

2015 NC Wildlife Action Plan

www.ncwildlife.org/plan

Decision Support Tools

- Conservation Opportunity Areas (COA)
- Habitat Threat Risk Assessment (TRA)

User Support Guide

Last updated: November 7, 2017

Table of Contents

| | |
|-------------------------------------------------------------------------------------------------|----------|
| 1. INTRODUCTION..... | 1 |
| Background on the NC Wildlife Action Plan | 1 |
| Background on the Decision Support Tools..... | 2 |
| Figure 1. Conservation Opportunity Area and Threat Risk Assessment website | 3 |
| 2. CONSERVATION OPPORTUNITY AREA DST | 4 |
| Components of the COA | 4 |
| Figure 2. Ecoregion Boundaries (map)..... | 4 |
| COA Tab, Ecoregions | 5 |
| Figure 3. COA Ecoregions & Habitats..... | 5 |
| Figure 4. Example: COAS FOR Sandhills Mixed Hardwood, Pine Forest & Managed Timberland | 5 |
| COA Tab, River Basins | 6 |
| Figure 5. River Basin Priorities Menu..... | 6 |
| SGCN List for COAs | 7 |
| Figure 6. Query Tool & Information Menu | 7 |
| Viewing the SGCN List for any HUC12 | 8 |
| Running a COA Analysis Step-by-Step Instructions | 8 |
| 3. THREAT RISK ASSESSMENT DST..... | 9 |
| Components of the TRA Tool | 9 |
| Figure 7. Exposure Risk Rating | 9 |
| Setup Tab | 10 |
| Analyze Tab | 10 |
| Figure 8. Data Thresholds | 11 |
| AOI Tab, Shapefile Upload (Green Menu Bar) | 12 |
| Figure 9. AOI Shapefile Upload | 12 |

| | |
|---------------------------------------------------------------|-----------|
| AOI Tab, New AOI (Red Menu Bar) | 12 |
| Figure 10. New AOI Creation | 12 |
| Figure 11. Command Buttons | 12 |
| Data Tab | 13 |
| Figure 12. DATA Tab metadata example | 14 |
| Print Tab | 14 |
| Figure 13. PRINT Tab..... | 14 |
| Running a TRA Analysis Step-by-Step Instructions | 15 |

4. USING STATISTICS AND MODELING TO ANALYZE THREATS IN AN AREA OF INTEREST (AOI) – Part 1..... 16

| | |
|--------------------------------------------------------------------------------------------------|----|
| Threat Severity – A Ranking of Threat Data..... | 16 |
| Example 1. Transportation Corridors – Divided Highways | 16 |
| Example 2. Cumulative Distribution Function – Analysis Results..... | 16 |
| Example 3. Cumulative Distribution Function – Threat Severity..... | 17 |
| Threat Occurrence | 17 |
| Example 4. Cumulative Distribution Function – Threat Occurrence (results for 0.8 threshold)..... | 17 |

USING STATISTICS AND MODELING TO ANALYZE THREATS IN AN AREA OF INTEREST (AOI) – Part 2..... 18

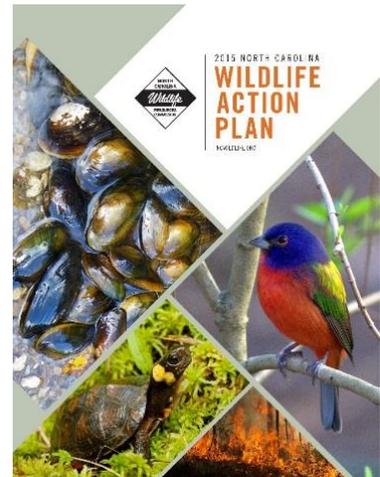
| | |
|----------------------------------------------|-----------|
| 1. Distinct Threat Count | 18 |
| 2. Individual Threat Occurrence Rating | 19 |
| 3. Individual Threat Severity Rating..... | 20 |
| 4. Composite Threat Count..... | 21 |
| 5. Composite Occurrence Rating | 22 |
| Definitions: What’s in the Analysis | 23 |
| Definitions: Bioenergy Scenario..... | 23 |

| | |
|----------------------------------------------------------|-----------|
| 5. ANATOMY OF A TRA REPORT | 24 |
| Title and SGCN List for HUC12 | 24 |
| Analysis Results, Summary for AOI | 25 |
| Analysis Results, Summary within 5 km Neighborhood | 26 |

1. INTRODUCTION

Background on the NC Wildlife Action Plan

The [2015 NC Wildlife Action Plan \(NCWAP, Plan\)](#) identifies fish and wildlife *Species of Greatest Conservation Need (SGCN)* and other species for which there are research or management priorities. The Plan describes 40 types of aquatic, wetland, and terrestrial natural communities that provide important habitat for SGCN and other priority species. Information on the state's 17 river basins is also provided.



The NCWAP matches SGCN to the habitat type or river basin where it is found, identifies the most important threats and critical problems facing the species and their habitats, and details priority conservation actions required to protect and conserve them. The primary goal of the NCWAP is to strategically target declining populations and imperiled animals and their required habitats early, thereby reducing the risk of extinction and precluding the need for listing under the Endangered Species Act. The Plan is available to download from the internet by visiting the NCWAP web site www.ncwildlife.org/plan.

A discussion about conservation actions that will benefit species requires consideration of the natural communities that provide the habitats they occupy. The concept of 'habitat' is based on the availability of the appropriate combination of food, cover, and water resources, climatic conditions, and other environmental conditions (e.g., competitors, predators, connectivity) that supports the ability of a species to survive and reproduce. Therefore, 'habitats' can be defined as the sum of all the resources a species needs to survive and persist. Efforts that benefit SGCN and other priority fish and wildlife can be specifically targeted by carefully considering conservation or management options within essential habitats.

Landscape composition varies across North Carolina, with elevation, moisture and temperature gradients, and soil textures having a significant influence on natural community structure. Given the complexities of natural communities and the variability of the organisms associated with them, local and regional landscape-scale approaches are used more often than species-specific approaches to accomplish conservation. Landscapes that are composed of multiple natural community types are more likely to contain the necessary resources to provide

habitats that support sustainable populations. The recommendations provided in the NCWAP are based on landscape-scale concepts.

Like the landscape concept, a guild concept is often used to provide a framework for discussions about habitat conservation that benefits multiple species and their natural communities. Groups of species that use the same resources, but are not taxonomically related, are often referred to as an ecological guild. As an aid when considering conservation and management actions based on guilds, a species–habitat association matrix is provided for SGCN in NCWAP Appendix H. This cross-walk matrix is formatted as a table and uses the ecoregions and natural communities described in Chapter 4 of the NCWAP. This species-habitat matrix forms the foundation for the DSTs. The table can be downloaded as an Excel compatible file from the NCWAP web page www.ncwildlife.org/plan.

Background on the Decision Support Tools (DST)

The NC Wildlife Resources Commission (**NCWRC**) is responsible for review and revision of the NCWAP. The first NCWAP was published in 2005. At a minimum, the Plan must be comprehensively reviewed and revised if needed at 10-year intervals. A description of the NCWAP, required topics, and review and revision guidelines can be found in Chapter 1 of the document.

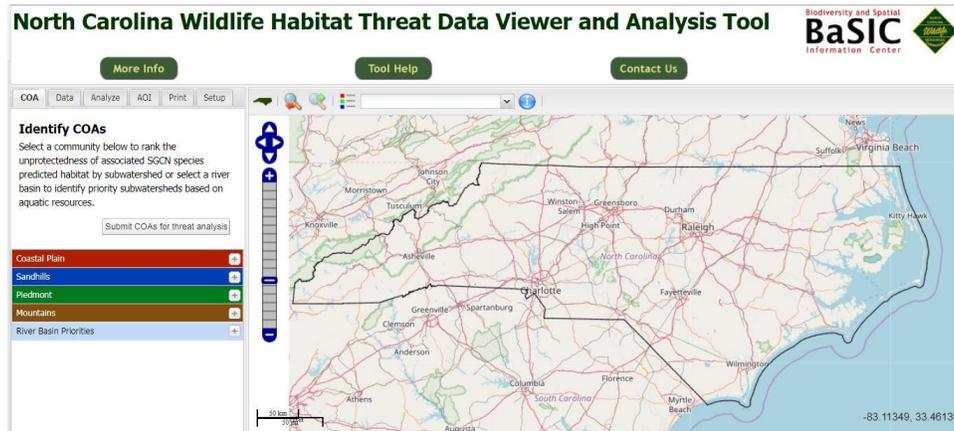
During the most recent 10-year revision cycle, the NCWRC followed best practice recommendations from the Association of Fish and Wildlife Agencies that called for states to develop spatial models and maps to provide information on SGCN, other at-risk wildlife, and key habitats. The recommendation was to use spatial models to analyze and identify areas likely to need conservation based on habitat threats such as urban growth, pollution, and the effects of climate change. To meet the recommendation, the NCWRC developed two new spatial modeling tools.

The NCWRC partnered with the Biodiversity and Spatial Information Center (BaSIC) at NC State University (NCSU) to develop decision support tools (**DST**) relevant to NCWAP priorities for species by way of habitats. The BaSIC is a collaborative effort funded by the US Geological Survey (USGS) and NCSU Southeast Climate Science Center to simulate future patterns of urban growth across a nine-state region over the next 50 years. The DSTs use GIS modeling to analyze spatial data and the results can be linked to conservation action priorities outlined in the NCWAP (see Chapters 3 and 4).

