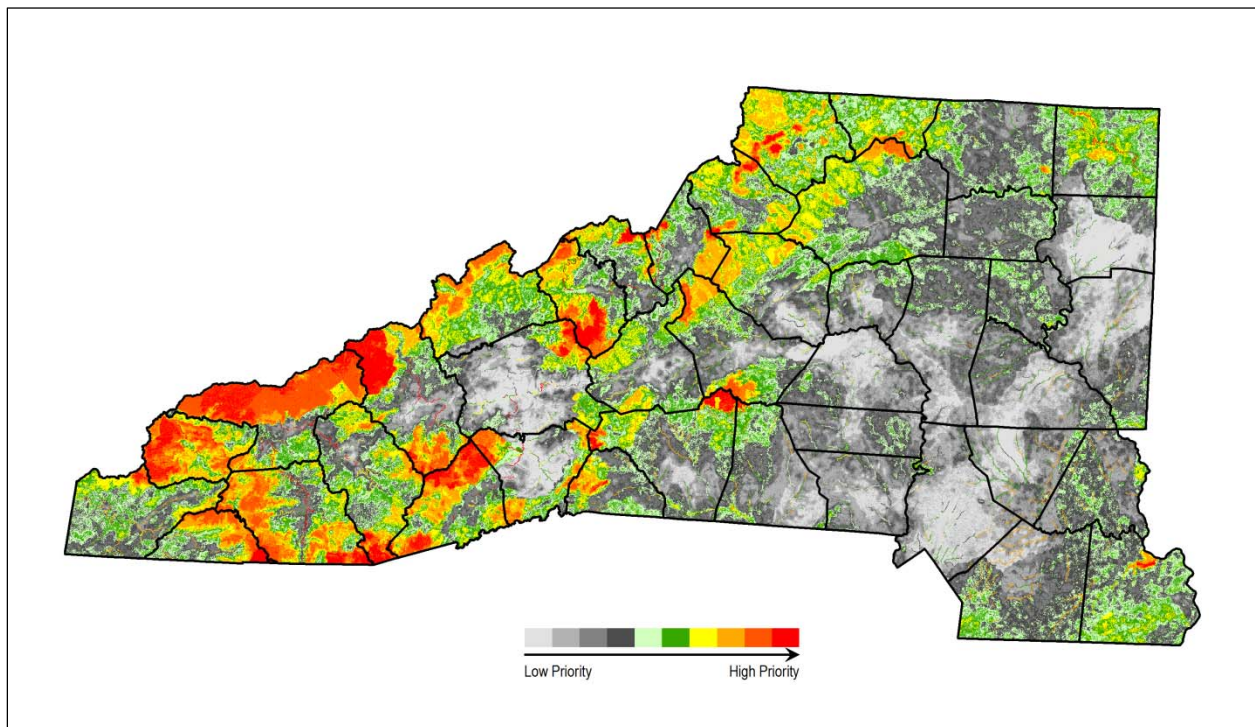


U.S. Fish and Wildlife Service
Ecological Services
Asheville, North Carolina Field Office
STRATEGIC PLAN 2012-2017



**THE U.S. FISH AND WILDLIFE SERVICE, WORKING WITH OTHERS,
CONSERVES, PROTECTS, AND ENHANCES FISH, WILDLIFE, AND PLANTS AND THEIR HABITATS
FOR THE CONTINUING BENEFIT OF THE AMERICAN PEOPLE.**

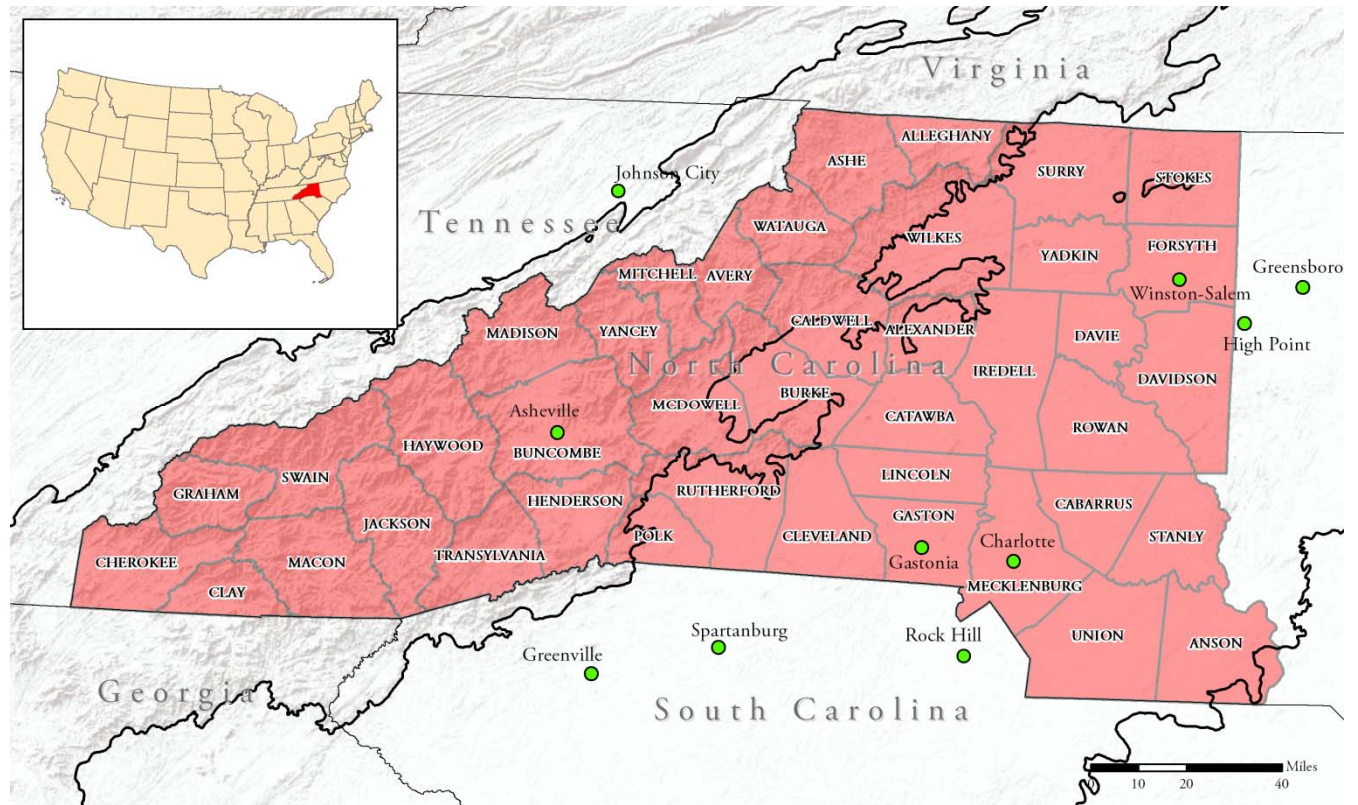
TABLE OF CONTENTS

INTRODUCTION AND BACKGROUND	3
STRATEGIC PLAN GOALS AND OBJECTIVES	8
AFO STAFFING AND DIVERSITY PLAN	13
APPENDIX A: AFO STRATEGIC PLAN PRIORITY WORK AREA MAP/GIS METHODOLOGY	18
MAP OF AFO STRATEGIC PLAN (FIGURE 2)	33
APPENDIX B: ENDANGERED AND THREATENED SPECIES FOR WHICH AFO HAS RESPONSIBILITIES	34
APPENDIX C: REFERENCES AND CITATIONS	38
APPENDIX D: STAFF ACTION PLANS	52
APPENDIX E: TABLE OF ACRONYMS	79

