

Best Management Practices Mapping and Tracking

CBP Citizens Advisory Committee Meeting

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Chesapeake
Conservancy

EXPLORE. CONSERVE. INNOVATE.

VIRGINIAN


CIC

CONSERVATION
INNOVATION
CENTER

S.E. CHESAPEAKE CONSERVANCY

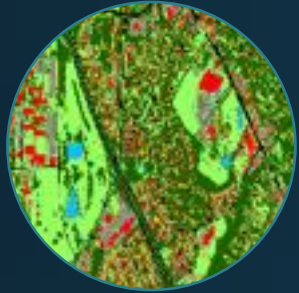


Precision Conservation

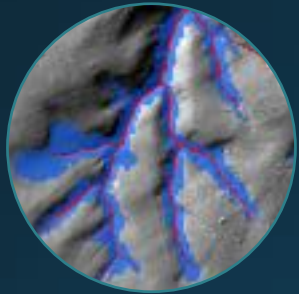
An aerial photograph of a river winding through a rural landscape. The river is dark blue. The surrounding land is covered in a colorful overlay representing precision conservation data. The overlay uses a color scale from red (high risk) to blue (low risk). The riverbanks are mostly red and orange, while the fields in the background are green and yellow. In the distance, there are trees and a few buildings.

*“Getting the right practices, in the right places,
at the right scale, and
making sure they are working”*

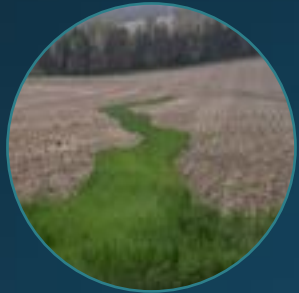
Geospatial Support: CBP



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



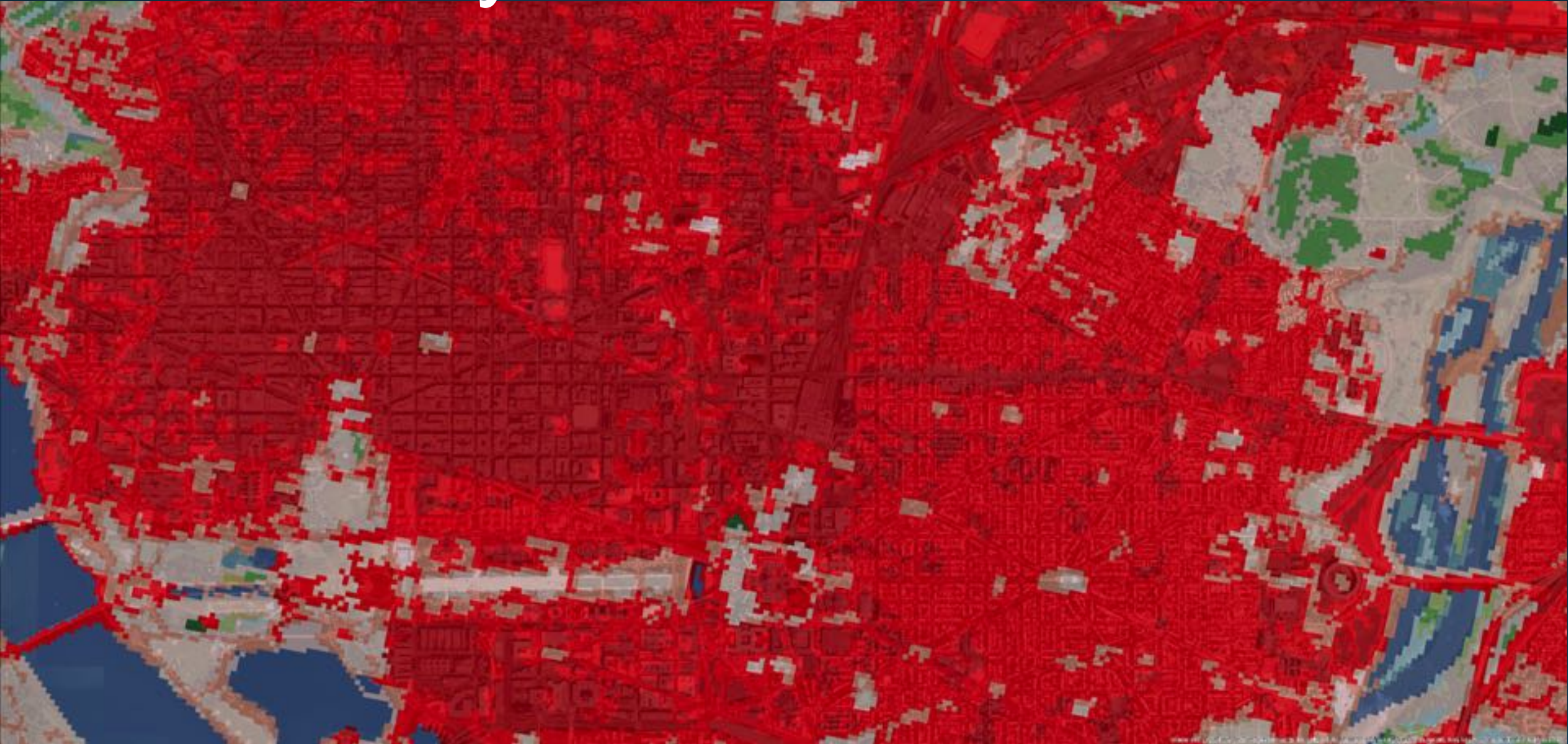
(2) LiDAR derived hydrography and ditch delineation