Results from DST analyses are presented on a map using a 12-digit Hydrologic Unit Code (HUC) classification system for sub-watershed drainage areas. Information about the HUC classification system is available from the USGS website <https://water.usgs.gov/GIS/huc.html>.

This user support guide provides information on both tools, how to use them, and tips for interpreting from the results of the COA or TRA analysis. Access to the DSTs is from the internet site <http://tecumseh.zo.ncsu.edu/coa> (Figure 1) or through a link provided on the NCWAP web site.

Figure 1. Conservation Opportunity Area and Threat Risk Assessment website



<http://tecumseh.zo.ncsu.edu/coa>

The information provided on the DST web site is dynamic and subject to change, including periodic updates and modifications. The information, data, and related graphics are not legal documents and are not intended to be used as such. Use of the DST and any analysis results do not constitute an endorsement by NCWRC and carries no financial obligation on the part of NCWRC.

The DST uses spatial modeling to analyze GIS data created by others. NCWRC is not responsible for any damage, loss or injury arising out of your access or inability to access this site; your use and interpretation of any results from this site; your purchase of goods, services, or property related to use of this site; the content displayed on this site; nor assume legal liability or responsibility for the accuracy, reliability, or completeness of the data described and/or contained within this web site and shall not be held liable for improper or incorrect use. It is the responsibility of the data user to use the data appropriately and consistent with these limitations.

2. CONSERVATION OPPORTUNITY AREA DST

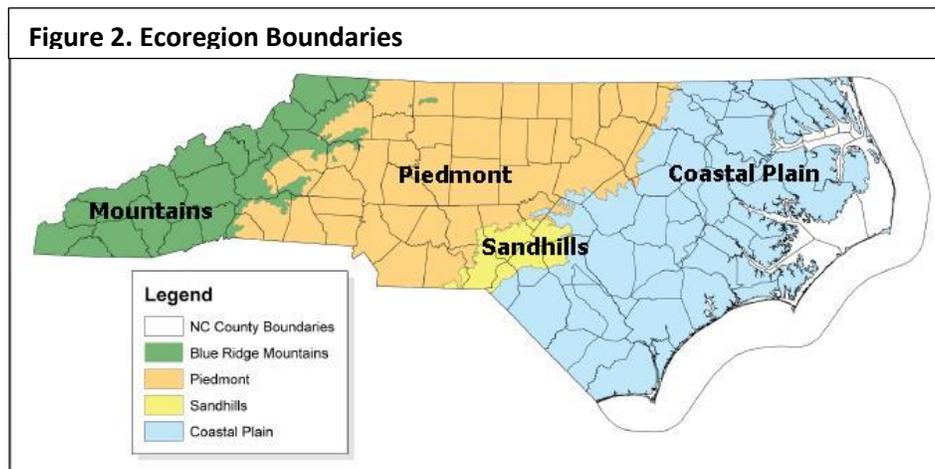
The Conservation Opportunity Area (**COA**) tool identifies areas predicted to contain the least amount of protected habitat for an ecoregion and natural community selected by the user. The top five areas from the analysis results are depicted on a map using HUC12 boundaries.

The datasets that form the foundation for the COA analysis are range maps for terrestrial species and the national land cover data developed by the USGS' [Southeast Gap Analysis Program](#) (GAP). As noted on the GAP web site, the composition and structure of dominant vegetation is an easily described measure of habitat for animals and can be used as an indirect indicator of animal distributions.

The predicted species distribution datasets used in the COA tool includes amphibians, mammals, reptiles, breeding birds, and wintering waterfowl. While aquatic habitats are represented in the COA tool, range maps for freshwater aquatic species (fish, mussels, crayfish, snails) are not provided in this version of the DST.

Components of the COA

The GAP range and land cover data has been correlated with a list of terrestrial SGCN and habitats in NCWAP Appendix H, a cross-walk table linking species with their habitats. The habitat and species information provided in the table is described in NCWAP Chapters 3 and 4. The four ecoregions used to group habitats used in the COA tool are described in NCWAP Chapter 4 and are shown in [Figure 2](#).



Ecoregions are often defined based on landscape settings and patterns that are influenced by climate, soils, land surface form, and potential natural vegetation. The boundaries used for these groupings can be useful for organizing, interpreting, and reporting information about land-use dynamics. The COA analysis results can be used to facilitate a wide

range of landscape-scale conservation planning. The following information describes the information found on the COA portion of the online DST.

COA Tab

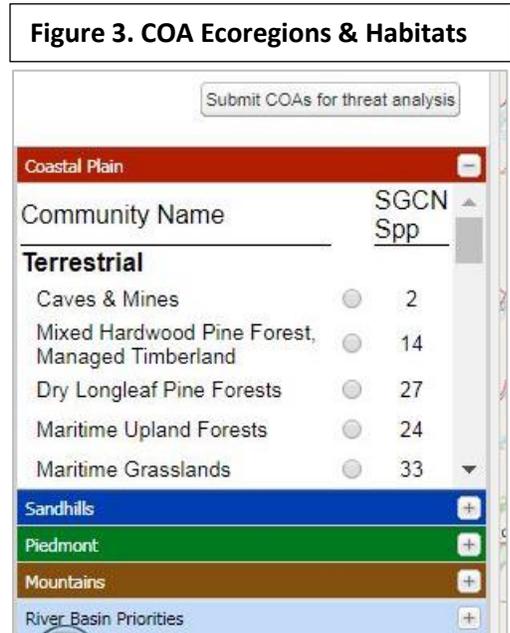
Select a natural community type to calculate how much of the predicted habitat is not protected within the ecoregion or select a river basin to identify the priority HUC12 subwatershed habitats described in the NCWAP.

Ecoregions

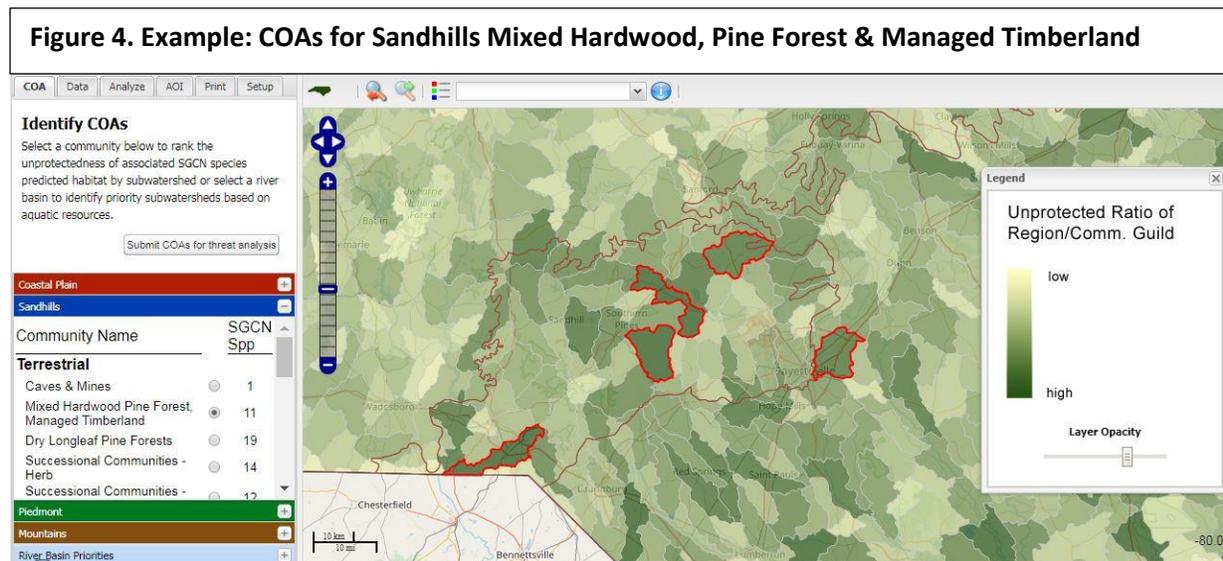
Natural communities are arranged by terrestrial, wetland, or aquatic type within the four ecoregions. [Figure 3](#) shows the Coastal Plain ecoregion Terrestrial habitats.

Habitats that occur statewide or in other ecoregions are listed multiple times. The number of SGCN associated with the habitat are shown to the right of the community name and may differ between ecoregions depending on predicted species distribution.

Results of a COA analysis will show the top five HUC12s predicted to have the most unprotected habitat; these are shown with red boundaries.



The 'Legend' color scale in [Figure 4](#) can be used to compare the ranking with other HUC12s. Darker colors indicate the least amount of protection and lighter colors indicate there are more protected areas containing the selected habitat type or less habitat type in that area.



Clicking the SUBMIT COAS FOR THREAT ANALYSIS button will open the ANALYZE tab (see Threat Risk Assessment section, page 9, for details). To complete a threat analysis, make selections for the desired target year (2000 to 2050), bioenergy scenario (none, conventional, or other), and threat categories to be analyzed. Bioenergy can refer to wood pellets burned to generate electricity or to liquid biofuels, and bioenergy sources range from crops like switchgrass and sweet sorghum to cultivated pine forests and natural pine and hardwood forest.