INTRODUCTION AND BACKGROUND

The U.S. Fish and Wildlife Service's (Service) Asheville Field Office (AFO), an Ecological Services facility, was established in the late 1970s. Forty-one counties make up the AFO's core work area in western North Carolina, which includes many publicly owned conservation lands, especially in the higher elevations, as well as the metropolitan areas of Charlotte, Winston-Salem, and Asheville (Figure 1). This area primarily encompasses portions of the Blue Ridge and Piedmont physiographic provinces. In addition to our core work area, the responsibilities of certain staff members extend beyond its boundaries and into adjacent states and other Service regions.

Figure 1. AFO core work area. Solid black line indicates border between the Blue Ridge (west side of work area) and Piedmont (east side of work area) physiographic provinces.



Using the best available science, our staff works with federal, state, tribal, local, and nonprofit stakeholders, as well as private landowners, to avoid, minimize, and mitigate threats to our area's natural resources. The AFO has responsibilities to administer numerous laws, including the Endangered Species Act, Fish and Wildlife Coordination Act, National Environmental Policy Act, Clean Water Act, Federal Power Act, Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, Partners for Fish and Wildlife Act, and Sikes Act. Using an array of programs, we work to recover endangered and threatened species, prevent the listing of imperiled species,

monitor and manage migratory birds and their habitats, restore nationally significant fisheries, and conserve and restore rare habitats and other federal trust resources in western North Carolina and beyond.

A Center of Biodiversity Threatened

The Southern Appalachian Mountains ecosystem, at the core of the AFO work area, contains a greater biological diversity than all of northern Europe (Clark 2001) for many reasons. The northeast to southwest alignment of the mountain range allowed for species migration as continental ice sheets advanced and retreated, the last retreat occurring about 10,000 years ago. While much of the Northeast was blanketed with glacial ice during periods of advancement, the Southern Appalachian Mountains remained free from glaciers and served as an important refugium for numerous plants and animals. Northern species migrated southward and established themselves in this region, where many persist today. Also, the area was never inundated by oceanic waters during interglacial periods. This lack of disturbance set the stage for species to evolve and diversify over millions of years. Significant rainfall, coupled with a diverse topography and multitude of habitat types, has led to exceptional biological diversity and a high number of endemic species, some of which have no known close relatives anywhere else in the world.

Locally, rainfall in the Southern Appalachians rivals that of the Pacific Northwest. This results from prevailing weather systems coming from the west and the Gulf of Mexico and associated orographic precipitation. As a result, portions of the area are considered temperate rain forests. The Southern Appalachian Mountains, along with key rivers that run from south to north, serve as important migratory bird pathways and critical breeding and wintering grounds, especially for neotropical migrants. This area is a part of the Appalachian Mountains Joint Venture. Some of the oldest river drainages in the world have led to remarkable aquatic species diversity, especially among fishes, crayfishes, and freshwater mollusks. Western North Carolina is home to the Southern Appalachian brook trout (a species of char) in certain headwater and high-elevation streams, and the Eastern Brook Trout Joint Venture encompasses portions of this area. A diversity of habitats (ranging from high-elevation grass and heath balds, mafic glades and barrens, mountain bogs and fens, high-elevation spruce-fir forests, northern hardwood and oak forests, montane pine forests, mesophytic coves, spray cliffs, and granitic domes) have led to a rich diversity of plant species and provide refugia for their associated fauna. The Southern Appalachian Mountains are a hotspot for salamander diversity, with our focus area containing at least 40 species. In fact, the first new genus of salamander described from the U.S. in half a century was recently discovered in a nearby Southern Appalachian Mountain stream in Georgia (Camp et al. 2009).

Much of the region's economic activity—agriculture, silviculture, mining, recreation, and tourism—is based on the area's abundant natural resources. Combined with a sizable and ever increasing human population base, these activities have contributed to habitat alteration on a grand scale. The direct exploitation of numerous natural resources and the invasion of hundreds of nonnative species also threatens the native biodiversity, resulting in an increase in the number of imperiled species. Alien species threatens forest composition and various ecological

processes. Some of the most notable recently include the hemlock and balsam wooly adelgids (insect pests) and Oriental bittersweet, an invasive, vine that girdles and strangles trees. White-nose syndrome, a deadly fungus that has caused a record number of deaths in bat hibernacula, has made its way to caves in the Southern Appalachian Mountains. Residential development and associated utility corridors have fragmented habitats and altered stream function. Prevailing wind currents have transported air pollutants from industry, cities, and power plants into this region, resulting in the acidification of mountain streams and soils and impacts to aquatic species and forests. Collectively, these threats have adversely affected the ecological integrity of the region, and there are ample indications that this stress is increasing. When this current array of threats is combined with the potential impacts from climate change, natural resource managers and conservationists are left with a gargantuan task of protecting our vast and imperiled biodiversity.

Defining the AFO Approach to Conservation

The AFO staff consists of 14 full-time biologists who have responsibility for 36 federally listed species (Appendix B), and they have the national recovery lead for 26 of these species. In light of this, and coupled with the fact that some of the fastest-growing regions of the country are in the AFO's work area, any chance at successful conservation must be well thought out and approached strategically.

This plan outlines three broad goals in which we will focus our conservation efforts:

- Conserve Priority Trust Resources.
- Conserve and Restore Priority Ecosystems.
- Identify and Address Potential Climate Change Challenges.

This plan explores how the AFO strategically approaches each of these conservation efforts. Key to our approach are three important devices: strategic habitat conservation, landscape-level cooperatives, and geographic information systems (GIS). Successful implementation of this plan will depend on the support of our conservation partners, both internally and externally.

Strategic Habitat Conservation – A Servicewide initiative

Nationwide, the Service has challenged itself to improve the efficiency with which it approaches and accomplishes conservation. As a result, the Service employs a *Strategic Habitat Conservation* (SHC) approach for conservation to enable the agency to more efficiently and effectively accomplish its mission.

