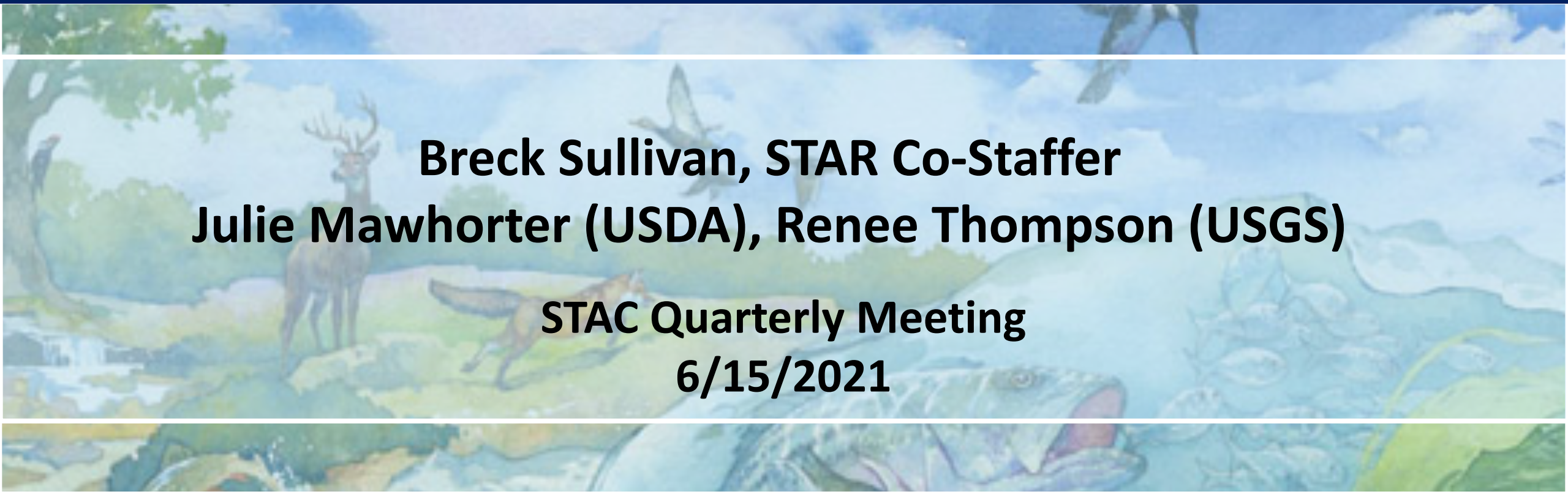
Chesapeake Bay Program Strategic Science & Research Framework:

Local Action Cohort



Breck Sullivan, STAR Co-Staffer
Julie Mawhorter (USDA), Renee Thompson (USGS)

STAC Quarterly Meeting
6/15/2021

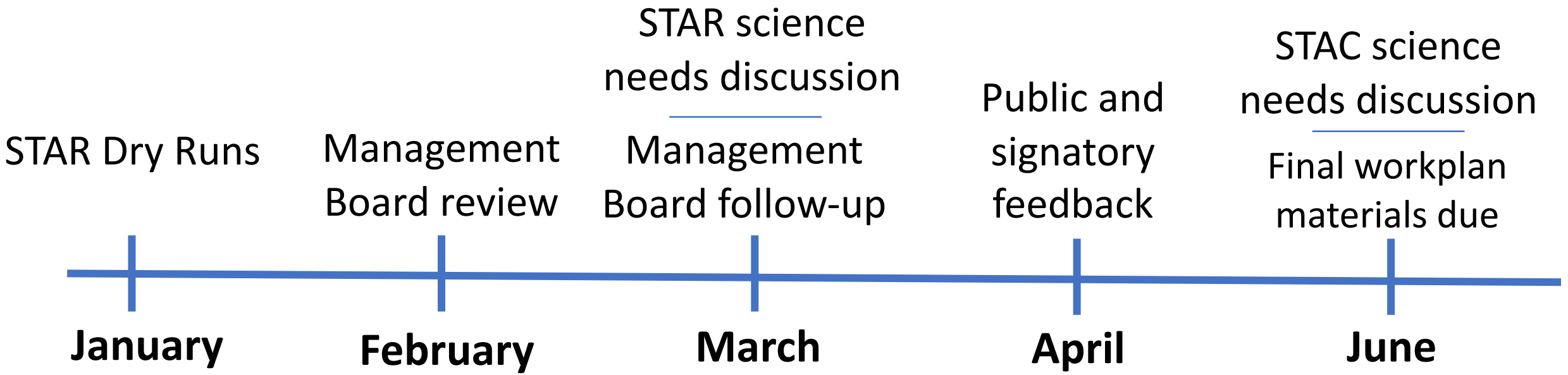
Reminder: CBP Strategy Review System (SRS)

- Cohorts of workgroups for each outcome report progress to Management Board
- Workgroups develop and update short-term action plans for achievement of long-term goals
- Strategic Science & Research Framework tracks and assesses science needs across the partnership

Local Action Cohort

- Tree Canopy
- Land Use Options Evaluation
- Land Use Methods and Metrics Development

Local Action Cohort SRS schedule



Local Action Cohort

Feedback requested from STAC:

- Do you or any of your colleagues have interest in contributing to addressing one of these needs?

- Do you want more information to come back to STAC from any groups on specific needs/projects?

- Are these needs appropriate? Do you see something missing?

Local Action Cohort

- **Tree Canopy:** *Continually increase urban tree canopy capacity to provide air quality, water quality and habitat benefits throughout the watershed. Expand urban tree canopy by 2,400 acres by 2025.*

Tree Canopy

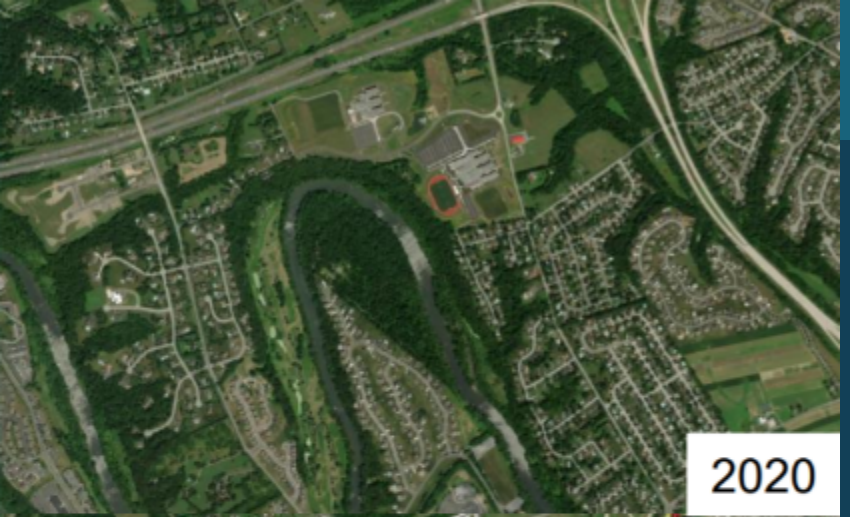
Science needs:

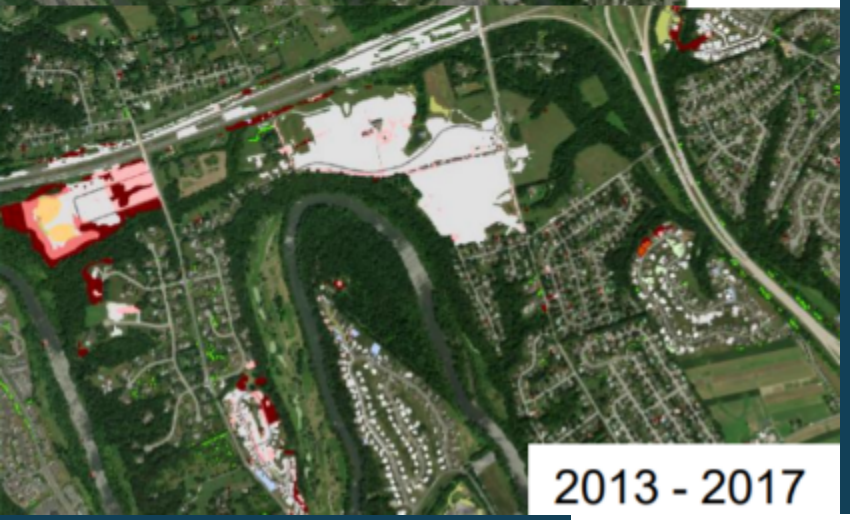
- Assess, summarize and communicate forest and tree canopy change using CBP high resolution data updates and change analysis
  - In process - Collaboration with Forestry Workgroup, Peter Claggett, Chesapeake Conservancy and other CBP partners
- Building on findings above, identify additional research/analysis needed around drivers and landscape/demographic patterns of tree canopy change, especially losses
  - Drivers - e.g. development and removals, pests/diseases, storms, natural mortality etc.

