Chesapeake Fish Passage Prioritization Tool: User Guide

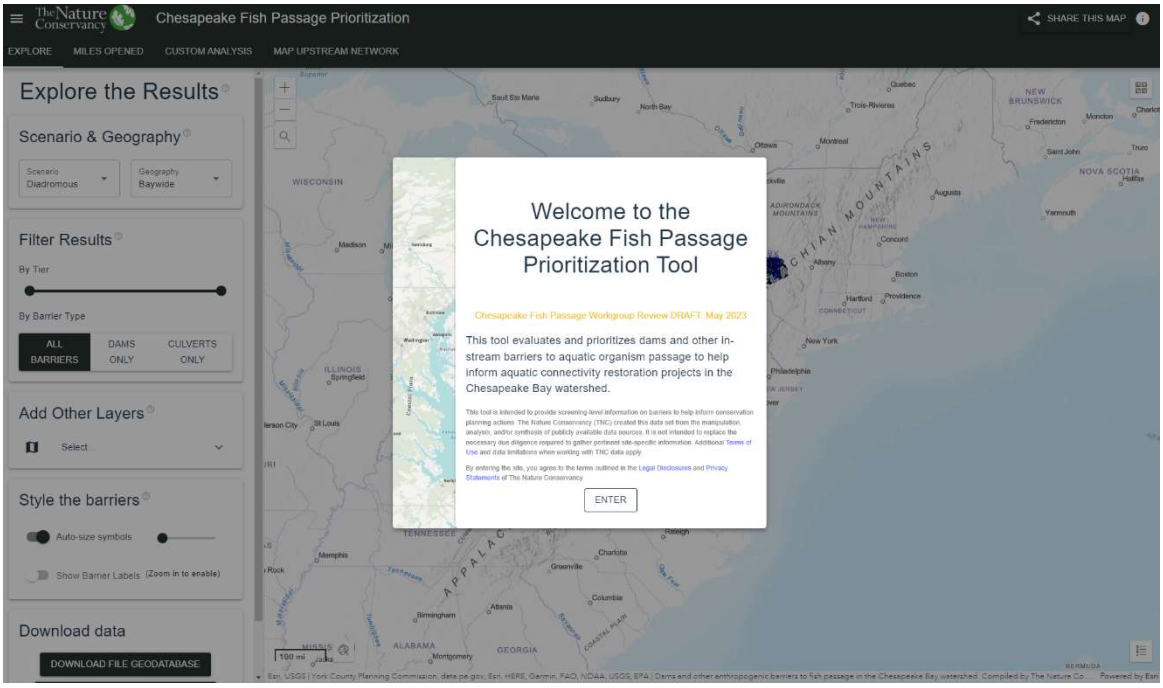
1 Web Map & Analysis Tools

This web mapping platform allows users to view and interact with the results of the Chesapeake Fish Passage Prioritization Project which is designed to help identify dams where improved fish passage or removal could most benefit migratory and resident fish species.

1.1 General Tool Functionality & Organization

Upon first entering the map, a general welcome “splash” screen is displayed to the user. This includes a brief description of the Tool along with caveats and TNC’s legal statements.

Figure 1-1: Click on "Enter" to access the tool from the welcome splash screen.



Along the top of the tool is a black header which is always present when the tool is open. There are multiple tabs on the left side of the header that can be clicked to expose content or

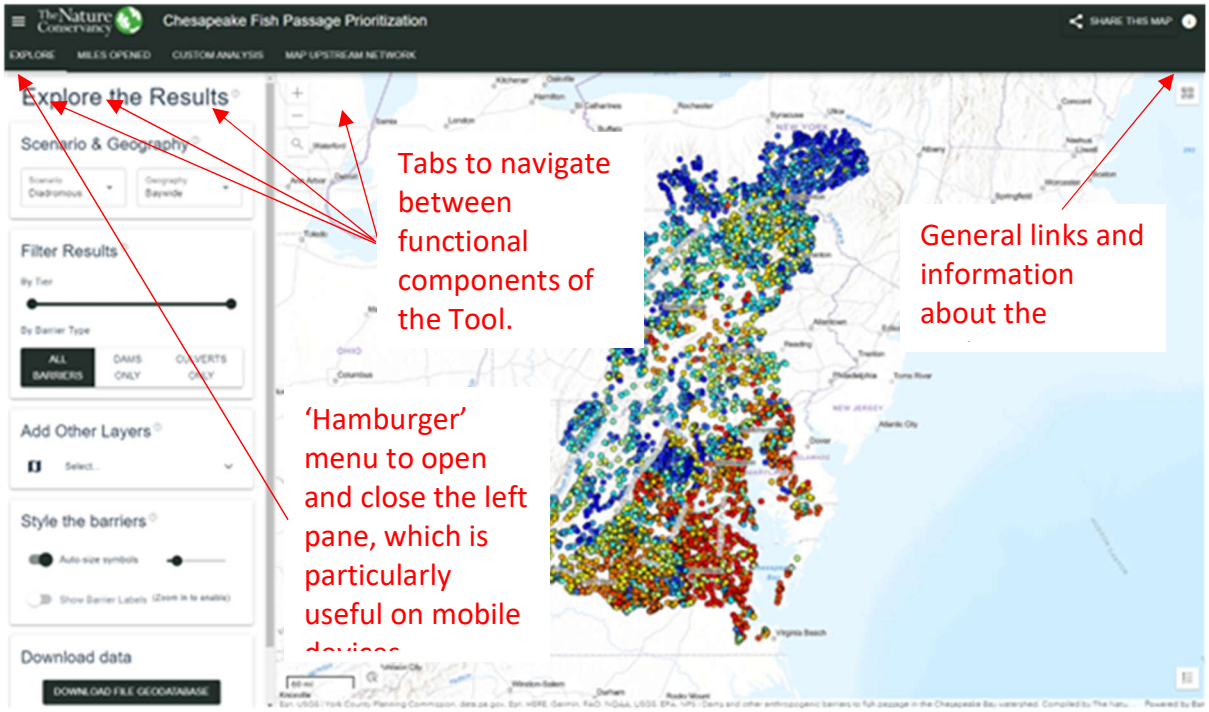


Figure 1-2 Tabs and controls on the tool header

functionality. Upon entering, the "Explore" tab is initially selected. This tab allows users to explore the results of the three consensus scenarios. Other buttons on the header include a hamburger menu at the top left to open and close the left side content pane and an info button at the top right which expands a pane with general information and links. Also included is a "Share This Map" button that can be clicked to copy a URL to the user's clipboard that stores the current state of the map (see Section 1.1.3).

