Protocol for Prioritizing Conservation Opportunity Areas in Centre County and Clinton County

Chesapeake Conservancy has developed this methodology to prioritize conservation opportunity areas in Centre County and Clinton County, based on new high-resolution datasets. These results are intended for planning applications only, and should not be used for legal or cadastral purposes.

Preliminary data setup

1. Generate an enhanced flow path centerline dataset, to be used in subsequent conservation opportunity area analysis.

    a. Use *Editor* > *Merge* to merge all of the centerline segments from the initial flow accumulation raster, then use *Editor* > *Explode Multipart* to separate them back out.

    b. Create an empty polygon shapefile, then fix centerline segment errors by filling in angular lattices with the *Editor* > *Construct Polygons* tool.

    c. Select all of the centerline segments that share a line segment with the filled-polygon shapefile, then delete those selected features.

    d. Use *Editor* > *Merge* to merge all of the filled polygons, then use *Editor* > *Explode Multipart* to separate them back out.

    e. Use the *Extend Line* tool to connect dangling centerline segments that are within 5 m of each other, then manually sweep through all filled polygons and connect the remaining dangles to form one complete centerline network.

    f. Merge all of the centerline segments together, then smooth it out using a PAEK tolerance of 5 m. Split centerline segments at each intersection.

    g. Calculate the length of each centerline segment, then sort by length. Manually sweep through and correct/delete segments that are less than 10 m long.

2. Calculate meander of each centerline segment.

    a. Use the *Sinuosity* add-in to create a new field and measure the deviation of each stream reach.

3. Identify centerline segments that are designated trout waters.

    a. Merge all original designated trout waters datasets, then clip to the Kettle Creek watershed boundary.

    b. Use the *Snap* tool with a 100 m radius to shift the original designated trout waters datasets so that they match the edges of the centerline segments.

    c. Select all centerline segments that intersect the snapped designated trout waters datasets.

d. Manually sweep through and unselect segments that don't have a true overlay.

e. Create a short integer field in the centerline attribute table labeled "Trt_Water" and change all selected segments to a value of 1. Change remaining centerline segments to a value of 0.

4. Identify centerline segments that are designated impaired streams.

a. Merge all original designated impaired streams datasets, then clip to the Kettle Creek watershed boundary.

b. Remove all streams that are not classified as agriculture-impaired.

c. Use the *Snap* tool with a 100 m radius to shift the original designated impaired streams dataset so that it matches the edges of the centerline segments.

d. Select all centerline segments that intersect the snapped designated impaired streams dataset.

e. Manually sweep through and unselect segments that don't have a true overlay.

f. Create a short integer field in the centerline attribute table labeled "Impaired" and change all selected segments to a value of 1. Change remaining centerline segments to a value of 0.

5. Identify centerline segments that are designated "Exceptional Value" or "High Quality" streams.

a. Clip the original designated EV/HQ dataset to the Kettle Creek watershed boundary.

b. Use the *Snap* tool with a 100 m radius to shift the original designated EV/HQ streams dataset so that it matches the edges of the centerline segments.

c. Select all centerline segments that intersect the snapped designated EV/HQ streams dataset.

d. Manually sweep through and unselect segments that don't have a true overlay.

e. Create a short integer field in the centerline attribute table labeled "EV_HQ" and change all selected segments to a value of 1. Change remaining centerline segments to a value of 0.

Conservation Opportunity Area evaluation

1. Filter existing conservation opportunity areas to remove those that are within road right-of-ways, by which the remaining analysis will be based on.

   a. Run the "Gap Filtering" tool.

   b. Clip the output to the Kettle Creek watershed boundary.

   c. Use *Editor > Merge* to merge all of the remaining opportunity areas, then use *Editor > Explode Multipart* to separate them back out.

   d. Calculate the area of each opportunity area, then delete all fields in the attribute table except the area field.

   e. Delete any opportunity areas that are smaller than 25 m^2, then manually sweep through and reshape or delete artificial opportunity areas that surround ponds. This will form the base dataset for the conservation opportunity area prioritization.

2. Use the *Watershed* tool to calculate the drainage basin of each opportunity area. Make sure to set the processing extent to the flow direction raster.

   a. Convert the output to a shapefile, then *Dissolve* the drainage basins by "GRIDCODE."

   b. Use *Field Calculator* to calculate the area of each drainage basin.

