



## SECTION 2. CONSERVATION DATA

TODD PIERSON

*ornate chorus frog*

The Green Growth Toolbox explains how to conserve priority wildlife and habitats in your community through three levels of land use planning:

- Visioning and plan making
- Incentives and ordinance and rule setting
- Development review and site design

To plan for Green Growth, communities need information and maps about important species, habitats and ecosystems in their jurisdiction. This section of the handbook describes the following for Geographic Information Systems (GIS) specialists and non-specialists:

- the three components of the Conservation Data for Green Growth,
- how to use the Conservation Data in site selection and the three levels of planning,
- and how to do natural resource inventories to supplement existing data.

### THE CONSERVATION DATA FOR GREEN GROWTH

Available for download at  
[www.ncwildlife.org/greengrowth](http://www.ncwildlife.org/greengrowth)

The Conservation Data for Green Growth is available for download from our website. It can be viewed with or without GIS software and online through the Natural Heritage Data Explorer. Our training workshops provide detailed guidance on how to interpret this data.

The highest priority wildlife habitats in greatest decline listed below are described in the N.C. Wildlife Action Plan and are represented in the GIS data explained in this section.

- Beaches and estuarine islands
- Coastal wetlands
- Maritime forests
- Longleaf pine forests
- Small wetland communities
- Mountain bogs
- Early successional habitat (grasslands and shrublands)
- Floodplain forests
- Habitats at high elevation
- Caves/mines
- Rock outcrops
- Streams and key aquatic habitats
- Large unfragmented, undeveloped parcels
- Undeveloped tracts in close proximity to existing Managed Areas
- Important wildlife travel corridors (natural areas between priority habitat areas)

Detailed information about priority habitats is available in the N.C. Wildlife Action Plan, which can be accessed at [www.ncwildlife.org/Plan.aspx](http://www.ncwildlife.org/Plan.aspx) or via CD by emailing us at [greengrowth@ncwildlife.org](mailto:greengrowth@ncwildlife.org). Habitat descriptions are also available on the Wildlife Commission website at [www.ncwildlife.org/Conserving/Habitats.aspx](http://www.ncwildlife.org/Conserving/Habitats.aspx) and in the Green Growth Toolbox regional appendices.

There are 3 components to the Conservation Data for Green Growth.

- **Component 1** (11 map layers)–centers on using the Biodiversity and Wildlife Habitat Assessment (BWHA) map. This assessment is part of the N.C. Conservation Planning Tool. The BWHA and other map layers that were used to create the BWHA values are provided as part of this component.
- **Component 2** (8 map layers)–is comprised of map layers that the N.C. Wildlife Resources Commission recommends be used in addition to the BWHA to give a complete picture of wildlife habitat conservation needs and opportunities in your community.
- **Component 3**– Additional regional information and map layers have been developed with more refined local data and appear as an appendix to the handbook if they are available in your planning area. See the map on page 33.

Collectively, these map layers constitute the Conservation Data for Green Growth.

**When possible, we recommend downloading or receiving data from the original referenced source in order that you have the most up-to-date data. The boxes next to each map layer provide the original data title and source information.**

Check the quick reference chart beginning on page 38 for summaries about how to use the data and to find out which map layers are appropriate to use in each level of planning.

### The Natural Heritage Data Explorer

Most of the Conservation Data can be viewed online through the Natural Heritage Data Explorer available from the NC Conservation Planning Tool website or at <https://ncnhde.natureserve.org>.



#### What is the N.C. Conservation Planning Tool?

The N.C. Conservation Planning Tool (<http://ncnhp.org/conservation/conservation-planning-tool>) is based on green infrastructure principles, which emphasize the importance of maintaining an interconnected network of green space that conserves natural ecosystems and provides associated benefits to our communities.

- The Conservation Planning Tool (CPT) identifies and prioritizes, on a statewide scale, essential high-quality natural resources required to maintain healthy ecosystems.
- This analysis pinpoints areas that are already protected as well as those areas that represent gaps, which are areas that would be a priority for conservation but are not protected.
- The goal of this tool is to highlight areas of opportunity to collaborate on conservation of significant natural resources.



pine barrens treefrog



marbled salamander



bobolink

## COMPONENT 1 ➔ Biodiversity and Wildlife Habitat Assessment (BWHA)

Part of the N.C. Conservation Planning Tool

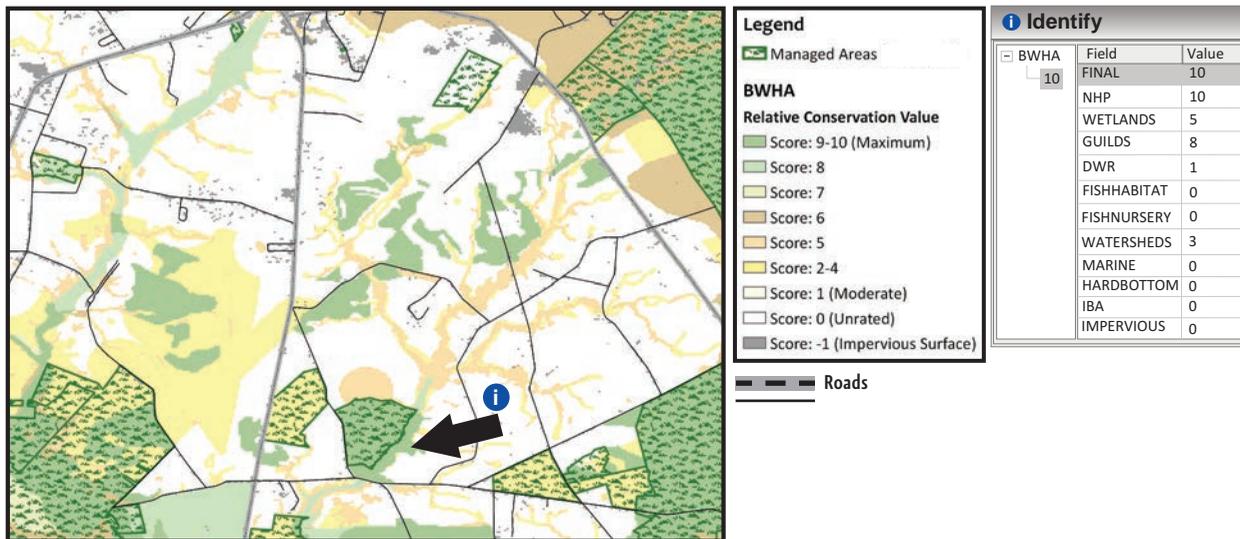
- GIS Raster File Title: bwha
- Original Source: N.C. Conservation Planning Tool

- The Biodiversity and Wildlife Habitat Assessment is a map that represents the highest priority areas for conservation of wildlife habitat and biodiversity in North Carolina.
- The BWHA is one map layer that is a composite 30 x 30 meter pixel grid comprised of most of the individual map layers used in the Green Growth Toolbox.
- The assessment is based on the best science and expertise from multiple sources. Areas with more rare, abundant and diverse species and habitats are rated as a higher conservation value on a scale of 10 to 1 in this map layer.
- The BWHA layer can be downloaded for the entire state by going to <https://ncnhde.natureserve.org/content/data-download> and from NC OneMap.
- The areas with a relative conservation value of maximum (10) to very high (7) are the most sensitive with the rarest species and habitats. These are the most important areas to conserve, buffer and connect for wildlife purposes.
- Areas with a rank of 6 to 1 are of high (6) to moderate (1) conservation priority. They play an important role in maintaining habitat connectivity and biodiversity but may not be as sensitive or rare as the higher ranked areas.
- The areas that appear as **grey** have at least 20 percent impervious surface and likely have the least habitat value. They have been assigned the value of -1.
- White areas are of unknown value and most have not been inventoried.
- Detailed information about the data used, the conservation value ranks and methods used for the BWHA can be found in Chapter 4 of the N.C. Conservation Planning Tool report at <http://ncnhp.org/conservation/conservation-planning-tool/resources/report>.

### Recommended use of these data:

- To identify important habitats and wildlife travel corridors that can be used in transportation plans, land use plans and other plans, incentives and ordinances.
- At a fine scale, the boundaries of this layer may be inaccurate. We recommend using the individual component map layers in addition to the BWHA for development review and site design.
- If your conservation options are limited to only the highest priority areas, we recommend that the greatest conservation measures are placed in areas that rank from 10 to 7 in the BWHA. High priority areas can be connected by maintaining low density but clustered development in or outside low ranking areas.
- All areas with a value equal to or greater than 1 are very important to maintaining a healthy natural environment. Major development or major roads in these areas should be kept to a minimum as much as possible.

**FIGURE 1. INTERPRETING THE BIODIVERSITY AND WILDLIFE HABITAT ASSESSMENT**



- When using the 'Identify' feature and clicking on the BWA map layer in ArcMap or ArcMap Reader (free software available through our website) you will see the BWA data table.
- A key to the BWA legend and data table key is on page 37.
- The FINAL field shows the maximum Relative Conservation Value of 10. This value comes from the NHP (Natural Heritage Program) field value (10) which means that it is a Natural Heritage Natural Area (see below). The value of the highest ranked feature is the FINAL value.
- Also at that location are other natural features including a wetland with a value of 5, which means the data come from the National Wetlands Inventory (NWI). Please note that on the Coastal Plain the Coastal Region Evaluation of Wetland Significance (CREWS) data is available and is more accurate.