SHC is a science-based framework for making management decisions about where and how to deliver conservation efficiently in order to achieve specific biological outcomes. This strategic conservation approach includes all Service programs and addresses both habitat and nonhabitat factors that limit fish, wildlife, and plant populations. SHC is a way of thinking about and carrying out conservation and management actions that require us to set specific biological goals; allows us to make strategic decisions about our work; and encourages us to constantly reassess

and, where necessary, improve our actions. The purpose of the SHC framework is to respond to the impact on fish, wildlife, and plants from the existing and growing threats of habitat fragmentation, urbanization, invasive species, disease, parasites, and water management as well as the potential threats wrought by climate change. SHC incorporates the following five key principles in an ongoing process that changes and evolves:

- Biological Planning (setting targets).
- Conservation Design (developing a plan to meet the goals).
- Conservation Delivery (implementing the plan).
- Monitoring and Adaptive Management (measuring success and improving results).
- Research (increasing our understanding).

Landscape Conservation Cooperatives

To assist with the application of SHC, the Service, with partners, has created Landscape Conservation Cooperatives (LCCs). LCCs are applied conservation science partnerships focused on a defined geographic area that informs on-the-ground strategic conservation efforts. LCC partners include Department of Interior agencies, other federal agencies, states, tribes, nongovernmental organizations, universities, and others.

LCCs will:

- Enable resource management agencies and organizations to collaborate in an integrated fashion within and across landscapes.
- Provide scientific and technical support to inform landscape-scale conservation using adaptive management principles.
- Engage in biological planning, conservation design, inventory and monitoring program design, and other types of conservation-based scientific research, planning, and coordination.
- Play an important role in helping partners establish common goals and priorities, so they can be more efficient and effective in targeting the right science in the right places.
- Inform the actions of partners and other interested parties in their delivery of on-the-ground conservation through products they develop.

The core area of coverage for the AFO is encompassed by two LCCs: the South Atlantic (SALCC) and Appalachian (ALCC). The SALCC includes portions of the South Atlantic Coastal Plain and Piedmont physiographic provinces, from southern Virginia to northern Florida. The terrestrial and aquatic landscape that comprises the area includes unique and valuable habitats that support concentrated populations of endangered, threatened, and declining species. Key habitats within our focus area of the SALCC include longleaf pine forests and savannahs in the Sandhills and upland hardwood forests, streams, bottomland hardwood forests, and swamp forests in the Piedmont. The ALCC extends from southwestern New England to central Alabama and from southern Illinois to central Virginia, including all or portions of the Blue Ridge, Valley and Ridge, Appalachian Plateau, and Interior Low Plateau physiographic provinces. The ALCC supports some of the largest expanses of public lands with contiguous

forests remaining in the eastern United States, as well as thousands of miles of streams, huge tracts of cropped and grazing land, numerous rural communities, and large urban areas. Portions of the ALCC (including key tracts within our focus area) are widely recognized as biodiversity hotspots of global importance. Both LCCs build upon existing joint ventures and other partnerships to provide biological planning and conservation design to guide on-the-ground conservation work of partners. Actions are directed at habitats that support multiple trust species and that are vulnerable to past and current anthropogenic alterations, the potential impacts of climate change, and other factors limiting populations of trust species.

GIS

One of the tools for implementing SHC is the integration of data for:

- seamless spatial modeling of species and habitats within and across geographic area boundaries;
- population modeling that links fish, wildlife, and plant populations to habitat and other limiting factors;
- identification of areas of converging and overlapping stressors;
- vulnerability assessments for fish, wildlife, plants, and their habitats;
- conservation strategies that spatially integrate biological objectives for species groups, management practices, and ecological functions and processes;
- designs for monitoring programs to assess and predict the ability of the landscape to support and sustain priority fish, wildlife, and plant populations;
- decision support systems and tools that make the science and models accessible to partners to define what is needed, how much is needed, and where it is needed;
- short- and long-term adaptation approaches at meaningful scales;
- maps of potential corridors, linking present and future habitats;
- application of scaled-down climate models to predict effects on fish and wildlife; and
- predicting ranges of native and invasive species under various temperature and precipitation projections.

To address these goals, the AFO developed a strategic plan priority work area map to consolidate all GIS datasets appropriate for identifying benefits or threats to biotic habitats and to generate an easy-to-interpret compilation of these datasets (Appendix A). Data layers used as inputs in the project fell into two categories: layers that are beneficial to federal trust resources (benefit layers) and layers that are a threat to federal trust resources (threat layers). All data layers were classified on a 0 to 10 scale, with 10 being of most benefit for the benefit layers and of greatest threat for the threat layers. The resultant map thus provides a location-based assessment of priority areas (Appendix A, Figure 2).

STRATEGIC PLAN – GOALS AND OBJECTIVES

Goal 1: Conserve Priority Trust Resources.

A. Migratory birds and their habitat.

Objectives:

1. Work with partners, permit applicants, and regulatory agencies to restore, enhance, manage, and protect priority migratory bird species identified in national, regional, and state bird conservation plans and their associated habitats.
2. Educate the public and others about the importance of conserving migratory birds and their habitat.
3. Support research that furthers the conservation of high-priority migratory birds and their habitat.

B. Endangered and threatened species.

Objectives:

1. Consult with action agencies and permit applicants to minimize and avoid impacts to listed species (including outreach to counties, municipalities, and other federal agencies), focusing on high-priority species and areas.
2. Conserve federal species of concern and candidate species and the habitats upon which they depend, focusing on the highest-priority species and high-priority areas and/or those for which listing can most easily be precluded.
3. Prevent extinction and promote the recovery of federally listed species and the habitats upon which they depend, focusing on high-priority species and areas.
4. Assist partners with identifying and implementing recovery actions in high-priority watersheds and habitats.
5. Educate the public and others about the importance of conserving endangered and threatened species and their habitat.
6. Support research that furthers the conservation of listed species, candidates, and species of concern.
7. Identify species that meet the criteria for listing, and, as funds permit, proceed with the preparation of proposed rules for the highest-priority species.

C. Wetlands and streams.

Objectives:

1. Work with partners, permit applicants, and regulatory agencies to avoid and mitigate impacts to wetlands/streams, focusing on protecting and improving high-priority areas.
2. Work with partners to conserve and restore wetlands and streams in high-priority areas.
3. Educate the public and others about the importance of conserving wetlands and streams.
4. Support research that furthers the conservation of wetlands and streams.

D. Diadromous fish.

Objectives:

1. Develop and implement migratory fish restoration plans and projects in high-priority areas.
2. Educate the public and others about the importance of conserving diadromous fish and their habitat.
3. Support research that furthers the conservation of migratory fishes.