1.1.1 Embedded help and info buttons

Throughout the tool, small help icons are embedded adjacent to content elements: . Clicking on these icons will raise a popup dialog with information and/or additional context about that element.

1.1.2 Mobile devices

The Tool was designed primarily for desktop systems. Mobile devices smaller than an iPad may be used but will not result in an optimal experience. On these mobile devices, the left content pane and the map are not simultaneously viewable. Swiping left will hide the content pane to display the map while clicking the hamburger menu at the top left of the header will expose the content pane. Panning the map is done with two fingers on mobile devices.

1.1.3 Share the current map

The 2023 version of the Tool improves on the ability to share the current state of the map.

Clicking the “Share This Map” button at the top right side of the header will copy a URL with multiple parameters embedded in it. This URL can be pasted into an email or otherwise saved or shared with another person. When loaded, the map will return to the extent and tab (Explore, Miles Opened, etc.) that were active at the time the link was created. Further, if the explore tab was active, the selected scenario and geography, any selected barrier, and additional layers will automatically load. Likewise, if the “Miles Opened” tab was active, the time span and visible layers that were active at the time the link was created are loaded. Custom analysis parameters and custom upstream functional network parameters are not saved.

1.2 Explore the Consensus Results

The Explore tab allows users to investigate the consensus prioritization scenarios and includes several aspects of functionality within it.

1.2.1 Select a consensus scenario and geography

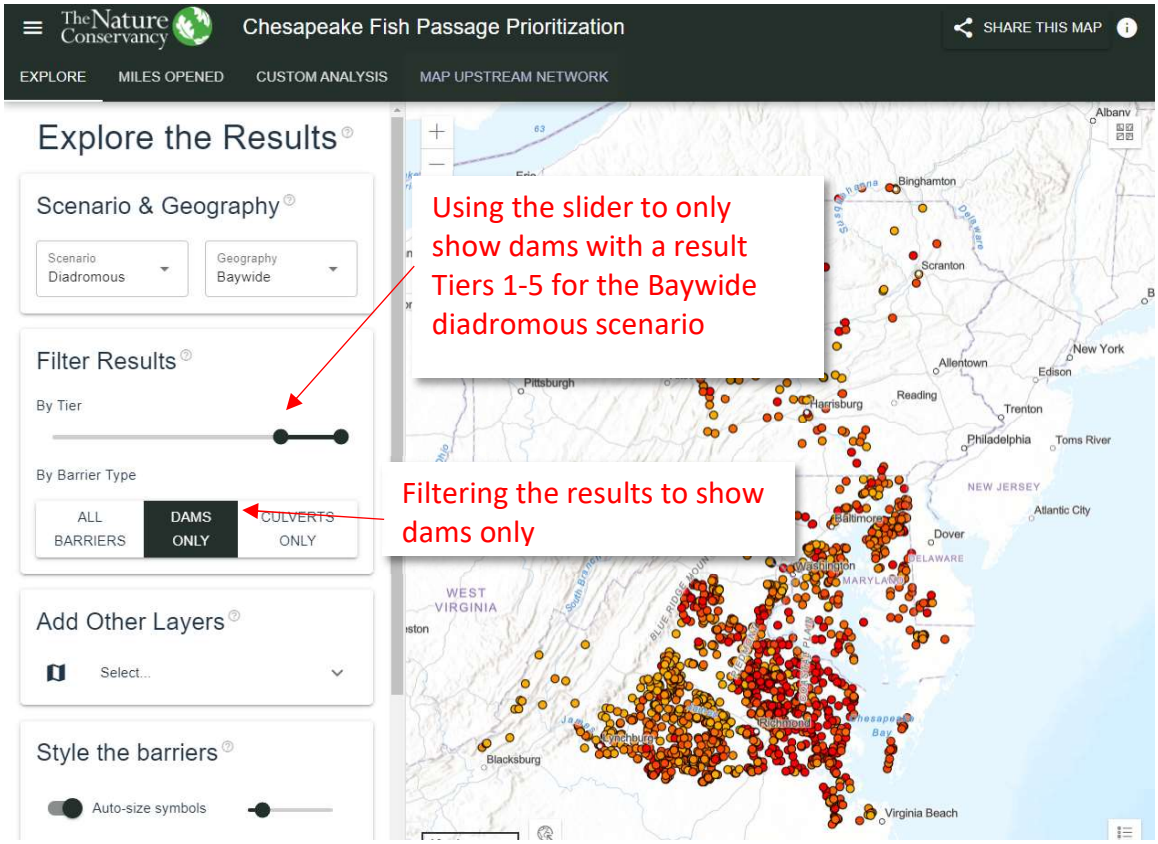
A region, either “Baywide” or one of the three states, along with a prioritization scenario can be selected using dropdown menus at the top of the “Explore the Results” tab. When a region is selected, the results for the selected scenario will be displayed, stratified by (relative to) that region. In addition to stratifying by states, results can also be stratified by barrier type: dams and culverts. The option to do this is also nested under the “Geography” dropdown. Analyses for other regions or subsets of data (e.g., watershed) can be run by applying a filter in a custom analysis (see Section1.4)

1.2.2 Filter the results in the map

The consensus results that are displayed in the map can be filtered by Tier or barrier type to reduce clutter and facilitate the viewing of relevant data.
A slider bar can be used to limit visible barriers to those whose tiered result are in the range selected for the consensus scenario and geography that are currently selected.
Barriers can also be filtered by type, using the buttons to display all barriers, dams only, or culverts only.

Note that filters applied via these two methods work together. That is, if results are filtered to show only result Tiers 1-5 and the button to only show dams is selected, the map will display dams in Tiers 1-5.

