Best Management Practices Mapping and Tracking

CBP Urban Stormwater Workgroup Meeting

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Chesapeake Conservancy
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Precision Conservation

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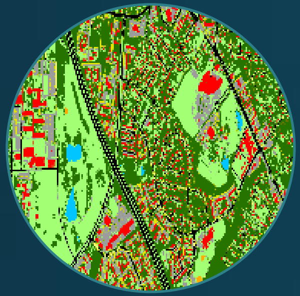
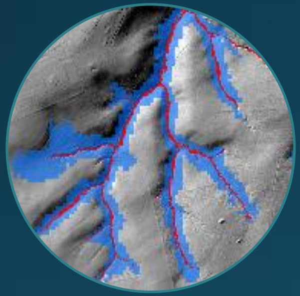
"Getting the right practices, in the right places,
at the right scale, and
making sure they are working"

Geospatial Support: CBP



(1) 1m Land Cover and Land Use data (2017 and 2021); change products (2013-2021)

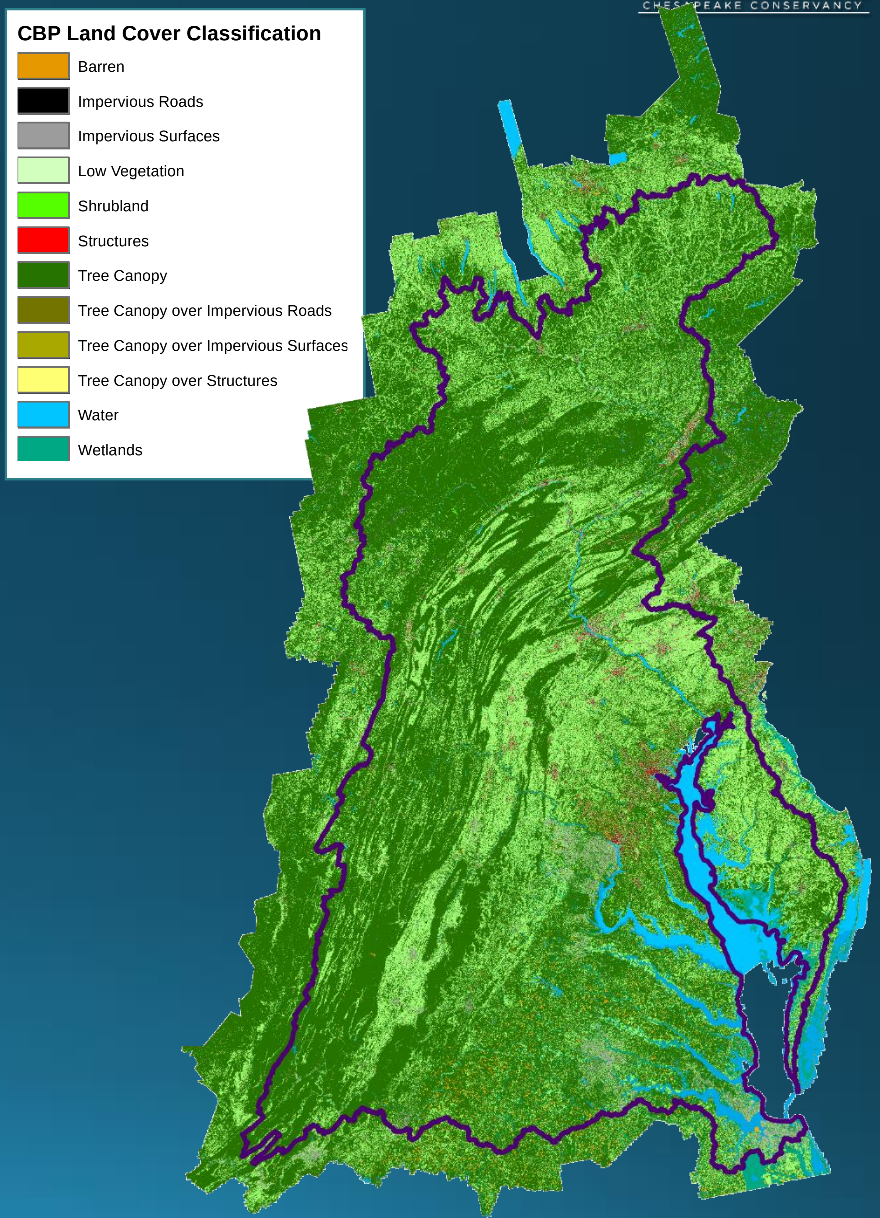


(2) LiDAR derived hydrography and ditch delineation

(3) Best Management Practices (BMP) opportunity mapping, tracking, and reporting

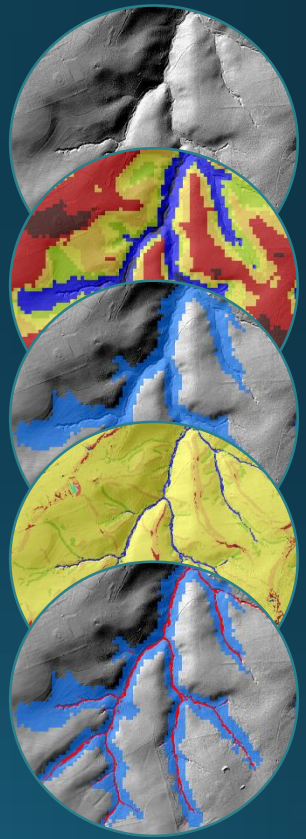
(4) Synthesizing geospatial data and integration opportunities

