWG Coordinator

Through the Chesapeake Bay Watershed Agreement*, the Chesapeake Bay Program has committed to…*

Goal: *Land Conservation*

Outcome: *Continually improve the knowledge of land conversion and the associated impacts throughout the watershed. By 2016, develop a Chesapeake Bay watershed-wide methodology and local level metrics for characterizing the rate of farmland, forest and wetland conversion, measuring the extent and rate of change in impervious surface coverage and quantifying the potential impacts of land conversion to water quality, healthy watersheds and communities. Launch a public awareness campaign to share this information with citizens, local governments, elected officials and stakeholders.*

What We Want

Photos: Will Parson

To have Management Board:

1. Delegate updating of jurisdiction-specific datasets to the jurisdictions (e.g., MS4s, protected lands, sewer service areas, and zoning). This will help free-up resources to work on this outcome.

2. Adjust the outcome language to extend the completion date to December 2021.

1

Setting the Stage:

What are our assumptions?

Logic Behind Our Outcome

Following the Decision Framework:

Factors

- Development of metrics at a resolution sufficient to inform county-level decisions.
- Methodology to quantify impacts to water quality, habitats and healthy watersheds, and communities.
- Sustainability of funding and management support.
- Agreement on the temporal and spatial scale at which to assess change.

Gaps

- Availability of funds to support high-resolution land cover mapping and change detection.
- Availability of high quality LiDAR data for all watershed counties.
- Methods to assess impacts to habitats, healthy watersheds, and communities.
- Affordable methods to assess wetland extent and change.

Logic Behind Our Outcome (cont.)

Following the Decision Framework:

Approaches

- Assessment of land use change using the Land Image Analyst software.
- Development of retrospective land cover change histories.
- Evaluation and implementation of wall-to-wall methodologies for mapping high-resolution land cover/use.
- Development and implementation of methodologies to quantify land change impacts (coordinated with relevant GITs).
- Communication and dissemination of data and information via the web and published papers.

2

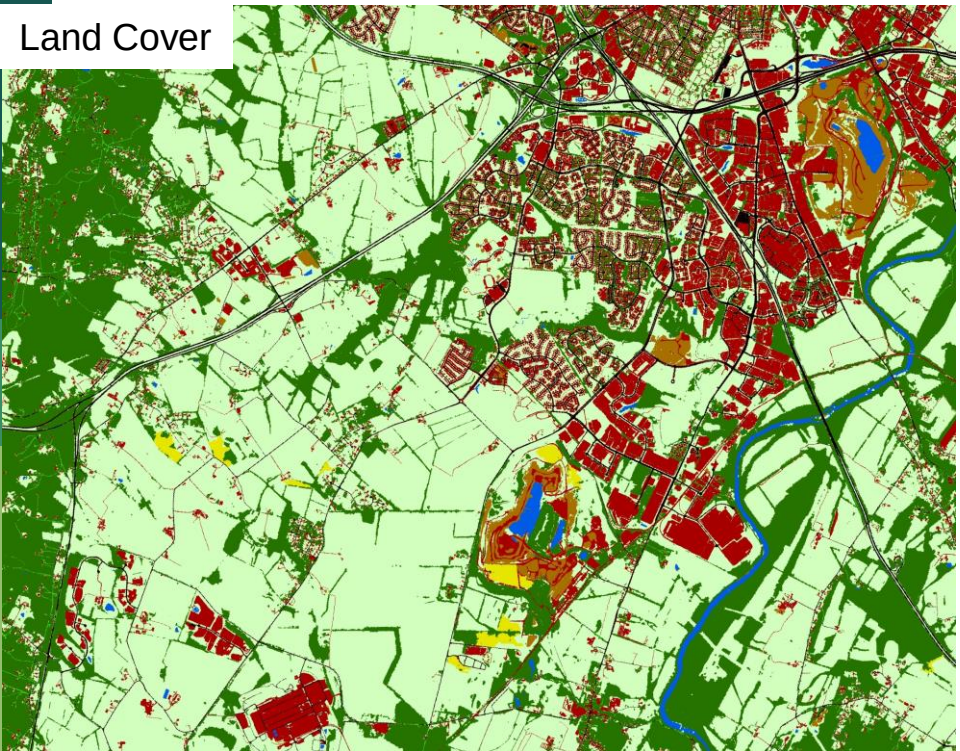
Progress:

Are we doing what we said we would do?