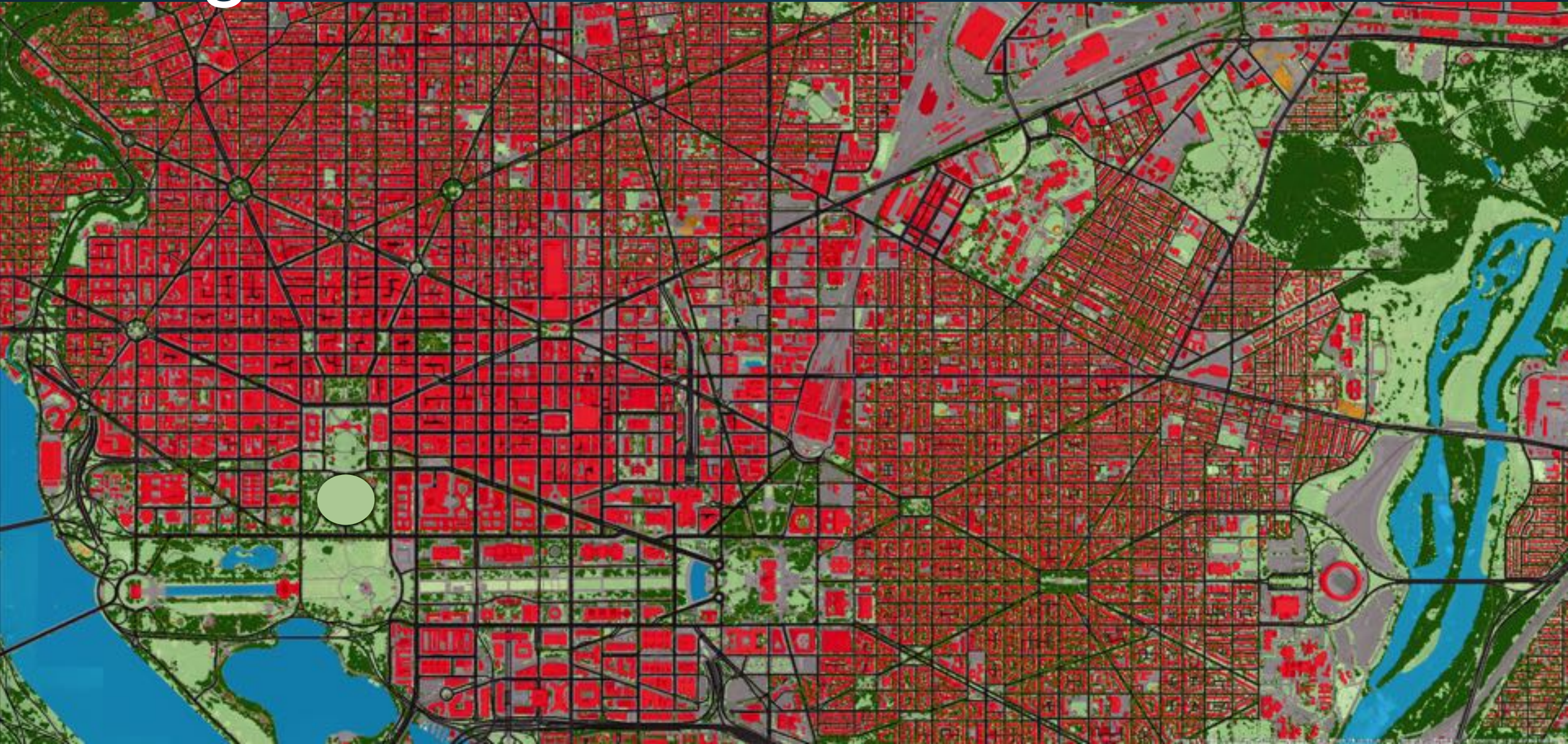
(3) Best Management Practices (BMP) opportunity mapping, tracking, and reporting