Figure 1-3 Applying filters to a consensus scenario

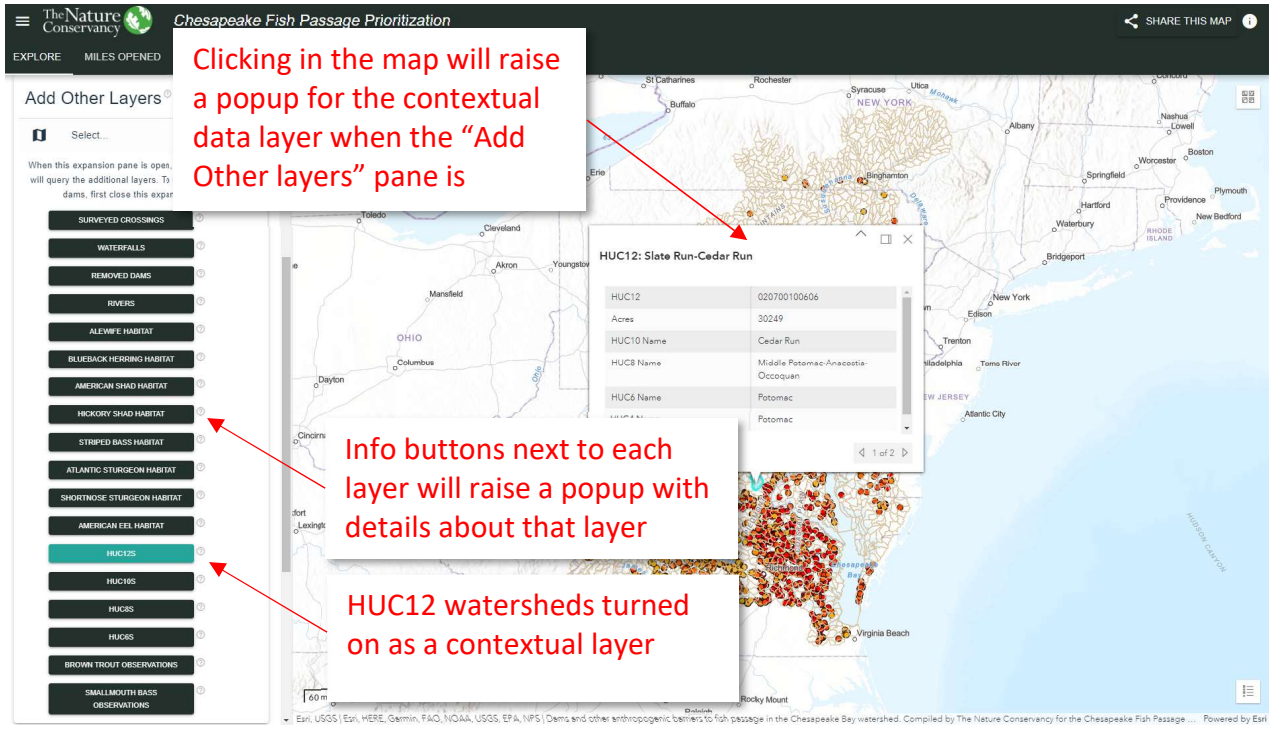


1.2.3 Additional layers

Additional contextual data can be added to the map. Expanding the pane under “Add Other Layers” will reveal a list of layers displayed as buttons that will turn each layer on or off. These layers include road-stream crossings, diadromous fish habitat, river hydrography, watershed boundaries, non-native fish observations, natural waterfalls, and previously removed dams.

Next to each layer is an info button which, when clicked, will bring up a popup with a brief description of that data layer and a link to its metadata.

Figure 1-4:Turning on and querying additional contextual layers

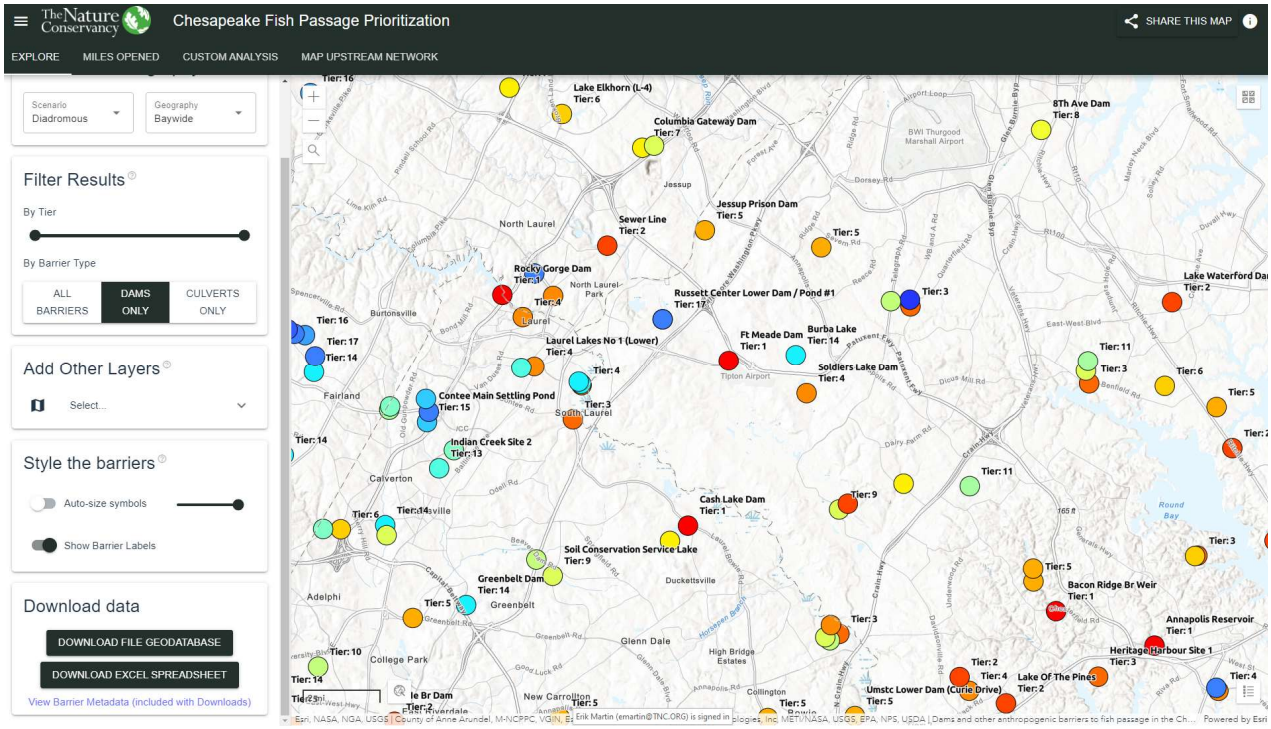


Note: When the layers menu is expanded, clicking on a feature in the map will bring up a popup dialog in the map with information about that feature. Closing this pane will leave any additional layers turned on in the map, but map-click queries are restricted to the prioritized barriers.