## What GIS Data Make up the Biodiversity and Wildlife Habitat Assessment?

### N.C. Natural Heritage Program Map Layers



- The data below are provided by the N.C. Natural Heritage Program (NCNHP), which is within the N.C. Department of Environment and Natural Resources.
- The N.C. Natural Heritage Program website is [www.ncnhp.org](http://ncnhp.org). See <http://ncnhp.org/contact> for contact information.
- NCNHP updates these data approximately four times each year. To inquire about receiving regular updates, contact the Conservation Information Manager.

### Natural Heritage Natural Areas

(Formerly named Significant Natural Heritage Areas)

- GIS Shape File Title: nhna
- Original Source: N.C. Natural Heritage Program

Natural Heritage Natural Areas (NHNAs) are identified by N.C. Natural Heritage Program ecologists. These sites support rare and high-quality populations of native plants, wildlife and natural communities (habitats) on both land and water and are extremely important to the conservation of our state's biodiversity. A site's value rating may be due to the presence of rare species, rare or high-quality natural communities or other important ecological features.<sup>1</sup>

Aquatic Natural Heritage Natural Areas are included in this dataset.

## Accuracy

All NHNAs are based on field surveys. These data are updated infrequently and some NHNAs may have been destroyed. It is important to verify their status on the ground ahead of site design or purchase.

## Where can I find more information?

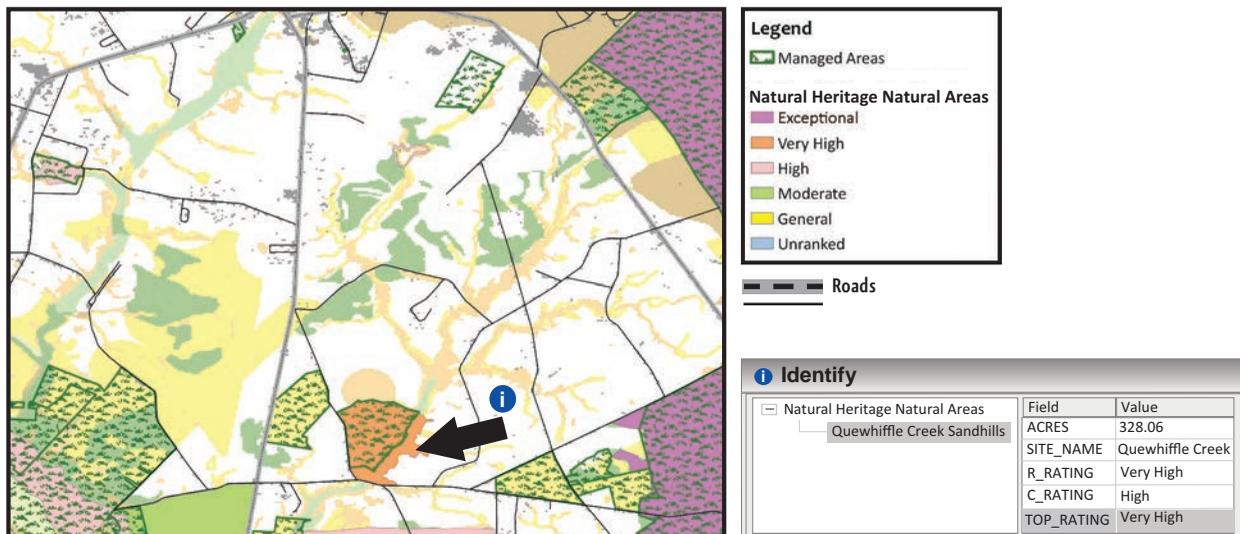
- Descriptions of each Natural Heritage Natural Area can be found in your county's Natural Heritage Inventory report, which can be accessed on the NCNHP website at <http://www.ncnhp.org/references/publications> by searching your county name.
- The file 'nhha.pdf' contains detailed instructions and comes with this map layer.
- The name and rating system for NHNAs have changed. The change is reflected in this GIS dataset and the 'nhna.pdf' file, but inventory reports may contain the old name (SNHA, Significant Natural Heritage Area) and rating system.

## Recommended use of these data:

- To identify districts where conservation and connection of natural open space in development standards could be a priority.
- These areas should be set-aside from development as much as possible.
- To identify high priorities for new parks and conservation lands.
- To identify high priority areas where a proportion of the site could be required to be conserved, if habitat is verified by a site survey, or where the placement of required open space should be encouraged.
- To identify high priority routes for wildlife travel corridors.
- When using this data please contact us at [greengrowth@ncwildlife.org](mailto:greengrowth@ncwildlife.org).

Please note: The BWhA depicts a 300 foot wide area of high conservation value on each side of the waterways classified as *Aquatic* Natural Heritage Natural Areas (see Figure 4).

FIGURE 2. NATURAL HERITAGE NATURAL AREAS



\* Compare this to Figure 1 to view how NHNAs are depicted in the BWhA.

Under the new NHNA rating system each NHNA has a C and R rating based on the biodiversity and rarity of species on the site (C rating) and the condition of the globally imperilled species populations on the site (R rating). The new TOP RATING field offers a single rating for each NHNA that is equal to the highest C or R rating.

## Natural Heritage Element Occurrences

- GIS Shape File Title: nheo
- Original Source: N.C. Natural Heritage Program

- Natural Heritage Element Occurrence (NHEO) data identify approximate locations of rare plants, animals, unique natural communities and important animal assemblages (places where rare animals live in groups).
- These plants, animals, natural communities and animal assemblages are elements of natural diversity and features of conservation interest. Occurrences of these elements are referred to as element occurrences or "EOs."<sup>2</sup>
- Most agencies, biologists and ecologists in North Carolina contribute to this dataset so it is fairly comprehensive. It only contains data for rare species and habitats and not all priority wildlife and habitats species datasets are included.

### The Limited vs. Detailed Data File

- The NHEO map layer included with the Conservation Data for Green Growth only shows limited information about each element occurrence and is appropriate for public use.
- The detailed data file contains sensitive information about the specific type of species. If you would like a copy of the full, detailed dataset for internal use, contact the N.C. Natural Heritage Program Conservation Information Manager. See <http://ncnhp.org/contact>.
- IMPORTANT – The detailed data file has been abused for illegal and damaging collection of rare wildlife and plants. The detailed data file should not be integrated into public online data systems or labeled with species names on maps.

### These data may need to be filtered.

The limited NHEO data set provided with the Green Growth Toolbox has been filtered. No action is needed. When using the detailed NHEO layer obtained directly from the Natural Heritage Program or the limited layer from NC OneMap, please consider the following:

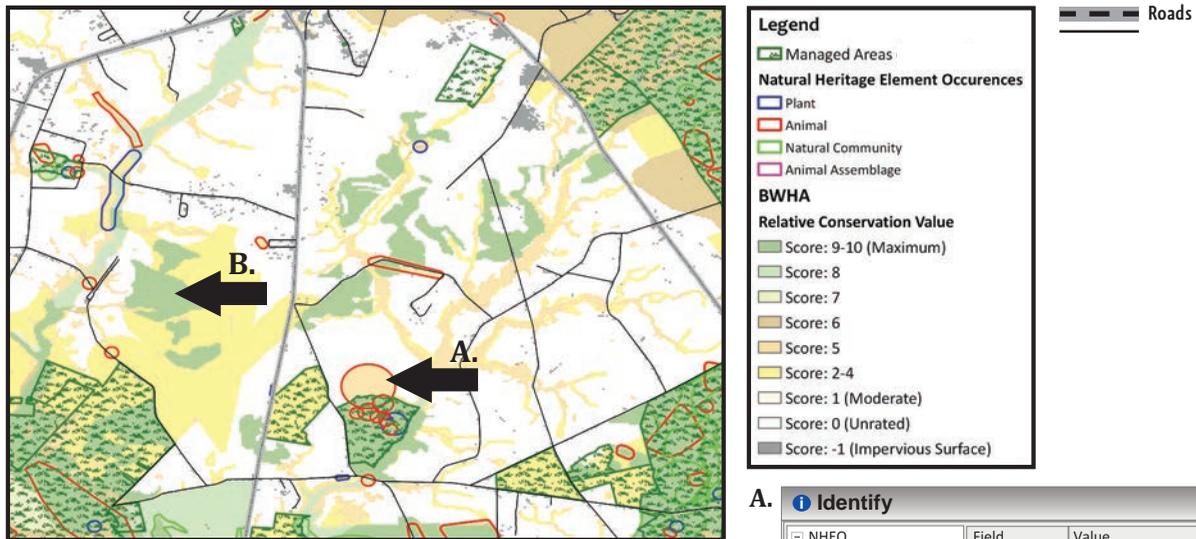
- The data set includes some historic records that are no longer viable and also some records for which the accuracy is low.
- Two steps are needed to filter the dataset:
  1. To display only occurrences that currently exist, delete records that are labeled "Historic" or "Destroyed" in the EO\_Status column of the data table.
  2. To ensure that less accurate records are not used, delete records that are labeled "Low" or "Very Low" in the ESTI\_ACCR column of the data table.