Tree Canopy

Science needs continued:

- Research effective policies, programs, and best practices for achieving tree canopy goals and minimizing losses
  - Compile content for 2022 Tree Canopy Funding & Policy Roundtable
- Compile existing datasets, tools and best practices to guide tree canopy efforts with climate resilience and environmental justice; identify gaps where additional data or tools should be pursued
  - Collaboration with Climate Workgroup/Diversity Workgroup/EJ Dashboard





Chesapeake Bay Program Strategic Science & Research Framework:

Land Use Methods and Metrics and
Land Use Options Evaluation outcomes

STAC June 16, 2021

Renee Thompson and Peter Claggett USGS CBP
Nora Jackson, CRC
Jason Dubow, MDP

Peter Claggett[1], Labeeb Ahmed[1], Jacob Czawlytko[2], Jarlath O'Neil-Dunne[3], Sarah McDonald[1], Patrick McCabe[2], Sean MacFaden[3], Rachel Soobitsky[2], and Renee Thompson[1]

[1] Lower Mississippi-Gulf Water Science Center, U.S. Geological Survey, Annapolis, MD 21403
[2] Chesapeake Conservancy, Annapolis, MD 21403
[3] Spatial Analysis Laboratory, University of Vermont, Burlington, VT 05405

Land Use Methods and Metrics Outcome

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

Outcome: Assess and understand the impacts of land use change on watersheds, habitats, and communities at a scale relevant to county-level decision-makers.

1. Measure rate of farmland, forest and wetland conversion and the extent and rate of change in impervious surface coverage.
2. Quantify the potential impacts of land conversion to water quality, healthy watersheds and communities.
3. Launch a public awareness campaign to share this information with citizens, local governments, elected officials and stakeholders.

Land Use Options Evaluation Outcome

By the end of 2017, with the direct involvement of local governments or their representatives, evaluate policy options, incentives and planning tools that could assist them in continually improving their capacity to reduce the rate of conversion of agricultural lands, forests and wetlands as well as the rate of changing landscapes from more natural lands that soak up pollutants to those that are paved over, hardscaped or otherwise impervious. Strategies should be developed for supporting local governments' and others' efforts in reducing these rates by 2025 and beyond.

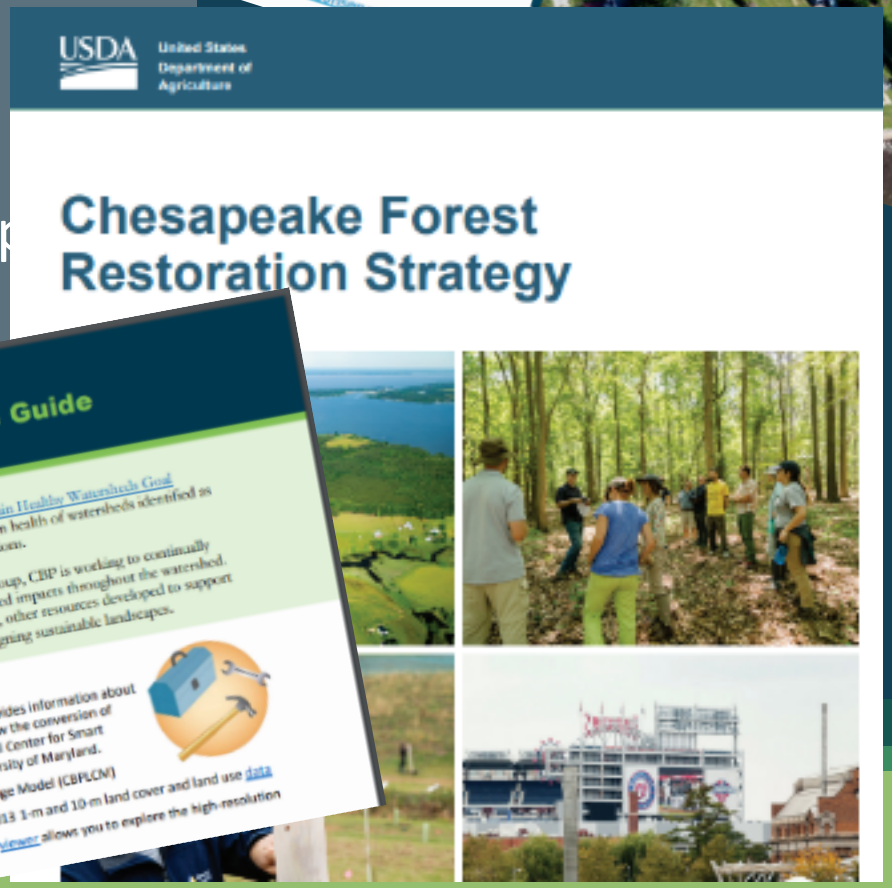
https://blog.nature.org/science/2016/09/08/energy-sprawl-is-the-largest-driver-of-land-use-change-in-the-u-s/

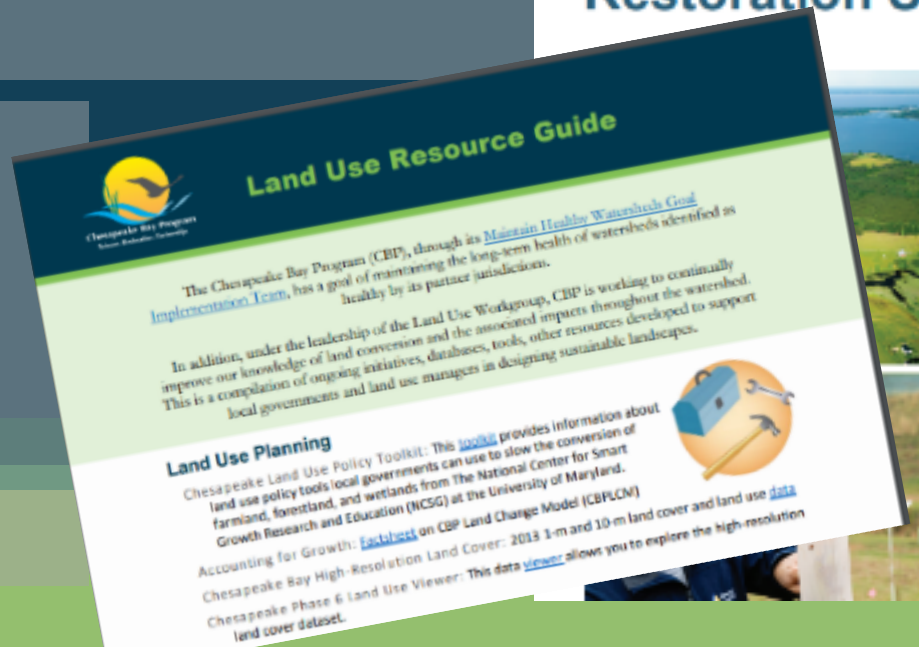
Projects

- Cross-Outcome Watershed Educational Materials
- Conservation of Working Lands-Finance Forum consultants
- Improving Technical Service Delivery for Private Landowners
- Targeted local outreach for green infrastructure in vulnerable areas
- Chesapeake Watershed Finance Intensive Workshop