E. Native American resources.

Objectives:

1. Work with federally recognized tribes to conserve and manage fish and wildlife resources, focusing on high-priority species and areas.
2. Maintain government-to-government relationships with tribes.
3. Educate the public and others about the importance of conserving tribal resources.

Goal 2: Conserve and Restore Priority Ecosystems.

A. Participate in ecosystem-level partnerships and planning efforts.

Objectives:

1. Participate in ongoing ecosystem-level planning and delivery efforts, including (but not limited to) nongovernmental organizations, federal and state agencies, and:
 - a. Landscape Conservation Cooperatives (LCCs).
 - b. Migratory Bird Joint Ventures (JVs).
 - c. Southeastern Aquatic Resource Partnership (SARP).
 - d. Southern Appalachian Man and the Biosphere (SAMAB) Cooperative.
2. Participate in the implementation of and periodic revision of North Carolina's Wildlife Action Plan.
3. Participate in watershed-level mitigation planning and implementation efforts within high-priority habitats.
4. Participate in regional faunal (and floral) groups, including (but not limited to) the North Carolina bat working group, Tennessee rare fish, Tennessee rare mussel, Project Bog Turtle, and Atlantic slope rare mussel groups.
5. Participate in restoration planning, implementation efforts, and the creation of the next forest plans for the Pisgah, Nantahala, and Uwharrie National Forests.
6. Develop a mechanism to regularly coordinate with counterparts at the National Park Service's Blue Ridge Parkway and Great Smoky Mountains National Park.

B. Act consistently according to the principles of SHC.

Objectives:

1. Identify key habitats in our core work area.
2. Identify focal species for those key habitats.
3. Identify population goals for focal species.
4. Work with partners to establish monitoring protocols for focal species.
5. Ensure that all projects funded by the AFO that occur within our core work area are evaluated within the SHC framework.

- C. Incorporate the conservation of high-priority ecosystems (priority areas designated as 7 to 10 on the attached map) into AFO programs.

Objectives:

1. Identify stakeholders who are key to the conservation of priority ecosystems, and develop a communication plan to reach out to them.
2. Focus environmental education efforts on the conservation of priority ecosystems.
3. Develop and maintain a GIS database to inform actions/decisions related to ecosystem-level issues (e.g., energy development, introduced pests).
4. Focus restoration projects in the core work area on priority ecosystems.
5. For high-priority ecosystems, identify significant stressors stemming from federally funded or authorized projects, and develop guidance for addressing those stressors.

Goal 3: Using the Service’s Climate Change Strategic Plan as a Guide, Identify and Address the Most Pressing Climate Change Challenges within the Purview of the AFO.

- A. Work toward becoming carbon neutral.

Objectives:

1. Identify and implement short- and long-term actions the AFO can take to reduce our internal carbon footprint, including (but not limited to):
 - a. Implement teleworking for the AFO staff.
 - b. Identify and implement the technology needed to participate in virtual meetings (e.g., video-conferencing, webinars).
 - c. Develop office recommendations related to vehicle fuel efficiency and use (e.g., carpooling, posting miles per gallon on vehicle notebooks).
 - d. Determine the office’s electrical consumption, and identify and implement measures to reduce it.
 - e. Identify and implement measures to reduce water consumption.
 - f. Identify and implement measures to reduce office supply use (e.g., paper, toner, ink).
2. Identify and implement projects that support the mutual goals of carbon sequestration and the conservation of priority trust resources.

- B. Understand and manage potential climate change impacts on priority resources, based on the priority resources identified in Goal 1 and spatially identified on the map (Appendix A).

Objectives:

1. Provide and participate in educational opportunities for our stakeholders in order to engage them about the topic of potential climate change and inform them of the Service's strategies for dealing with this threat.
2. Work with experts to understand the likely range of potential climate change scenarios applicable to our area.
3. Evaluate the relative vulnerability of priority species and habitats as related to the likely range of potential climate change scenarios for our area, including (but not limited to):
 - * Identifying and testing vulnerability assessment tools for our priority species and habitats.
 - * Addressing critical information gaps revealed by Strategy 2 through targeted monitoring and research programs.
4. Collaborate with conservation partners to inform, address, and find workable solutions to the potential impacts of climate change, including (but not limited to):
 - * Addressing habitat fragmentation and promoting habitat connectivity for native species.
 - * Focusing on the conservation of priority species and habitats as they are impacted by and adapt to climate change.
 - * Developing recommendations to address climate change impacts and to reduce nonclimate stressors.
 - * Considering climate change in resource allocation for the AFO.
 - * Working with state and federal regulatory agencies to identify barriers to, and opportunities for, implementing climate change actions.
 - * Using vulnerability assessments to guide and prioritize recovery strategies for priority species.

AFO STAFFING AND DIVERSITY PLAN

The AFO is committed to building and maintaining a diverse workforce. Our historically low turnover rate, while ensuring we had experienced biologists, hampered our ability to increase diversity. However, with future staff changes we have a plan to help develop our office workforce in order to better reflect the diversity of the people we serve.

Background

The AFO core work area is less diverse than the rest of the Nation. Additionally, when you look at the Blue Ridge province of North Carolina, where the AFO is located and where the majority of our imperiled species and rarest habitats are located, diversity drops further. One important exception is the Indian/Alaska Native percentage; it is higher in our work area due to the presence of the Eastern Band of Cherokee Indians.

	White	Black	Indian/Alaska Native	Asian	Islander	Other	Two or more races	Hispanic/Latino
National average	79.5%	12.9%	1.0%	4.6%	0.2%	-	1.8%	16.0%
AFO work area	85.3%	7.2%	1.4%	1.0%	0.0%	3.0%	2.1%	5.6%
North Carolina Blue Ridge	91.1%	1.8%	2.9%	0.5%	0.0%	2.0%	1.7%	4.5%

The AFO currently employees eight females (three interns, two administrative, and three biologists - all white) and nine males (one project leader and eight biologists - all white) and has three vacancies.¹

¹Per an agreement with the Service's Southeast Regional Office, reached when we lowered the grades of other positions, one of these vacancies is an 11/12 placeholder to be used when we feel a position needs to be upgraded. Upon upgrading, the lower-graded position would be eliminated.