The Natural Heritage Program keeps these historic, destroyed and low accuracy records as part of the NHEO dataset because they are useful to biologists for habitat restoration and survey projects.

### Where can I find more information?

- Read the nheo.pdf file that comes with the data download *and*
- Contact the Natural Heritage Program
- Contact the Green Growth Toolbox Coordinator at [greengrowth@ncwildlife.org](mailto:greengrowth@ncwildlife.org)

FIGURE 3. NATURAL HERITAGE ELEMENT OCCURRENCES AND GUILDS



A) Depicts a Natural Heritage Element Occurrence for a rare animal. This area is ranked as a 5 out of 10 in the BWAH.

B) Depicts a habitat that is ranked as a 9 out of 10 in the BWAH because it is a 'Landscape Habitat Indicator Guild' (see below) of a rare and high-quality habitat type.

A. Identify

NHEO	Field	Value
Vertebrate Animal	EO_STATUS	Extant
BWAH	TYPE	Terrestrial
5	NAME_CTTY	Vertebrate Animal

B. Identify

BWAH	Field	Value
9	FINAL	9
	NHP	0
	WETLANDS	0
	GUILDS	9

### Accuracy

- These data come from field surveys and some NHEOs may have since been destroyed. It is important to verify their existence on site, if conservation is required.
- Some filtered NHEO data represents areas that are still quite large and general. NHEOs that are large perfect circles or squares mean that habitat for a species is likely to occur on undeveloped, natural areas within those polygons, but that the exact location has not been determined.
- The NHEO data used in the BWAH includes only the most accurate records.

### Recommended use of these data:

See recommendations for Natural Heritage Natural Areas.

### Landscape Habitat Indicator Guilds

Landscape Habitat Indicator Guilds (hereafter "guilds") represent high-quality, core wildlife habitats and connections between those habitats where wildlife can travel. These habitats are mapped based on the presence of guilds (groups) of species that use a particular type of habitat. These species are highly sensitive to habitat fragmentation and need large areas of habitat that are not separated by incompatible vegetation types, development or roads that they cannot travel across. Guild areas are ranked as a higher priority for conservation if they are more rare and if there are records of a larger number of guild species.

- Interpret from the BWAH
- Original Source: N.C. Natural Heritage Program

### **Where can I find more information?**

- Chapter 4 of the CPT report at [ncnhp.org/conservation/conservation-planning-tool/resources/report](http://ncnhp.org/conservation/conservation-planning-tool/resources/report).

### **Accuracy**

Each guild core habitat area is established only when field surveys confirm the presence of guild species within the habitat. The core areas and habitat connectors are then mapped using aerial photos. The extent of the habitat and wildlife travel corridors is based on the documented dispersal behavior of the guild species from the scientific literature.

### **Recommended use of these data:**

- See recommendations for use of the BWA.
- Interpret the presence of guilds from the BWA where the data table “GUILDS” field is a value greater than 0.
- If using this data in site design, on the ground surveys may be needed.

## ***Riparian Habitats and Priority Watersheds***

The BWA depicts buffers on all streams. These recommendations are based on extensive scientific research that demonstrates conditions necessary to conserve aquatic life. We recommend trying to keep impervious surfaces to 10 percent in all watersheds due to the detrimental effects of runoff on aquatic life. We recognize our recommendations may not always be possible and encourage local governments and developers to do as much as possible through development standards, especially in priority watersheds.

### **Streams within Subwatersheds with Federally Listed Fish and Mussels**

- Biologists with the N.C. Wildlife Resources Commission and the U.S. Fish and Wildlife Service conduct field surveys that help identify subsections of watersheds (subwatersheds) that contain federally listed fish and mussels.
- If a federally listed fish or mussel is found within streams in a subwatershed or if the subwatershed leads directly into waters that contain federally threatened or endangered species, the subwatershed will appear in this map layer.

- GIS Shape File Title: Fed\_hucs
- Original Source: N.C. Natural Heritage Program
- GIS map layer only available on the GGT website.

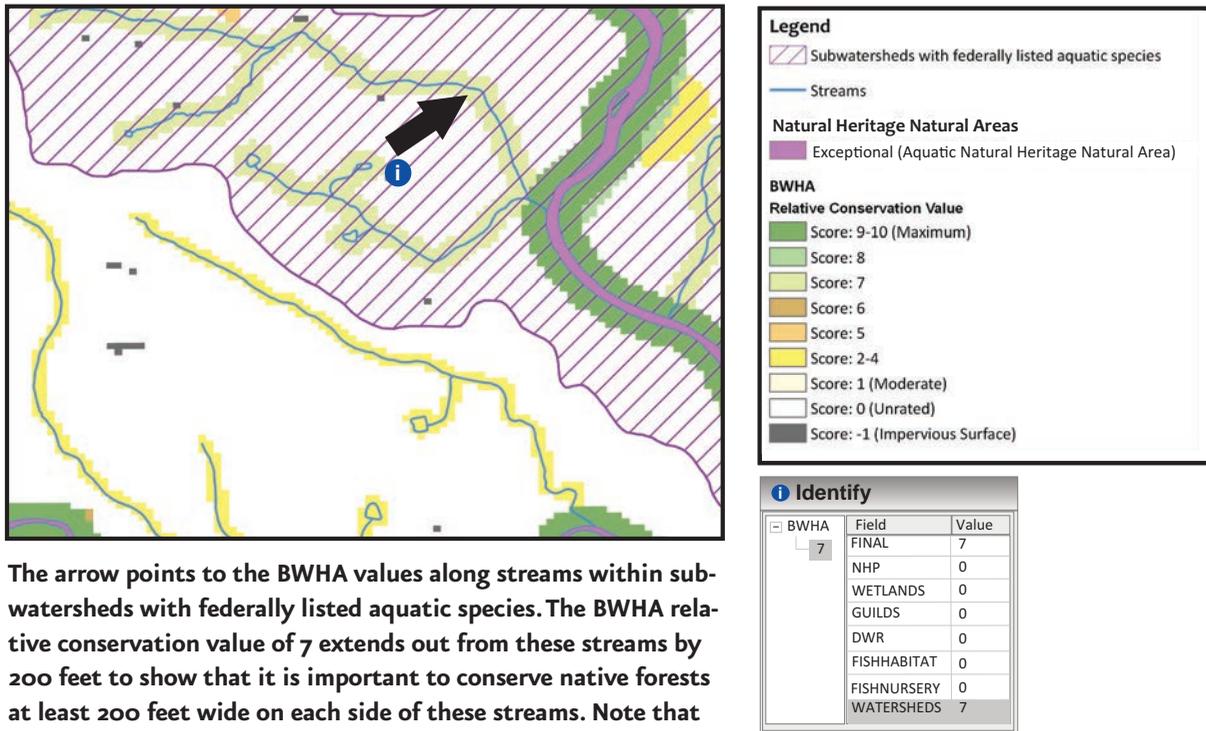
### **Accuracy**

These data are collected during field surveys and the map is updated every six months.

### **Recommended use of these data:**

- All streams in these subwatersheds are recommended to have 200 foot buffers on each side of the stream to ensure the endangered animal’s habitat is maintained. This buffer is represented on the BWA map.
- Aim to keep impervious surfaces to a maximum of 10 percent in watersheds.
- These recommendations come from a scientific literature review and recommendations published by the NCWRC. See page 26, “Where can I find more information?” for details.

FIGURE 4. RIPARIAN HABITATS: SUBWATERSHEDS WITH FEDERALLY LISTED SPECIES



The arrow points to the BWA values along streams within subwatersheds with federally listed aquatic species. The BWA relative conservation value of 7 extends out from these streams by 200 feet to show that it is important to conserve native forests at least 200 feet wide on each side of these streams. Note that the Aquatic Natural Heritage Natural Area has a 300 foot wide area of high conservation value on each side. We recommend conservation of these buffer areas.

## Map Layers from Other Organizations

### Outstanding Resource Waters and High Quality Waters

- In addition to using data on the location of streams, we recommend local governments use a layer that depicts watersheds that contain streams that are Outstanding Resource Waters and High Quality Waters.
- This map layer was developed by the North Carolina Division of Water Resources to, “enhance planning, siting and impact analysis in areas directly affecting waters considered as having excellent (high) water quality or designated as an outstanding resource.”<sup>3</sup>
- Streams within these watersheds are important for wildlife habitat and biological diversity because they are high-quality, which means they are likely to support healthy ecosystems.

• GIS Shape File Title: hqworw  
• Original Source: N.C. Division of Water Resources

### Accuracy

These waters go through a rigorous process to become designated but are not always taken off of this list once they become impaired and no longer meet the criteria.

### Recommended use of these data:

- To identify priority watersheds within which streams or rivers could be buffered by at least 100 feet (or 200 feet if they also contain federally listed species) on each side.
- Aim to keep impervious surfaces to a maximum of 10 percent in watersheds.