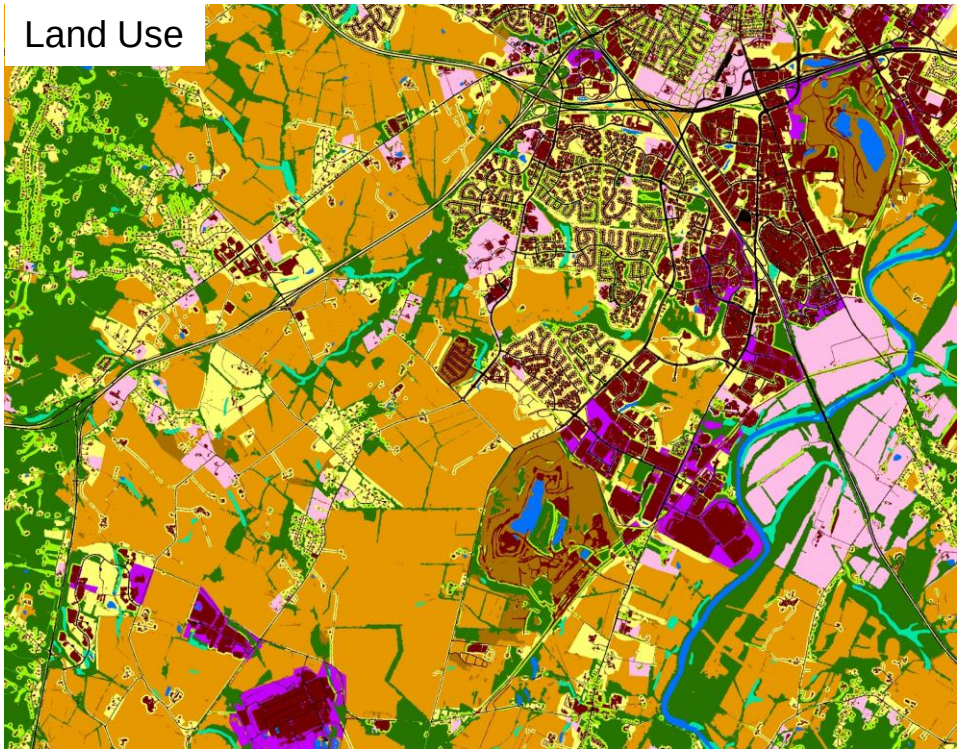
What is our progress?

Establishment of a 2013 baseline for monitoring land cover and land use change.