1.2.4 Style the barriers

By default, the barriers in the map are set to change size based on the scale of the current map view. This is designed to help users comfortably view barriers regardless of map scale.

Figure 1-5: Barriers styled as large points with labels turned on.



However, this default behavior can be modified and the size of the barrier points manually sized using the slider.

Additionally, when zoomed in to local scales, an option is available to turn on map labels showing each barrier's name and Tiered value for the currently selected scenario.

1.2.5 Download data

The data for the consensus scenarios displayed in the "Explore" section of the tool can be downloaded as a file geodatabase or Excel spreadsheet from the bottom section of the Explore content tab. Metadata is included with downloads, or can be viewed or downloaded separately from the View Barrier Metadata link.

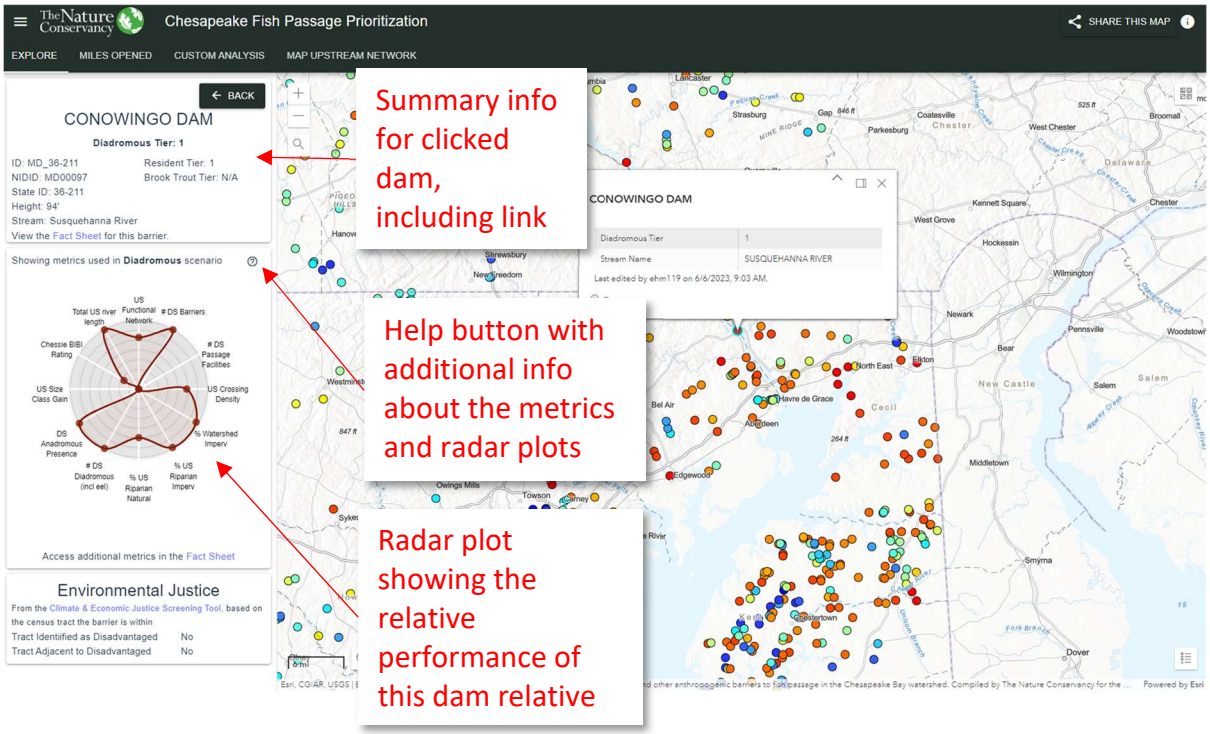
1.2.6 Assess a barrier

Clicking on a barrier will show, in the left window, information about that barrier including its name, ID, result tier for each of the consensus scenarios, a link to a fact sheet with all the metric information for that dam, link to the NAACC page for culvert barriers, and a radar plot that displays the relative values for each metric. The radar plot can be used to see what factors are driving its prioritized result – values near the perimeter of the plot perform better for a given metric than most other barriers. That is, the radar plot shows the relative performance of

the barrier for each metric, relative to the other barriers in the stratification region. Hovering the cursor over a metric in the plot will display the actual value for that metric. The metrics shown in the radar plot correspond to the metrics that are used in the selected consensus scenario (diadromous, resident, or brook trout). Additional metrics for a barrier can be viewed by clicking on the Fact Sheet link for the barrier.

Clicking the Back button at the top of the left content pane will return to the main Explore