## Wild Brook Trout Streams (Mountains only)

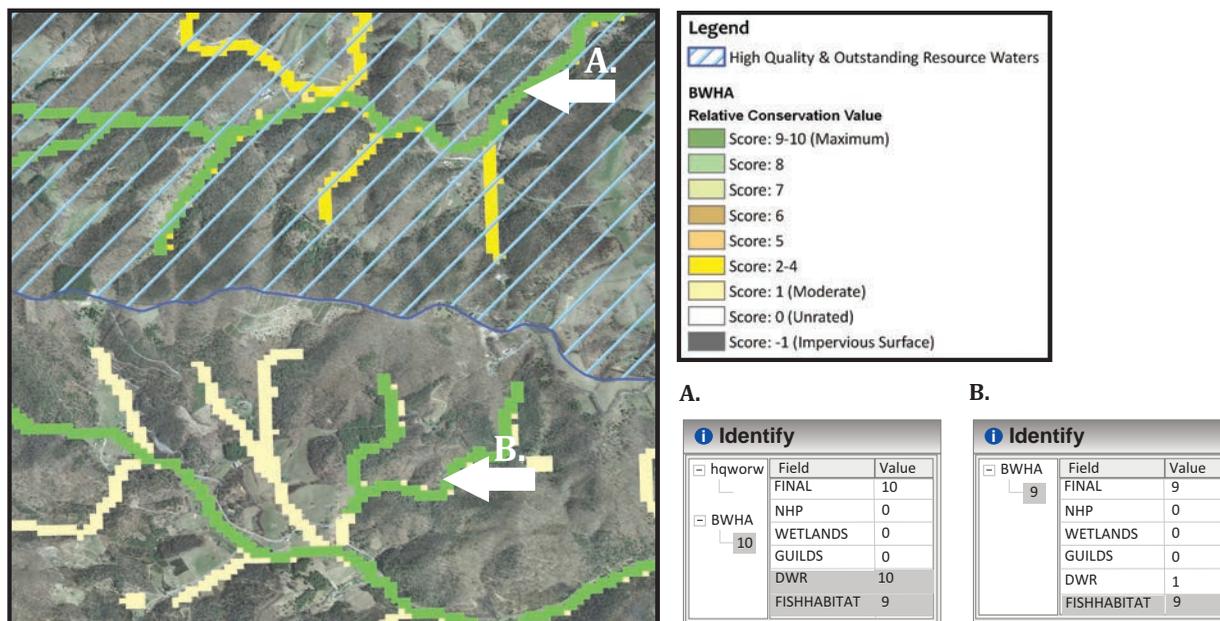
North Carolina is home to more brook trout than anywhere else in the Southeast, yet this prized fish has been greatly impacted and now exists only in 20 percent of its historic range.

We do not provide these streams as an individual map layer because it is possible to identify the location of these streams from the BWAH map and by using the 'hydro24k' streams map layer (on page 27). These streams are identified in the BWAH data table as FISHHABITAT with a BWAH rank of 9 and have a 100 foot buffer mapped on each side of them.

### Recommended use of these data:

- To identify priority watersheds with streams or rivers that could be buffered by at least 100 feet (or 200 feet if they also contain federally listed species) on each side.

**FIGURE 5. RIPARIAN HABITATS: HIGH QUALITY AND OUTSTANDING RESOURCE WATERS AND WILD TROUT STREAMS**



- A) The BWAH relative conservation value for this stream is a 10 because the stream is rated as Outstanding Resource Waters by the N.C. Division of Water Resources (DWR). The GIS map layer for High Quality and Outstanding Resource Waters, which is a statewide map is also depicted. The data table shows a value of 9 for FISHHABITAT. This means that the stream also contains wild trout. Wild trout only occur in some streams in the mountains.
- B) This stream contains wild trout and is not rated as High Quality and Outstanding Resource Waters therefore the BWAH value at this location is 9 for the FISHHABITAT field and the FINAL field.

### Where can I find more information on aquatic wildlife conservation?

N.C. Wildlife Resources Commission conservation recommendations for aquatic wildlife can be found in the publication, "Guidance Memorandum to Address and Mitigate Secondary and Cumulative Impacts to Aquatic and Terrestrial Wildlife Resources and Water Quality" (2002).

[www.ncwildlife.org/Conserving/Programs/HabitatConservationProgram.aspx](http://www.ncwildlife.org/Conserving/Programs/HabitatConservationProgram.aspx)

## Streams

- GIS Shape File Title: hydro24k
- Original Source: N.C. Division of Water Resources
- Best GIS data are available for some streams via the N.C. Stream Mapping Project.

- State regulations administered by the N.C. Division of Water Resources require the use of their data by communities in several river basins. You should consult these regulations, located at <http://deq.nc.gov/about/divisions/water-resources/water-resources-regulations>, as this handbook is not meant to describe or replace these regulations.
- The best available source of data to identify and classify streams is from the North Carolina Stream Mapping Project. Unfortunately, this dataset is currently only available for certain mountain counties. Visit [www.ncstreams.org](http://www.ncstreams.org).
- The dataset that is available statewide for streams is the 1:24,000-scale *Hydrography with Water Classifications based on the USGS 1:24,000 scale Topographic Quad Data* (also known as “blue-line” streams).

### Accuracy

Research indicates that USGS topographic maps (and USDA Soil Survey maps) are somewhat inaccurate. Due to such inaccuracies, we recommend field surveys be conducted to identify and classify stream location and quality ahead of development.

### Recommended use of these data:

*Identify stream location on the ground.*

- The ‘hydro24k’ map layer is most appropriate to use for viewing the general locations of streams. If N.C. Stream Mapping data is not available it is best to survey stream location on site.
- The North Carolina Division of Water Resources (DWR) has developed a stream identification manual that presents guidance on identifying intermittent and perennial streams in North Carolina, located at <https://deq.nc.gov/about/divisions/water-resources/water-resources-permits/wastewater-branch/401-wetlands-buffer-permitting/stream-determinations>.

*Buffer verified streams in order to adequately conserve aquatic life and water quality.*

*Use the DWR Classifications in the data table to understand the BWA rank for stream buffers.*

- The BWA ranks stream buffer areas based on the DWR surface waters classification – denoted as the field DWR in the BWA data table. Refer to Chapter 4 of the N.C. Conservation Planning Tool Report for DWR Classifications and BWA conservation value ranks.
- In the hydro24k streams map layer data table, refer to the 'CLASS' field for descriptions of the DWR Surface Water Classifications.
- Use the BWA rank to identify priority stream buffers when stream buffers on all streams are not possible.

### Where can I find more information?

The NCDENR Division of Water Resources website on Surface Water Classifications at <https://deq.nc.gov/about/divisions/water-resources/planning/classification-standards/classifications>.

## Wetlands

### Coastal Region Evaluation of Wetland Significance (CREWS)

This dataset contains information on wetland quality and is sometimes more accurate than the National Wetlands Inventory below. The CREWS analysis differentiates between exceptional, substantial and beneficial wetlands. Exceptional wetlands are the highest quality and the best functioning. The CREWS data provided through the GGT website includes a legend for these wetland significance ratings. Please see the Green Growth Toolbox Coastal Region Appendix and N.C. Division of Coastal Management website (<https://deq.nc.gov/about/divisions/coastal-management/coastal-management-data>) for more information.

- GIS Shape File Title: [County name]\_wets
- Original Source: N.C. Division of Coastal Management.

### National Wetland Inventory (NWI) Wetlands

- GIS Shape File Title: CONUS\_wet\_poly
- Original Source: U.S. Fish & Wildlife Service

#### NWI Layer—and its Limitations

- The only available GIS layer that displays wetland locations across the state is the National Wetland Inventory layer, which was produced in 1983 using high altitude aerial photographs and elevation, soils maps and other information.
- Due to the inaccuracies in photo interpretation and draining and ditching of wetlands over the past decades, this layer is generally considered to have moderate to low accuracy because it does not completely reflect conditions on the ground.<sup>4</sup> In addition, this layer does not have easily accessible wetland quality information.
- Yet, because the NWI layer is the only available source of wetland data for the entire state, we recommend using this layer in planning.

#### Where can I find more information?

- For more information on the NWI, visit [www.fws.gov/wetlands/index.html](http://www.fws.gov/wetlands/index.html).