Land Cover

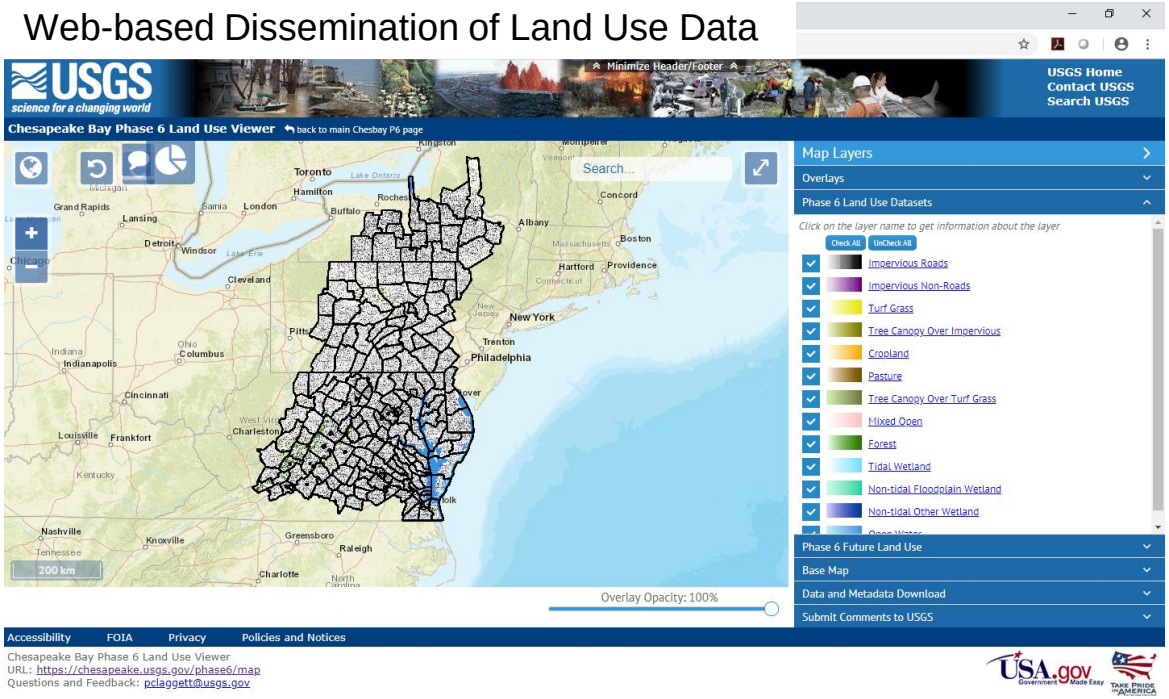


Land Use

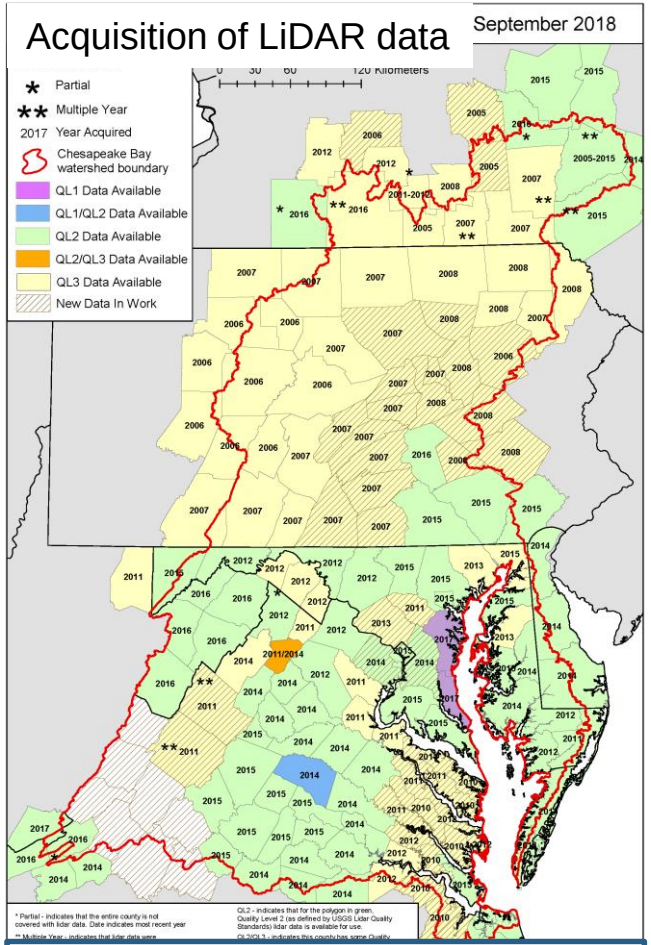


What is our progress?