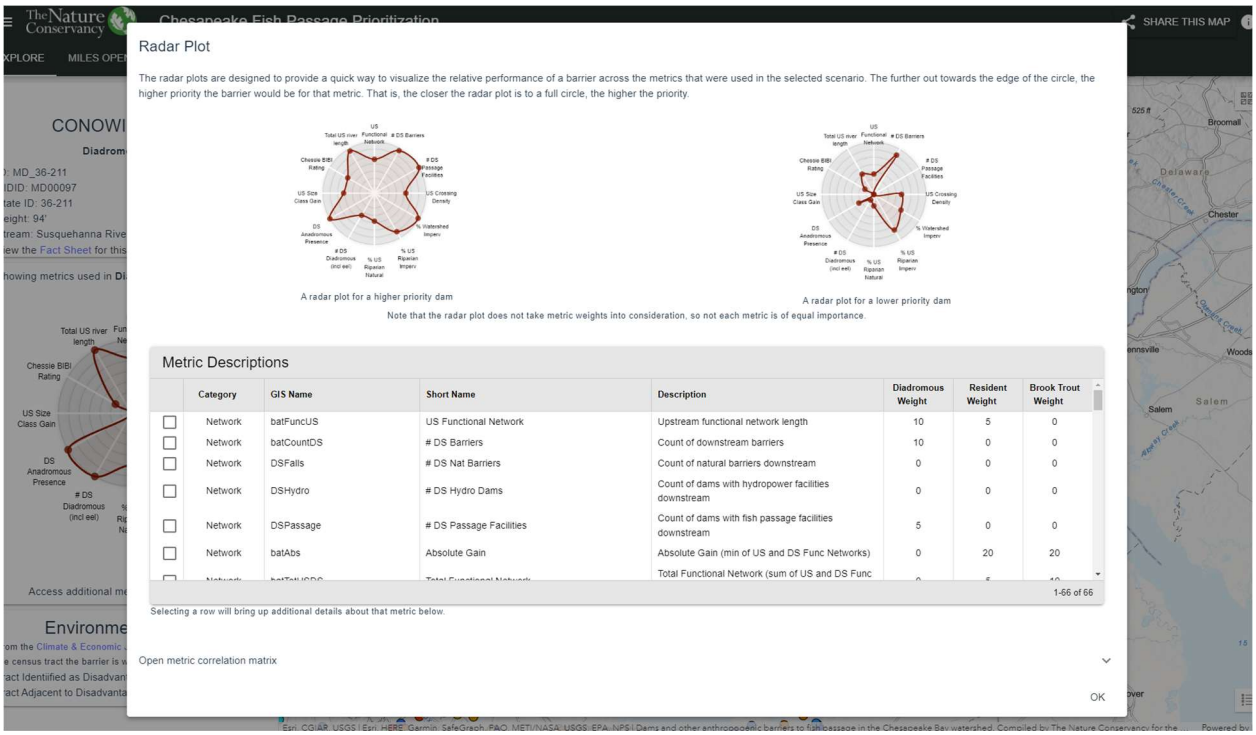
Figure 1-6: "Assess a barrier" functionality that is exposed when a barrier is clicked in the map



content.

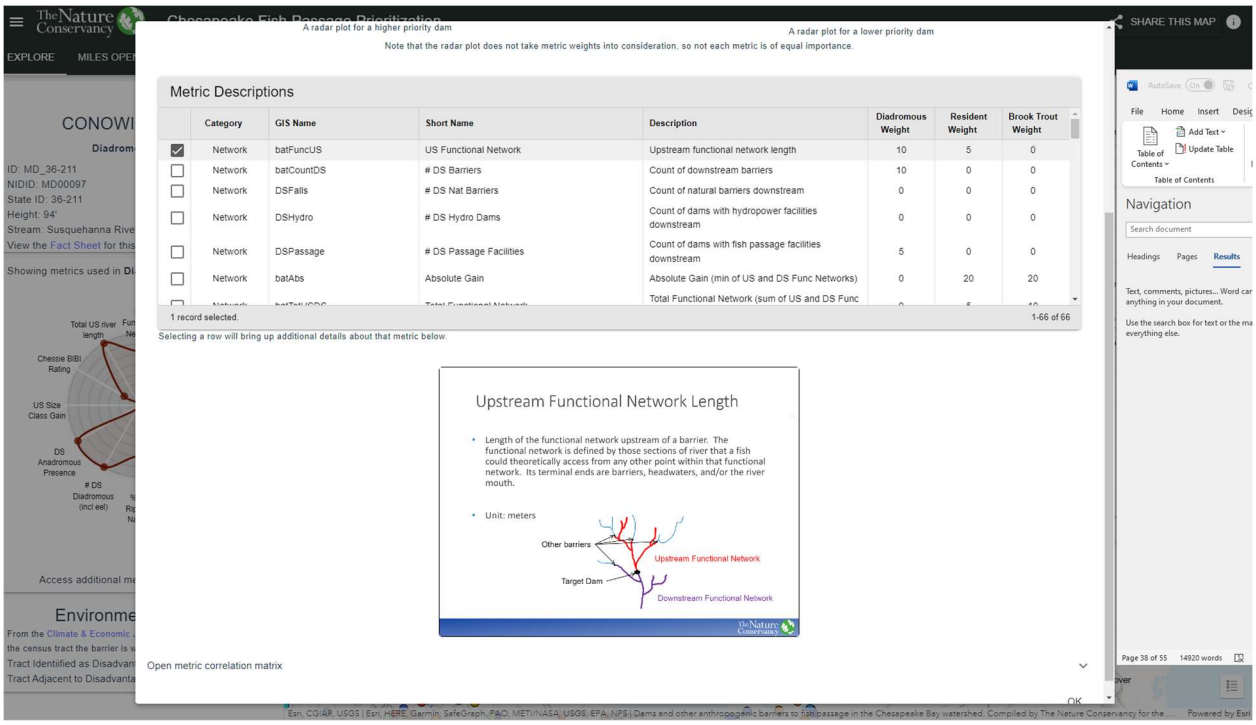
Additional information about the radar plots and metrics is available by clicking on the help button above and to the left of the radar plot. Clicking this button will bring up a popup with a brief explanation of how to interpret the radar plots, a table with descriptions and consensus scenario weights for each metric, and a correlation matrix for all metrics.

Figure 1-7: Radar plot help dialog.



Selecting one of the metrics in the description table will bring up a more detailed description of that metric with a conceptual illustration and/or data source, as applicable.