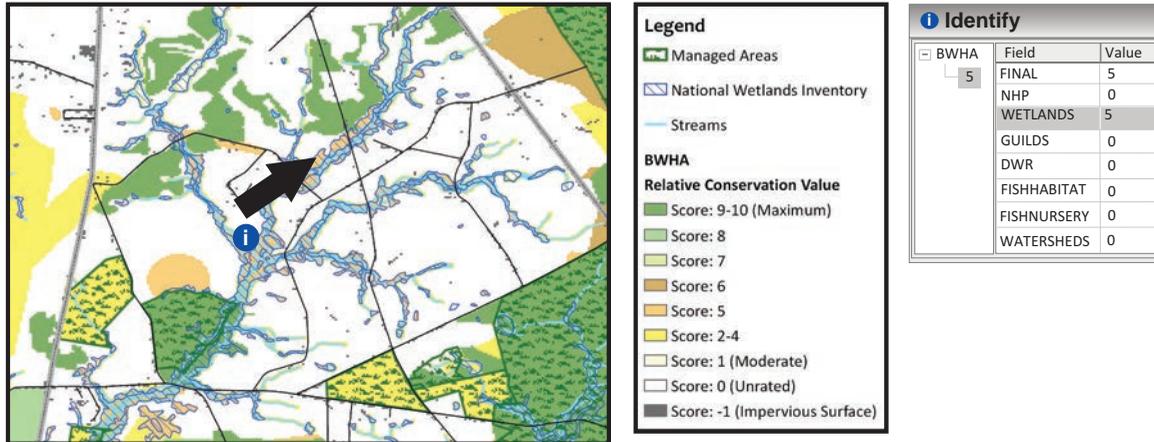
#### Recommended use of these data:

- To identify areas where many wetlands exist and where extensive development may not be appropriate in order to conserve water and wildlife.
- In order to conserve small wetland communities (isolated wetlands fed by surface water and not by streams or rivers) for wildlife and water quality, it is essential that wetlands be surrounded with undisturbed upland habitat. For more information and recommended buffer widths, see Section 3, pages 50 to 51.
- To identify areas to survey for confirmation of wetland presence and habitat quality.

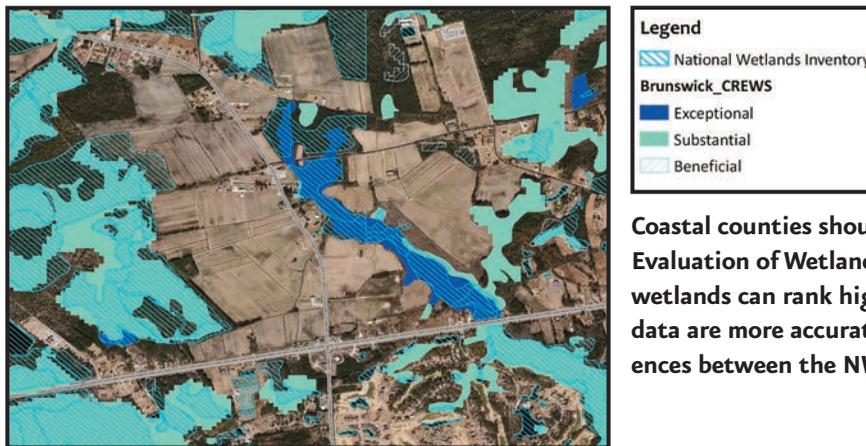
#### Why are wetlands important for wildlife?

- In addition to playing an important role in cleaning and storing our water, many wetlands provide outstanding wildlife habitat and have high biodiversity.
- The N.C. Wildlife Action Plan identifies wetland communities as priority habitats for conservation efforts across the state.<sup>5</sup>
- Small wetland habitats such as vernal pools, seeps, bogs and small depression ponds are especially important as breeding sites for amphibians and reptiles because they do not typically contain fish that prey on their eggs and young.
- Due to the lack of regulations for protecting small wetlands (typically < 0.1 acre), these are declining dramatically along with the unique animal and plant species that depend on these types of wetlands.

FIGURE 6. WETLANDS



For non-coastal counties the available wetlands data are from the National Wetlands Inventory (NWI), pictured above. The BWA 'WETLANDS' value for NWI wetlands is always 5.



Coastal counties should refer to the Coastal Region Evaluation of Wetland Significance—CREWS. CREWS wetlands can rank higher in the BWA because the data are more accurate. This image shows the differences between the NWI and the CREWS maps.

## Important Bird Areas (IBAs)

Important Bird Areas are documented and mapped by the N.C. Audubon Society using field survey data. All IBAs rank as a 6 in the BWA.



- GIS Shape File Title: NC\_IBAs
- Original Source: N.C. Audubon Society

“IBAs, are places that provide essential habitat for one or more species of birds at some time during their annual cycle, including breeding, migration and wintering periods. Well-known North Carolina IBAs include iconic landmarks such as Grandfather Mountain and Cape Lookout National Seashore. Nearly all of the state’s IBAs include a state, federal, or nongovernmental conservation lands component, but many also contain a high percentage of privately owned and managed land” (N.C. Audubon).<sup>6</sup>

### Recommended use of these data:

- This data is most appropriate for visioning and plan making because IBAs are typically very large. All areas within the IBAs are important to birds, however, specific habitat that should be conserved within the IBAs is best identified by a biologist or by using the other map layers in the Conservation Data for Green Growth.
- Identification, during visioning and plan making, of areas where large blocks of fields and forests should be maintained.

## COMPONENT 2 ➔ Statewide Data to Use in Addition to the Biodiversity and Wildlife Habitat Assessment

### Managed Areas

- GIS Shape File Title: marea
- Original Source: N.C. Natural Heritage Program

- This layer displays private and public lands that are managed under an agreement, easement or public ownership where habitat management is one of the goals. Management on these areas can include prescribed burning and tree thinning that enhances wildlife habitat.
- The N.C. Conservation Planning Tool provides a more extensive set of Open Space and Conservation Lands maps that include lands that are not managed for habitat.

#### Recommended use of these data:

- Buffer and connect these areas with other natural areas by encouraging agricultural districts around and between them. Managed Areas include NCWRC Game Lands discussed below.

#### Why is it important to connect Managed Areas with corridors of undeveloped land?

When lands that are permanently conserved are surrounded by development, many wildlife species and habitats within them will cease to exist. Wildlife and plant populations need to be connected with one another to maintain genetic diversity.

### Smoke Awareness Areas

- GIS Shape File Title: Smoke\_Awareness
- Original Source: N.C. Wildlife Resources Commission

Smoke awareness areas demonstrate locations that are most likely to experience smoke from prescribed burning. See page 4 for information on prescribed burning. These areas are indicated by a one half mile boundary drawn around the perimeter of lands managed with fire. The Sandhills GGT Regional Appendix has more refined Smoke Awareness Area maps based on local conditions. Most prescribed burns occur on smaller units within larger tracts of managed lands. Agencies and organizations that conduct prescribed burns do so only under conditions that are designed to maximize vertical smoke dispersal and minimize any impacts to public safety. See Section 5, page 94, for information on Wildfire and Smoke Management ordinances.

#### Recommended use of these data:

- To identify areas where working lands or natural areas should be encouraged to avoid the exposure of residents to smoke for a few days every two to three years.

### Game Land Hunting Safety Buffer

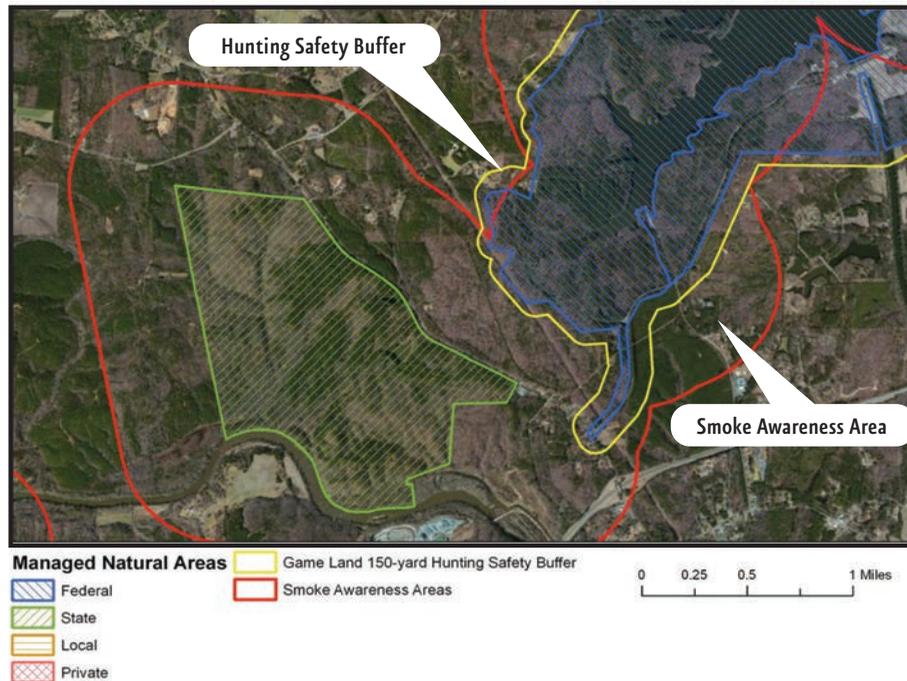
- GIS Shape File Title: gml\_buffer
- Original Source: N.C. Wildlife Resources Commission

- Conflicts can arise between Game Land users and residents who live close to Game Lands, such as disturbance to homeowners and limits to hunting on Game Lands. To minimize such conflicts, we recommend establishing a 150 yard hunting safety buffer around Game Lands in your jurisdiction, especially in areas where Game Lands are narrow.
- The hunting safety buffer map layer displays this recommended 150 yard buffer.

#### Recommended use of these data:

- To identify areas where working lands or natural areas should be encouraged to maintain habitat quality and connectivity and the use of Game Lands for hunting.