Communications

- Land Use Resources Guide
- Forest Restoration Strategy
- Land Policy Data Dashboard resources
- Presenter, panelist, speaker

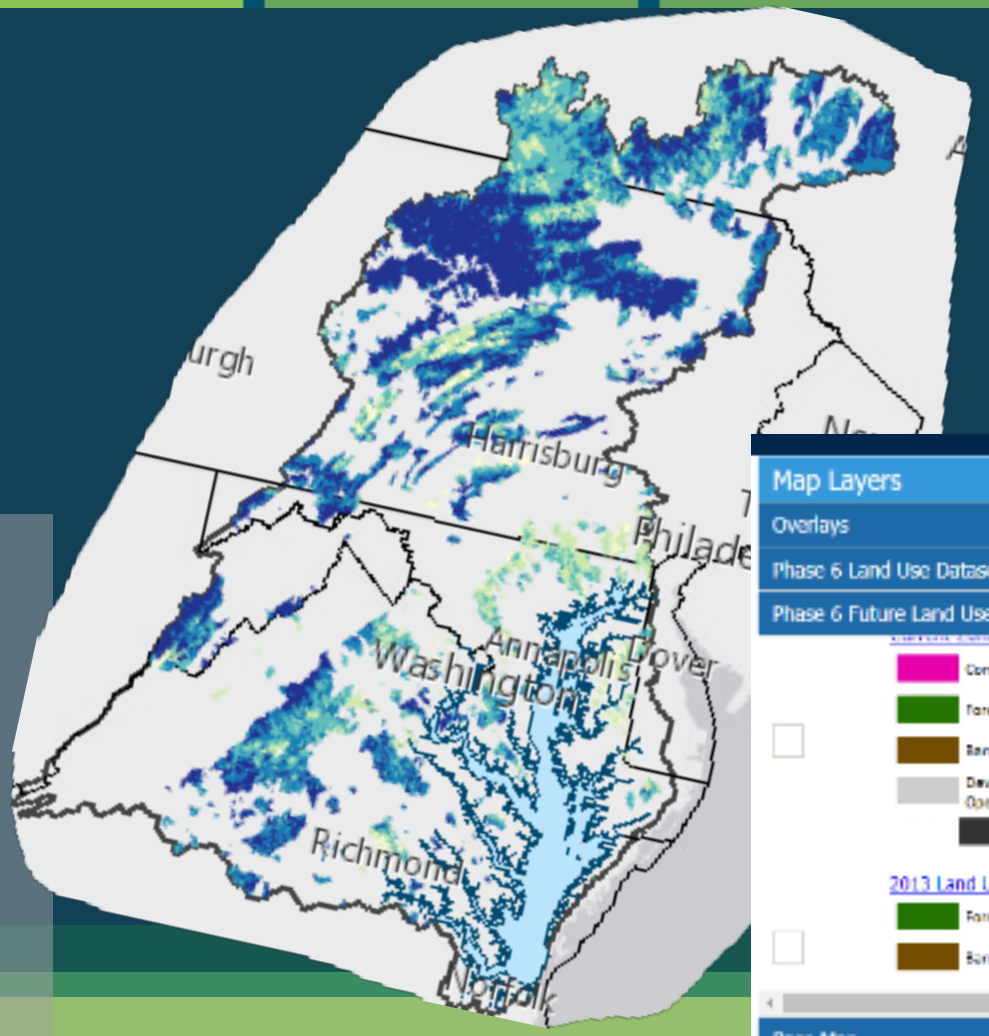


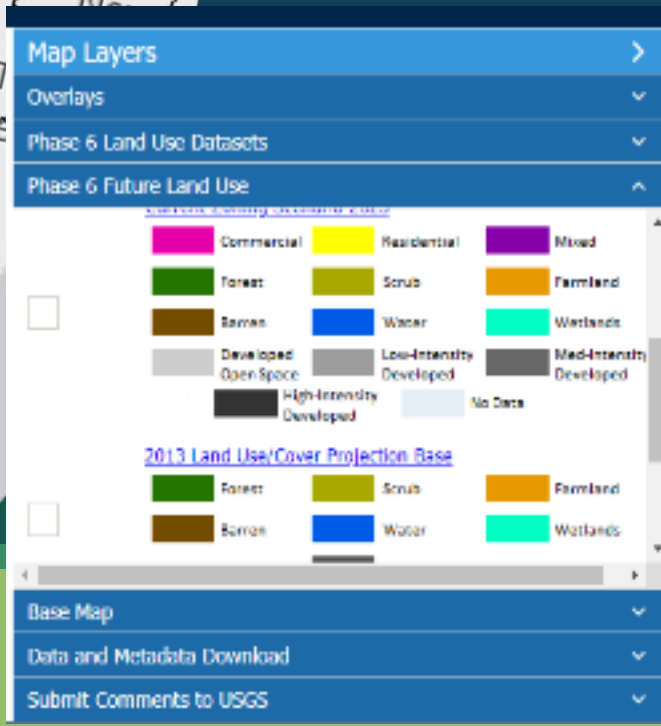


Chesapeake Bay Environmental Justice and Equity Dashboard (DRAFT)

Overview | Demographic Indicators | Cross-Outcome Applications | Current Initiatives | Acknowledgements

.."Evaluate policy options, incentives and planning tools that could assist in continually improving capacity.."