Recent changes in AFO grade structure		
Grade	2007	2011
3/4	0	4 (STEPS)
4	1	0
5	1	1
5/6	0	0
5/7/9	1	0
7/9	0	2
7/9/11	1	1
9/11	1	1
11	1	0
9/11/12	1	2
11	0	1
11/12	2	2 ¹
12	6	5
13	0	0
14	1	1
<i>Total target staff numbers</i>	<i>16</i>	<i>20</i>

Strategy

Our strategy to increase workforce diversity is two-fold. First, we plan to alter the grade structure to recruit well-qualified students and early-career professionals and provide the opportunity for advancement into senior and management-level positions. Lack of diversity has long been an issue in natural resource organizations, extending from natural resource programs at colleges and universities. As colleges and universities work to increase their diversity, our strategy allows us to take advantage of their success and provide opportunities for members of under-represented groups to professionally develop and move up in our organization. Secondly, we plan to reach out to historically black colleges and universities in our area and the Eastern Band of Cherokee Indians to provide opportunities for aspiring professionals.

Recent Progress

Because of the long tenure and the outstanding capability of many of our biologists, the office was heavy with senior staff. In recent years, as vacancies have arisen, we lowered position pay grades to provide opportunities for early-career professionals and college students, where we believe there is the greatest chance for increasing diversity. Additionally, these pay-grade changes provide an office structure with opportunities for existing staff to move into senior-level positions and eventually into management positions.

The following recent changes in our staffing and grade structure have provided opportunities for youth to gain experience with the Service and for professionals to enter the Service at lower grades:

- In 2008 we used a GS 4 receptionist vacancy to create an internship program to recruit area college students for part-time GS 3/4 STEP positions. To date, six students (five female, one male) have served as interns through this effort, including one who moved on to become a SCEP intern with the Refuge Program. In filling the STEP positions, we announced the vacancies at, and actively sought out candidates from, all the local colleges and universities.
- In 2009 we converted a GS 12 position to a GS-401-7/9 and used the Federal Career Intern Program (FCIP) to recruit and hire.
- Also in 2009 we converted a GS 11 Information Technology Specialist position to a GS-401-9/11 Fish and Wildlife Biologist. The change in series allowed us to recruit from a larger pool of applicants. We also used FCIP to fill this position at the GS 9 level.

- In 2010 we converted a GS-401-9/11 position to a GS-401-7/9 and also used FCIP to recruit and hire at the GS 7 level.
- In 2011 we converted a GS 11/12 to a GS 9/11/12.

By recruiting at these grades, we have been able to bring on high-quality staff who promise to be long-term assets for the Service. At the same time we have substantially lowered costs now and into the future.

Future Plans

In the coming years we will continue to provide opportunities for college students and new professionals. We intend to create a staffing structure that would allow entry-level staff to advance into senior positions and senior staff to hone the skills that would allow them to move into supervisory positions at the field, Regional Office, and Washington Office levels.

We view the transition to a new staffing structure as a long-term endeavor, taking advantage of retirements and other departures. The next four years will bring opportunities to adjust our grade structure as we expect the retirement of two of our most experienced GS 12 biologists. During this period of transition, we anticipate creating two GS 7/9/11 journeyman biologist positions and either a GS 13 deputy/assistant field supervisor or team leader. Additionally, as soon as our existing GS 7/9 positions are vacated, they'll be converted to GS 5/7/9 entry-level positions.

These changes will reduce the number of straight GS 12s from five to three, with an eventual target that every grade from GS 3 to GS 14 is represented. When we attain our target grade structure, we will have a significant number of entry-level positions and opportunities for staff to rise into senior and supervisory positions, strengthening our ability to recruit, develop, and retain a diverse workforce.

We will continue using the STEP program and the new Pathways program as a means of attracting new talent to the Service. We are also very interested in using the SCEP program to attract and retain talent. This program has historically been coordinated at the regional office level. It is our hope that the Ecological Services program will more fully develop the SCEP program to be better funded, allow for seamless transition for STEPs to become SCEPs, and allow for SCEPs to move into the new GS 5/7/9 positions being created.

By working toward the target grade structure laid out here, we expect our

office structure to contribute significantly to the *Diversity and Inclusion Implementation/Action*

Target AFO grade structure				
Grade	2007	2011	2015 (anticipated)	Target
3/4	0	4 (STEPS)	4 (STEPS)	4 (STEPS)
4	1	0	0	0
5	1	1	1	0
5/6	0	0	0	1
5/7/9	1	0	2	2
7/9	0	2	0	0
7/9/11	1	1	2	3
9/11	1	1	1	1
9/11/12	1	2	2	4
11	1	1	1	0
11/12	2	2	2	3
12	6	5	3	0
13	0	0	1	1
14	1	1	1	1
<i>Total staff</i>	<i>16</i>	<i>20</i>	<i>20</i>	<i>20</i>

Plan's criteria that 30% of all accessions be used for entry level GS 5/7/9 positions. This structure would also maintain a cadre of senior-level staff, including the new GS 13 position. It is expected that the GS 13 position would be supervisory, and up to two of the GS 11/12 positions could also be supervisory or team leaders.

Recruitment Strategies

To fill future vacancies, our recruitment strategy would follow a three-pronged approach:

- Advertising almost all of our positions nationwide within government and outside government.
- We will take advantage of existing and future iterations of the STEP, SCEP, and Pathways programs to recruit entry- and junior-level staff.
- Finally, we will continue to work with area schools and other organizations to identify potential entry- and junior-level staff. We have worked closely with several area schools and organizations to recruit for our STEP and FCIP positions, including:
 - University of North Carolina at Asheville
 - Western Carolina University
 - Warren Wilson College
 - Mars Hills College
 - Haywood Community College
 - Asheville Buncombe Technical Community College
 - Montreat College
 - North Carolina Wildlife Resources Commission
 - North Carolina Department of Transportation
 - North Carolina Natural Heritage Program
 - U.S. Department of Agriculture (USDA), Forest Service
 - National Park Service
 - Area consulting firms

The schools with which we have worked are those closest to the AFO and where we have developed relationships with faculty members in key disciplines. Working with these professors, we are able to identify those students who show the greatest promise, and target them with our recruitment efforts. However, western North Carolina is one of the least diverse areas in the region. To advance the Service's diversity efforts, we will broaden our school-based recruitment efforts to include historically black colleges and universities in or near the core AFO work area. These include:

- North Carolina Agricultural and Technical State University
- North Carolina Central University
- Winston-Salem State University
- Bennett College
- Johnson C. Smith College
- Livingstone College

➤ Knoxville College

As with other schools, we will work directly with faculty members in the appropriate disciplines to identify the best and brightest students for recruitment.

The presence of the Eastern Band of Cherokee Indians within the AFO work area provides us with an opportunity to increase Service diversity while strengthening our ties with the Tribe. Building upon our past work with tribal youth and tribal fish and wildlife programs, we propose teaming with the tribal fish and wildlife agency to develop a strategy for exposing Cherokee youth to career opportunities in fish and wildlife conservation and helping them make educational choices that would lead them to successful natural resource careers and, hopefully, Service employment.