3. Calculate the percentage of agriculture, turf grass, and impervious surface land uses within each drainage basin.

   a. *Mosaic to New Raster* all of the relevant land use datasets together.

   b. Use the *Resample* tool to scale it down to 1x1 meter pixels.

   c. Use the *Tabulate Area* tool to calculate the area of resampled land use within each drainage basin. Use the *Field Calculator* to convert into acres.

   d. Join the table to the drainage basin dataset and export as a new shapefile.

   e. Delete all attribute table fields not pertinent to the analysis except the area.

   f. Create a new field and use the *Field Calculator* to divide each land use area by the area of the drainage basin, then multiply that by 100 to extract percentage values.

   g. Export as a new shapefile, then delete all attribute table fields not pertinent to the analysis. Join to the opportunity area dataset.

4. Calculate the ratio of land use within drainage basin to corresponding opportunity area's total area.

   a. Use *Field Calculator* to divide the total area of agriculture, turf grass, and impervious surfaces by the opportunity area total area.

5. Append characteristics of centerline segments to adjacent opportunity areas.

   a. Use the *Near* tool to determine closest centerline segment to each opportunity area.

   b. Join the centerline segments to the opportunity areas by "NEAR_ID." Delete all attribute table fields not pertinent to the analysis.

6. Calculate the majority habitat connectivity value that falls within each opportunity area.

   a. *Reclassify* the raster local connectedness data into seven categories, indicating level of resilience.

   b. Use the *Zonal Statistics as Table* tool to calculate the majority value that falls within each opportunity area.

   c. Join the table to the opportunity areas, then delete all attribute table fields not pertinent to the analysis.

7. Identify opportunity area adjacency to Brook Trout highly suitable habitat.

   a. Convert the raster highly suitable habitat data into polygons, then select all opportunity areas that intersect them.

   b. Add a new short field to the attribute table labeled "Brk_Trt" and change all selected opportunity areas to a value of 1. Change remaining opportunity areas to a value of 0.

8. Identify opportunity area adjacency to wildlife habitats.

   a. *Reclassify* raster species distribution data into binary values, then convert into polygons and select all opportunity areas that intersect those polygons.

   b. Add six new short fields to the attribute table and change all selected opportunity areas to a value of 1. Change remaining opportunity areas to a value of 0.

9. Calculate the majority soil erodibility factor within each opportunity area.

   a. Use the *Zonal Statistics as Table* tool to determine the majority soil erodibility factor within each opportunity area, then join the table to the opportunity area attributes.

   b. Create a float field labeled "K_factor" in the buffer gap attribute table. Use *Field Calculator* to multiply each value by 0.01, then subtract it from 1 so that higher values indicate lower erodibility factors.

10. Identify opportunity area remoteness to karst features.

    a. Select all opportunity areas that are within 50 feet of a karst feature, then switch the selection.

b. Create a short integer field in the opportunity area attribute table labeled "Karst" and change all selected opportunity areas to a value of 1. Change remaining opportunity areas to a value of 0.

11. Calculate percentage gap slope of all opportunity areas.

a. Extract opportunity area slope from the opportunity areas shapefile.

b. *Reclassify* the values from 0-35 = 1; 35-45 = 2; 45+ = 3.

c. Use the *Tabulate Area* tool to calculate the area of low, medium, and high slope within each opportunity area, then join the table to the opportunity areas dataset.

d. Add three new fields to the attribute table and use the *Field Calculator* to convert the areas into acres.

e. Add an additional three fields to the attribute table and use the *Field Calculator* to divide each slope value by the total area of each opportunity area, then multiply that by 100 to obtain the percentage of each slope value.

12. Format opportunity area attribute table to obtain ranking.

a. Export the opportunity area attribute table using the *Table to Excel* tool.

a. Calculate percentile rank for the ratio of land use area to corresponding opportunity area total gap area, meander, landscape connectivity, soil erodibility factor, and percentage low opportunity area slope within the exported table.

b. Multiply those fields by their respective weights.

b. Multiply the adjacency to classified trout waters, adjacency to classified impaired streams, and adjacency to EV/HQ streams, adjacency to Brook Trout habitat, adjacency to total species distribution*, and proximity to karst features by their respective weights.

c. Add all of the weighted values for each opportunity area, then copy and paste only the values into a new Excel. Save as a .txt file extension.

d. Import that table into ArcMap, then export it as a .dbf file extension.

e. Join the .dbf to the buffer gaps and delete any duplicate fields, then export as a new shapefile. This is the final conservation opportunity area prioritization dataset.

*Species Distribution values should be added together before being multiplied by their weight.