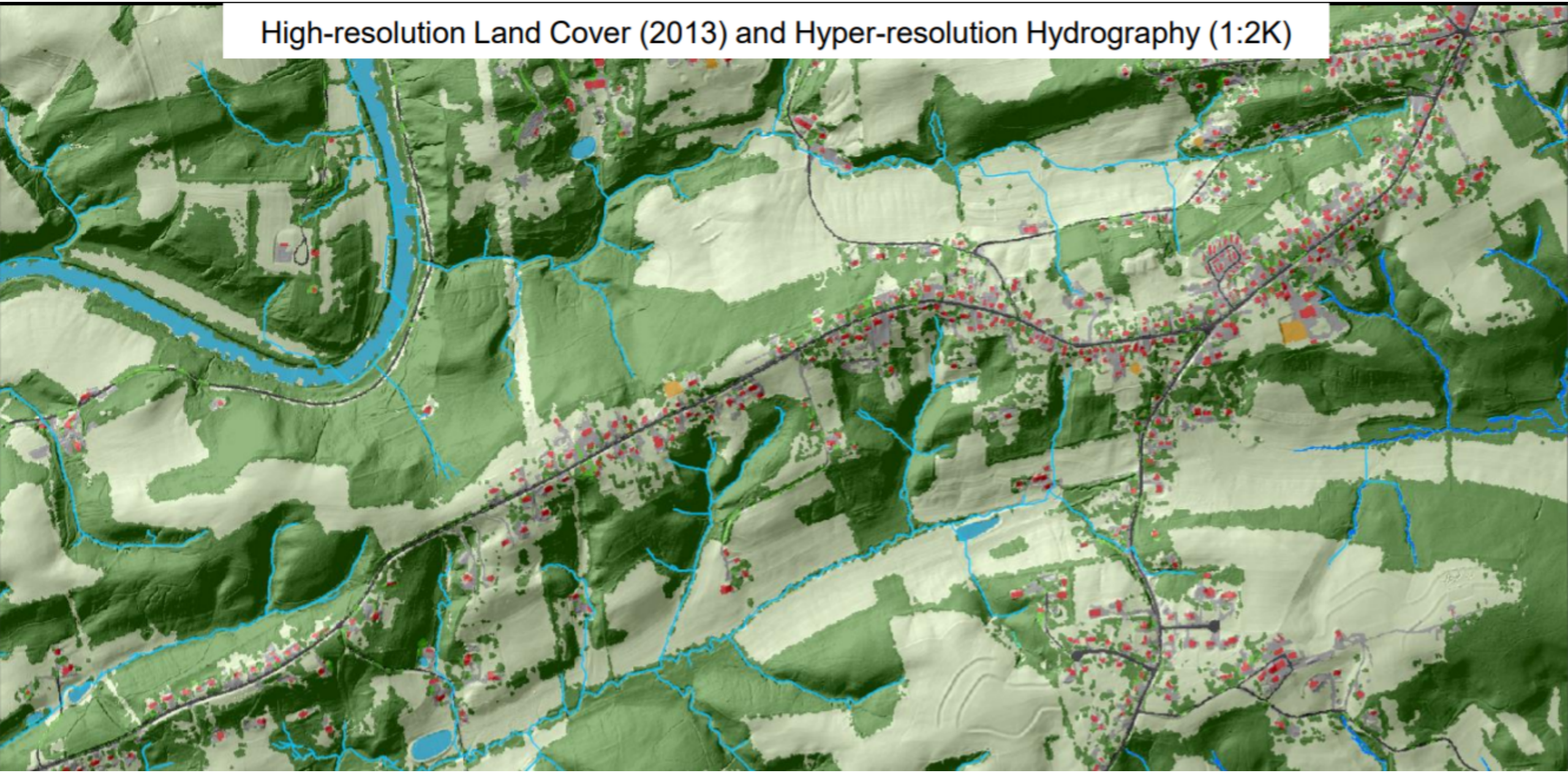




Data and Tools

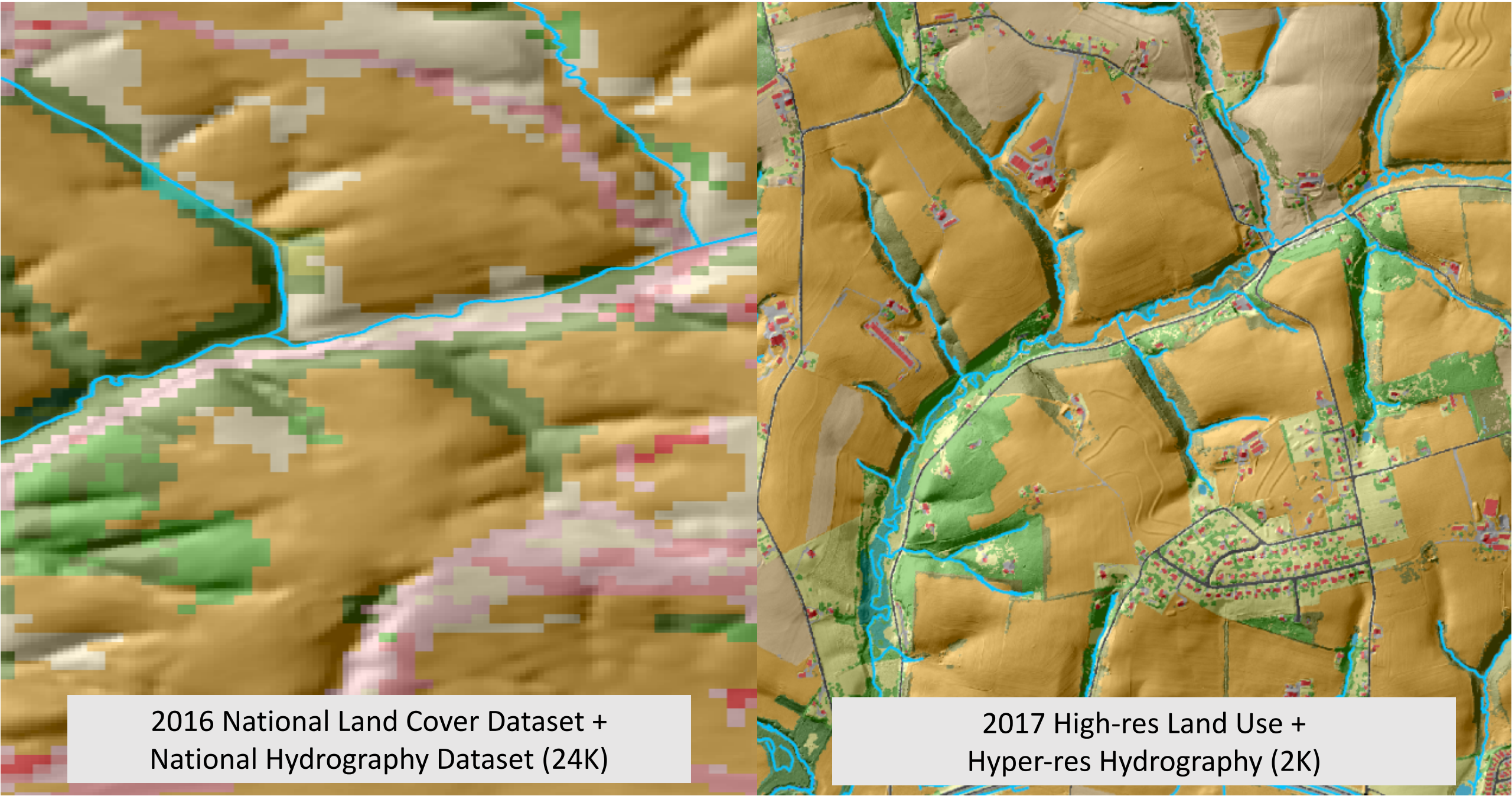
- Hi-res land cover
- Phase 6 Land Use Viewer
- Data Dashboard
- Chesapeake Healthy Watersheds Assessment
- Environmental Justice and Equity Dashboard

High-resolution Land Cover (2013) and Hyper-resolution Hydrography (1:2K)