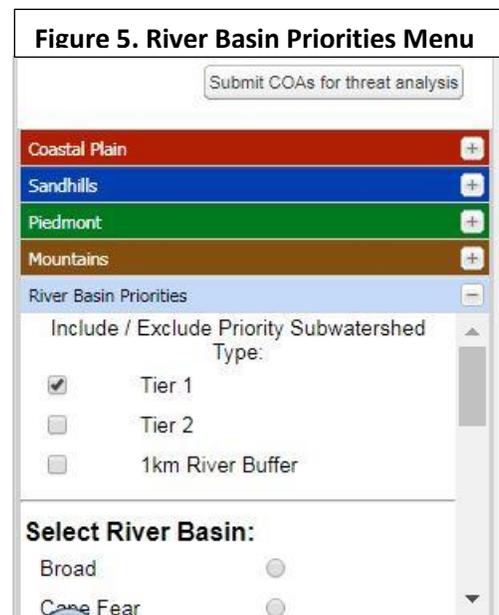
As a default, the ANALYZE tab will pre-select threat categories based on ecoregion. [Information about bioenergy scenarios](#) is available in [two research papers](#), both [published in 2016](#) and written by scientists with the USGS and NC Cooperative Fish and Wildlife Research Unit at NC State University. Exceptions to the default pre-selections are the following:

- Threat categories for Sea Level Rise are applied to the Coastal Plain ecoregion only.
- Threat categories for Energy Development Triassic Basin will apply to the Piedmont and Sandhills ecoregions; the Wind Energy threat will apply to all ecoregions.

River Basins

North Carolina’s 17 river basins are used by the COA tool to depict the HUC12 priorities described in NCWAP Chapter 4.5. The priorities are represented by Tier 1 and 2 and 1 km river buffers.

- Tier 1 = Presence of SGCN species (highest priority). SGCN have been documented through survey and monitoring projects.
- Tier 2 = Upstream protection of priority areas (high priority). These areas have been identified by NCWRC staff responsible for conducting SGCN survey and monitoring projects.
- 1 km river buffers = mainstem waterways for which riparian buffers have been designated to be a priority.



Expand the RIVER BASIN PRIORITIES tab to select priority type and a river basin of interest (see [Figure 5](#)). NCWAP Chapter 4.5 provides complete descriptions of the 17 river basins.

SGCN LIST FOR COAs

The COA tab does not provide an option to print a report. To print a list of SGCN for a COA use the query tool and select COA SGCN Info from the drop-down information menu at the top of the map. See [Figure 6](#).

- Click on one of the selected COAs to see the SGCN list.
- You can also click on any other HUC12 to create a list of SGCN for the habitat type selected on the COA tab.

Figure 6. Query Tool & Pull-down Information Menu



Viewing the SGCN List for a HUC12

1. To view a list of SGCN select an ecoregion and habitat type.
2. CLICK on the blue query tool button (**i**) in the tool bar.
3. Select 'COA SGCN Info' from the pull-down menu (See [Figure 6](#)).
4. CLICK on any HUC12 polygon and the list will open in a separate popup window. Hold the "SHIFT" key and hold the left mouse button to draw a box to zoom into any area.

Running a COA Analysis: Step-by-Step Instructions

1. On the COA tab, select the ecoregion and habitat type as your area of interest (AOI). The system analyzes habitats one at a time so additional habitat types will need to be selected individually.
2. CLICK the button next to the habitat name to run the COA analysis. The screen will automatically zoom out to display the entire state and the HUC12s determined to be COAs will be highlighted with a red outline.
3. To use an AOI shapefile, go to the AOI tab select an AOI method and to upload the required files. HUC12(s) associated with the AOI will be highlighted with a red boundary. See page 13 for a description of the AOI tab.
 - a. Use Green menu bar to choose files to upload a shapefile. CLICK the 'Upload Shapefiles' button. CLICK the 'Submit' button.
 - OR
 - b. Use Red menu bar to choose Predefined areas - OR – create a custom AOI. CLICK the "Submit' button.
4. To zoom to a selection or AOI polygon, hold the "SHIFT" key and hold the left mouse button to draw a box to define the zoom area.
5. To select any HUC12 other than the COAs, CLICK inside the boundary. Clicking inside a HUC12 boundary will select or deselect it.
6. To deselect any of the five highlighted COAs, CLICK inside the boundary.
7. To view a list of SGCN for a COA/HUC12, click on the blue query tool button (**i**) in the tool bar and select 'COA SGCN Info' from the pull-down menu next to the query tool. CLICK on the COA/HUC12 polygon and the list will open in a separate popup window.
8. CLICK the 'Submit COAs for threat analysis' button to run a Threats analysis. See page 14 for step-by-step instructions to run a TRA report.
9. To view a list of Threats and the analysis results, click on the blue query tool button (**i**) in the tool bar and select 'THREATS INFO' from the pull-down menu next to the query tool. CLICK on the AOI polygon and the list will open in a separate popup window.

3. THREAT RISK ASSESSMENT DST

The NC Wildlife Habitat Threat Risk Assessment (**TRA**) tool is a spatially explicit DST that uses modeling to predict future probability that specific threats will occur relative to terrestrial and aquatic habitats, specifically climate change and urbanization. This DST includes other types of threats that are not projected in time but whose occurrence on the landscape can create impacts or add to other types of impacts. Data for these static threats are updated periodically and the DST will also be updated appropriately.

- The TRA tool will allow users to explore individual threats or a combination of threats in a spatial environment as well as being able to combine and weigh components in user-defined configurations to highlight specific threats and develop specific scenarios of future trends.
- Users can assess risks in terms of the number of threats (occurrence), the proximity of threats, and their severity, or how well represented is a given threat within or in proximity to a parcel of land of interest.

The TRA tool is intended to give managers, decision makers, and other users an accessible and flexible tool to help assess risks to wildlife populations, and ultimately, inform decisions. Details about the statistical analysis aspects of the TRA model are provided at the end of this user guide.

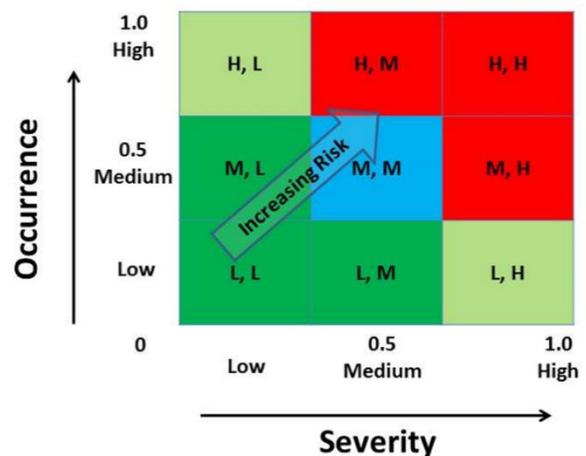
Components of the TRA Tool

The TRA tool evaluates threats within an Area of Interest (**AOI**). The boundaries of the AOI will fall within one or more HUC12s. The analysis considers how many threats are predicted to occur and the proximity of those threats to the AOI (e.g., occurrence) and measures the intensity (e.g., severity) of the threat within the AOI. Several threats can be modeled for a specific decade between 2000 and 2050.

Results are interpreted using a rating matrix based on a 0 to 1 scale, where 0 to 0.5 indicates low to medium/moderate risk and 0.5 to 1 indicates medium/moderate to high risk. The Exposure Risk Rating image (see [Figure 7](#)) is a Bayesian comparison graphic that provides a visual representation of how to interpret the occurrence and severity ratings.

The following list of 11 threat categories represents 20 different GIS shapefile layers used in the DST analysis.

Figure 7. Exposure Risk Rating



Threat Categories

1. Habitat loss – Forest, Wet Forest, Wet Herbaceous, Open, Scrub/Shrub (2010-2050 modeling)
2. Urban growth – Predicted urban development (2010-2050)
3. Fire suppression – Density of urban development (2010-2050)
4. Transportation – Divided center line highways (2010-2050)
5. Sea level rise – Undeveloped upland and terrestrial land cover change (2010-2050)
6. Nutrient loading – Manure and synthetic nitrogen fertilizer application
7. Atmospheric deposition – Total nitrogen and sulfur deposition
8. Energy development – Triassic basin (fracking) and wind power
9. Forest health – Forest insect/disease risk
10. Hydrologic alteration – Number of dams
11. Impaired waters 303(d) – Biota and metal impairments

Setup Tab

The SETUP tab allows the user to select from several boundary data layers that can be drawn on the map to help orient the user. These include state, county, ecoregion, bird conservation region, and several watershed delineations. The user also can set the background image to show satellite imagery, a street map, or no background.

- Turning on “County Boundaries,” as a minimum, may be the easiest way for the user to navigate to parts of the state that are of conservation interest.
- Using “Ecoregion Boundaries” can help determine the area on the COA tab to select to find natural communities (habitats) of interest.
- Select ‘Watershed Boundaries’ to display HUC12s and “Subbasin Boundaries” to see a larger area of multiple HUC12s.

Analyze Tab

The ANALYZE tab contains the list of threats that can be selected by the user for spatial analysis. The user can select a decade time step (i.e., 2030) to target habitat loss, urban growth, fire suppression, and transportation corridor threats to analyze their impacts over time.

To complete a threat analysis, make selections for the desired target year (2000 to 2050), bioenergy scenario (none, conventional, or other), and threat categories to be analyzed. Bioenergy can refer to wood pellets burned to generate electricity or to liquid biofuels, and bioenergy sources range from crops like switchgrass and sweet sorghum to cultivated pine forests and natural pine and hardwood forest.