Web-based Dissemination of Land Use Data



Acquisition of LiDAR data

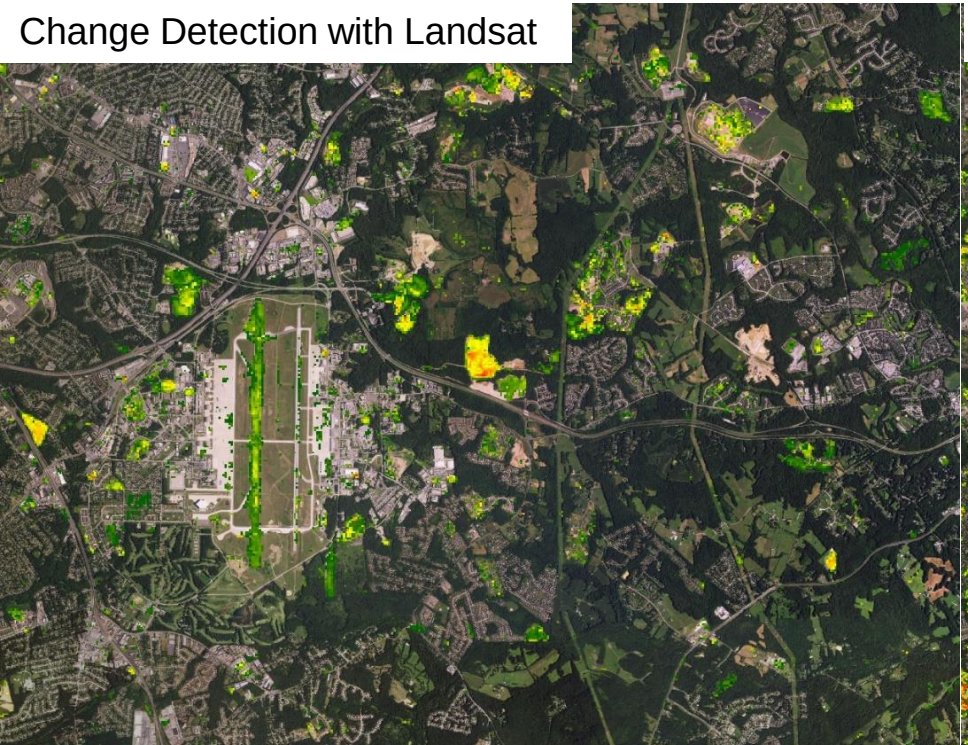


Solid yellow areas have lower quality LiDAR

What is our progress?

Determined that both high resolution and Landsat data have utility and should be used for this outcome

Change Detection with Landsat

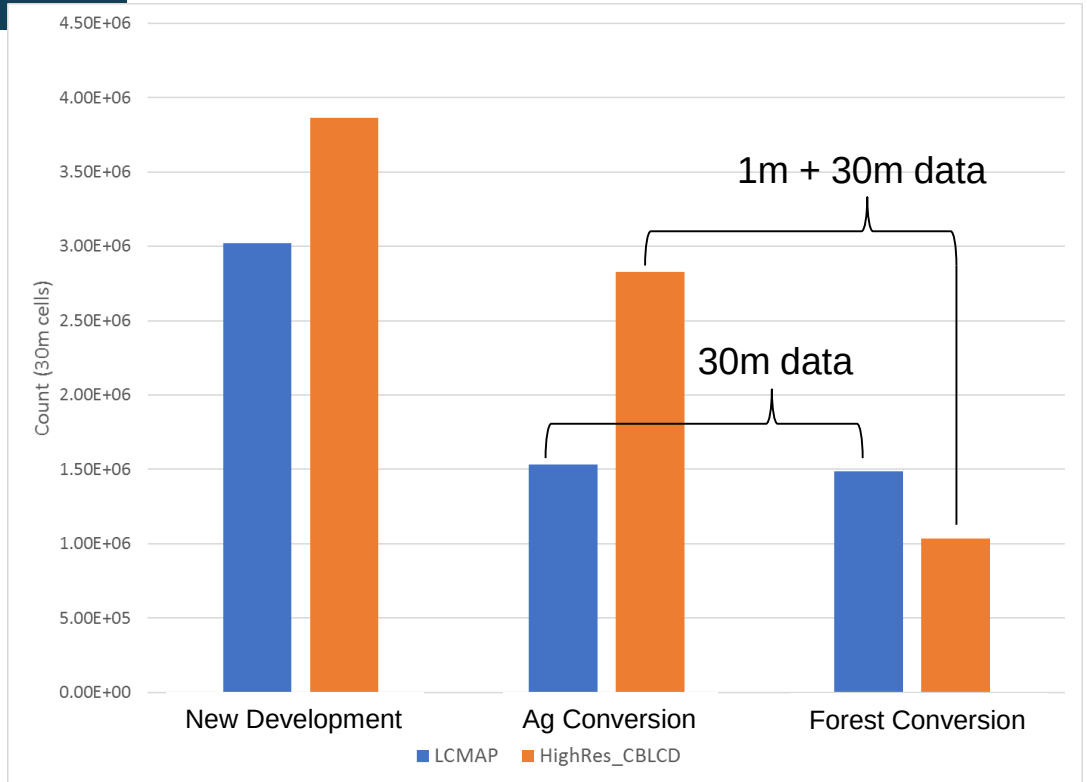


Noise in 1m Resolution Change Detection

What is our progress?