30-meter Resolution

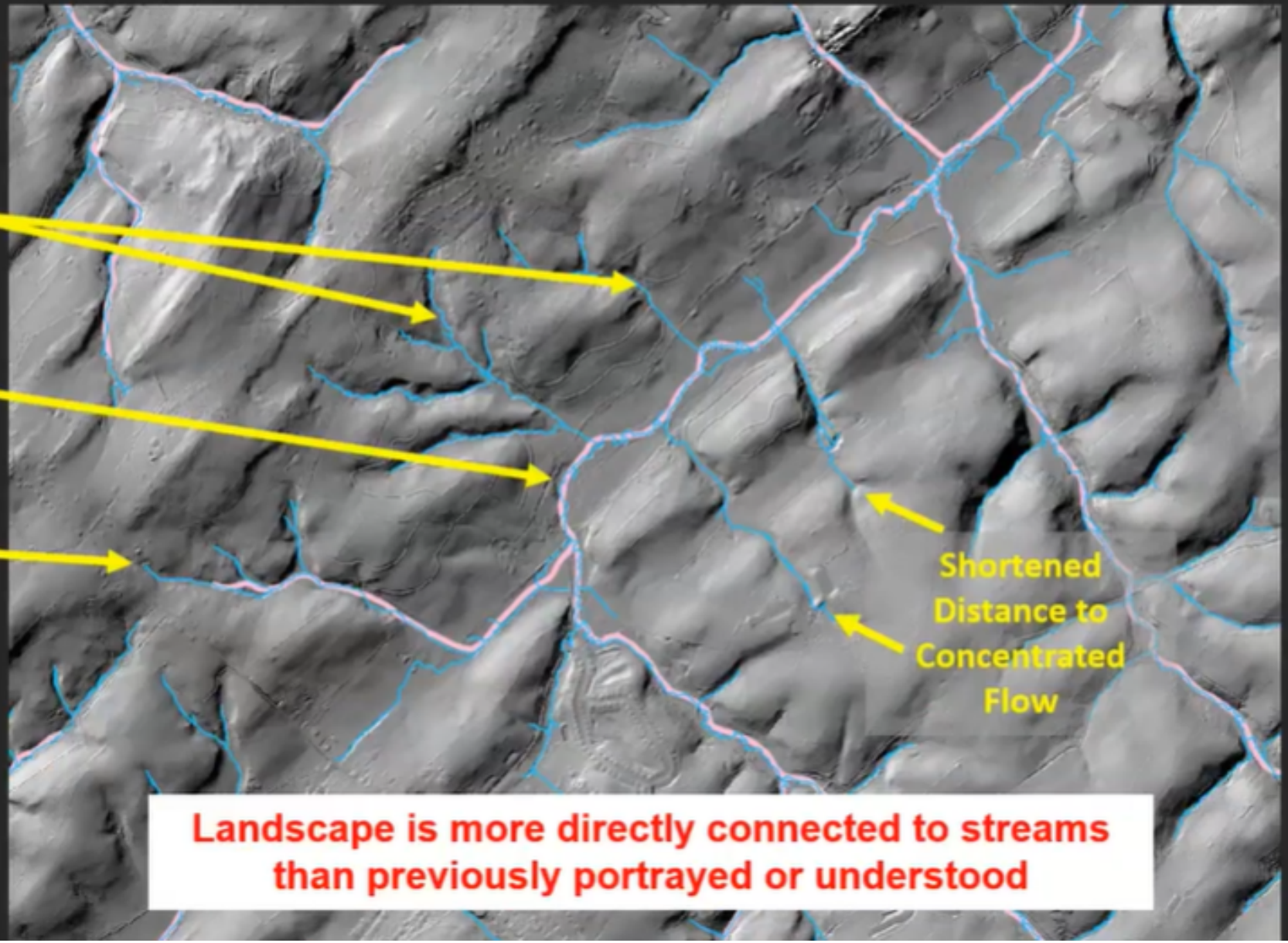
1-meter Resolution



2016 National Land Cover Dataset +
National Hydrography Dataset (24K)

2017 High-res Land Use +
Hyper-res Hydrography (2K)

Hyper-resolution Hydrography



Ancillary Data

- County Land Use
- Abandoned Mine Lands
- Landfills
- Roads

Land Cover Data

- Impervious surfaces
- Tree canopy
- Low vegetation
- Water

Land Use Data

- Impervious-Roads
- Forests
- Turf Grass
- Cropland

CBP Full Land Use/Cover Classification (61 classes, final version)

1. Water (10)
- 1.1 Lentic
  - 1.1.1 Estuary (tidal)
  - 1.1.2 Lakes & Ponds
- 1.2 Lotic
  - 1.2.1 Streams
    - 1.2.1.1 Open Channel
    - 1.2.1.2 Tree Canopy over Channel
    - 1.2.1.3 Culverted/ Buried Channel
  - 1.2.2.Ditches
    - 1.2.2.1 Open Ditch
    - 1.2.2.2 Tree Canopy over Ditch
    - 1.2.2.3 Culverted/ Buried Ditch

2. Developed (12)
- 2.1 Impervious
  - 2.1.1 Roads
  - 2.1.2 Structures
  - 2.1.3 Other Impervious (Parking lots, driveways)
  - 2.1.4 Tree Canopy (TC) over Impervious
    - 2.1.4.1 TC over Roads
    - 2.1.4.2 TC over Structures
    - 2.1.4.3 TC over Other Impervious
- 2.2 Pervious
  - 2.2.1 Turf Grass
  - 2.2.2 Bare Developed
  - 2.2.3 Suspended Succession (rights-of-way)
    - 2.2.3.1 Barren
    - 2.2.3.2 Herbaceous
    - 2.2.3.3 Scrub-shrub
  - 2.2.4 Tree Canopy over Turf Grass

3. Forest (7)
- 3.1 Forest (>= 1 acre, 240-ft width)
- 3.2 Tree Canopy in Agriculture
- 3.3 Harvested Forest (<= 3 years)
  - 3.3.1 Barren
  - 3.3.2 Herbaceous
- 3.4 Natural Succession (> 3 years)
  - 3.4.1 Barren
  - 3.4.2 Herbaceous
  - 3.4.3 Scrub-shrub

4. Production (16)
- 4.1 Agriculture
  - 4.1.1 Cropland
    - 4.1.1.1 Barren
    - 4.1.1.2 Herbaceous
  - 4.1.2 Pasture
    - 4.1.2.1 Barren
    - 4.1.2.2 Herbaceous
  - 4.1.3 Orchard/vineyard
    - 4.1.3.1 Barren
    - 4.1.3.2 Herbaceous
    - 4.1.3.3 Scrub-shrub
  - 4.1.4 Animal Operations (TBD)
    - 4.1.4.1 Impervious
    - 4.1.4.2 Barren
    - 4.1.4.3 Herbaceous
- 4.2 Solar fields
  - 4.2.1 Impervious
  - 4.2.2 Pervious
    - 4.2.2.1 Barren
    - 4.2.2.2 Herbaceous
    - 4.2.2.3 Scrub-shrub
- 4.3 Extractive (active mines)
  - 4.3.1 Barren
  - 4.3.2 Impervious

5. Wetlands and Water Margins (16)
- 5.1 Tidal
  - 5.1.1 Barren
  - 5.1.2 Herbaceous
  - 5.1.3 Scrub-shrub
  - 5.1.4 Tree Canopy
  - 5.1.5 Forest
- 5.2 Riverine (Non-tidal)
  - 5.2.1. Barren
  - 5.2.2 Herbaceous
  - 5.2.3 Scrub-shrub
  - 5.2.4 Tree Canopy
  - 5.2.5 Forest
- 5.3 Terrene/Isolated (Non-tidal)
  - 5.3.1 Barren
  - 5.3.2 Herbaceous
  - 5.3.3 Scrub-shrub
  - 5.3.4 Tree Canopy
  - 5.3.5 Forest
- 5.4 Bare shore

CBP 2017 Land Use Roll-up to Phase 6 Land Use/Cover Classes

1. Impervious Roads
- 2.1 Impervious
  - 2.1.1 Roads

2. Impervious Non-Roads
- 2.1 Impervious
  - 2.1.2 Structures
  - 2.1.3 Other Impervious
- 4.2 Solar fields
  - 4.2.1 Impervious

3. Tree Canopy Over Impervious
- 2.1 Impervious
  - 2.1.4 Tree Canopy over Impervious

4. Turf Grass
- 2.2 Pervious, Developed
  - 2.2.1 Turf Grass

5. Tree Canopy over Turf Grass
- 2.2 Pervious. Developed
  - 2.2.4 Tree Canopy over Turf Grass

6. Forest
- 3.1 Forest (>= 1 acre, 240-ft width)
- 3.2 Tree Canopy in Agriculture

7. Wetlands, Floodplain
- 5.2 Riverine, Wetlands

8. Wetlands, Other
- 5.3 Terrene/Isolated, Wetlands

9. Wetlands, Tidal
- 5.1 Tidal, Wetlands

10. Mixed Open
- 2.2 Pervious, Developed
  - 2.2.2 Bare Developed
  - 2.2.3 Suspended Succession
- 3.3 Harvested Forest (<= 3 years)
- 3.4 Natural Succession (> 3 years)
- 4.2 Solar fields
  - 4.2.2 Pervious
- 4.3 Extractive (active mines)
- 5.4 Bare shore, Water Margins

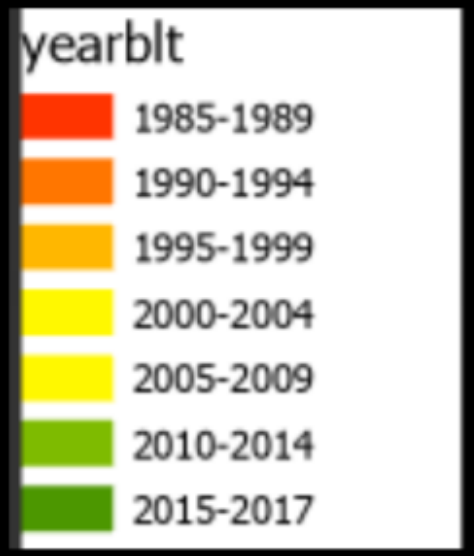
11. Cropland
- 4.1 Agriculture
  - 4.1.1 Cropland
  - 4.1.3 Orchard/vineyard