As a default, the ANALYZE tab will pre-select threat categories based on ecoregion. Information about bioenergy scenarios can be found in two research papers, both published in 2016 and written by scientists with the USGS and NC Cooperative Fish and Wildlife Research Unit at NC State University.

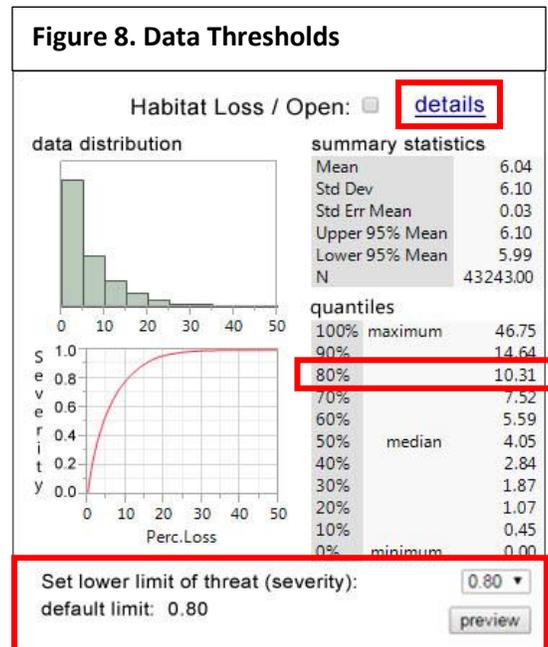
- Threat categories for Sea Level Rise are applied to the Coastal Plain ecoregion only.
- Threat categories for Energy Development Triassic Basin will apply to the Piedmont and Sandhills ecoregions; the Wind Energy threat will apply to all ecoregions.

Each threat has been assigned a default lower limit of threat severity; each default limit is based on a 0 to 1.0 scale. Clicking on “details” next to the threat name opens a graph and scale depicting default thresholds.

In the [Figure 8](#) example, the default limit for loss of Open habitat has been set to a threshold level of 0.8. A default threat severity of 0.80 is calculated as 10.31% Open habitat loss in the AOI.

- Interpretation: when the model predicts loss of Open Habitat is 10.31% or greater, this threat is reported as occurring in the AOI. When the predicted loss is less than the threshold limit, the threat is not reported as occurring in the AOI.

The threshold limits can be adjusted by the user. Setting a lower limit allows the user to review whether a lower threat severity will have a more (or less) severe impact to the type of habitat targeted in the analysis.



Each threat has a PREVIEW button that displays the results of changing the severity limit. Once an analysis is configured, the user can view the resulting threat count map and/or a comprehensive report detailing threat occurrence and severity.

AOI Tab

The AREA OF INTEREST (AOI) tab provides several methods to set an area where the analysis will take place. There are two menus, one allows for a shapefile upload (**green menu bar**, see [Figure 9](#)) and the other provides several predefined options (**red menu bar**, see [Figure 10](#)).

Shapefile Upload (Green Menu Bar)

For ArcGIS shapefiles that contain a *single* polygon, upload requires the *.shp, *.shx, and *.prj files.

Shapefiles containing *more than one* polygon must include a “Name” field that includes identification for each polygon and a *.dbf file is required in the upload.

Generally, clicking the ‘Choose Files’ button, then highlighting all of the files associated with the shapefile will fill in the appropriate requirements for the upload. Click the UPLOAD SHAPEFILES button to complete the process.

New AOI (Red Menu Bar)

Use the ANALYZE tab to select a decade period, bioenergy option, and threat(s) to be analyzed. See page 22 for bioenergy scenario definitions.

- Predefined Selections. A drop-down menu provides predefined boundary selections for counties, bird conservation regions (BCR), river basins, sub-basins, and watersheds (see [Figure 10](#)).

Click on the predefined selection from the drop-down menu, then click any place on the map to select an AOI. For example, if you selected ‘Counties’ from the drop-down menu, clicking on a county will result in that county boundary being highlighted by a darker boundary line. There is also the option to select multiple areas by holding the ‘Shift’ key while clicking to select the areas.

- Update COA Watersheds. Click any place on the map and the HUC12 will be highlighted. The COAs for any natural community types you selected on the COA tab will be deselected. Click the SUBMIT button to use the newly selected HUC12(s) in the threat analysis.

Figure 9. AOI: Shapefile Upload

The screenshot shows the 'Shapefile Upload' panel in the North Carolina Wildlife Tool. The panel has a green header with 'Shapefile Upload' and a minus sign. Below the header is a 'Choose Files' button and the text 'No file chosen'. There are four text input fields labeled SHP, SHX, PRJ, and DBF. At the bottom is an 'upload shapefiles' button. The background shows the tool's navigation tabs: COA, Data, Analyze, AOI, Print, and Setup.

Figure 10. New AOI Creation

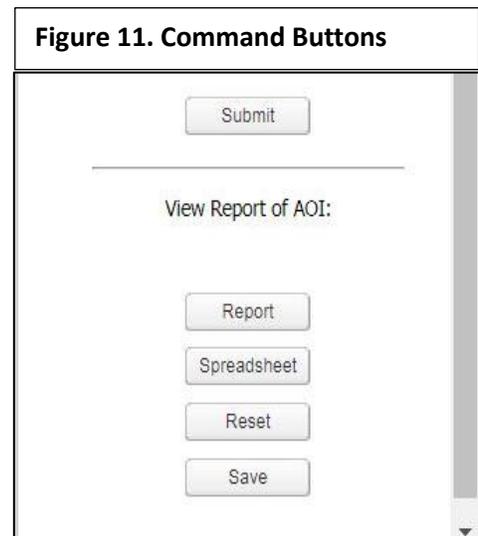
The screenshot shows the 'New AOI' panel in the North Carolina Wildlife Analysis Tool. The panel has a red header with 'New AOI' and a minus sign. Below the header is the 'AOI creation' section. It includes a 'Predefined selections:' dropdown menu, an 'Area Of Interest (AOI) type:' section with four radio button options: 'predefined', 'update COA subwatersheds', 'custom polygon', and 'custom point buffer'. The 'custom point buffer' option has a text input field with the value '3'. At the bottom is a 'Submit' button. The background shows the tool's navigation tabs: COA, Data, Analyze, AOI, Print, and Setup.

- **Custom Point Buffer.** Click any place on the map to create a single point. Click the SUBMIT button to generate a polygon representing a 3km radius from that point. This will be used by the tool as the AOI and the HUC12(s) that contain the AOI will be highlighted by red boundary lines.

Use the scroll bar along the right side of the AOI Creation box to reach the SUBMIT, REPORT, SPREADSHEET, RESET, and SAVE command buttons (see [Figure 11](#)).

Clicking the REPORT button will open a PDF summary of the threat analysis results. The REPORT summarizes threats in several ways.

- *Distinct Threat Count* is how many threats occur within the area of interest (the number occurring out of the total number selected by the user on the Analyze tab).
- *Occurrence Rating* is a measurement of how pervasive threats are throughout the AOI (as a percentage of the AOI area).
- *Individual Threat Occurrence and Severity* is mean occurrence and severity for each distinct threat listed in the report (as selected by the user on the Analyze tab).



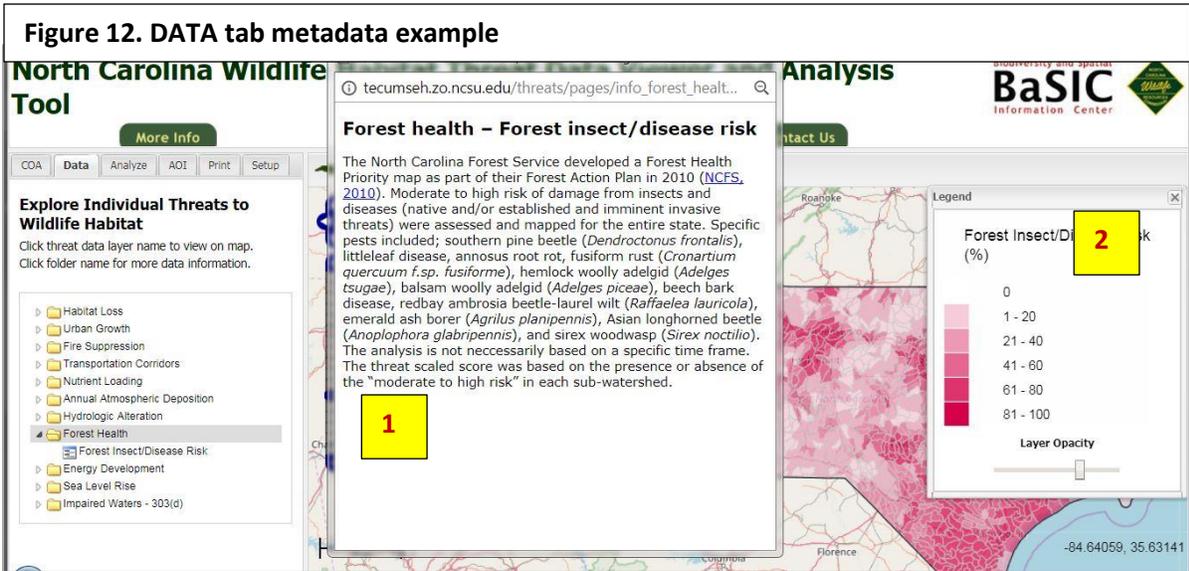
Clicking the SPREADSHEET button will download a compressed ZIP file with an Excel compatible spreadsheet containing the threat analysis results.