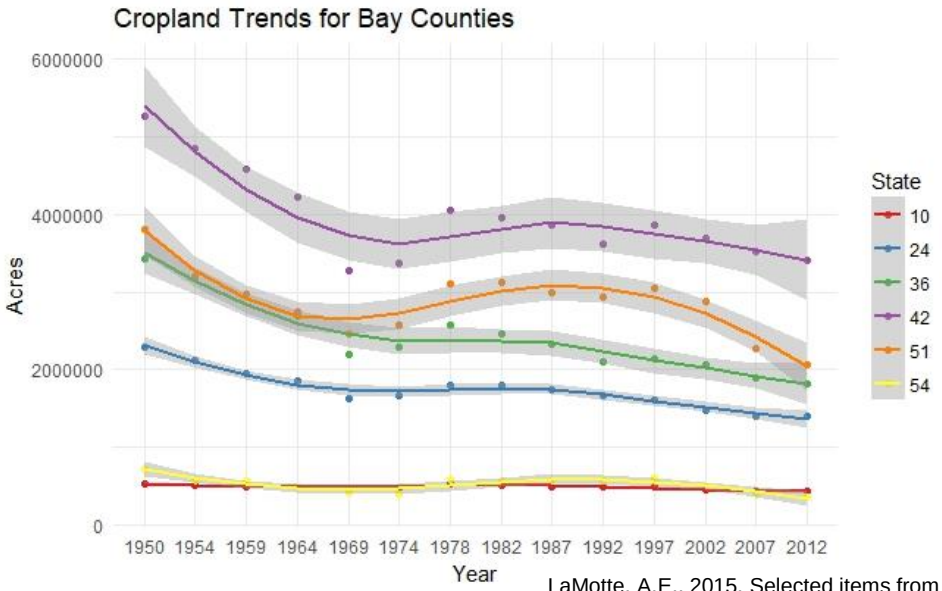
Determined that both high resolution and Landsat data have utility and should be used for this outcome

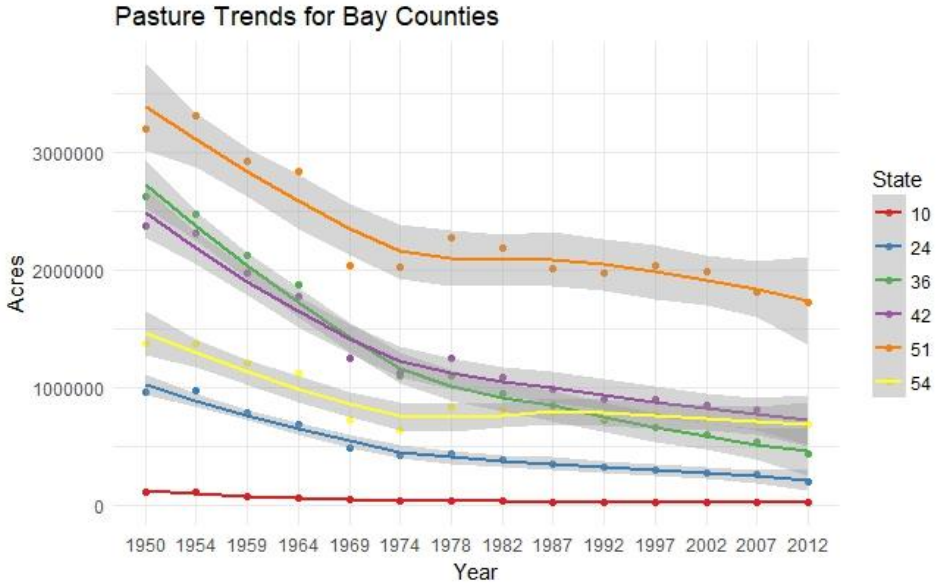
Incorporating high-resolution data into our historic assessments of land use change (orange bars) reveal that agricultural conversions occur at 2x the rate of forest conversions. This conclusion is not apparent without the high-resolution data (blue bars).



What is our progress?