12. Pasture
- 4.1 Agriculture
  - 4.1.2 Pasture

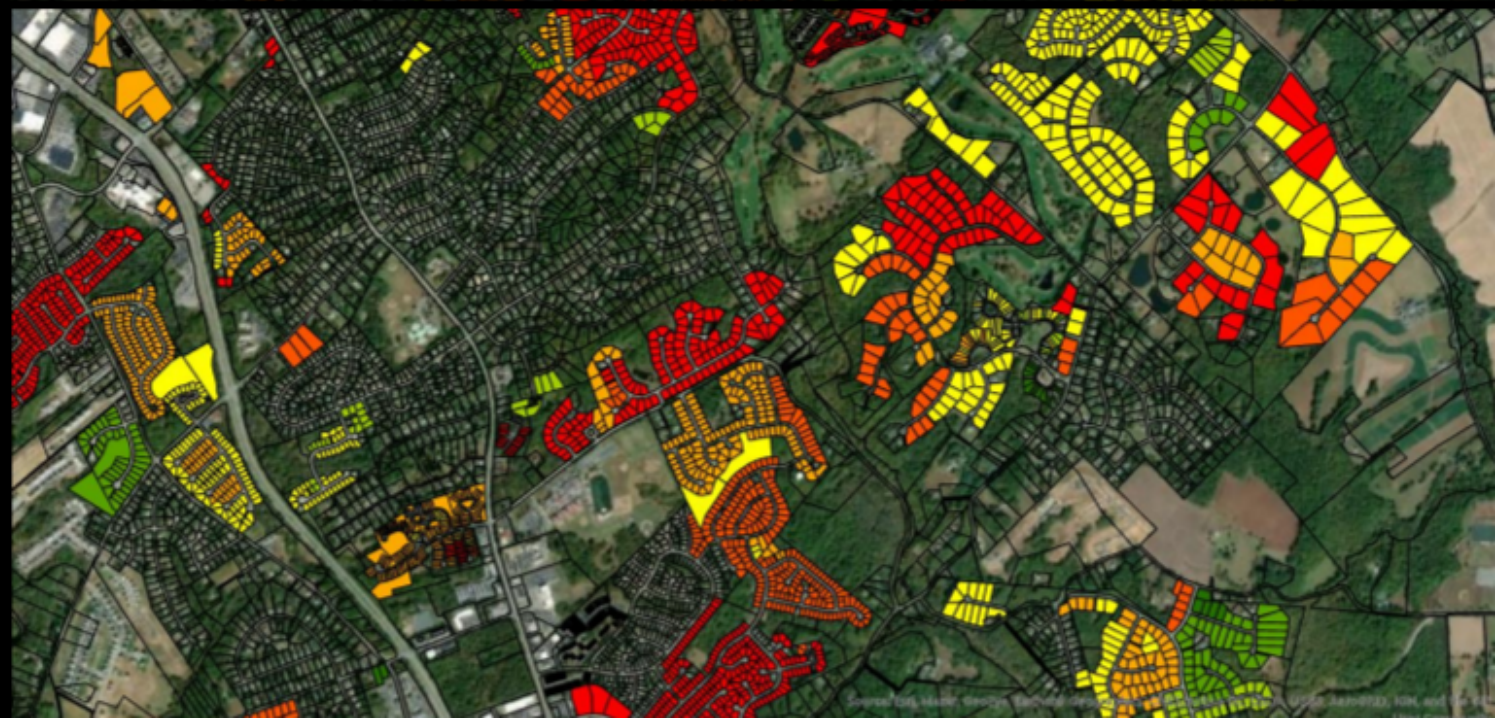
13. Water
- 1.1 Lentic
  - 1.1.1 Estuary (tidal)
  - 1.1.2 Lakes & Ponds
- 1.2 Lotic
  - 1.2.1 Streams

Parcel-Level Deconstruction of Urban Development (1985 – 2017)

Year-Built Attributes from Tax Records

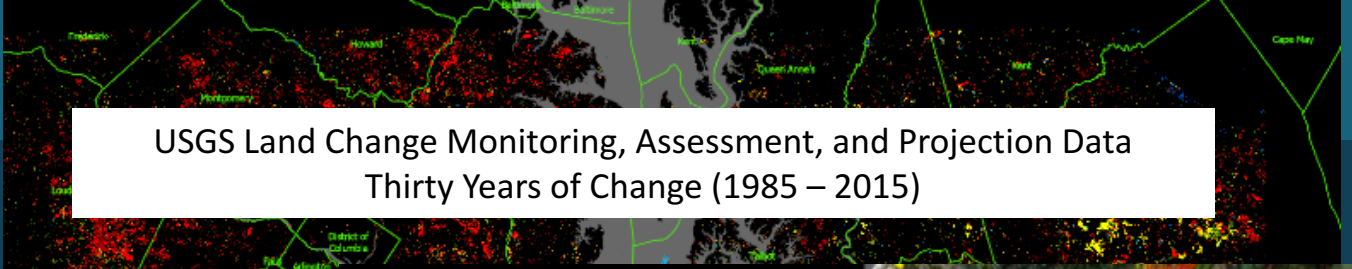


Year-Built Attributes from USGS' LCMAP*

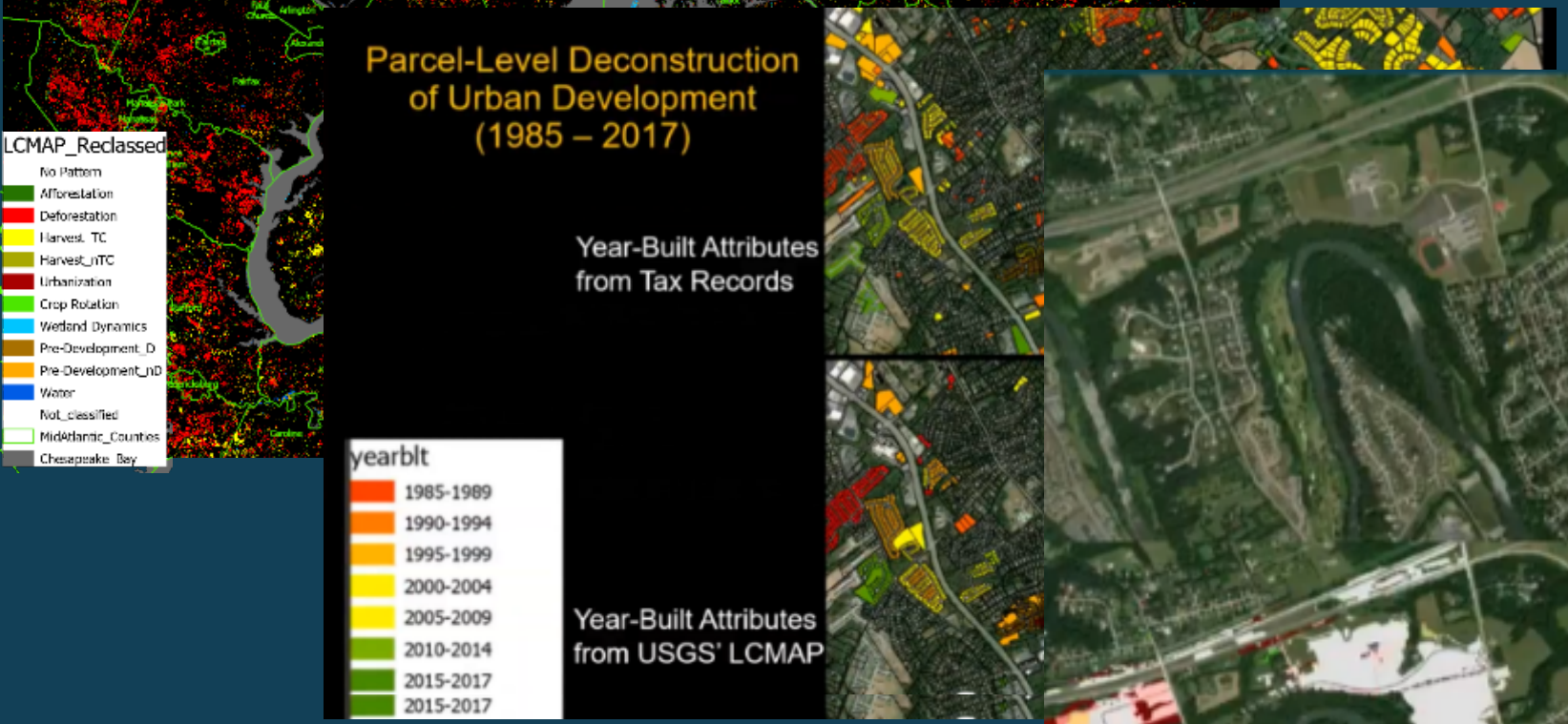


* Land Change, Monitoring, Assessment, and Projection (LCMAP)

Increasing knowledge at a scale that is locally relevant



USGS Land Change Monitoring, Assessment, and Projection Data
Thirty Years of Change (1985 – 2015)



Rates of conversion:

- Farmland
- Forest
- Wetland
- Impervious Cover

Slides courtesy of Peter Claggett, USGS CBP

Science Needs

Land Use Methods and Metrics

Land Use options Evaluation Outcome

Baseline information (planned and resourced)

Publish the DATA!!