Click the RESET button to remove any selections.

Data Tab

The DATA tab lists each of the threat data layers grouped by subject. Clicking on the name of the threat will open a window with metadata information about the threat, including citations and sources (see [1](#) in [Figure 12](#)).

The user can view statewide results for a single threat data layer by clicking on the threat layer name. The results are depicted as a color gradient map, where the threat is predicted to have the highest (darkest color) to lowest (lightest color) impacts. Turn on the Legend to view the scale that applies to that threat (see [2](#) in [Figure 12](#)).



Print Tab

The PRINT tab generates a PDF of the current map (Figure 13). The user must enter a title and any other comments in the box.



Running a TRA Analysis: Step-by-Step Instructions

The query selection tool must be off. If it is on, CLICK on the blue (i) icon in the toolbar to deselect it.

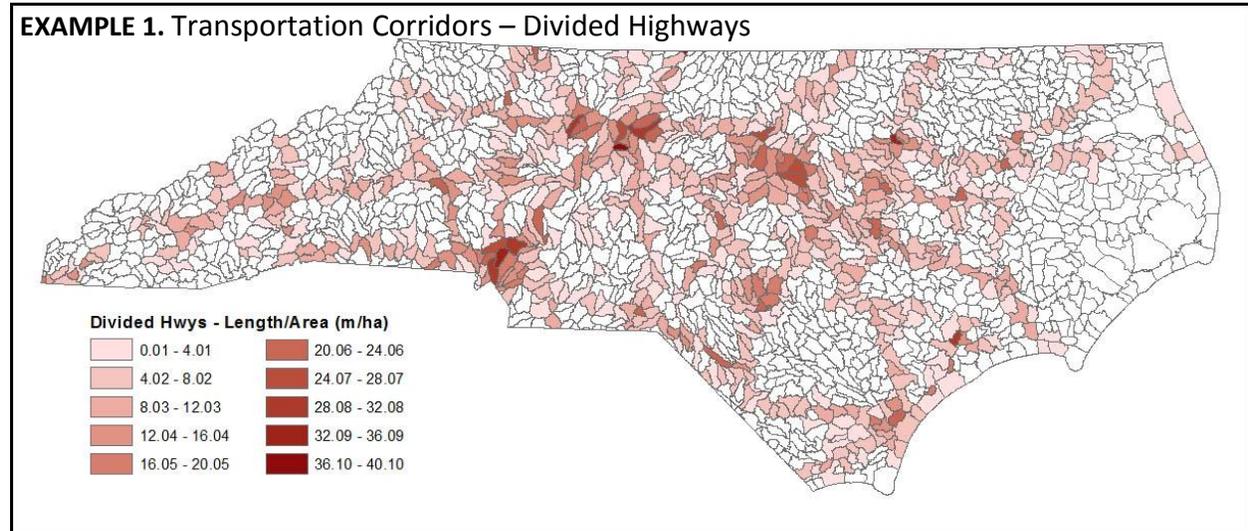
Use SHIFT & LEFT mouse button to draw a zoom box on the map.

4. On the SETUP tab, select 'Boundaries' of interest. Selecting 'Ecoregion' and 'Watershed Boundaries' will help you to re-orient your view when the screen image changes (zooms in/out).
5. To include a list of SGCN (optional): On the COA tab, select the ecoregion and habitat type of interest.
6. On the AOI tab, select an AOI method. HUC12(s) associated with the AOI will be highlighted with a red boundary.
 - c. Use Green menu bar to choose files to upload a shapefile.
CLICK the 'Upload Shapefiles' button. CLICK the 'Submit' button.
 - OR
 - d. Use Red menu bar to choose Predefined areas - OR - create a custom AOI.
CLICK the "Submit' button.
7. On the ANALYZE tab, select the 'Target Year' and 'Bioenergy Scenario' from the drop-down menus. CLICK in the box next to the threat name to select it for the analysis. CLICK the 'Submit' button.
 - e. To change the Data Threshold for any threat, CLICK on 'Details' next to the name and enter a new threshold in the box or use the slider to adjust. To close the info window, CLICK on 'Details' again.
8. To view a color scale of number of threats present, turn on the 'Legend' by CLICKING on the legend icon in the tool bar.
9. CLICK on the 'Report' button to view a summary report of the analysis.

To start over, use the refresh button for your internet browser.

4. USING STATISTICS AND MODELING TO ANALYZE THREATS IN AN AREA OF INTEREST (AOI) – Part 1

Many threats have highly skewed distribution on the landscape – entirely absent in many areas with relatively rare high values (see [Example 1](#)).

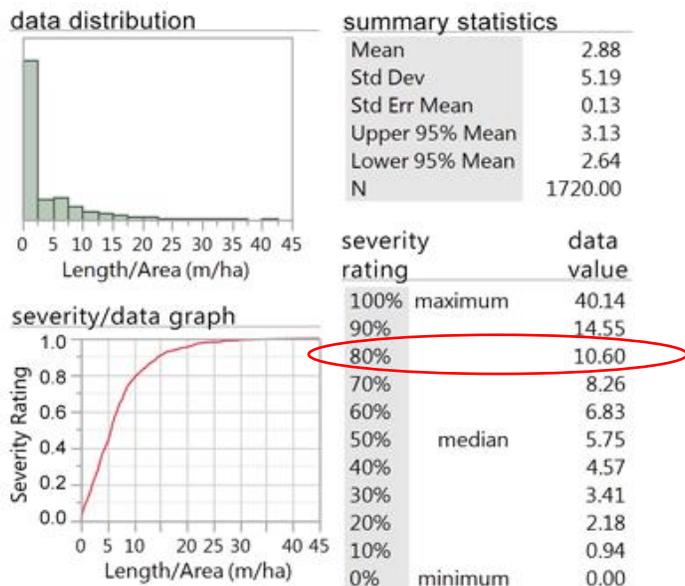


THREAT SEVERITY – A RANKING OF THREAT DATA

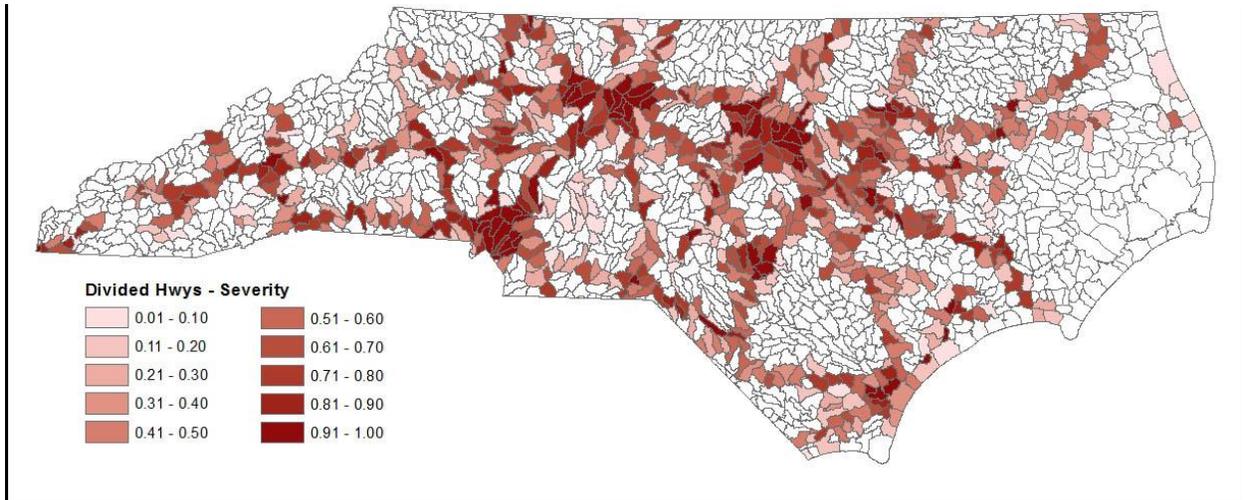
The model uses a cumulative distribution function (CDF) to set a severity scale ranging from 0.0 to 1.0 for each threat. Users can see the relationship between the raw data of the threat and its severity ranking within the pool of non-zero data (see [Example 2](#)).

When the analysis results are equal to or greater than the threshold limit, the threat is predicted to occur and will be displayed in a map (see [Example 3](#)).