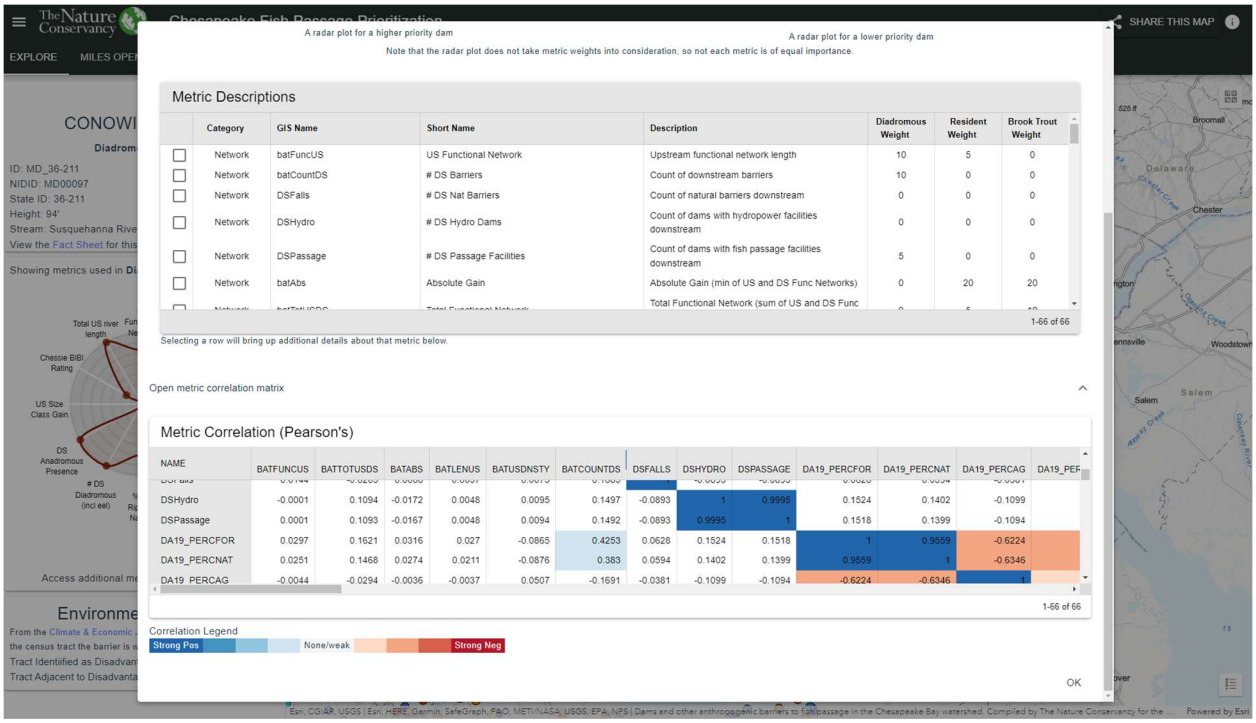
Figure 1-8: The upstream functional network metric selected in the metric description table and its additional descriptive information below the table.



The metric correlation table is particularly useful when evaluating the metric weightings

selected by the Steering Committee or when selecting weights for a custom scenario. The correlation matrix (Pearson's) quantifies the degree of positive or negative correlation between each metric which can help reduce the unintentional overweighting of a criterion.

Figure 1-9: Expanded correlation matrix on the radar plot info dialog.



In addition to the metrics used in the prioritization, basic environmental justice information for the census tract where the dam is located is included in the results. Information on whether the tract has been identified as disadvantaged or is adjacent to a disadvantaged tract is shown at the bottom of the dam information. This data is sourced from the Climate and Economic Justice Screening Tool (https://screeningtool.geoplatform.gov/en/#3/33.47/-97.5) and is passed along for informational purposes.

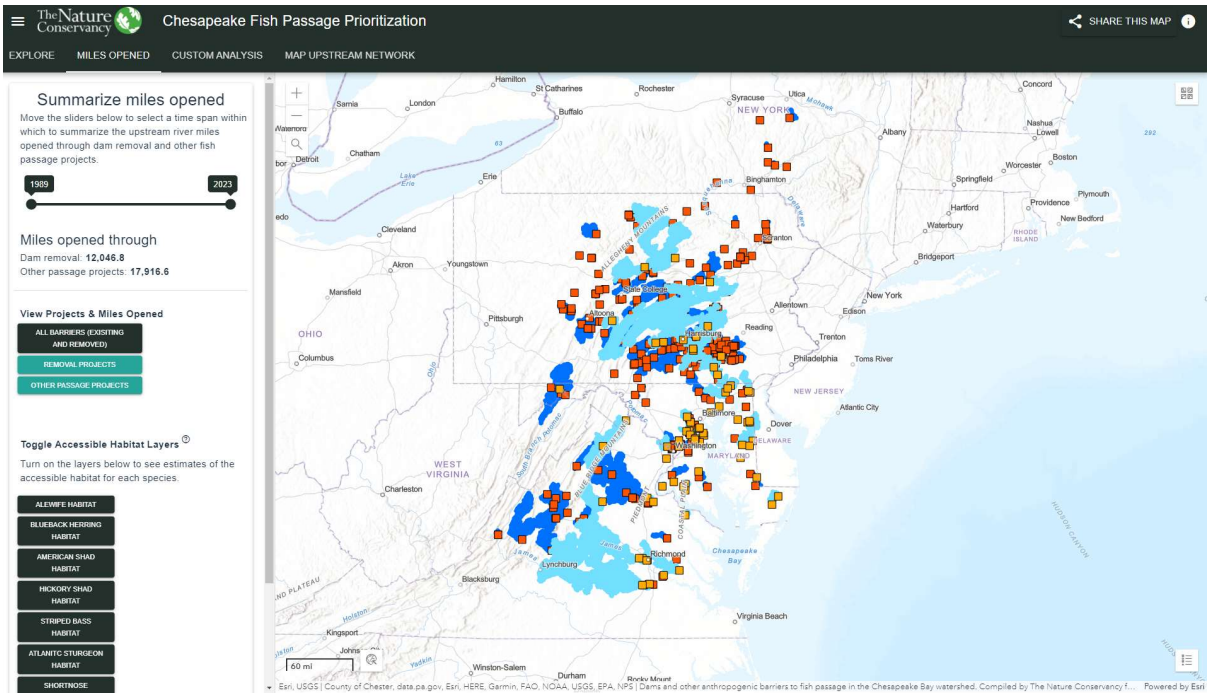
1.3 Track Miles Opened Over Time

The functionality to track upstream miles opened over time was developed in the 2019 revision of the Tool. To access this functionality, select the "Miles Opened" tab from the header. This will open the tab, remove other content from the map and load the data to track miles opened over time. In its initial state, the map will display rivers that were connected to the Chesapeake Bay in 1988 and all dam removal and other fish passage projects between 1989 and 2023. Buttons are available to turn on or off dam removal projects, other fish passage projects, and all other dams (which bound the upstream networks of removed dams).