FIGURE 7. MANAGED AREAS, SMOKE AWARENESS AND HUNTING SAFETY AREAS



Managed Areas are privately or publically owned and are managed for wildlife and biodiversity conservation to some extent under a conservation agreement. These areas appear in hatched colors above. The managed areas where prescribed fire takes place have a smoke awareness area mapped around them. N.C. Wildlife Commission Game Lands have a hunting safety buffer of 150 yards mapped around them. It is important to encourage working lands around and between Managed Areas to maintain habitat quality and wildlife travel corridors.

### Colonial Waterbird Nesting Colony Buffers

This map layer displays areas where groups of waterbirds such as herons and egrets, nest in colonies. Research shows that disturbance from development causes colonial waterbirds to abandon their nests if the development takes place within 330 feet of the colony. This map layer displays the 330 foot buffer on each nesting colony.

- GIS Shape File Title: Waterbird\_nest\_buffers
- Original Source: N.C. Wildlife Resources Commission

#### Recommended use of these data:

- To identify areas for a 330 foot no-touch buffer that will protect colonial waterbirds.

### Bald Eagle Nest Buffers

Bald eagles are protected under the Bald and Golden Eagle Protection Act. This map layer displays a 330 and a 660 foot buffer on each nest. See page 100 for more information.

- GIS Shape File Title: Contact NCWRC for data
- Original Source: N.C. Wildlife Resources Commission

#### Recommended use of these data:

- To identify areas for a 330 foot or 660 foot no-touch buffer that will protect bald eagles. A 660 foot buffer is needed if development is visible from the nest.
- We recommend consulting with the U.S. Fish and Wildlife Service. See Appendix B for contact information.

## Floodplain Boundaries from the N.C. Floodplain Mapping Program

- In addition to using floodplain data to reduce flood hazards, data on floodplain location can help local governments plan to conserve valuable wildlife habitat.
- The best available data on floodplains is the N.C. Floodplain Mapping Program.
- To download floodplain data for your county, visit [www.ncfloodmaps.com](http://www.ncfloodmaps.com).

- Original Source: N.C. Floodplain Mapping Program
- Download from their website at [www.ncfloodmaps.com/](http://www.ncfloodmaps.com/)

### Recommended use of these Data:

- Displaying floodplain boundaries can provide a starting place for identifying important floodplain forest habitats within floodplain boundaries either with aerial photos or on the ground surveys.
- Consider discouraging major development in the 100 or 500-year floodplains. One hundred-year floods (one percent chance of annual flooding) may become more common due to climate change. Property damage can be reduced by conserving habitats for wildlife and plant communities by not building in floodplains.

## Other Assessments in the N.C. Conservation Planning Tool

Besides the Biodiversity and Wildlife Habitat Assessment, the CPT includes other natural resource assessments available at <https://ncnhde.natureserve.org/content/data-download>. Detailed information on the map layers is provided in the CPT report at <http://ncnhp.org/conservation/conservation-planning-tool/resources/report>.

- Open Space and Conservation Lands by the N.C. Natural Heritage Program
- Agricultural Lands Assessment by the N.C. Department of Agriculture [www.ncmhtd.com/EnvironmentalPrograms/AgAssessment/](http://www.ncmhtd.com/EnvironmentalPrograms/AgAssessment/)
- Forest Lands Assessment by the N.C. Forest Service based on the N.C. Forest Action Plan ([www.ncforestactionplan.com](http://www.ncforestactionplan.com)). [www.ncmhtd.com/NCFS/ForestActionPlanPriorityLayers/](http://www.ncmhtd.com/NCFS/ForestActionPlanPriorityLayers/).

### Recommended use of this data:

- To identify areas where multiple natural resources and wildlife conservation objectives can be achieved through maintaining agricultural districts, connected wildlife habitat and working lands.

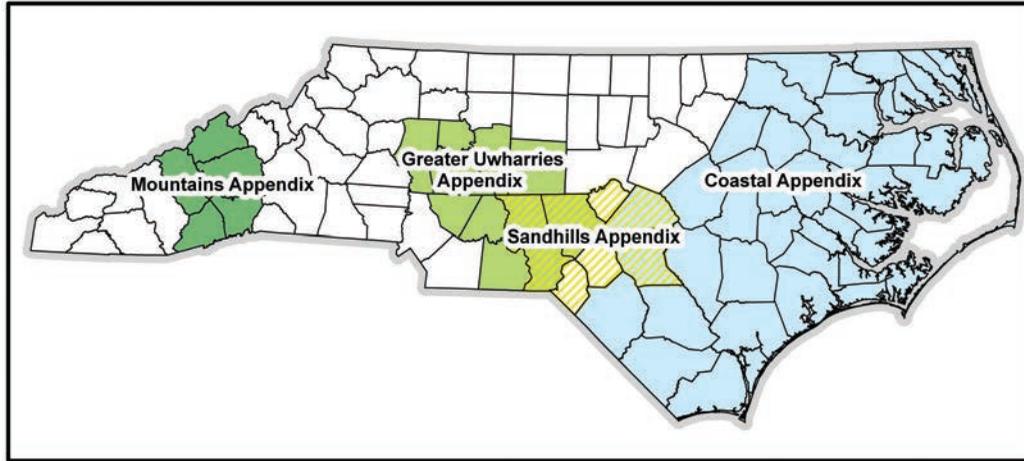
## Further References for Conservation Planning

There are a variety of resources that can be used to identify priority areas to employ conservation-based development planning methods. The number of map layers and the scale of the tools below make them most appropriate for reference to identify priority conservation areas during planning as opposed to being part of the core set of Conservation Data for Green Growth map layers. See Appendix F for details and links.

- The Conservation Blue Print - crafted by “Landscape Conservation Cooperatives,” the Blueprint identifies priority areas, habitat types and estimates habitat quality.
- The Conservation Planning Atlas - contains many map layers from habitat quality to projected development.
- Conservation Opportunity Areas - watersheds that have the most need for conservation due to the likely occurrence of species of greatest need on unprotected lands.

## COMPONENT 3 ➔ Regional Datasets and Habitat Information

- In addition to data that are relevant statewide, more detailed conservation data exist for different regions of the state.
- Regional conservation datasets are available for the regions pictured below and are explained along with regional habitat information in a Regional Appendix of this handbook.



### ■ USING CONSERVATION DATA IN LOCAL PLANNING

Local governments can take four basic steps to start using the Conservation Data for Green Growth in planning activities:

1. **Integrate the data with your community's online or networked GIS database.**
2. **Use the data in visioning and plan making.**
3. **Use the data in incentives and ordinance and rule setting.**
4. **Use the data in development site location, review and design.**

#### 1. **Integrate the dataset with your community's GIS database.**

- The most effective way to use this dataset is to integrate it with your community's existing GIS database and online interactive map server.
- These layers can then be easily accessed by developers for site selection, all local government departments and the public during planning projects.
- Prevent illegal collection of rare species by displaying only the public Natural Heritage Element Occurrence data without species names on public maps.

#### **Example**

- To see an example, visit Chatham County, North Carolina's mapping website, located at [www.chathamgis.com/mapguide/ChathamGISWeb](http://www.chathamgis.com/mapguide/ChathamGISWeb). Click on the folders labeled "conservation planning," "natural heritage" and "wildlife resources commission" to see layers from the Conservation Data for Green Growth in action.

## **Update Data Regularly**

It is important to schedule regular updates of your community's Conservation Data. The dataset available for download on the Green Growth website will be updated once per year. It is best if you schedule updates for different layers from their original source using information provided in the quick reference guide on page 38.

## **2. Use the dataset in visioning and plan making.**

For more detailed information, see Section 4, "Green Planning."

Green planning refers to creating and revising planning documents and stand-alone conservation plans to consider, encourage and enable conservation of priority habitats.

To integrate the Conservation Data for Green Growth in visioning and plan making follow these steps:

- 1) Display the map layers in planning documents and provide descriptions of what each layer means.
- 2) Develop strategies to conserve and connect the important species, habitats and ecosystems displayed on maps. A menu of conservation strategies is presented in Section 4.
- 3) Identify natural areas that may contain important wildlife habitats that have not been mapped such as springs, seeps and vernal pools. Establish goals and strategies to gather this information.

## **3. Use the dataset in incentives and ordinance and rule setting.**

For more detailed information, see Section 5, "Greening Ordinances."

Greening incentives, ordinances and rule setting involves creating and revising land use incentives and regulations to implement the goals and strategies for habitat conservation set forth in planning documents.

To use the Conservation Data for Green Growth in ordinance and rule setting:

- 1) Display the map layers on parcel maps and use these maps to help guide development of incentives, placement of zoning districts or subdivision ordinances that encourage open space conservation.
- 2) Integrate requirements for using the data in relevant parts of your subdivision ordinance. For instance, require development proposals to display conservation data map layers on development plans to help guide voluntary conservation.

## **4. Use the dataset in development site location, review and design.**

For more detailed information, see Section 6, "Greening Development Site Location, Review and Design."

To "green" developments planners and local government staff can follow three basic steps:

- 1) Consult the Conservation Data for Green Growth to see if any map layers overlap with the parcels to be developed.
- 2) Highlight any overlapping habitat areas on preliminary development sketch plans and bring these areas to the applicant's attention.
- 3) Help the applicant incorporate wildlife friendly development practices into their preliminary plans using the recommendations in Section 3.