EXAMPLE 2. Cumulative Distribution Function – Analysis Results



EXAMPLE 3. Cumulative Distribution Function – Threat Severity



Transportation Corridors – Divided Highways

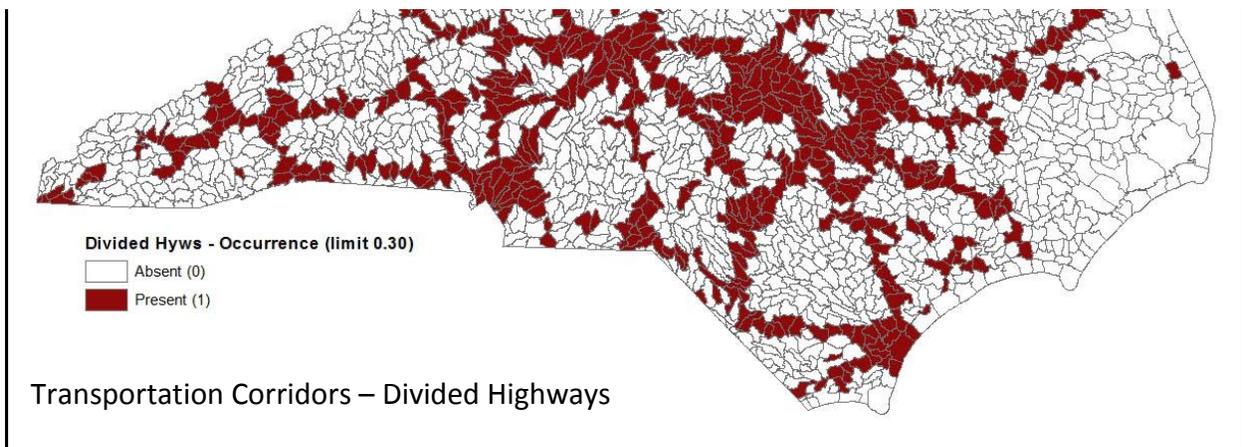
Users can adjust the default threshold for any threat. This example uses 0.3 as the threshold and shows the scaled results in the map. Using a CDF to derive severity scores provides visual results for threat exposure.

THREAT OCCURRENCE

If a threat value is above a set minimum threshold, it is predicted to occur. Otherwise, it is said to be absent.

Notice that everything in the color scale ranked 0.01 to 0.3 is no longer represented in the map (compare [Examples 3 and 4](#)).

EXAMPLE 4. Cumulative Distribution Function – Threat Occurrence (results for 0.8 threshold)



Transportation Corridors – Divided Highways

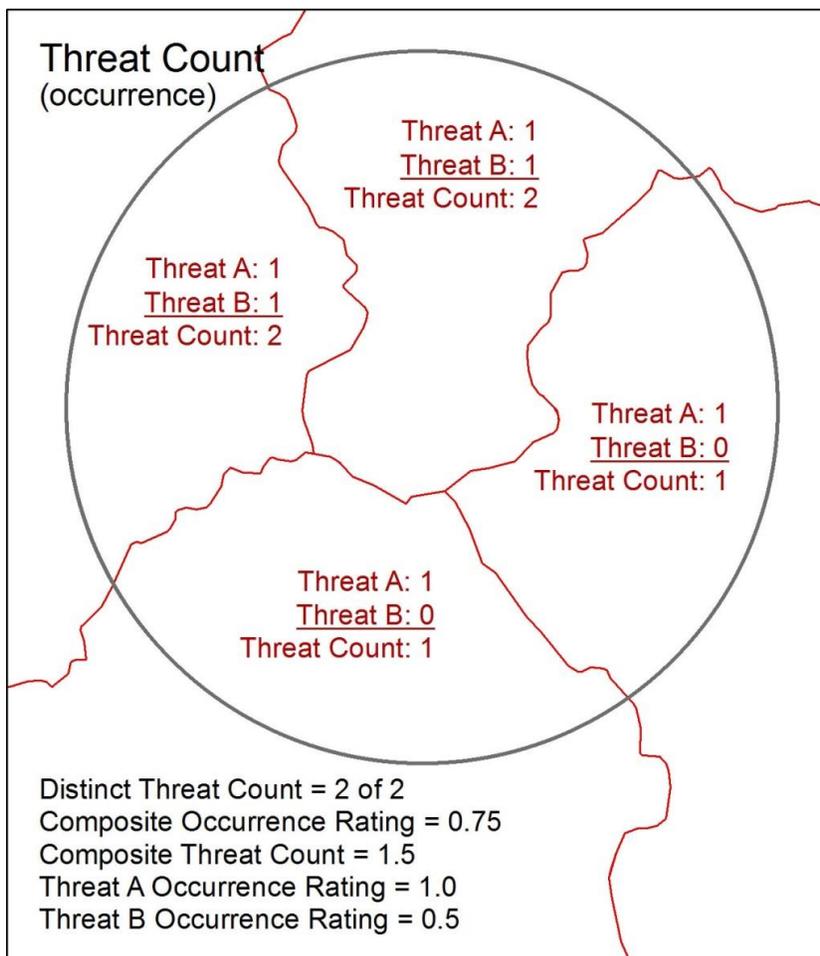
4. USING STATISTICS AND MODELING TO ANALYZE THREATS IN AN AREA OF INTEREST (AOI) – Part 2

1. Distinct Threat Count

The number of threats present within the AOI.

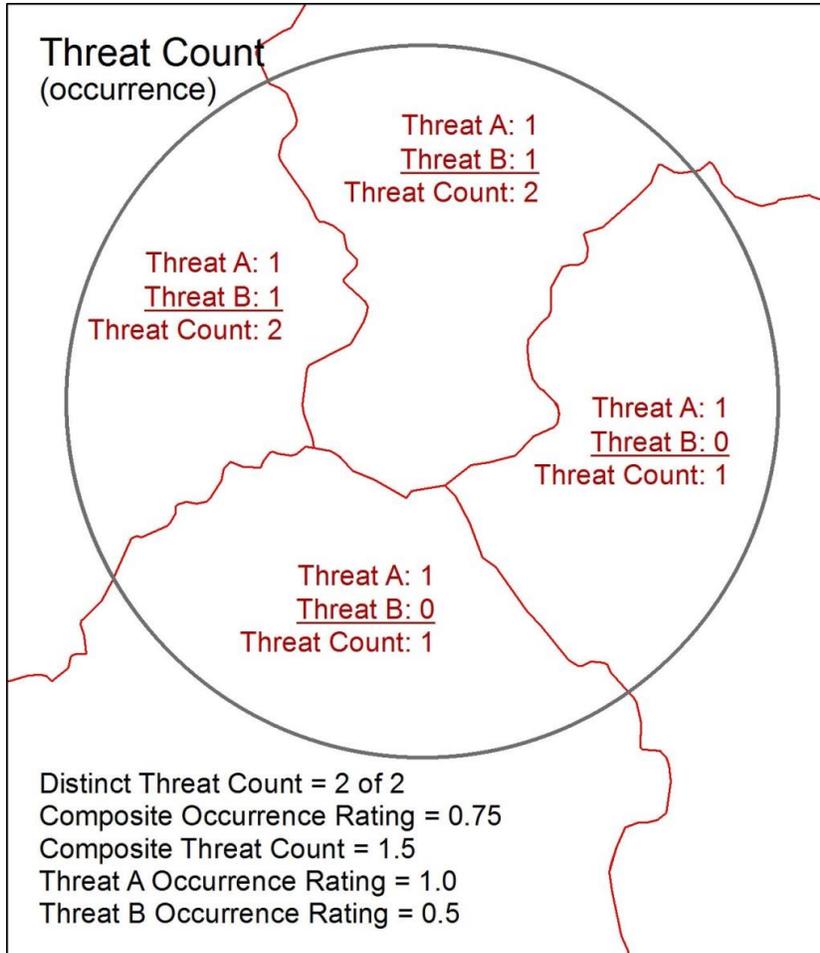
Several threats may be selected on the ANALYZE tab, but not all may occur in the AOI. In this example, each of 2 threats included in the analysis occurred in the AOI, therefore, the threat count is 2 of 2.

The red wavy lines represent boundaries of a subwatershed (HUC12).
The black circle represents an AOI.



2. Individual Threat Occurrence Rating

Probability that a specific threat occurs within an AOI.



Number of HUC12s in AOI = 4

Number of occurrences in the AOI:

Threat A: 1+1+1+1 = 4

Threat B: 1+1+0+0 = 2

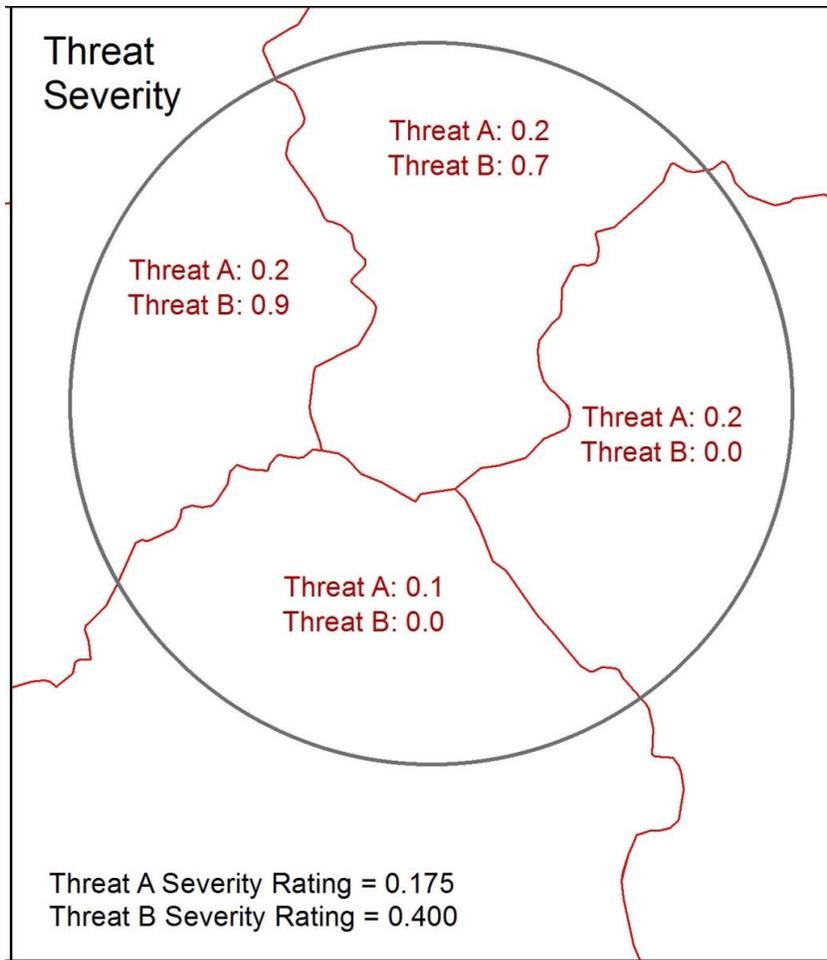
Individual Threat Occurrence Ratings

Threat A: $4/4 = 1$

Threat B: $2/4 = 0.5$

3. Individual Threat Severity Rating

A measure of the mean (statistical) severity of a threat within an AOI.