(4) Synthesizing geospatial data and integration opportunities

Previously Available Data



High-resolution Data



High Resolution Land Cover Data



CBP Land Cover Classification

Orange	Barren
Black	Impervious Roads
Grey	Impervious Surfaces
Light Green	Low Vegetation
Bright Green	Shrubland
Red	Structures
Dark Green	Tree Canopy
Brown	Tree Canopy over Impervious Roads
Olive Green	Tree Canopy over Impervious Surfaces
Yellow	Tree Canopy over Structures
Blue	Water
Teal	Wetlands



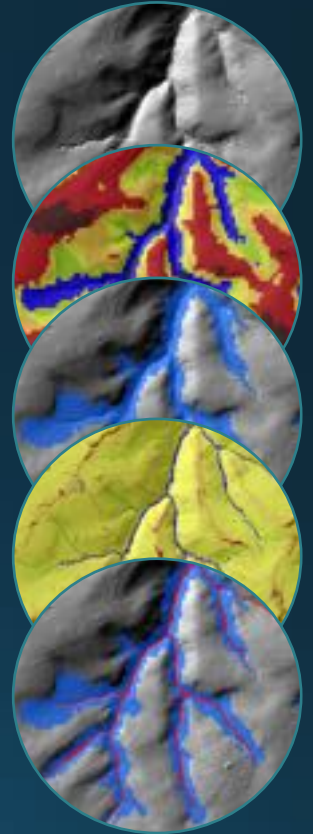
Previously available hydrography data



High Resolution 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)

- acpf_V3_Pro.tbx
- 1. DEM Preparation
- 2. Develop Stream Network and Catchments
- 3. Field Characterization
 - a. By-Field Slope Statistics
 - b. Tile-Drainage Classification
 - c. D8 Distance To Stream
 - d. Runoff Risk Assessment
- 4. Precision Conservation Practice Siting
 - a. Depression Identification
 - b. Depression Drainage Area
 - c. Drainage Water Management
 - d. Moore Terrain Derivatives
 - e. Grassed Waterways - SPI Threshold
 - f. Contour Buffer Strips
 - g. Edge-of-field Bioreactors
- 5. Impoundment Siting
- 6. Riparian Assessment
- Utilities