Conclusion

In recent years, the AFO has taken advantage of every staffing change to lower our grade structure to provide opportunities to recruit and develop a diverse workforce. We are committed to continuing this effort, and the next few years should provide opportunities to make further strides to reduce the number of GS 12 positions and broaden our base of lower-graded positions. We also intend to strengthen our ties and expand our recruitment and student development efforts with the Eastern Band of Cherokee Indians and historically black colleges in and near our work area.

APPENDIX A

AFO STRATEGIC PLAN

PRIORITY WORK AREA MAP/GIS MODEL METHODOLOGY Goal of the Project

The goal of the AFO's strategic plan priority work area map was to compile all GIS Datasets appropriate for identifying benefits or threats to wildlife and wildlife habitat and to generate a compilation of these datasets that is easy to interpret.

Development of GIS Data Layers:

Data layers used as inputs in the project fell into two broad categories: layers that are beneficial to federal trust resources (benefit layers) and layers that are a threat to federal trust resources (threat layers). All data layers were classified on a 0 to 10 scale, with 10 being of most benefit for the benefit layers and of greatest threat for the threat layers.

Description of the Creation of GIS Data Layers:

Benefit Layers:

Aquatic Subbasin Rank – The source of the data used for this layer is fish and benthic macroinvertebrate monitoring data from the North Carolina Division of Water Quality (NCDWQ). In both of these datasets there is a community rank attribute field that ranks the general quality of each sample site (IBI_Value for the fish dataset and BIOCLASS_Value for the macroinvertebrate dataset). Using these fields, the fish and benthic macroinvertebrate monitoring site data was combined, and an average hydrologic unit code (HUC) subbasin score (based on all the points that fell within the subbasin) was created. The manipulation of the individual layers used in the merge is given below:

Fish Community Rank by Subbasin – The NCDWQ maintains a dataset of fish community sampling sites. An attribute of this dataset is IBI_Rating, which is an index of biological integrity and is the method used to rate fish communities. A value for each IBI_Rating category was given:

IBI Rating	IBI Value
Excellent	5
Good	4
Good-Fair	3
Fair	2
Poor	1

Benthic Community Rank by Subbasin – The NCDWQ maintains a dataset of benthic macroinvertebrate monitoring sites. An attribute of this

dataset is BIOCLASS, which is a water quality classification based on biological monitoring. A value for each BIOCLASS category was given:

BIOCLASS	BIOCLASS Value
Excellent	5
Good	4
Good-Fair	3
Fair	2
Poor	1

We used these values and created an average subbasin score based on the points that fell within each subbasin. The average HUC subbasin score was classified on a 10-point scale, using natural breaks:

Class	Combined Rank Score
1	1.66 - 1.94
2	1.95 - 2.30
3	2.31 - 2.76
4	2.77 - 3.15
5	3.16 - 3.47
6	3.48 - 3.68
7	3.69 - 3.83
8	3.84 - 4.00
9	4.01 - 4.33
10	4.34 - 5

NCGAP Natural Land Density – This layer ranks a site (a 30- x 30-meter pixel) by the density of natural land that is within 1 kilometer (km). The layer is useful for identifying large blocks of contiguous natural land as well as small patches of natural land situated among, but not contiguous with, larger patches of natural land. To create the layer, the NCGAP Land Cover Dataset was reclassified where all “natural” land cover types were given a value of 1; all others were classified as “NoData.” Our definition of natural was any land cover category that is not the result of human modification. Next, we used a sum focal statistic in ArcGIS with a radius of 1 km. The moving window analysis identified the total

count of natural land pixels that occur within a 1-km radius of the focal pixel. The resultant layer was classified to a 10-point scale using a quantile classification scheme.

Class	Density Sum
1	5 - 1376
2	1377 - 1727
3	1728 - 1993
4	1994 - 2233
5	2234 - 2459
6	2460 - 2680
7	2681 - 2902
8	2903 - 3124
9	3125 - 3304
10	3305 - 3409

Land Cover Prioritization – This layer prioritizes the NCGAP Land Cover Dataset by importance of habitat to the Service’s AFO. AFO staff prioritized the NCGAP land cover classes by referencing the AFO’s 2004 strategic plan. In this plan there are habitat conservation priority tiers identified that rank into tiers the habitat types found in western North Carolina. Staff crosswalked these tiers to match the land cover classification scheme of the NCGAP Dataset. Please note that the two classes highlighted in yellow were modified from the original NCGAP land cover classification scheme to extract differences between the Appalachians and Piedmont. Originally, the highlighted classes were composed of a single statewide class.

CLASS	Priority	Value
Appalachian Swamp Forest	Priority 1	10
Appalachian Wet Shrubland/Herbaceous	Priority 1	10
Appalachian Xeric Mixed Forest	Priority 1	10
Appalachian Xeric Pine Forest	Priority 1	10
Floodplain Wet Shrubland	Priority 1	10
Grassy Bald	Priority 1	10
Mountain Emergent Vegetation	Priority 1	10
Mountain Mixed Bottomland Hardwood Forests	Priority 1	10
Northern Hardwood Forest	Priority 1	10
Riverbank Shrubland	Priority 1	10
Shrub Bald	Priority 1	10

CLASS	Priority	Value
Spruce/Fir Forest	Priority 1	10
Talus/Outcrops/Cliffs	Priority 1	10
Xeric Oak-Pine Forests	Priority 1	10
Appalachian Oak Forest	Priority 2	7
Appalachian Xeric Deciduous Forest	Priority 2	7
Dry Mesic Oak Forest	Priority 2	7
Dry Mesic Oak Pine Forests	Priority 2	7
Mesic Longleaf Pine	Priority 2	7
Piedmont Emergent Vegetation	Priority 2	7
Piedmont Mixed Bottomland Hardwood Forests	Priority 2	7
Piedmont Oak Bottomland Forest and Swamp Forest	Priority 2	7
Piedmont Xeric Pine Forests	Priority 2	7
Piedmont Xeric Woodlands	Priority 2	7
Piedmont/ Mountains Dry-Mesic Oak and Hardwood Forests	Priority 2	7
Piedmont/Mountain Submerged Aquatic Vegetation	Priority 2	7
Xeric Longleaf Pine	Priority 2	7
Appalachian Hemlock	Priority 3	4
Hemlock Floodplain Forest	Priority 3	4
Xeric Pine-Hardwood Woodlands and Forests	Priority 3	4
Appalachian Cove Forest	Priority 4	1
Coastal Plain Mixed Successional Forest	Priority 4	1
Piedmont Dry-Mesic Pine Forests	Priority 4	1
Piedmont Mesic Forest	Priority 4	1

Significant Natural Heritage Areas and Element Occurrence (EO) Area Sum – This layer ranks western North Carolina based around the North Carolina Natural Heritage Program’s Significant Natural Heritage Areas (SNHA) and EO locations. SNHA identify areas containing ecologically significant natural communities or rare species. The SNHA were scored based on their sum of AFO alternate rank. The AFO alternate rank for species in North Carolina was developed by AFO staff. Each SNHA was given the sum total of all EO/AFO–weighted values that occur within the boundaries of the SNHA. Also included in the final layer were all EO polygons of federally listed species that do not intersect any SNHA. These areas were also given the sum of ASNC alternate values of the species they represent. Staff classified the range of values into a 10-class classification scheme using the scheme listed below:

Class	Values
1	0 (an SNHA with no listed species occurrence)
2	2 - 50
3	51 - 94
4	95 - 160
5	161 - 310
6	311 - 700
7	701 - 1370
8	1371 - 2670
9	2671 - 5730
10	>5730

*Note – There are large data gaps between the categories, and the range of values is an estimate. Typically, the cutoffs were chosen to be the lower end of the gap, rounded to the 10th.