The severity rating is calculated by averaging the scaled scores per HUC12 in an AOI. There are 4 subwatersheds in the example and 2 threats in the analysis.

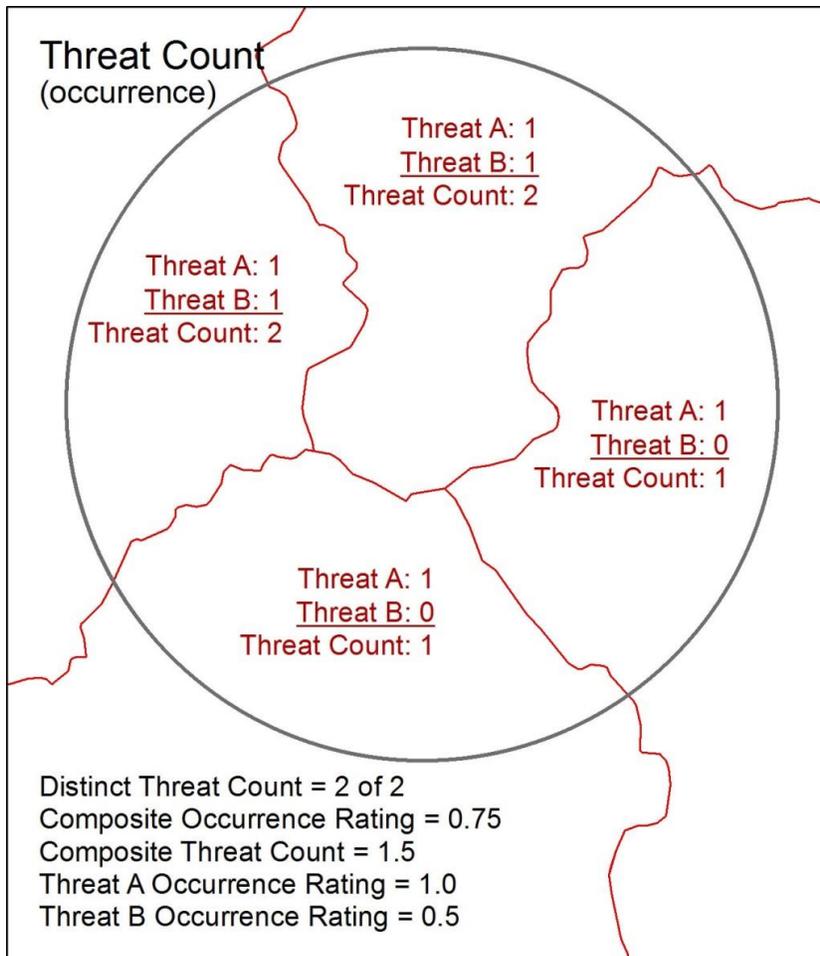
Number of HUC12s in AOI = 4

Threat A: $(0.2+0.2+0.2+0.1) / 4 = 0.175$

Threat B: $(0.9+0.7+0.0+0.0) / 4 = 0.400$

4. Composite Threat Count

The average number of threats that occur in each HUC12 within an AOI.



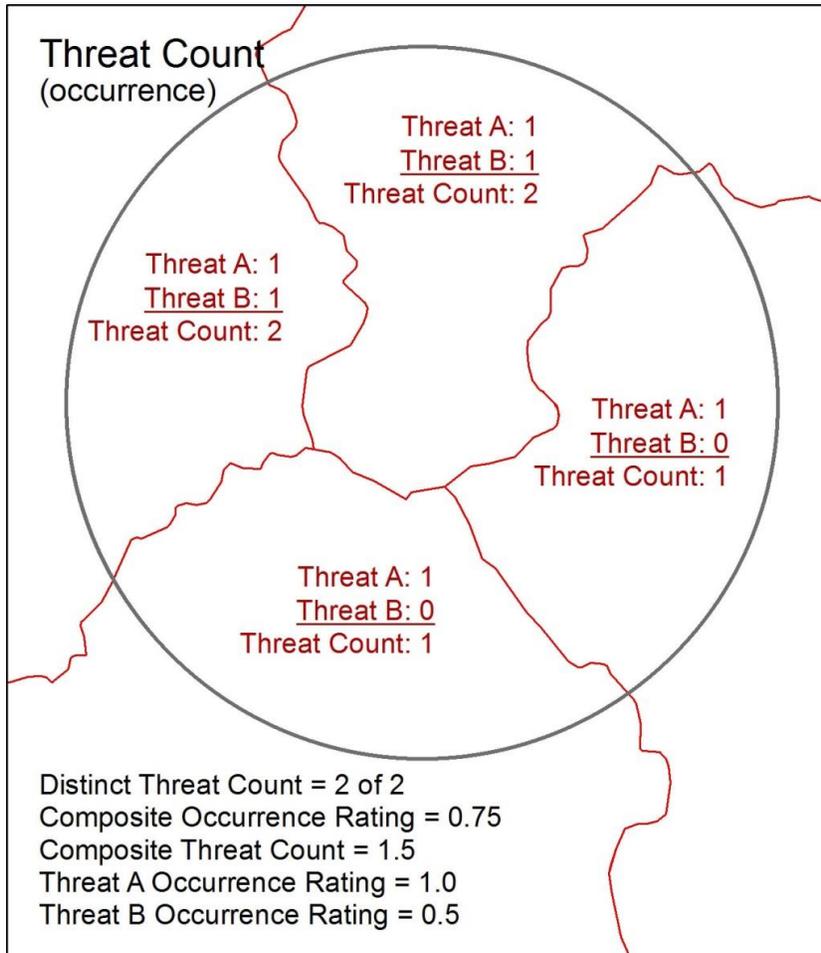
Number of HUC12s in the AOI = 4

Number of times each threat occurs in the AOI: $2+2+1+1 = 6$

Composite Threat Count: $6/4 = 1.5$

5. Composite Occurrence Rating

Combined measurement of threat probabilities within an AOI.



Number of times each threat occurs in the AOI: $2 + 2 + 1 + 1 = 6$

Number of potential threat occurrences in the AOI = 8

Composite Occurrence Rating: $6/8 = 0.75$

DEFINITIONS: What's in the Analysis

| | |
|------------------------------------------------|--------------------------------------------------------------------------------|
| 1. Distinct Threat Count | tally of different threats within or in proximity of an area of interest (AOI) |
| 2. Occurrence Rating, Individual Threat | probability that a specific threat occurs within or in proximity of an AOI |
| 3. Severity Rating, Individual Threat | mean severity of a threat within or in proximity of an AOI |
| 4. Composite Threat Count | average number of threats per HUC12 within or in proximity of an AOI |
| 5. Composite Occurrence Rating | probability that distinct threats occur within or in proximity of an AOI |

DEFINITIONS: Bioenergy Scenarios - Bioenergy (feedstocks) can refer to wood pellets burned to generate electricity or to liquid biofuels, and bioenergy sources range from crops like switchgrass and sweet sorghum to cultivated pine forests and natural pine and hardwood forest.

| | |
|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| None | Baseline scenario. Business-as-usual production of conventional forest products; no bioenergy production. |
| Conventional | Increased conventional forestry for bioenergy. - 100% of scenario derived from planted and natural forests. |
| Conventional + Marginal Ag. | Increased conventional forestry and conversion of agricultural lands for bioenergy. - 15% of scenario derived from planted and natural forests. - 85% of scenario derived from conversion of agricultural lands on marginal soils to purpose-grown feedstocks. |
| Conventional + M.Ag. & Forest | Increased conventional forestry and conversion of agricultural lands and forests for bioenergy. - 15% of scenario derived from planted and natural forests. - 42.5% of scenario derived from conversion of agricultural lands on marginal soils to purpose-grown feedstocks. - 42.5% of scenario derived from conversion of forests on marginal soils to purpose-grown feedstocks. |
| Marginal Agriculture | Conversion of agricultural lands for bioenergy. - 100% of scenario derived from conversion of agricultural lands on marginal soils to purpose-grown feedstocks. |
| Marg. Ag. & Forest | Conversion of agricultural lands and forests for bioenergy. - 50% of scenario derived from conversion of agricultural lands on marginal soils to purpose-grown feedstocks. - 50% of scenario derived from conversion of forests on marginal soils to purpose-grown feedstocks. |

5. ANATOMY OF A THREAT RISK ASSESSMENT (TRA) REPORT: Title and SGCN List

Report

Year 2020

Associated SCGN Species

Sandhills / Dry Longleaf Pine Forests

spreadsheet ([/wps/ssheet/ncthreatszpyQpH.zip](#))