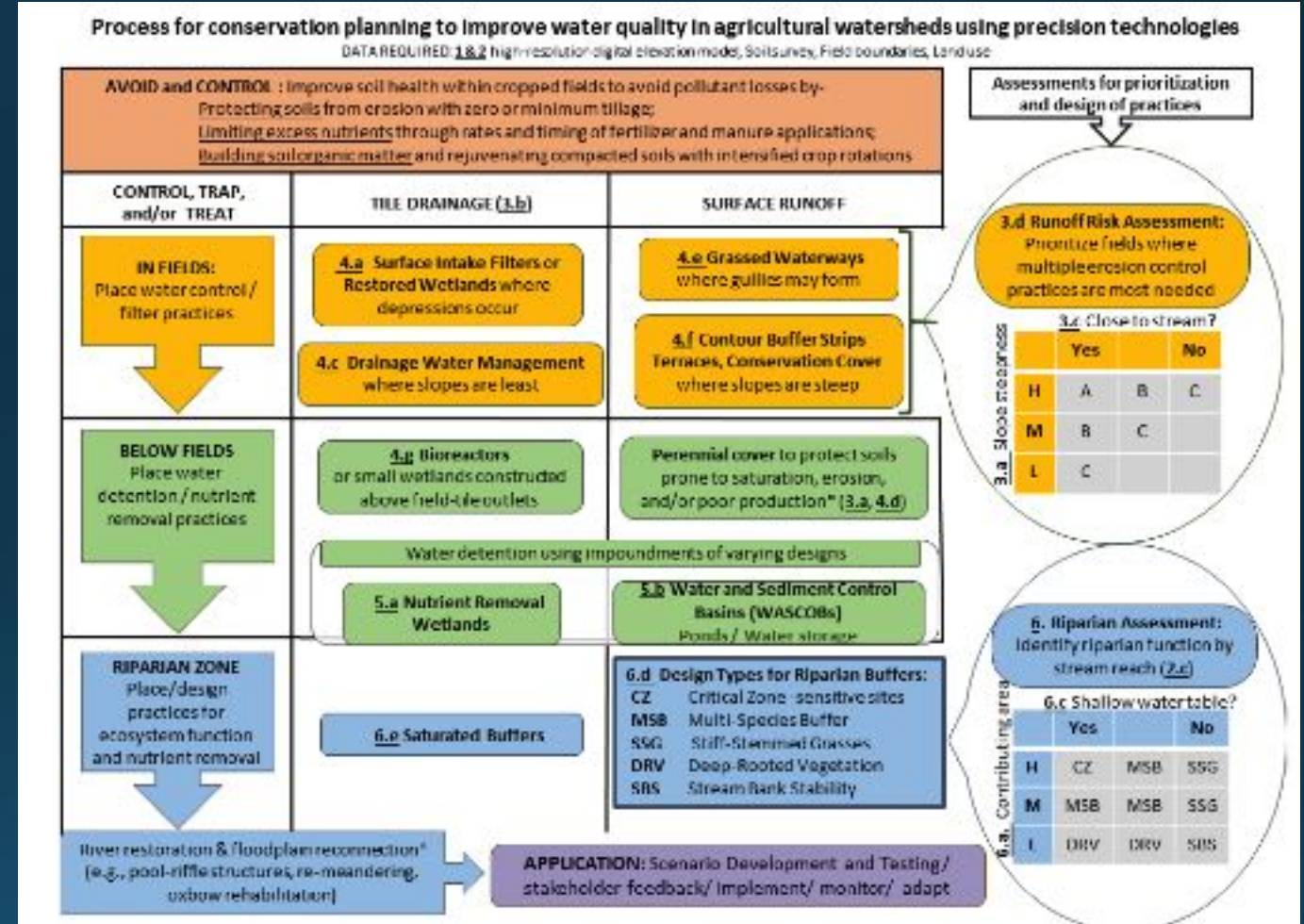


Figure 1. Conceptual diagram for the Agricultural Conservation Planning Framework (Tomer et al., 2013), with section numbers in this manual identified where appropriate. * indicates planning options where use of additional data sources, modeling tools, and/or novel site-specific designs are suggested.