Important Bird Areas – This layer identifies Audubon’s Important Bird Areas in North Carolina. All important bird areas were given a value of 10.

Managed Land – Identifies managed land in the state. Reclassified the One North Carolina Naturally public land dataset, where all managed land was given a value of 10.

Wildlands Charette – A representation of potential habitat connectivity based upon the conclusions reached in the North Carolina Wildlands Charette project. The North Carolina Wildlands Charette results were reclassified based on the different values given land. The classification scheme is given below:

Type	Value
Core	10
Nugget	10
Corridor	7
Buffer	4
Digitized but no type given	1

Critical Habitat – Identifies land officially identified as critical habitat. All critical habitat was given a value of 10.

Indian Land – Identifies all Indian land from the U.S. Census TIGER/Line data. All Indian land was given a value of 10.

Wetlands – Prioritized National Wetlands Inventory (NWI) wetland areas, based on the ATTRIBUTE field. Staff contributed to developing the list:

Value	NWI ATTRIBUTE code
1	L1UBH, L1UBHh, L1UBHx, PUBF, PUBFh, PUBFx, PUBGh, PUBGx, PUBH, PUBHh, PUBHhs, PUBHx, PUBKh, PUBKHh, PUBKr, PUBKx, PUSA, PUSAd, PUSAh, PUSAx, PUSC, PUSCd, PUSCh, PUSCx, PUSKx
2	L2UB3Fh, L2UBFh, L2UBFx, PAB3Fh, PAB3Hh, PAB4Fh, PAB4Fx, PAB4Hh, PAB4Hx
3	L2AB3Hh, L2US3Ah, L2US3Ch, L2USAh, L2USAx, L2USCh, L2USChs, L2USCx, L2USFh, R3UBHx
4	PAB3H, R2UBHh, R2UBHx, R2USCx
5	PEM1Ah, PEM1Ax, PEM1Ch, PEM1Chs, PEM1Cx, PEM1Eh, PEM1Fh, PEM1Fx, PEM1Kx, PFO1/2Gh, PFO1/4Ah, PFO1Ah, PFO1Ax, PFO1Ch, PFO1Chs, PFO1Cx, PFO1Fh, PFO1Fx, PFO2Fh, PFO2Gh, PFO4/1Ah, PFO4Ah, PFO5Fh, PFO5Fx, PFO5Hh, PSS1/2Fh, PSS1/3Ah, PSS1/3Ch, PSS1/4Ah, PSS1/4Ch, PSS1Ah, PSS1Ax, PSS1Ch, PSS1Chs, PSS1Cx, PSS1Fh, PSS1Fhs, PSS1Fx, PSS1Gh, PSS3Ah, PSS4Ah, PSS4Cx, PSS5Fh, PSS5Hh, PSS6Fh, PUBFb, PUBGb, PUBHb
6	PAB3Fb, PEM1Ad, PEM1Bd, PEM1Cd, PEM1Fd, PFO1/4Bd, PFO1/SS1Ad, PFO1Ad, PFO1Bd, PFO1Cd, PFO1Fd, PFO4/SS1Bd, PFO4Ad, PFO4Bd, PSS1/4Ad, PSS1/4Bd, PSS1/EM1Ad, PSS1Ad, PSS1Bd, PSS1Cd, PSS1Fd, PSS3Bd, PSS4Bd, R3RBA, R3RBC, R3RBH, R3RSA, R3UB3H, R3UBH, R3USA, R3USC, R4US3C, R4USArx, R5UBH, R5USA
7	PAB5H, PEM/SS1C, PEM1/FO1A, PEM1/FO4B, PEM1/SS1A, PEM1/SS1B, PEM1/SS1C, PEM1/SS4A, PEM1/UBF, PEM1A, PEM1Ab, PEM1B, PEM1C, PEM1Cb, PEM1F, PEM1Fb, PFO1/2C, PFO1/2F, PFO1/2Fb, PFO1/3A, PFO1/3B, PFO1/4A, PFO1/4B, PFO1/4C, PFO1/4Ch, PFO1/EM1Eb, PFO1/SS1A, PFO1/SS1B, PFO1/SS3A, PFO1/SS3B, PFO1A, PFO1Ab, PFO1B, PFO1Bb, PFO1C, PFO1Cb, PFO1F, PFO1Fb, PFO3/1B, PFO3/4B, PFO3A, PFO3B, PFO4/1A, PFO4/1B, PFO4/1C, PFO4/3B, PFO4/EM1C, PFO4A, PFO4Ab, PFO4B, PFO4C, PFO4Cb, PFO5Fb, PSS/EM1A, PSS/EM1C, PSS/FO1A, PSS/FO1C, PSS1/2C, PSS1/2Cb, PSS1/2F, PSS1/2Fb, PSS1/3A, PSS1/3B, PSS1/4A, PSS1/4B, PSS1/EM1A, PSS1/EM1B, PSS1/EM1C, PSS1/EM1Fb, PSS1/FO1A, PSS1/FO1B, PSS1A, PSS1Ab, PSS1B, PSS1Bb, PSS1C, PSS1Cb, PSS1E, PSS1Eb, PSS1F, PSS1Fb, PSS1Gb, PSS1Hb, PSS3/4B, PSS3/FO4A, PSS3A, PSS3B, PSS3C, PSS3Cb, PSS4/1B, PSS4A, PSS4B, R2UB3H, R2USA, R2USC
8	PAB3F, PAB4F, R2ABHh, R2UBH, R3RB2H, R3UB2H
9	R3RB1H, R3UB1H
10	NA

Threat Layers:

Impervious Surface – The National Land Cover Database Impervious Surfaces Dataset and the NCGAP Land Cover Dataset were used to develop this dataset. It identifies pixels with greater than 20% impervious surface. Additionally, a reclassified NCGAP Dataset (with only those areas classified as Urban High-Intensity Developed, Urban Low-Intensity Developed, Residential Urban, or Barren; quarries, strip mines, and gravel pits in the NCGAP Land Cover Dataset) was merged with the Impervious Surfaces Dataset. This

merged layer was summarized by percent impervious within each 14-digit HUC basin. The classification scheme is given below.