Click on this link to download results in Excel compatible format

1. Target Year

2. Ecoregion and
Habitat Name

3. HUC12 Number/Name

Report contains results for each HUC12
crossed by the AOI boundary

Polygon name: 030300040302

| Common Name | Scientific Name | Protected Acres | Unprotected Acres | Total Acres | Percent Unprotected |
|--------------------------|----------------------------|-----------------|-------------------|-------------|---------------------|
| Gopher Frog | Lithobates capito | 16 | 9,529 | 9,545 | 100% |
| Pine Barrens Treefrog | Hyla andersonii | 2 | 1,263 | 1,264 | 100% |
| American Kestrel | Falco sparverius | 29 | 5,935 | 5,964 | 100% |
| Bachman's Sparrow | Aimophila aestivalis | 6 | 5,211 | 5,217 | 100% |
| Brown-headed Nuthatch | Sitta pusilla | 34 | 14,244 | 14,278 | 100% |
| Kentucky Warbler | Oporomis formosus | < 1 | 99 | 99 | 100% |
| Loggerhead Shrike | Lanius ludovicianus | 18 | 3,656 | 3,674 | 99% |
| Northern Bobwhite | Colinus virginianus | 22 | 17,311 | 17,333 | 100% |
| Red-cockaded Woodpecker | Picoides borealis | 12 | 10,358 | 10,370 | 100% |
| Red-headed Woodpecker | Melanerpes erythrocephalus | 37 | 20,311 | 20,348 | 100% |
| Yellow-throated Warbler | Dendroica dominica | 14 | 2,945 | 2,959 | 100% |
| Eastern Pipistrelle | Pipistrellus subflavus | 56 | 24,691 | 24,748 | 100% |
| Little Brown Myotis | Myotis lucifugus | 36 | 19,029 | 19,065 | 100% |
| Slender Glass Lizard | Ophisaurus attenuatus | 25 | 19,314 | 19,340 | 100% |
| Southern Hog-nosed Snake | Heterodon simus | 17 | 13,346 | 13,363 | 100% |

4. Protected Acres based on SEGAP
Land Cover and Managed Areas
within the AOI

5. Total Acres based on SEGAP
Land Cover within the AOI

5. ANATOMY OF A THREAT RISK ASSESSMENT (TRA) REPORT: Analysis Results

Summary for AOI

Number of Sub-watersheds: 1

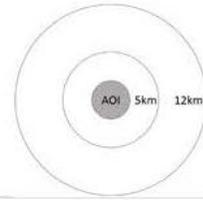
Distinct Threat Count: 4 of 17

Occurrence Rating: 23%

1. The AOI is in one HUC12

2. User selected 17 threats on the ANALYZE tab. Only 4 of the threats occur in the AOI

3. Modeling results predict threats occur in 23% of the AOI



| | | | Mean | S.D. | Min. | Max |
|----------------------------------|-------------------|-----------------|---------------|---------------|---------------|-------------------------|
| Composite Threat Count | | | 4.0 | na | 4.0 | 4.0 |
| Threat Name (data threshold) | Occurrence (0 -1) | Severity (0 -1) | Severity S.D. | Severity Min. | Severity Max. | Data Mean |
| Forest Baseline - (10.2) | 1.0 | 0.93 | na | 0.934722 | 0.934722 | 18.52 % lost since 2000 |
| Wet forest Baseline - (6.28) | 0.0 | 0.16 | na | 0.161074 | 0.161074 | 0.09 % lost since 2000 |
| Wet herbaceous Baseline - (4.42) | 0.0 | 0.0 | na | 0.0 | 0.0 | 0.0 % lost since 2000 |
| Open Baseline - (10.31) | 0.0 | 0.43 | na | 0.439943 | 0.439943 | 2.37 % lost since 2000 |
| Scrub Baseline - (8.14) | 0.0 | 0.0 | na | 0.0 | 0.0 | 0.0 % lost since 2000 |
| Urban Growth - (29.05) | 0.0 | 0.7 | na | 0.704198 | 0.704198 | 14.08 % area |
| Fire Suppression - (45.95) | 0.0 | 0.71 | na | 0.717911 | 0.717911 | 37.65 urban density |
| Highway - (10.6) | 0.0 | 0.0 | na | 0.0 | 0.0 | 0.0 meters/hectares |
| Triassic Basin - (19.32) | 0.0 | 0.26 | na | 0.263736 | 0.263736 | 15.67 % area |
| Manure Application - (16.03) | 1.0 | 0.82 | na | 0.824579 | 0.824579 | 19.42 kg/ha/yr |
| Synthetic Nitrogen - (15.82) | 0.0 | 0.23 | na | 0.231638 | 0.231638 | 3.46 kg/ha/yr |
| Total Nitrogen - (11.66) | 0.0 | 0.47 | na | 0.4739 | 0.4739 | 10.9 kg/ha/yr |
| Total Sulfur - (11.68) | 0.0 | 0.4 | na | 0.4006 | 0.4006 | 10.02 kg/ha/yr |
| Forest health - (23.61) | 1.0 | 0.61 | na | 0.619793 | 0.619793 | 54.14 % area impacted |
| # of dams - (8) | 1.0 | 0.93 | na | 0.933974 | 0.933974 | 11.0 n |
| Impaired biota - (3.39) | 0.0 | 0.0 | na | 0.0 | 0.0 | 0.0 km* stream density |
| Impaired metal - threshold(1.92) | 0.0 | 0.0 | na | 0.0 | 0.0 | 0.0 km* stream density |

4. The DATA THRESHOLD value represents the default (0.0 to 1.0) set for each threat. See the DATA tab for default threshold values for each threat. The DATA THRESHOLD values can be changed for each threat on the DATA tab.

The SEVERITY (0 – 1) value represents the calculated percentile of a threat within the AOI.

The DATA MEAN represents the predicted impact of the threat within the AOI. When the value is greater than the DATA THRESHOLD value (see 1st column), the threat OCCURRENCE (see 2nd column) will be 1.

4. ANATOMY OF A THREAT RISK ASSESSMENT (TRA) REPORT: Analysis Results

The model also looks at the area surrounding the AOI using a 5 km and 12 km buffer.

This information is included in the report for each HUC12 that the AOI crosses.

Summary w/in 5 km Neighborhood

Number of Sub-watersheds: 12

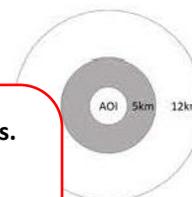
Distinct Threat Count: 7 of 17

Occurrence Rating: 12%

A larger Neighborhood area will cross more HUC12s.

More threats can occur in the larger area.

The occurrence rating indicates the 7 threats occur only in a portion of all the HUC12s in the AOI.



| | Min. | Max |
|------------------------|------|-----|
| Composite Threat Count | 1.0 | 5.0 |

| | Occurrence (0 -1) | Severity (0 -1) | Severity S.D. | Severity Min. | Severity Max. | Data Mean |
|----------------------------------|-------------------|-----------------|---------------|---------------|---------------|-------------------------|
| Forest Baseline - (10.2) | 0.59 | 0.64 | 0.2888 | 0.0 | 0.93125 | 10.78 % lost since 2000 |
| Wet forest Baseline - (6.28) | 0.0 | 0.3 | 0.2093 | 0.0 | 0.697028 | 0.49 % lost since 2000 |
| Wet herbaceous Baseline - (4.42) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 % lost since 2000 |
| Open Baseline - (10.31) | 0.0 | 0.38 | 0.1882 | 0.027008 | 0.579957 | 2.15 % lost since 2000 |
| Scrub Baseline - (8.14) | 0.0 | 0.0 | 0.0281 | 0.0 | 0.097561 | 0.02 % lost since 2000 |
| Urban Growth - (29.05) | 0.09 | 0.62 | 0.1691 | 0.278626 | 0.911578 | 13.36 % area |
| Fire Suppression - (45.95) | 0.25 | 0.69 | 0.1246 | 0.504869 | 0.925052 | 40.45 urban density |
| Highway - (10.6) | 0.17 | 0.34 | 0.3516 | 0.0 | 0.942363 | 4.81 meters/hectares |
| Triassic Basin - (19.32) | 0.0 | 0.03 | 0.0709 | 0.0 | 0.197802 | 1.36 % area |
| Manure Application - (16.03) | 0.17 | 0.61 | 0.2153 | 0.220539 | 0.894949 | 10.56 kg/ha/yr |
| Total Sulfur - (11.68) | 0.0 | 0.23 | 0.1607 | 0.0445 | 0.5105 | 9.56 kg/ha/yr |
| Forest health - (23.61) | 0.75 | 0.54 | 0.2849 | 0.109306 | 0.941211 | 49.75 % area impacted |
| # of dams - (8) | 0.09 | 0.51 | 0.3621 | 0.0 | 0.951282 | 4.33 n |
| Impaired biota - (3.39) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 km*stream density |
| Impaired metal - threshold(1.92) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 km*stream density |

NOTE:

A similar summary is produced for a 12 km Neighborhood. Results will include a larger number of sub-watersheds (HUC12s) in the analysis, as well as potentially more threats. The Occurrence Rating will be based on statistics for these additional areas.

The Occurrence and Severity ratings should be interpreted using the 0.0 to 1.0 scale shown in [Figure 7](#), where 0.0 – 0.5 is a low to medium threat and 0.5 – 1.0 is a medium to high threat.