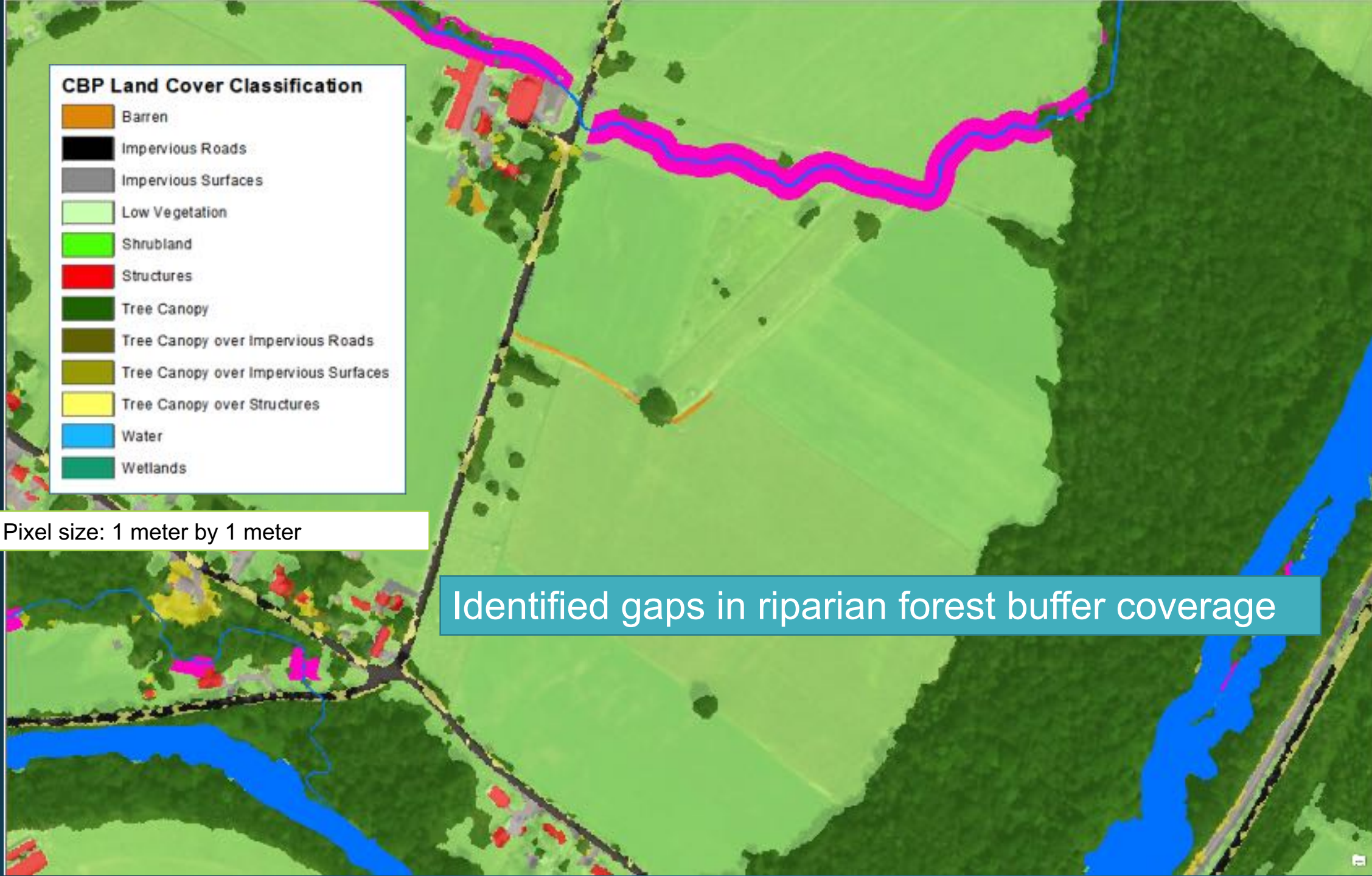
Pixel size: 1 meter by 1 meter

High Resolution Land Cover Dataset



Pixel size: 1 meter by 1 meter

Identified gaps in riparian forest buffer coverage