Land Cover Data



Hydrography Data

1. High-Resolution LiDAR
2. Classify Terrain (10m)
3. Delineate Stream Valleys
4. Classify Terrain (1m)
5. Extract Channels
6. Manual Corrections



Objective 3: BMP Mapping & Tracking

Partnering with Chesapeake Commons and Drexel University

Main Goal: To analyze the landscape for potential BMP implementation opportunities for the entire Chesapeake Bay watershed; and designing a streamlined platform for project identification, prioritization, tracking, and standardized reporting.

Agricultural BMPs in the Chesapeake

Water and Sediment Control Basins

Nutrient Removal Wetlands

Forested Buffers

Contour Buffer Strips

Grassed Waterways

BMP Identification and Mapping with ACPF: Agricultural Conservation Planning Framework (USDA)

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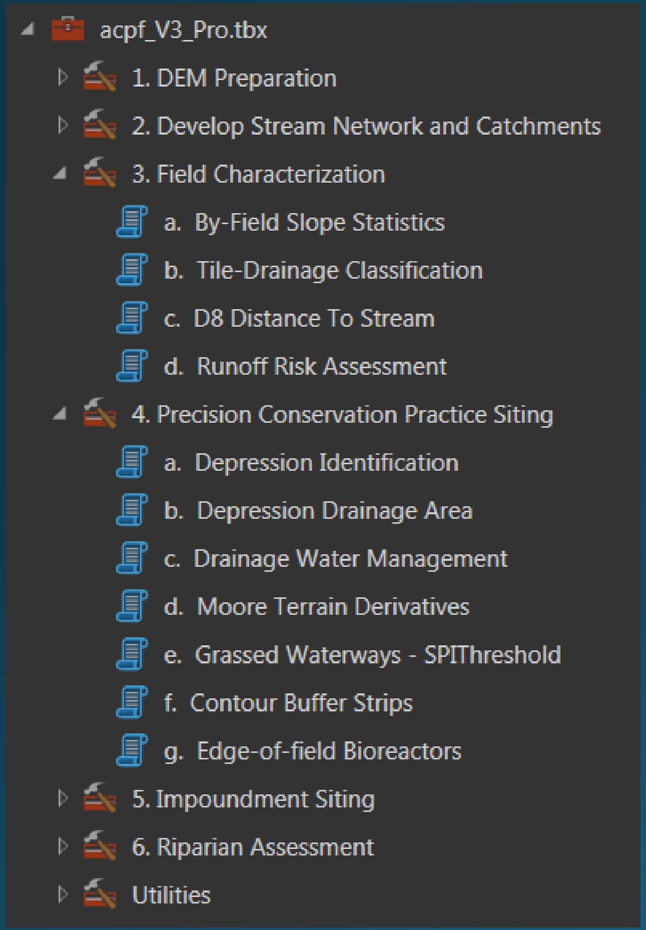