Now utilizing the USGS compilation of Census of Agriculture data by County: 1950 – 2012

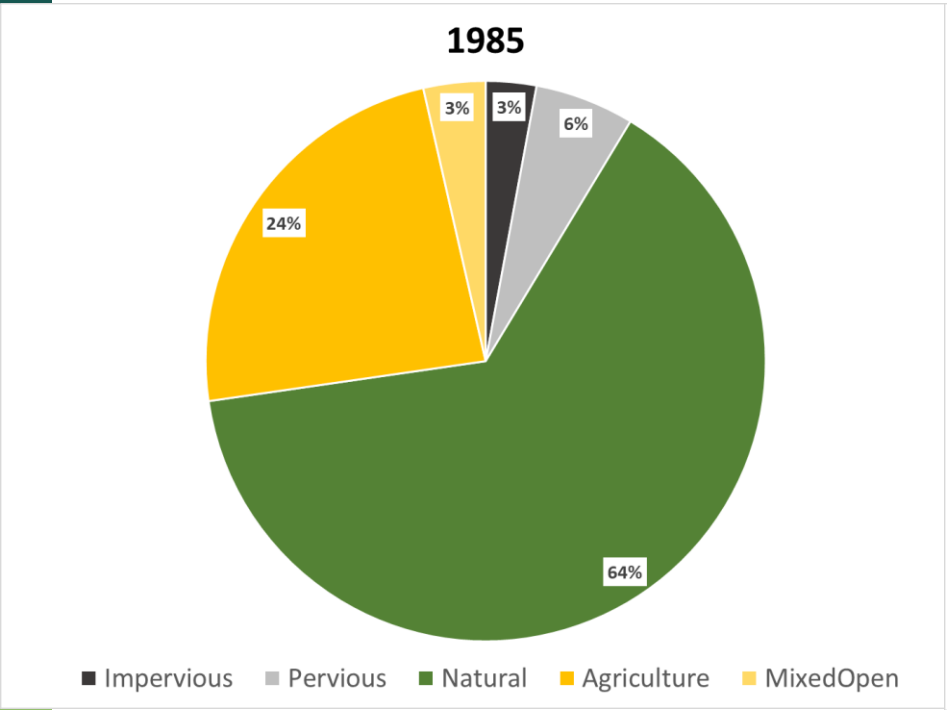


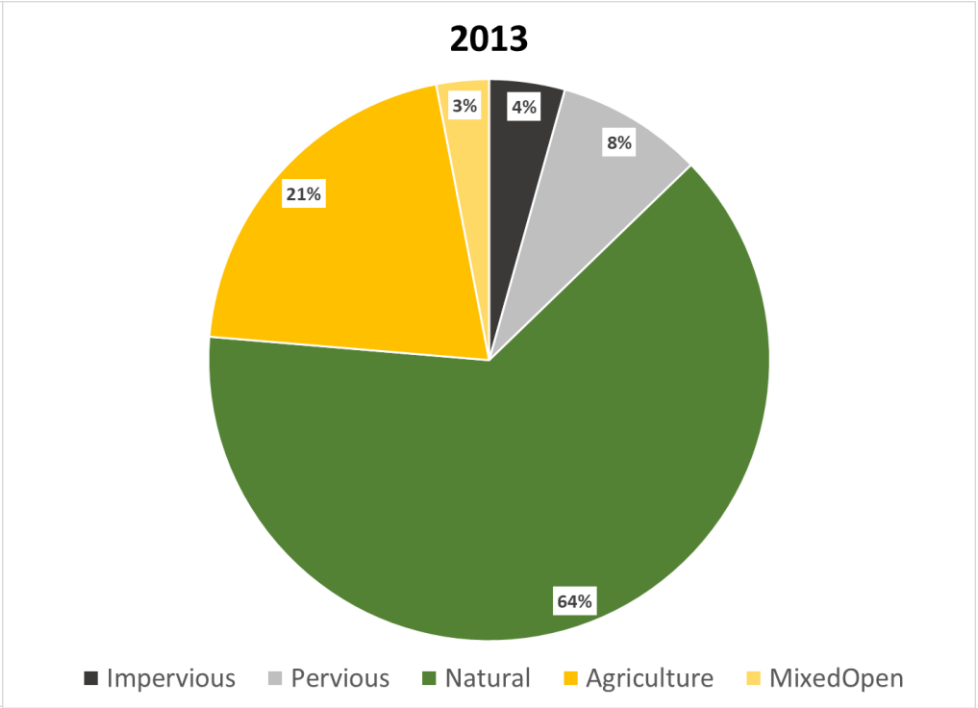


LaMotte, A.E., 2015, Selected items from the Census of Agriculture at the county level for the conterminous United States, 1950-2012: U.S. Geological Survey data release, http://dx.doi.org/10.5066/F7H13016.