- USGS will co-publish data and an interpretive paper with CIC and UVM on high-res land use characteristics and change in the Chesapeake Bay Watershed to contextualize the nature of observed changes in impervious cover, turf grass, forests, wetlands (loss only), tree canopy, and agriculture (2021/2022).
- USGS will incorporate the 2013 and 2017 land use data into the Phase 6 Watershed Model and Chesapeake Healthy Watersheds Assessment (2021 – 2024).
- USGS will co-publish a paper with UMBC and CIC on land use characteristics and change along hyper-resolution streams (2022 – 2023).

Hydrologic / Water Quality Impacts

How do the *increased density of streams* and *corresponding decrease in overland flow-path length* affect our interpretation and modeling of how *land use and land use change* affect nutrient processing and stream flow?

Land Use Metrics / Hi Resolution Data

COVID (future impacts on land use?)

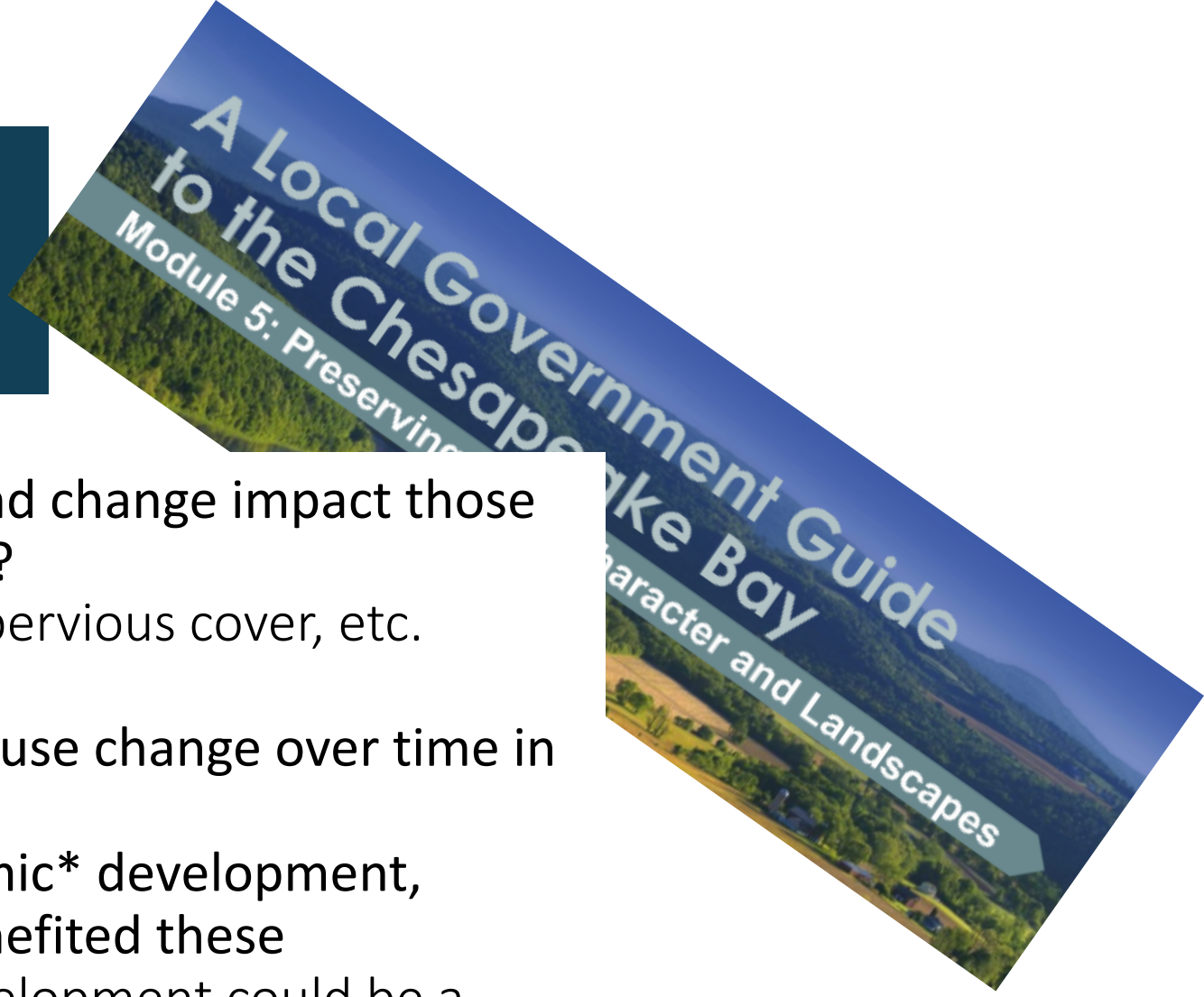
- Long term monitoring and evaluation
- Short term metrics and vulnerability
- Land policy BMP connections
- Understanding “thresholds” from a scientific and local government perspective.
- U.S. Geological Survey’s Land Change Monitoring, Assessment and Projection (LCMAP 1985 – 2019)

User Experience and Research

- Decision support tools for informing decisions
  - How can land use and land use change information best be communicated to select targeted audiences to inform land use and land conservation decisions?

- Understanding end user needs (of different stakeholder audiences)
- Improvements to data and communication to meet local needs