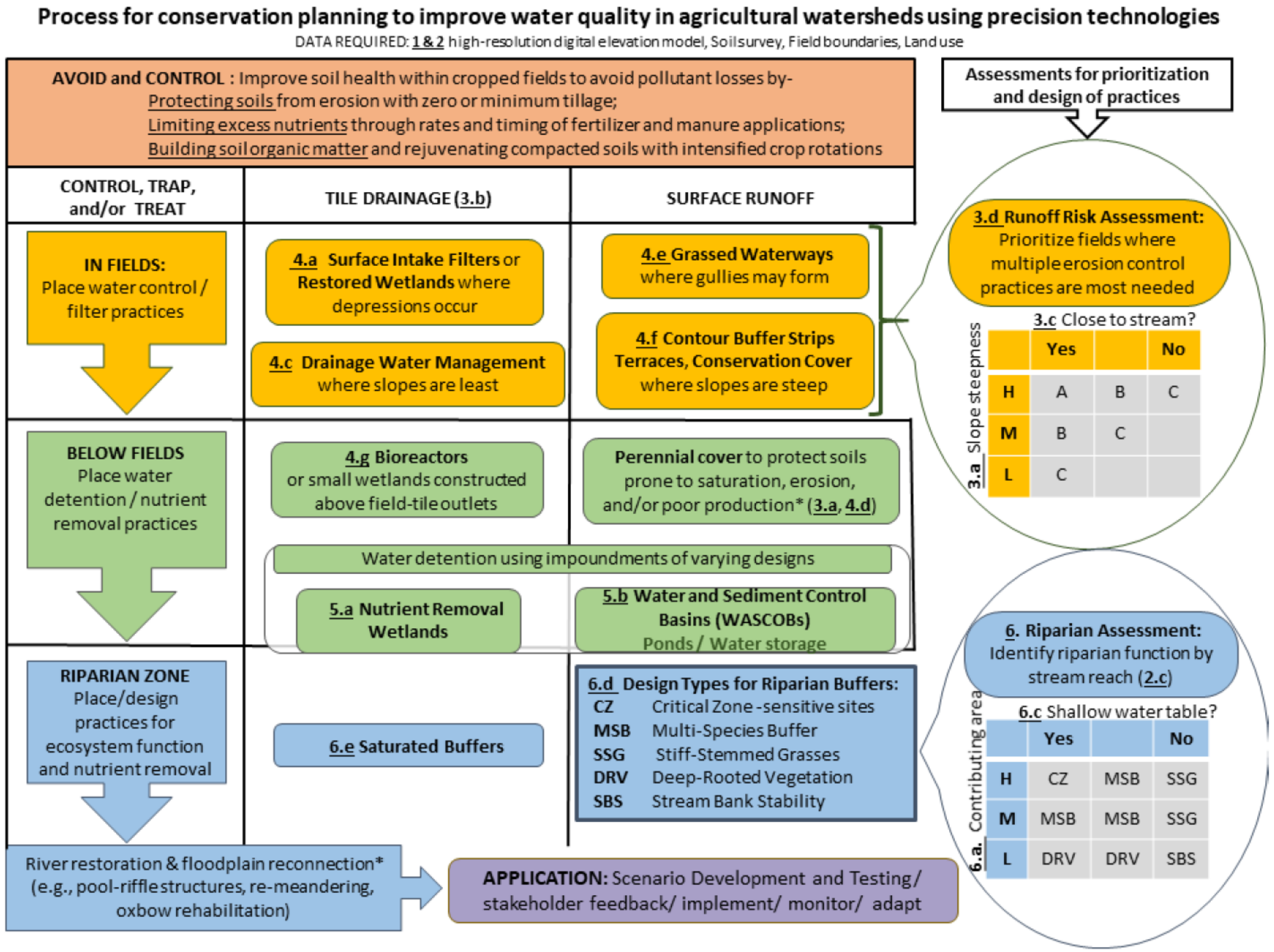
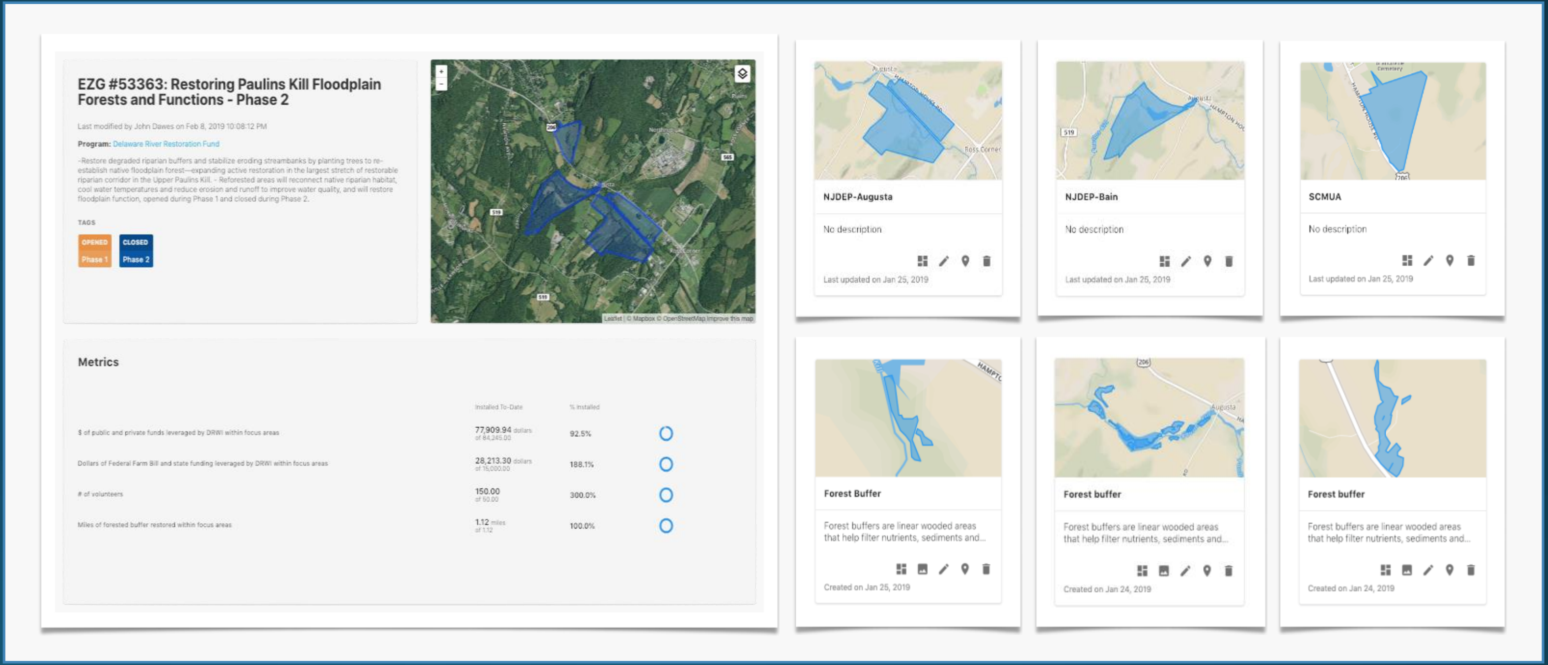