What is our progress?

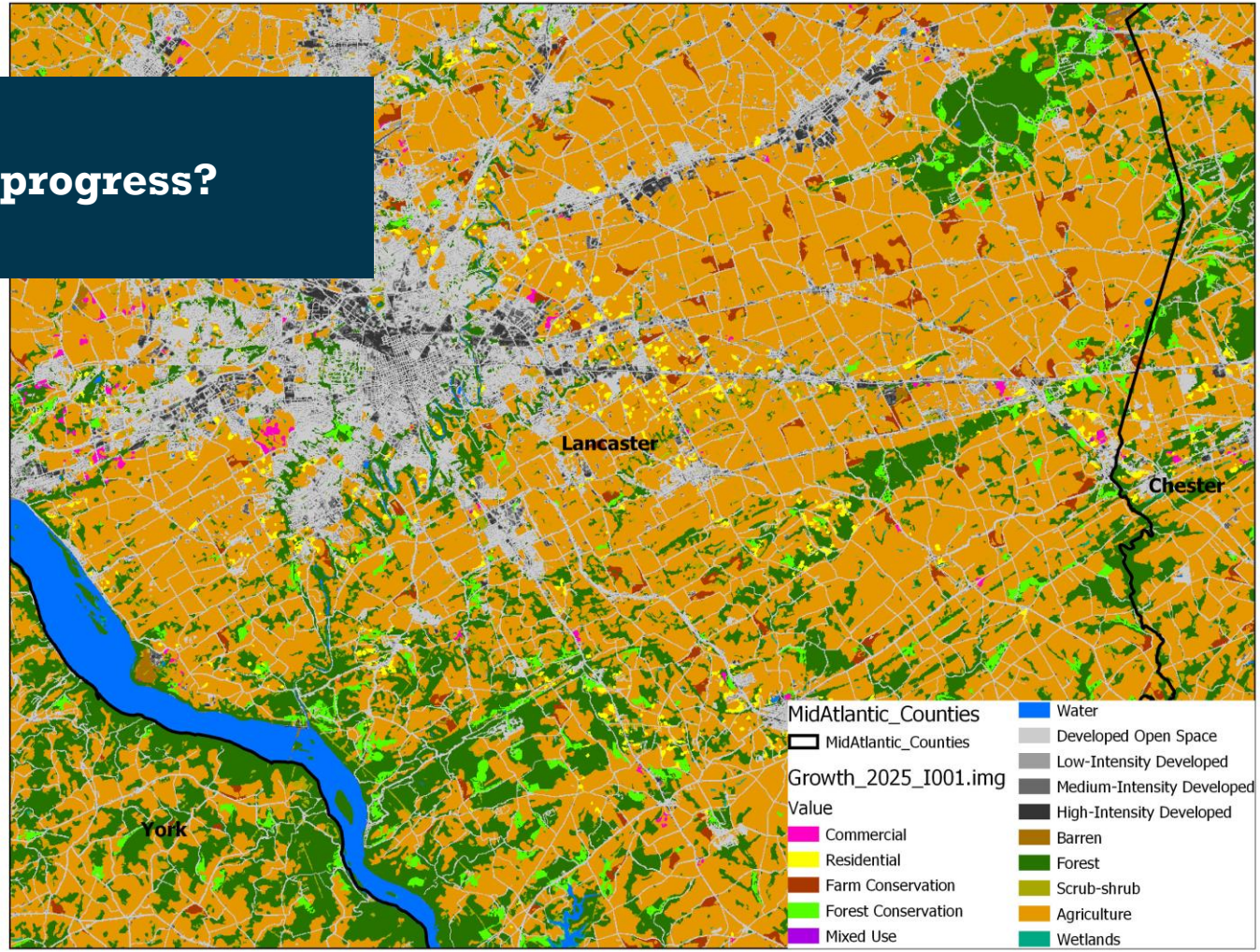
Phase 6 Assessment of Chesapeake Bay Watershed Land Use: 1985 - 2013





What is our progress?