**Caveats:**

- \* Please note it is not appropriate to require conservation of natural areas solely based on map boundaries. Site surveys are needed to verify habitat presence ahead of development design when specific habitats are required to be conserved.
- \* It is appropriate to use maps to guide which *districts* require open space set asides. If site surveys before development are not a desired requirement, it is appropriate to encourage (but not to require) that the specific location of natural open space be within mapped habitats.
- \* It is appropriate to require some form of open space conservation within the boundaries of the game land hunting safety buffers and other map layers based on property boundaries if desired.

## ■ NATURAL RESOURCE INVENTORIES AND SITE SURVEYS

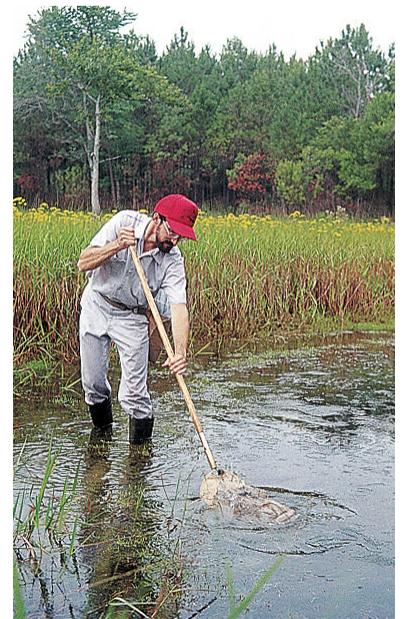
A natural resource inventory or a site survey involves biologists and ecologists doing fieldwork to collect information about the location and status (condition or rarity) of important species and habitats. The Conservation Data for Green Growth may not always provide all of the information your community may need to understand the condition of local natural assets. Although using conservation data is a good starting point, you may wish to do a more extensive field inventory to supplement existing information.

### Natural Resource Inventories—Where to start

The following five steps will help you get started.

#### ***Step 1. Determine if your county or city needs additional natural resource information.***

- First, identify what field inventory work has already been done in your jurisdiction.
- The N.C. Natural Heritage Program has conducted "Natural Heritage Inventories" for many counties across the state. To determine whether an inventory has been completed for your county, visit [www.ncnhp.org/activities/inventories](http://www.ncnhp.org/activities/inventories) and search for your county's name in the Natural Heritage Program's publications database at <http://www.ncnhp.org/references/publications>.
- Even if a Natural Heritage Inventory has been conducted recently, you may want additional information—whether for a specific watershed or your entire jurisdiction.



#### ***Step 2. Identify how the inventory will be used. You could use the inventory to:***

- Better guide transportation and hazard planning
- Develop conservation strategies for your comprehensive plan
- Update outdated inventories
- Improve information to be more competitive for land acquisition grants for natural parks and historic sites
- Identify important districts or sites for conservation subdivisions
- Improve management of parks, open space, trails and greenways

***Step 3. Develop a list of the types of natural resources to be inventoried. A qualified biologist can assist in developing this list, which may include:***

- Streams, wetlands, springs, seeps
- High-quality and rare natural communities
- Important wildlife habitats identified in the N.C. Wildlife Action Plan
- Significant or sensitive native plant communities
- Forest resources, including canopy cover, native forest communities and plantations
- Location of invasive, exotic species outbreaks

***Step 4. Identify how the inventory will be completed.***

- An ecological consultant could be hired to complete the inventory.
- Refer to Appendix B for contact information of partner agencies and organizations who may be able to assist your community to complete the inventory at lower expense.
- Work with a biologist to organize a “Bioblitz” as part of your inventory. These are fun events where families, school groups and ecological experts team up to inventory every area possible within 24 hours.
- Whatever your approach, be certain to involve organizations with biological expertise to ensure the inventory methodology is sound.

***Step 5. Conduct the inventory, analyze the data and develop your product.***

- Qualified natural resource professionals should lead the inventory and data analysis efforts.
- One of the most useful products can be a database containing the inventory results.
- Maps displaying the inventory and other conservation data can then be used in all of your community’s planning activities.

**Examples of Local Natural Resource Inventories**

- Mecklenburg County, North Carolina, Division of Natural Resources conducts biological inventories to guide park management and purchase.
- Orange County, North Carolina, actively updates and uses their Natural Heritage Inventory (<http://orangecountync.gov/ercd/NaturalAreasReportIntroduction.asp>) in their comprehensive plan and in their Natural and Cultural Resources Conservation programs ([http://orangecountync.gov/deapr/nat\\_cul\\_resources.asp](http://orangecountync.gov/deapr/nat_cul_resources.asp)).
- Wake County, North Carolina, Parks, Recreation and Open Space Department conduct natural resources inventories for their parks and work to dedicate nature preserves in partnership with the Wake Nature Preserves Partnership. <http://wakenature.wordpress.com/>
- The City of Portland, Oregon, Natural Resource Inventory uses aerial photography and GIS to map important buffers, habitats and wildlife travel corridors. [www.portlandoregon.gov/bps/59299](http://www.portlandoregon.gov/bps/59299)
- The City of Lakeland, Tennessee, conducts a Natural Resources Assessment used in their Comprehensive Plan. [www.lakelandtn.gov/index.aspx?NID=155](http://www.lakelandtn.gov/index.aspx?NID=155)
- Dutchess County, NY, has an award winning Natural Resources Inventory used in land use decision making. <http://dutchessemc.org/projects/dutchess-county-nri/>

## LEGENDS FOR CPT ASSESSMENT LAYERS

### Biodiversity/Wildlife Habitat Assessment

#### Relative Conservation Value

	9-10 (Maximum)
	8
	7
	6
	5
	2-4
	1 (Moderate)
	0 (Unrated)
	Impervious surface >20%

Identify Tool results for the Biodiversity/Wildlife Habitat Assessment			
Category Name	Value	Individual Input Layers	Source for Input Layers
NHP	10	Significant Natural Heritage Areas – Outstanding and Very High Ranking	NC Natural Heritage Program
NHP	8	Significant Natural Heritage Areas – High and Moderate Ranking	
NHP	6	Significant Natural Heritage Areas - General Ranking	
NHP	5	Element Occurrences – High Ranking	
NHP	4	Element Occurrences – Other	
Wetlands	7	Coastal Region Evaluation of Wetland Significance (CREWS) – Exceptional	NC Division of Coastal Management
Wetlands	6	Coastal Region Evaluation of Wetland Significance (CREWS) – Substantial	
Wetlands	5	National Wetlands Inventory	US Fish and Wildlife Service
Wetlands	2	Coastal Region Evaluation of Wetland Significance (CREWS) – Beneficial	NC Division of Coastal Management
Guilds	1-10	Landscape Habitat Indicator Guilds	NC Natural Heritage Program
DWQ	10	Outstanding Resource Waters	NC Division of Water Quality
DWQ	9	Stream BioClassification - Excellent	
DWQ	8	High Quality Waters	
DWQ	7	Stream BioClassification - Good	
DWQ	1	All other streams	
FishHabitat	9	Wild Brook Trout	
FishHabitat	8	Anadromous Fish Spawning Areas	NC Division of Marine Fisheries
FishNursery	8	Fish Nursery Areas	NC Division of Marine Fisheries
Watersheds	7	Stream buffer tributaries to Threatened & Endangered Species	NC Natural Heritage Program
Watersheds	3	Priority Watersheds	NC Natural Heritage Program, NC Wildlife Resources Commission
Marine	8	Oyster Sanctuaries	NC. Division of Marine Fisheries
Marine	6	Submerged Aquatic Vegetation	
Hardbottom	8	Open Shellfish /Shellbottom	NC Division of Marine Fisheries
Hardbottom	7	Hard Bottom	
Hardbottom	5	Closed Shellfish /Shellbottom	
IBA	6	Important Bird Area	Audubon Society
Impervious	-1	Impervious Surface above 20%	US Environmental Protection Agency

DWQ is now DWR, the NC Division of Water Resources

Source: N.C. Conservation Planning Tool, 2013

## STATEWIDE GIS CONSERVATION DATA REFERENCE CHART

These conservation data map layers are the most applicable data available statewide for land use planning. The 'Levels of Planning' column denotes whether the map layer is appropriate for use in the planning activity. Additional regional datasets are referenced in the regional appendices.