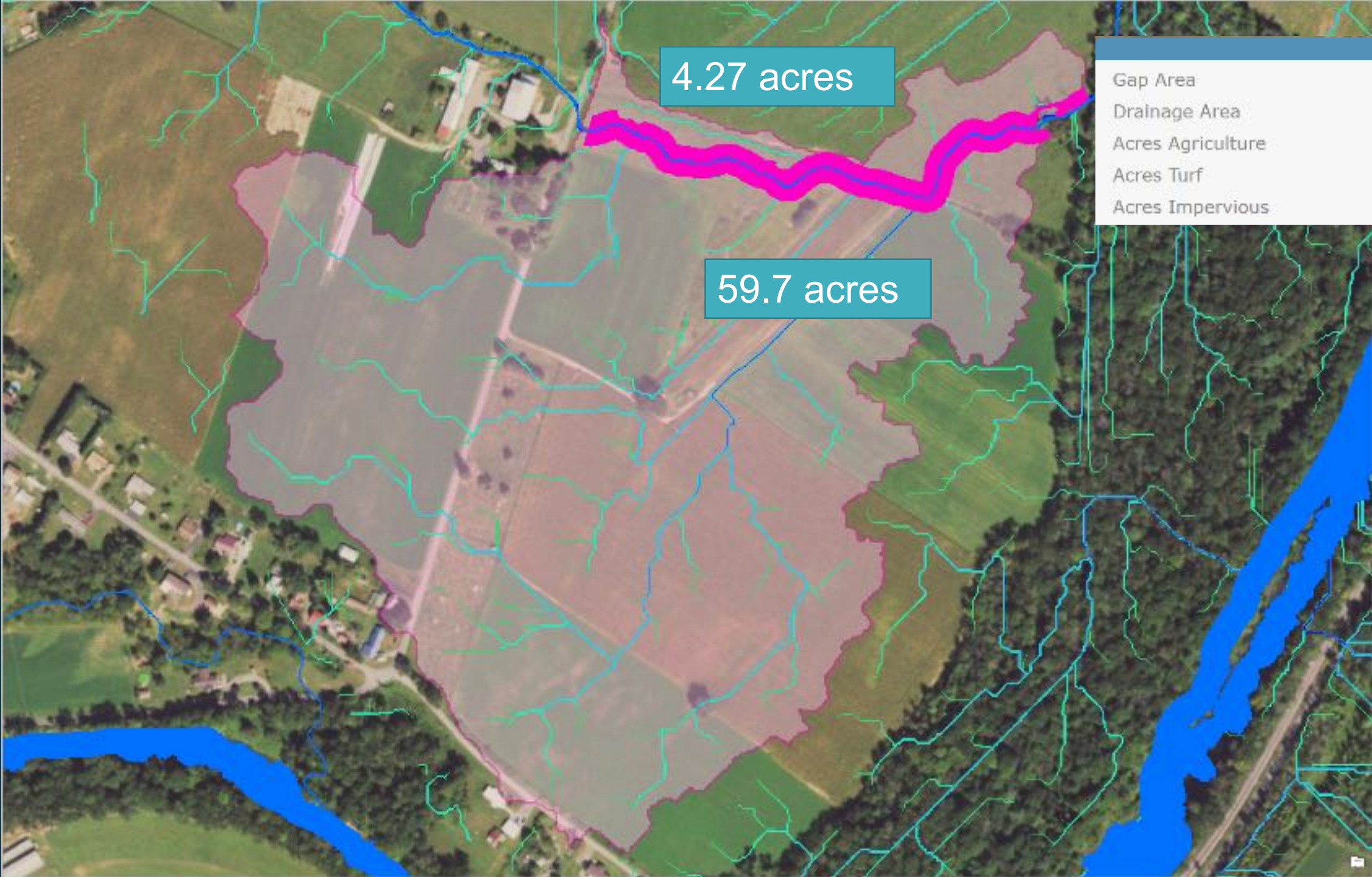




4.27 acres

59.7 acres

Legend	
Gap Area	1.16
Drainage Area	59.70
Acres Agriculture	53.62
Acres Turf	5
Acres Impervious	0