DEIJ and communities



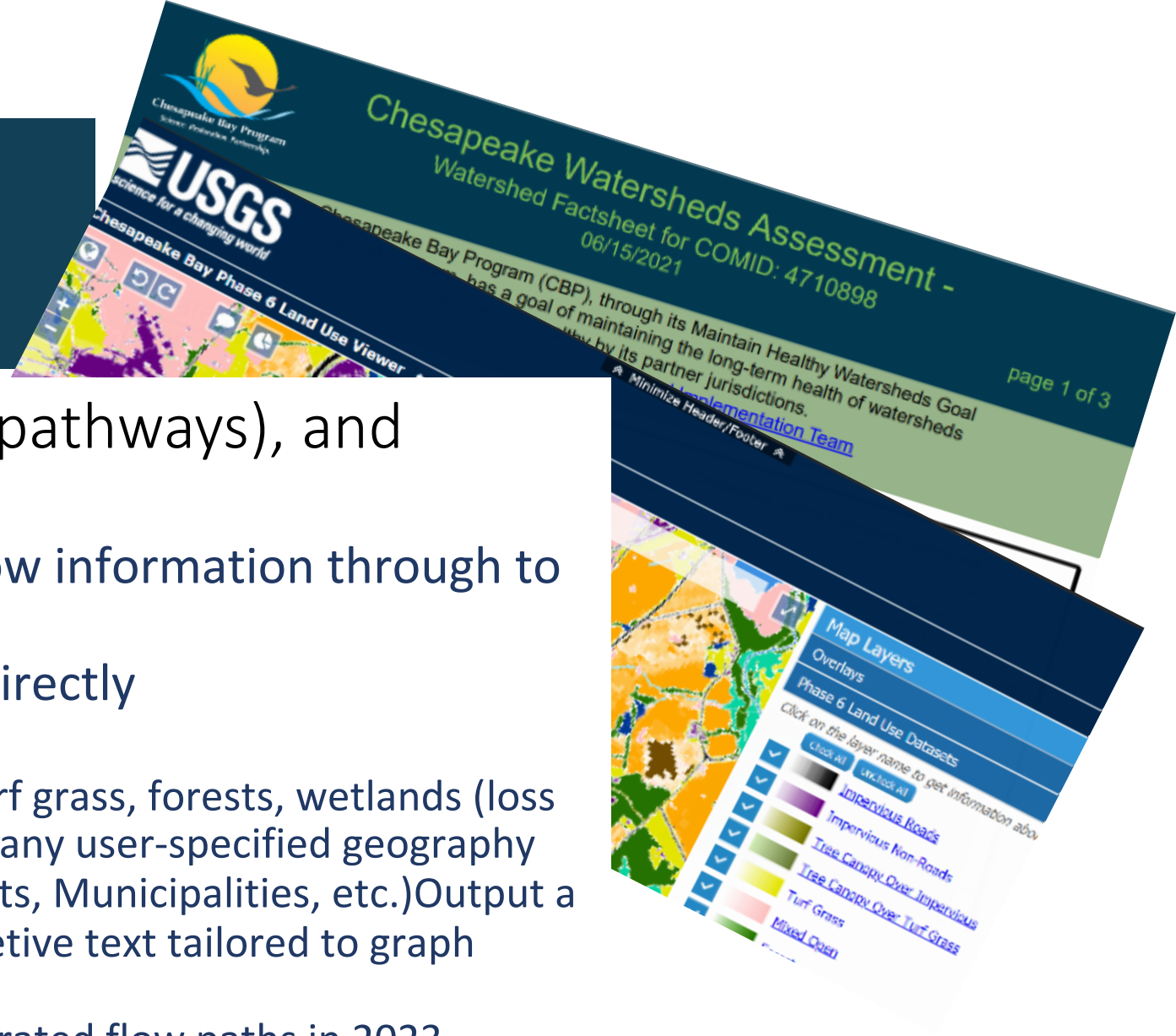
- How does land use composition and land change impact those communities and or local governments?
    - Percent tree canopy, percent impervious cover, etc.

- Assess disproportionate impact of land use change over time in underserved communities
    - How have investments in economic* development, conservation and restoration benefited these communities? *Note: lack of development could be a negative impact?
    - Incorporation of public health considerations

Climate and Community

- Marsh Migration – potential for protection
- Protection of infrastructure and communities
  - Resiliency
  - Flood protection

Synthesis and Communication



- Communication, Translation, (pathways), and Engagement.
  - Translate, format, package and flow information through to trusted sources.
  - How to effectively engage locals directly

Online tools:

- Assess changes in impervious cover, turf grass, forests, wetlands (loss only), tree canopy, and agriculture, for any user-specified geography (e.g.,user-drawn polygons, Census Tracts, Municipalities, etc.)Output a standardized set of graphs and interpretive text tailored to graph content.
- Adapt to report changes along concentrated flow paths in 2023.

Field Research Needs

- What's causing changes in land use and what are the management implications of those changes?
- Example: What proportion of tree canopy loss is ephemeral, associated with natural mortality vs permanent removal. (Iris Allen's work with MD-DNR)

Prince George's County Tree Canopy Loss

Discussion

Renee Thompson, Geographer
Lower-Mississippi Gulf WSC, USGS,
Chesapeake Bay Program, MD
Coordinator Maintain Healthy Watersheds
Goal Implementation Team
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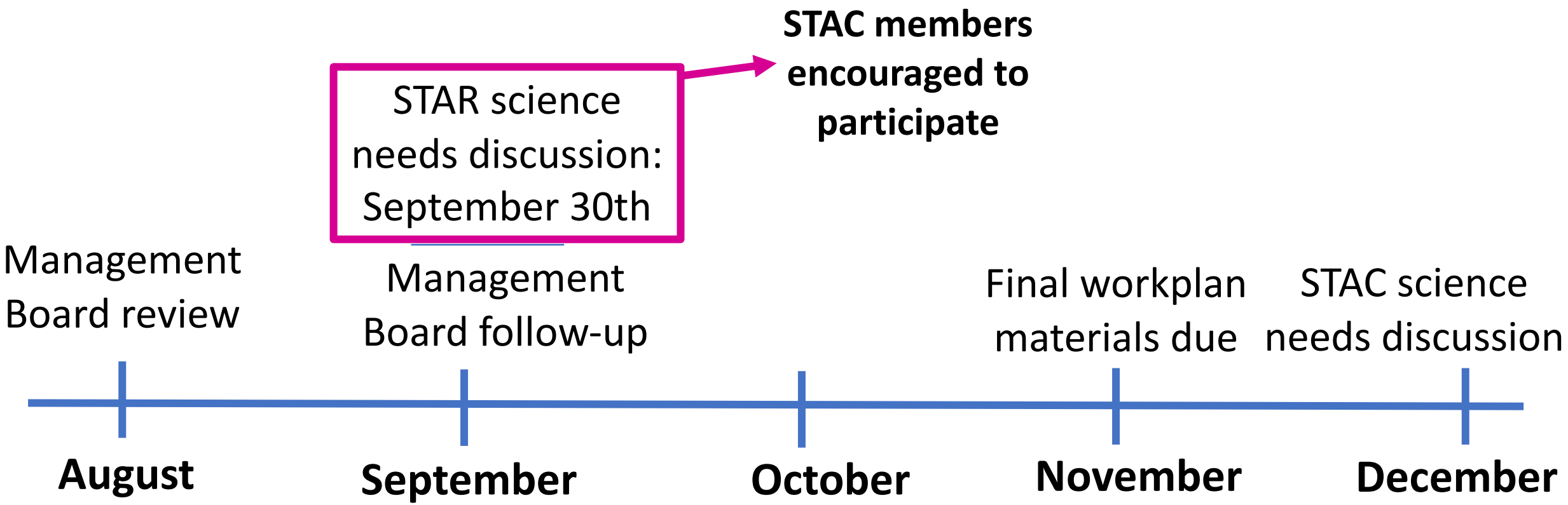
Healthy Watersheds Cohort SRS Schedule



Healthy Watersheds Cohort

- **Brook Trout:** *Restore and sustain naturally reproducing brook trout populations in Chesapeake headwater streams with an eight percent increase in occupied habitat by 2025.*

Healthy Watersheds Cohort

- **Fish Habitat:** *Continually improve effectiveness of fish habitat conservation and restoration efforts by identifying and characterizing critical spawning, nursery and forage areas within the Bay and tributaries for important fish and shellfish, and use existing and new tools to integrate information and conduct assessments to inform restoration and conservation efforts.*

Healthy Watersheds Cohort

- **Fish Passage:** *Continually increase access to habitat to support sustainable migratory fish populations in the Chesapeake Bay watershed's freshwater rivers and streams. By 2025, restore historical fish migration routes by opening an additional 132 miles every two years to fish passage. Restoration success will be indicated by the consistent presence of alewife, blueback herring, American shad, hickory shad, American eel and brook trout, to be monitored in accordance with available agency resources and collaboratively developed methods.*

Healthy Watersheds Cohort

- **Healthy Watersheds:** *One-hundred percent of state-identified currently healthy waters and watersheds remain healthy.*

Healthy Watersheds Cohort

- **Protected Lands:** *By 2025, protect an additional two million acres of lands throughout the watershed—currently identified as high-conservation priorities at the federal, state or local level—including 225,000 acres of wetlands and 695,000 acres of forest land of highest value for maintaining water quality.*

Healthy Watersheds Cohort

- **Stream Health:** *Continually improve stream health and function throughout the watershed. Improve health and function of ten percent of stream miles above the 2008 baseline for the watershed.*

Strategic Science and Research Framework: Feedback from STAC

Chesapeake Bay Program
Science. Restoration. Partnership.

Help us improve SSRF for the 3rd SRS cycle!

Chesapeake Bay Program Strategic Science & Research Framework:

Local Action Cohort

Breck Sullivan, STAR Co-Staffer

bsullivan@chesapeakebay.net