### REFERENCE INFORMATION<sup>8</sup>

### LEVELS OF PLANNING<sup>9</sup>

GIS Data Layer	Layer Label	Where to Download Directly	Update Frequency	Summary of Interpretation & Recommendations for use <sup>10</sup>	Visioning & Plan-Making	Ordinance & Rule-Setting	Development Review & Design
Biodiversity and Wildlife Habitat Assessment (BWH/A)	bwha	N.C. Conservation Planning Tool <sup>11</sup> or via N.C. One Map <sup>12</sup>	Biannual	<ul style="list-style-type: none"> <li>To identify priority areas for conservation.</li> <li>To identify wildlife and habitat corridors that connect important natural areas.</li> <li>Areas that rank 10 to 7 or 6 should receive the strongest protections.</li> <li>Low intensity land uses should be encouraged.</li> </ul>	X	X	
<b>Map Layers that were used to create the Biodiversity and Wildlife Habitat Assessment</b> - The map layers below were used to create the BWH/A. They can be used for a higher degree of accuracy, more detailed information and to highlight specific types of habitat and priority areas in land use planning activities.							
Landscape Habitat Indicator Guilds	N/A	Interpret these areas directly from the BWH/A data table.	Biannual	(Same as those for BWH/A above). These represent large habitats where area sensitive species have been found in surveys.	X	X	
<b>Tier 1 Resources: Sensitive Wildlife Habitats</b> - The map layers below are used in the BWH/A and represent the following: a) data of high accuracy that should be ground-truthed at the site level, b) areas that are highly sensitive to development and that should be set aside from development to the maximum extent possible.							
Natural Heritage Natural Areas	nhna	N.C. One Map	Quarterly	Field-delineated high-quality habitats that should receive the highest protections.	X	X	X
Natural Heritage Element Occurrences <sup>13</sup>	nheo	Limited dataset from N.C. One Map. Contact N.C. Natural Heritage for detailed dataset.	Quarterly	(Same as NHNA above) Data available via the GGT website has been filtered to remove inaccurate, destroyed or historic records.	X	X	X
Streams	hydro24k	N.C. One Map	Irregular	Maintain buffer of natural forest at least 100 feet wide, especially in priority watersheds.	X	X	X
Subwatersheds with federally listed fish and mussels	Fed_HUCs	Green Growth Toolbox website <sup>14</sup>	Biannual	Buffer streams within these watersheds by 200 feet to protect imperilled species.	X	X	X
Wild Brook Trout Streams	N/A	Interpret these areas directly from the BWH/A data table.	Biannual	The 100 foot stream buffers mapped in the BWH/A are a high priority (9 out of 10).	X	X	X
CREWS Wetlands (Coastal counties only)	[County name]_wets	Division of Coastal Management. Obtain from the Green Growth Toolbox website for easier to use legend.	Irregular	<ul style="list-style-type: none"> <li>Sites where a federal or state wetlands permit is likely required.</li> <li>Verify wetlands by survey ahead of development.</li> <li>Set aside development especially for higher quality wetlands.</li> <li>Buffer and connect verified wetlands to each other and to streams.</li> </ul>	X	X	
National Wetland Inventory wetlands	CONUS_wet_poly	U.S. Fish & Wildlife Service website <sup>15</sup>	Irregular		X		

## STATEWIDE GIS CONSERVATION DATA REFERENCE CHART

REFERENCE INFORMATION				LEVELS OF PLANNING			
GIS Data Layer	Layer Label	Where to Download Directly	Update Frequency	Summary of Interpretation & Recommendations for use	Visioning & Plan-Making	Ordinance & Rule-Setting	Development Review & Design
<b>Tier 2 Resources: Wildlife Habitat Landscapes</b> - The map layers below represent the following: a) data that are meant to be used at large scales and b) areas where agricultural districts should be encouraged and c) areas where low overall development density is recommended but rural cluster development is encouraged outside of sensitive areas and away from Managed Areas.							
High Quality Waters and Outstanding Resource Waters	hqworw	N.C. One Map	Irregular	Streams documented to be high-quality and support important resources. If all streams cannot receive wide buffers consider these as priority for buffers.	X	X	
Important Bird Areas (IBAs)	NC_IBAs	N.C. Audubon Society <a href="http://ncaudubonblog.org/downloads/">http://ncaudubonblog.org/downloads/</a>	Irregular	To identify areas where widespread or intense development will negatively impact priority bird species and should be avoided if possible.	X	X	
<b>Map layers not used in the BWHA that we recommend should be used in addition to the BWHA</b> These layers will give a more complete picture of wildlife habitat: conservation needs and opportunities in your community.							
Managed Areas	marea	N.C. One Map	Quarterly	Buffer and connect these areas with other managed and high priority areas by encouraging agricultural land uses around and between Managed Areas.	X	X	X
<b>Tier 1 Resources: Sensitive Wildlife Habitats</b>							
Colonial waterbird nest site buffers	Waterbird_nest_buffers	Green Growth Toolbox website	Yearly	Maintain a 330 foot undeveloped buffer to avoid disturbing large groups of nests.	X	X	X
Bald Eagle nests	N/A	Obtain from the N.C. Wildlife Resources Commission and filter the detailed NHEO dataset.	Irregular	A formal or informal permit may be needed from the U.S. Fish & Wildlife Service. Buffers range from approximately 330 to 660 feet. <sup>16</sup>	X	X	X
Floodplain boundaries <sup>17</sup>	fldmaphazar	N.C. Floodplain Mapping Program <a href="http://www.ncfloodmaps.com">www.ncfloodmaps.com</a>	Irregular	Locations with flooding risk and high potential for important wildlife habitats. Should be set aside from development to the maximum extent possible.	X	X	X
<b>Tier 2 Resources: Wildlife Habitat Landscapes</b>							
Smoke Awareness Areas (approx. 1/2 mile)	smoke_awareness	Green Growth Toolbox website	Yearly	An area that may experience smoke from controlled burning periodically, where it is best to encourage non-developed land uses.	X	X	X
Game Land Hunting Safety Buffer (150 yards)	gml_buffer	Green Growth Toolbox website	Yearly	An area where it is best to encourage non-developed land uses to prevent conflicts between hunting and private property.	X	X	X
Forestry Lands Assessment		N.C. Conservation Planning Tool	Irregular	Encourage agricultural districts especially in high priority areas.	X	X	
Agriculture Lands Assessment					X	X	

- <sup>1</sup> N.C. Natural Heritage Program. 2015. Natural Heritage Natural Areas. GIS coverage. Accessed 2015 May.
- <sup>2</sup> Ibid. Natural Heritage Element Occurrences.
- <sup>3</sup> N.C. Division of Water Quality. 2011. High quality water and outstanding resource water management zones metadata. GIS coverage. Accessed 2012 Dec.
- <sup>4</sup> Beginning with habitat: An approach to conserving Maine’s natural landscape for plants, animals, and people [Internet]. [2003]. Maine Department of Inland Fisheries and Wildlife. Available from: [www.beginningwithhabitat.org](http://www.beginningwithhabitat.org) Accessed 2012 Feb. 2.
- <sup>5</sup> N.C. Wildlife Resources Commission. 2015. North Carolina Wildlife Action Plan. Available from: [www.ncwildlife.org/Plan.aspx](http://www.ncwildlife.org/Plan.aspx).
- <sup>6</sup> Important Bird Areas in N.C. [Internet]. [2011]. Audubon N.C. Available from: <http://ncaudubonblog.org/iba/>. Accessed 2012 Jan. 1.
- <sup>7</sup> Ibid. 5, P.,177-183.
- <sup>8</sup> The columns under the header “Reference Information” mean the following. The “GIS Data Layer” column presents the name of each data layer that is described in Section 2 of this handbook. The column titled “Layer Label” displays the name of the shapefile. The “Where to Download Directly” column contains instructions on where to download the most up-to-date data from the original source. The “Update Frequency” column indicates how often updates are made by the data originator and should be made to each data layer.
- <sup>9</sup> The columns under the header “Levels of Planning” contain “X” marks that show which levels of planning are appropriate for each data layer. For example, all three boxes in Natural Heritage Natural Areas row are marked with an “X.” This means that this data layer should be used in visioning and plan making, ordinance and rule setting, and development review. On the other hand, only one box in the “National Wetland Inventory wetlands” row is marked with an “X”. This means that layer is only appropriate for use in visioning and plan making.
- <sup>10</sup> The ‘Summary of Interpretation & Recommendations for Use’ column summarizes the recommendations of the N.C. Wildlife Resources Commission for use of this GIS data to conserve wildlife and habitats of conservation concern.
- <sup>11</sup> <http://ncnhp.org/conservation/conservation-planning-tool>
- <sup>12</sup> <http://data.nconemap.com/geoportal/>
- <sup>13</sup> The Natural Heritage Element Occurrence layer downloaded through the Green Growth Toolbox website or NC OneMap only has a minimal set of attributes. Because the full dataset contains sensitive information, it must be obtained by contacting the N.C. Natural Heritage Program Conservation Information Manager ([www.ncnhp.org/web/nhp/contact](http://www.ncnhp.org/web/nhp/contact)).
- <sup>14</sup> [www.ncwildlife.org/Conserving/Programs/GreenGrowthToolbox/ConservationData.aspx](http://www.ncwildlife.org/Conserving/Programs/GreenGrowthToolbox/ConservationData.aspx)
- <sup>15</sup> [www.fws.gov/wetlands/Data/State-Downloads.html](http://www.fws.gov/wetlands/Data/State-Downloads.html)
- <sup>16</sup> U.S. FWS Bald Eagle Management Guidelines and Permits. [Internet]. [2013]. U.S. Fish and Wildlife Service. Available from: <http://www.fws.gov/midwest/MidwestBird/EaglePermits/baeatakepermit.html>
- <sup>17</sup> Floodplain data is not available for download on the GGT website. The best available data for your county should be downloaded from [www.ncfloodmaps.com](http://www.ncfloodmaps.com).