BMP Identification & Mapping

Integrating high-resolution datasets from Objectives 1 and 2

```
beginTime = datetime.datetime.now()

# Define parameters
BDFlowDir = r"C:\Users\TJ\Documents\BDFlowDir_20180418\BDFlowDir_0200030407.gdb\flow_0200030407"
BDFlowDir = r"C:\Users\TJ\Documents\BDFlowDir_20180418\BDFlowDir_0200030407.gdb\flow_0200030407"
AreaThreshold = 1 # Specify a flow accumulation threshold value between 1-10
OutFlowDir = r"C:\Users\TJ\Documents\BDFlowDir_20180418\BDFlowDir_0200030407.gdb\FlowDir_0200030407" # (AreaThreshold)

# Set workspace
arcpy.env.workspace = BDFlowDir
arcpy.env.overwriteOutput = True
arcpy.env.outputCoordinateSystem = BDFlowDir

# Determine the precision and resolution of the input flow accumulation raster.
cellSize = arcpy.GetRasterProperties_management(BDFlowDir, "CELLSIZES").getOutput(0)
resolution = float(cellSize) * cellSize

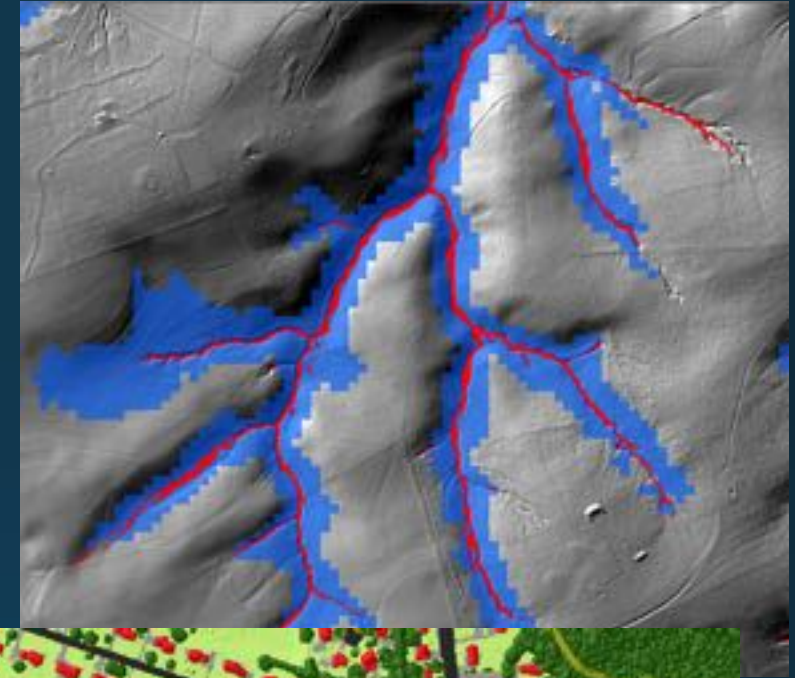
# Ensure input layers are all in the same projection
CoordinateList = []
LayersList = [BDFlowDir, BDFlowDir]
for layer in LayersList:
    if arcpy.Exists(layer):
        ar = arcpy.Describe(layer).spatialReference
        ar_name = ar.name
        if ar_name not in CoordinateList:
            CoordinateList.append(ar_name)
CoordinateCount = len(CoordinateList)
if CoordinateCount > 1:
    arcpy.AddMessage("CoordinateList")
    print CoordinateList
    arcpy.AddMessage("Input layers are in different coordinate systems...Q1222180111")
    print "Input layers are in different coordinate systems...Q1222180111"
    arcpy.exit()

***
if not arcpy.Exists(ar.workspace):
    arcpy.AddMessage("workspace does not exist!! Please set your workspace to a valid path directory in ArcMap --> Geoprocessing --> Environments --> Workspace")
    print "workspace does not exist!! Please set your workspace to a valid path directory in ArcMap --> Geoprocessing --> Environments --> Workspace"
    arcpy.exit()

***

# Run modules
StreamNetByThreshold(BDFlowDir, BDFlowDir, AreaThreshold)

endTime = datetime.datetime.now()
totalElapsed = endTime - beginTime
print "Script done. Total elapsed time: " + str(totalElapsed)
```