Forecasts of future development to “account for growth” (TMDL) and to help assess vulnerability of habitats, streams, and watersheds to impairment.



Are we on track?

- We’re on track to complete monitoring of land cover/use change throughout the watershed at 1-meter resolution by 2020 – four years past the original deadline of 2016.

- Assessing and communicating the impacts of land use change will depend on CBP management priorities and continued funding support for CBPO GIS Team activities.

Most Critical Actions for Progress to Date

- USGS funding for LiDAR acquisitions in the Bay watershed.
- CBP funding of the first high-resolution land cover/use dataset.
- USGS and CBP support for developing the Chesapeake Bay Land Change Model.

Most Critical Actions for Future Progress

- Delegation of updating of MS4s, protected lands, sewer service areas, and other jurisdiction-specific datasets to the jurisdictions.
- Availability of funds to support repeated mapping of land cover/use in the watershed.
- Development of a coordinated cross-GIT strategy for assessing the impacts of land change on habitats, healthy watersheds, and communities.

3

Challenges:

Are our actions having the expected effect?

Challenges

- Activities associated with the TMDL Mid-Point Assessment consumed the attention of the CBPO GIS Team and Land Use Workgroup from 2013 – 2018.
- Updating datasets and model inputs will continue to strain GIS Team resources every odd year through 2025. Assessing the impacts of land change to habitats, streams, watersheds, and communities will further strain GIS Team resources.
- Resources to conduct a scientific literature review on high-resolution methods (Action 1.4).
- Emergence of new, affordable technologies to track wetland change.

4

Adaptations:

How should we adapt?

Based on what we've learned, we plan to…

- Assess historic land use change by combining 2013 high-resolution land use data with annual, coarser-resolution, land cover/use data for the period 1985 – 2013.
- Update the high-resolution land use data every two years with hot-spot change detection techniques and every 4-5 years with complete remapping of the watershed at 1m resolution.
- Initiate cross-GIT conversations concerning land change impacts to habitats, watersheds, and communities.
- Extend the time frame to fulfill this outcome to December 2021.

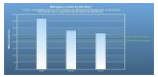
Agreement Goals and Outcomes

Sustainable Fisheries

- Blue Crab Abundance
- Blue Crab Management
- Oyster
- Forage Fish
- Fish Habitat

Vital Habitats Goal

- Wetlands
- Black Duck
- Stream Health
- Brook Trout
- Fish Passage
- Submerged Aquatic Vegetation (SAV)
- Forest Buffer
- Tree Canopy



Water Quality Goal

- 2017 Watershed Implementation Plans (WIP)
- 2025 WIP
- Water Quality Standards Attainment and Monitoring

Toxic Contaminants Goal

- Toxic Contaminants Research
  Toxic Contaminants Policy and Prevention

Healthy Watersheds Goal

- Healthy Waters

Stewardship Goal

- Citizen Stewardship
- Local Leadership
- Diversity

Land Conservation Goal

- Protected Lands
- Land Use Methods and Metrics Development
  Land Use Options Evaluation

Public Access Goal

- Public Access Site Development

Environmental Literacy Goal

- Student
- Sustainable Schools
- Environmental Literacy Planning

Climate Resiliency Goal

- Monitoring and Assessment
- Adaptation Outcome

Cross-Outcome Considerations

Water Quality – Updating land conditions for 2-year milestones; validating Land Policy BMPs in Phase III WIPs.

Fisheries – Assessing threats to near-shore habitats.

Vital Habitats – Assessing threats to black ducks, brook trout, stream health; status and trends in forest buffers and tree canopy; and change in wetlands (may be dropped).

Healthy Watersheds – Assessing threats to healthy watersheds; targeting outreach to local governments to improve planning actions.

Land Conservation – Crediting conservation under the TMDL; Assessing the vulnerability of unprotected lands to urban development.

Climate Resiliency – Combining forecasts of land change with those of climate change for future out year assessments of Bay health.

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Discussion