Figure 1. Conceptual diagram for the Agricultural Conservation Planning Framework (Tomer et al., 2013), with section numbers in this manual identified where appropriate. * indicates planning options where use of additional data sources, modeling tools, and/or novel site-specific designs are suggested.

Streamlined platform for WIP Planning and Reporting: FieldDoc

- Manage metrics, targets, and geographies
  - Site specific and project levels
- Custom data dashboards for tracking and reporting
  - Planned integration with CBP CAST model
  - Standardized nutrient and sediment load reductions
- Drexel ANS
  - Back-end data analytics
  - Rapid watershed delineation function for stormwater practice footprints created or uploaded to FieldDoc
  - Project practice 1-meter LULC area statistics



Credit: FieldDoc. Chesapeake Commons 2019

- https://www.chesapeakecommons.org/fielddoc

Drexel ANS rapid watershed delineation algorithm

- Orders of magnitude faster than ESRI watershed delineation algorithm
- Surface flow algorithm
  - limitations in urban environments

ELSEVIER

Environmental Modelling & Software

Volume 109, November 2018, Pages 420-428

A new rapid watershed delineation algorithm for 2D flow direction grids

Scott Haag [a, b], Bahareh Shakibajahromi [b], Ali Shokoufandeh [b]

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https://doi.org/10.1016/j.envsoft.2018.08.017

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Abstract

In this paper we propose an algorithm for retrieving an arbitrary watershed boundary from a 2D Flow Direction Grid. The proposed algorithm and associated data model provides geometric speed increases in watershed boundary retrieval while keeping storage constraints linear in comparison to existing techniques. The algorithm called Watershed Marching Algorithm (WMA) relies on an existing data structure, the modified nested set model, originally described by Celko and applied to hydrodynamic models by Haag and Shokoufandeh in 2017. In contrast to existing algorithms that scale proportionally to the area of the underlying region, the complexity of the WMA algorithm is proportional to the boundary length. Results for a group of tested watersheds ($n=14,718$) in the $\approx 36,000\,km^2$ Delaware River Watershed show a reduction of between 0 and 99% in computational complexity using a 30 m DEM vs. existing techniques.

Urban BMPs

- Looking for data that can help improve our efforts in mapping urban surface water flow and opportunities for BMP implementation.
  - Stormwater infrastructure where available to hydro-condition DEMs
    - Culverts
    - Inlets
    - Outfalls
  - Current BMP locations for validation

- Seeking guidance on connecting with largely developed counties or jurisdictions we could work with to pilot our research and validate mapping results
  - Top counties with greatest potential to achieve pollution reductions from stormwater practices?

culvert

https://commons.wikimedia.org/wiki/File:Prefabricated_culverts_under_country_road_in_Rocklea,_Queensland,_Australia.jpg

bioswale

https://www.flickr.com/photos/taestell/15013858234

- What urban BMPs would be of interest for potential opportunity mapping?
  - Ponds
  - Infiltration/filtering practices
  - Runoff reduction/stormwater treatment
  - Nutrient management
  - Stream restoration
  - Erosion/sediment control
  - Forest buffers/tree planting

More Information

- CIC
  http://conservationinnovationcenter.org
- Chesapeake Bay Program Cooperative Agreement
  https://chesapeakeconservancy.org/conservation-innovation-center/precision-conservation/chesapeake-bay-program/

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