Integrating additional R&D



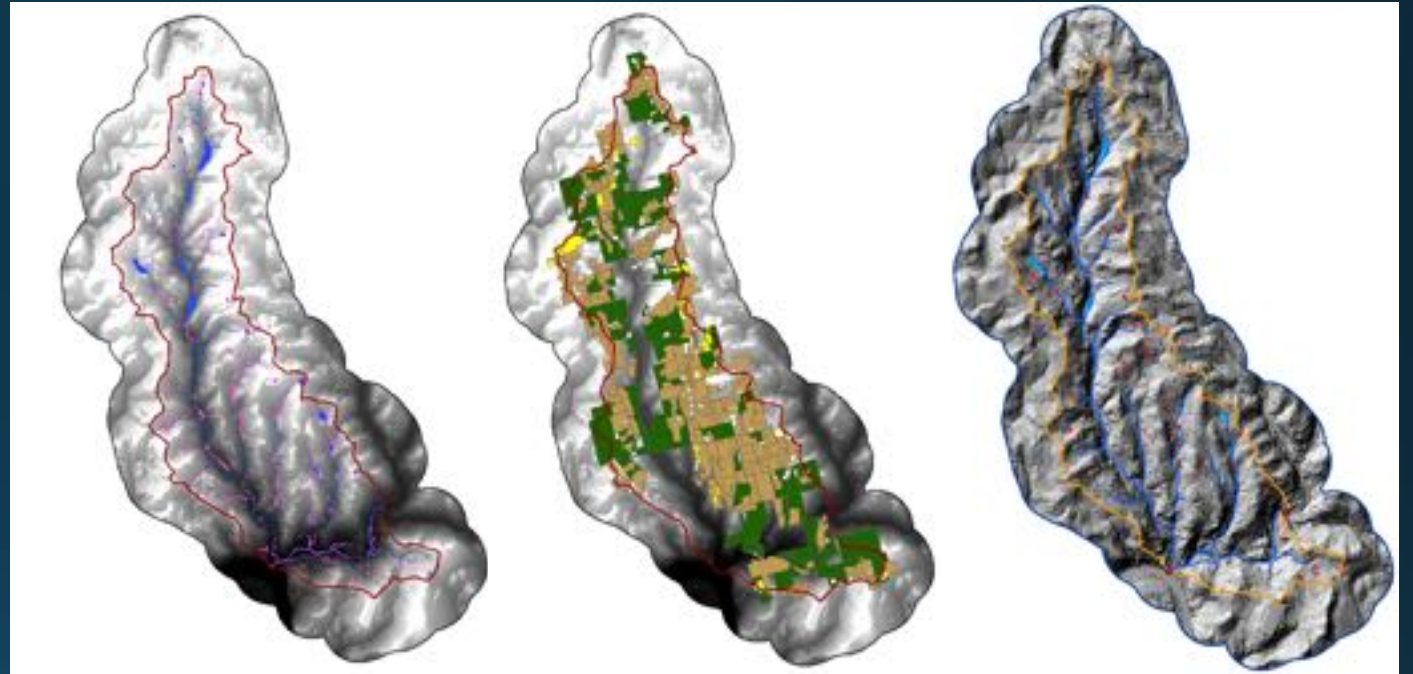
Fixed width buffer



Precision buffer

Pilot region

- BMP opportunity analysis by October 2019
- 73 HUC12s covering York and Lancaster counties, PA
- Technical advisory group
 - Validation
 - Informing tool parameters



Urban Stormwater BMP Opportunity Mapping

- Upcoming research over the next few years
 - Working with Drexel ANS
 - Modeling surface flow of water
 - Utilizing stormwater infrastructure GIS data
- Top counties with greatest potential to achieve pollution reductions from stormwater practices?
- Potential urban BMPs of most interest for mapping?
 - Ponds
 - Infiltration/filtering practices
 - Runoff reduction/stormwater treatment
 - Nutrient management
 - Stream restoration
 - Erosion/sediment control
 - Forest buffers/tree planting



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



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

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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