

Precision Conservation: Using New Technologies to Identify Landscape Scale Conservation and Restoration Priorities

Chesapeake Conservancy







Precision Conservation Landscape Analysis



"Getting the right practices, in the right places, at the right scale, at the right time and making sure they are working"



By Jeffrey Allenby and David Burks

The Need for High Resolution Data



Existing datasets work well for watershed-scale planning but lack the resolution needed to identify opportunities to implement solutions at the field scale



The State of Existing High Resolution Data







High-resolution Land Use Classification



- Rule-based, object oriented image classification identifies land cover types with 900x the resolution of National Land Cover Dataset (NLCD)
- Identifies 8 major land cover types with an additional three detailing agricultural lands in the Choptank River



High-resolution Land Use Classification



- Data Analysis Incorporates:
 - 1m National Agricultural Imagery Program (NAIP) Aerial Imagery
 - Red
 - Green
 - Blue
 - Near Infrared (NIR)
 - Normalized Difference
 Vegetative Index (NDVI)
 - Light Detecting and Ranging (LiDAR) Elevation data
 - First Returns (Tree-tops, DSM)
 - Last Returns (Bare-Earth, DEM)



High-resolution Land Use Classification



- 2-stage process:
 - Initial semi-automated feature extraction
 - Manual reclassification to improve overall accuracy (>90% accuracy)
- Currently incorporates
 LiDAR data but we have an
 alternate method that still
 produces high accuracy
 data for areas where LiDAR
 has not been collected







Anticipated benefits for the Chesapeake Bay Program's Goal Implementation Teams

Sustainable Fisheries (GIT 1)



- Improve the characterization of edge-of-shore habitats (e.g. wetlands, riparian corridors)
- Increase the predictive modeling capabilities of river and stream suitability for migratory fish habitat and spawning



Habitats (GIT 2)



- Create more detailed habitat connectivity models and identify priorities for habitat restoration
- Establish a baseline for critical habitat and track development pressure and fragmentation of core habitats to prioritize conservation
- Monitor success and implementation of restoration efforts across entire landscapes (e.g. increased riparian buffers, wetland restoration, etc.)



Water Quality (GIT 3)



- Increase the accuracy of modeling efforts by providing better estimates of landscape composition (e.g. impervious surface percentage)
- Identify specific landscapes

 (often at the parcel scale) that
 are priorities for restoration or
 BMP implementation



Healthy Watersheds (GIT 4)



- Calculate and track natural landscape condition metrics (e.g. riparian buffer attainment, ecological connectivity, headwater stream condition, etc.)
- Establish a highly accurate baseline to track changes in impervious surface and natural landscape coverage in high-functioning sub-watersheds
- Identify specific high-functioning landscapes that are priorities for conservation because they are providing water quality benefits



Stewardship (GIT 5)



- Target outreach and education efforts and identify tangible actions landowners could take to reduce the impact of their land (e.g. install BMPs) or conserve high-functioning landscapes (e.g. conservation easements)
- Create individualized reports for land owners detailing the land use composition of their properties and how they fit into the watersheds in which they are located (e.g. showing that they have critical habitat)



Appalachian Mountains Joint



Core Benefits of Precision Conservation to Other Federal, State, Local, and Nonprofit Partners

Precision Conservation Landscape Targeting



We are using advanced GIS and LIDAR based elevation data to identify priorities for conservation and restoration at the *parcel-scale*

We are combining:

- High-resolution Land Use Classification
- Concentrated Flow Path Analysis
- Normalized Difference Flow Index



Conservation and Restoration Prioritization



We are improving targeting for:

- Identifying or comparing potential projects in a high-priority watershed
- Working with a willing landowner to locate a potential project where it will have the greatest impact on water quality
- Educating and reaching out to landowners to help them understand what they can do reduce the impact of their land and improve ecosystem health



Detailing the Importance of Projects in Grant Proposals

We are helping our partners communicate the need for implementation funding to protect and restore the most important habitats and improve water quality



Chesapeake Conservancy

Building Regional Partnerships for Large-Landscape Conservation



We are providing relevant targeting information to our federal, state, local, and non-profit partners helping to facilitate and catalyze large-landscape conservation



High Resolution Land Cover Data for the Chesapeake Bay Watershed







Contact: Joel Dunn jdunn@chesapeakeconservancy.org **Jeffrey Allenby** jallenby@chesapeakeconservancy.org Lawrie Jordan

LJordan@esri.com