From this point, the time slider can be used to select a range of years within which to display dams that have been removed as well as dams where other fish passage projects have been implemented. In addition to showing the dams that have been removed or had passage projects, the upstream functional networks of these dams will be shown in the map. The pane on the left side of the screen will also show a cumulative total of miles opened by dam removal

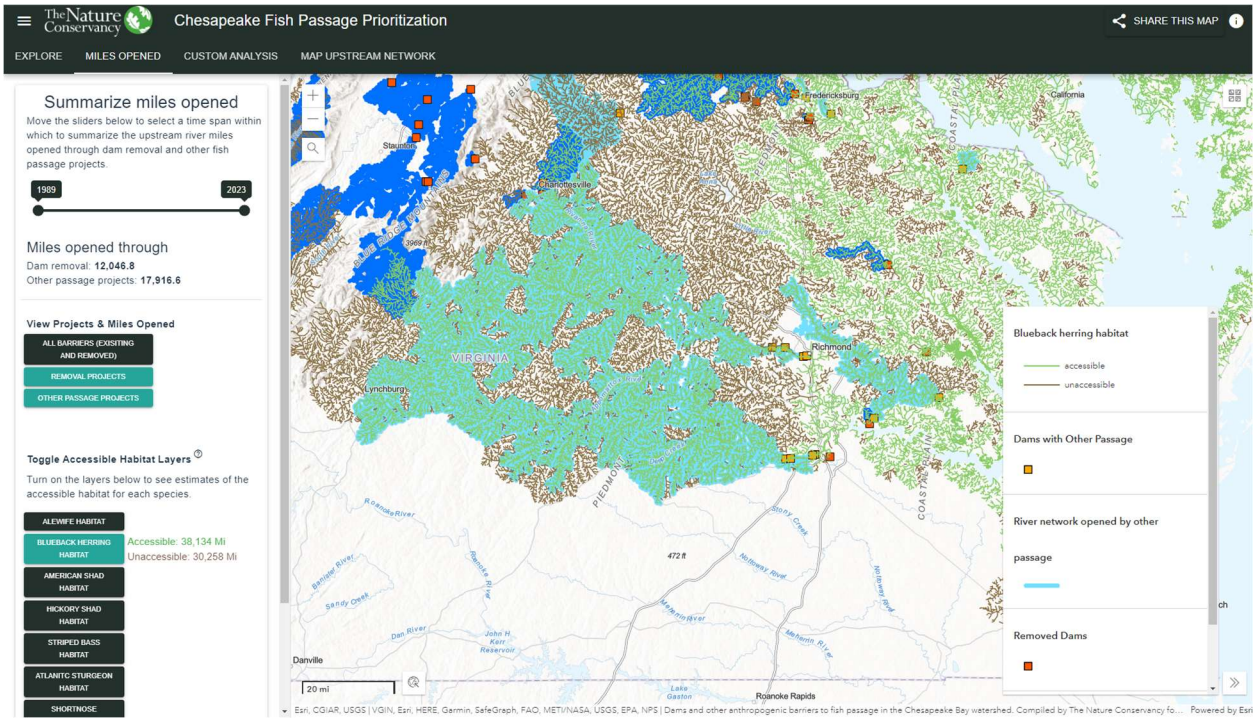
and by other passage projects. Zooming in to one of these dams on the map will display the dam's name and the year the passage project was completed.
New in the 2023 revision of the Tool is the addition of estimates of accessible river miles for each of the anadromous species evaluated in the Project. The anadromous fish habitat data

Figure 1-10: Functionality to track upstream miles opened by dam removals and other fish passage projects



that was developed over the previous versions of the project was updated using dam removal and other passage project information. Thus, accessible fish habitat was determined by identifying river segments that were both within a network opened via dam removal or other passage, were contiguous with existing contiguous habitat for each species, and met the stream size qualifications for each species (e.g., Sturgeon not found on headwater streams, even if there are no obstructions). "Accessible" was defined using both the "Current" and "Potential Current" classes of fish habitat. The miles in the "accessible" category were summed and are presented when one of the fish habitat layers is turned on.

Figure 1-11: The "Miles Opened" tab content showing accessible habitat for blueback herring in green and inaccessible habitat in brown.

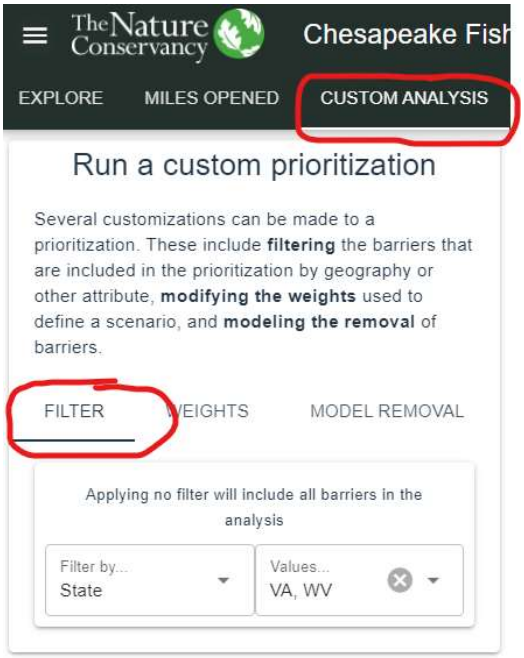


1.4 Custom Dam Prioritization Tool

The Custom Dam Prioritization tool allows users to modify and build off of the three scenarios developed by the Chesapeake Fish Passage Workgroup by altering metric weights, filtering the input dams (e.g., by state or watershed), running "removal scenarios" as if one or more dams had been removed from the network, and generating summary statistics of the results.

Custom prioritizations can be run by first clicking on the "Custom Analysis" tab.

Figure 1-12: Interface for applying a filter to limit the barriers included in an analysis



1.4.1 Filter

The first option allows users to limit the dams that are included in the analysis based on geography or some other subset of data. Menus are available to help users select what barriers are included in the analysis. Selecting the type of unit to filter by from the left-side drop down will then populate the right-side drop down with values to include. Multiple

values can be selected. For example, selecting to filter by “State” will populate the right-side drop down with the names of the states in the Bay watershed.

1.4.2 Weights

As described in the report, weights can be applied to metrics to indicate the relative importance of each metric in a given prioritization scenario. The Chesapeake Fish Passage Workgroup developed three weighting scenarios for diadromous fish, resident fish, and brook trout. These consensus weights can be used in a custom analysis by selecting the scenario of choice under the “Use Consensus Scenario Weights” section. However, any number of alternate scenarios could be developed based on the needs and objectives of the user. For example, if the primary objective of a user was to open up the most possible upstream river miles, then 100% of the weight could be applied to “Upstream Functional Network Length.” The results of this prioritization would be analogous to sorting the dams so that the one with the longest upstream functional network was on top. Expanding the “Customize Weights” section of the weights tab will reveal all of the available metrics grouped by logical category. Weights can be distributed between metrics as desired by the user so long as they sum to 100. A running tally of metric weights is provided at the top of the screen. If weights do not sum to 100, the “Analyze” button which begins the analysis will be disabled.

Figure 1-13: Selecting to use consensus scenario weights in a custom analysis. In this case, the weights from the Resident fish scenario are selected.

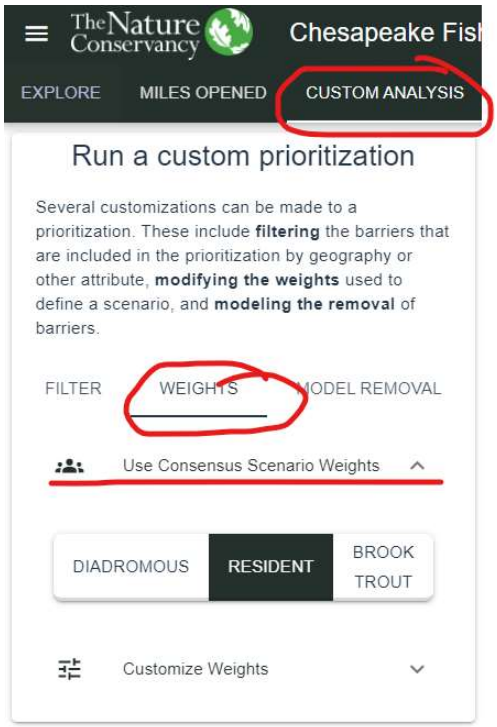
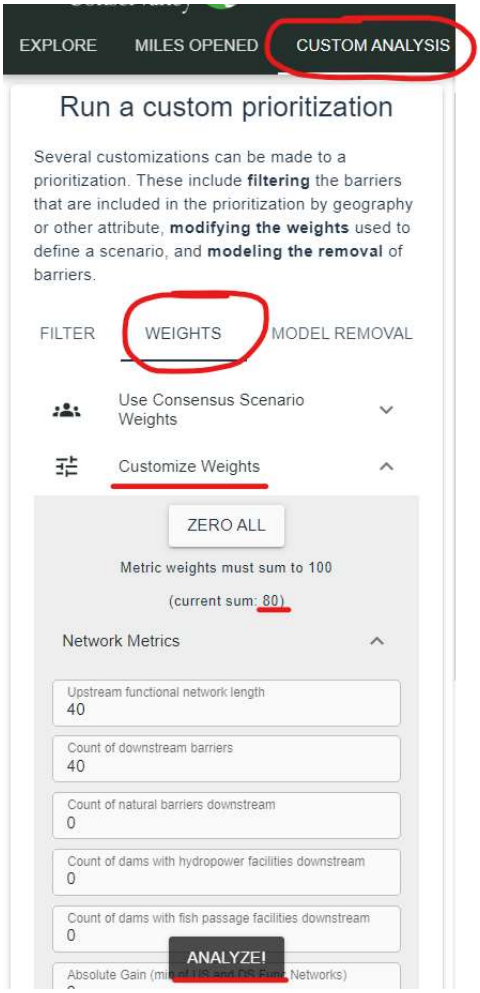


Figure 1-14: Customizing weights for a custom analysis. In this image the metric weights only sum to 80 and so the "Analyze" button is disabled



1.4.3 Dam removal scenarios

Up to ten dams can be selected for "removal" when a prioritization is run. This functionality allows users to model the impact of a proposed project on the remaining dams in the network. When dams are modeled for removal, all of the metric values are recalculated as if that dam doesn't exist so users can assess the impact on a metric-by-metric level. For example, if a given dam is "removed," all the upstream dams will have one fewer dam downstream of them, the next downstream dam will have a longer upstream functional network, the next upstream dam will have a longer downstream functional network, etc. This can be particularly useful when there are multiple dams in a series which might be treated as a single removal project. That is, by "removing" all but one of a series of dams, the one remaining dam will have metric values which reflect the group, rather than its individual components.

To run a prioritization scenario that includes modeled removals, select the "Model Removal" tab. This will load a data layer of dams (all styled as black points) which allows for barriers to be interactively selected for removal through the web map. This is simply done by clicking on a point, which will highlight the barrier in red. If a mistake is made, clicking on a highlighted barrier will unselect it.

Note that barriers that are modeled as "removed" in a custom analysis do not alter the source dam database. The custom analysis results are only valid for the current user's session.

1.4.4 Starting the analysis, viewing and exporting results

When all inputs are completed, the "Analyze" button can be clicked to begin the analysis. The time required to run a prioritization varies based on the number of dams included in the analysis, the number of metrics included in the analysis, the number of dams being modeled for removal, whether summary statistics are being calculated, as well as server load. Generally, a custom analysis can be expected to run between 15 seconds and two minutes.

1.4.4.1 Results

When the analysis is complete, the results are added to the map and the "Custom Analysis Results" pane is opened. The pane will include buttons to download the results as a zipped File Geodatabase for use in a GIS.

In the map, symbols of the result features in the map use the same color ramp as the pre-loaded Workgroup-consensus results to indicate Tier (Tier 1 in red toTier 20 in blue).

As long as the "Custom Analysis" tab is selected, clicking on a barrier in the map will bring up information about the barrier from the results. Thus, if dams are modeled as removed, the metrics for the remaining dams will reflect those removals. Exiting the Custom Analysis Results pane will remove the results. So, for example, clicking on the "Explore" pane will remove the custom results and load the consensus results.

It is strongly recommended that input parameters always be saved with results. File names are set up with a date/time stamp so inputs and results can be easily tracked.

1.5 Upstream Network for a Clicked Point

In the 2019 revision of the Chesapeake Fish Passage Prioritization functionality was added to generate an upstream functional river network for any location on the river network. First, select the “Map Upstream network” tab. Next, zoom in until you are able to clearly see the location of the point from which you want to trace an upstream network. Next, flip the switch to “Enable start point click”. Subsequently, clicking on a river line (be sure to click within 100m of the river line as it’s represented in the map) will automatically start the analysis. A status message will appear in the active pane and, when processing is completed the upstream functional network will appear in the map and its length will be displayed in the pane. Processing time for generating an upstream functional network varies based on the river where the point is located, but general takes 1-2 minutes.

Figure 1-15: An upstream functional river network generated for a point clicked within the map