Percent Impervious	Value
0% Impervious	0
0-3% Impervious	2
3-6% Impervious	4
6-10% Impervious	6
10-20% Impervious	8
>20% Impervious	10

Forest Insect and Disease Risk – The composite results of the U.S. Forest Service (USFS) analysis of forest insects and disease risks on the Nation’s forests. Forty-two risk agents acting on 57 tree species were selected for the risk map. The threshold of risk of mortality is defined as the expectation that, without remediation, 25% or more standing live basal area greater than 1 inch in diameter will die over the next 15 years (2005 to 2020) due to insects and diseases. All areas identified as exceeding this threshold were given a value of 10.

Road Density with traffic volume – This layer ranks the state based on the density of roads, with consideration given for traffic volume data. Annual Average Daily Traffic (AADT) data was merged with the North Carolina Department of Transportation (NCDOT) Integrated Statewide Road Network (ISRN) line segments via spatial join. AADT sample locations (17,076 of 17,575) were merged to an ISRN road segment. However, there are a total of 366,171 line segments in the NCDOT ISRN database, so the majority of road segments have no traffic data. The density analysis identifies the density of roads (sum of road pixels/area) within either a 1-km radius (3.142 km²) surrounding a pixel. The more roads there are and the higher the traffic volume, the higher the density value. The layer was classified using a 10-class quantile scheme:

Class	Density Value
0	0
1	0.096 - 0.673
2	0.674 - 1.155
3	1.156 - 1.540
4	1.541 - 1.925
5	1.926 - 2.310
6	2.311 - 2.695
7	2.696 - 3.272
8	3.273 - 4.235
9	4.236 - 6.161
10	>6.161

Dam Density – This layer prioritizes hydrologic subbasins based on the storage capacity of dams. Two data sources were used for this analysis, the National Inventory of Dams (NID) and North Carolina Department of Environment and Natural Resources (NCDENR) Dams (NCDAMS). The two datasets can represent the same dam; therefore, all NCDAMS that had an NID_ID in the NID Dataset were excluded. The NID reports the storage capacity of each dam in an NID_storage field. In the NCDAMS Dataset, the MAX_IMPOUND field was the same as the NID_storage field, so it was used to represent storage for the NCDAMS records. For each subbasin, the total storage capacity (TSC) of the dams that occur within the subbasin were summed by using the NID_storage or MAX_IMPOUND values of all dams occurring in a subbasin and divided the TSC by subbasin area (sum of TSC area/area of subbasin). All subbasins were classified into a 10-class classification scheme, using natural breaks. Values increase as the total storage capacity of dams increases.

Class	TSC per Ha
1	0.012 – 1.381
2	1.382 – 4.330
3	4.331 – 7.511
4	7.512 – 12.023
5	12.024 – 17.479
6	17.480 – 25.869
7	25.870 – 61.452
8	61.453 – 144.619
9	144.620 – 431.773
10	431.774 – 826.432

Wind Power – This layer ranks the state by the potential to support wind farms. The source is the North Carolina State Energy Office. The original layer had a 4-class ranking system, which was reclassified as follows:

Watts Per Square Mile	Class
Less than 300 watts per square mile	0
300 – 500 watts per square mile	4
500 – 800 watts per square mile	7
Greater than 800 watts per square mile	10

Mining – This layer identifies mining density by hydrologic subbasin. The layer was created by merging the two mining datasets--NCDENR Permitted Mines and the U.S. Geological Survey (USGS) Mineral Resources Data System (MRDS) Dataset for North Carolina--and removing all duplicates within the USGS data. The number of mines within each subbasin was summarized and classified using a 10-class quantile scheme:

Class	Count of Mines
1	1 - 2
2	3 - 8
3	9 - 16
4	17 - 21
5	22 - 26
6	27 - 36
7	37 - 42
8	43 - 50
9	51 - 87
10	>87

Pollutant Discharge by 14-digit HUC – This layer summarizes by hydrologic subbasin the number, type, and history of violations of pollutant discharge locations based on the latest version of the National Pollutant Discharge Elimination System (NPDES), not the publicly available dataset; rather, we used a more detailed dataset supplied directly from the NCDWQ) and Environmental Protection Agency (EPA) facilities subject to environmental regulation. The NPDES identifies all nationally permitted point-source pollution discharge locations. The EPA Facilities Dataset includes the following data:

- Superfund National Priorities List (NPL)
- RCRAInfo – EPA and State Treatment, Storage, Disposal facilities
- Toxic Release Inventory System - All reported years, including the just-released 2008 data
- Integrated Compliance Information System (ICIS) and Permit Compliance System (PCS) – National Pollutant Discharge Elimination System (NPDES) Majors
- RCRAInfo – Large-Quantity Generators (LCG)
- Air Facility System (AFS) – Major discharges of air pollutants
- RCRAInfo – Corrective Actions
- RMP – Risk Management Plan
- SSTS – Section Seven Tracking System (Pesticides)
- ACRES – Brownfields Properties

The focus of this dataset is NPDES. We prioritized NPDES locations by the type of facility and whether they had any instances of violating their permit. The classification of NPDES points is listed below:

Criteria	Class
Permit type: Water Plant/Water Conditioning	2
Permit type: all others except Water Plant/Conditioning	5
NPDES permit with a Special Order by Consent	7
NPDES permit with Notice of Violation	10

Twenty-three NPDES sites derived from the publicly available NPDES Dataset were added because they were under a Special Order by Consent (SOC) but were not included in the NPDES Dataset supplied by the NCDWQ. All EPA facilities data was included as a value of 5. Any points that had a NPDES permit number which matched the data in the NCDWQ/NPDES Dataset were removed. The merged dataset was summarized by HUC subbasin using the total sum of ranked discharge points that fell within a HUC and ranked the resultant dataset in a 10-class scheme, using the following quantiles:

Discharge Sum	Class
0	0
1 - 27	1
28 - 50	2
51 - 92	3
93 - 130	4
131 - 150	5
151 - 162	6
163 - 182	7
183 - 255	8
256 - 532	9
> 533 (max value 1367)	10

Compilation of the Data Layers to Produce the Final Model:

Prior to the final set of layers described above, many more data layers were created to be considered as inputs to this project. A correlation analysis was run on all data layers (including some not listed above), and significant correlations were removed by removing data layers from the analysis.

The next step in the process was to weight each dataset (AFO rank). Members of the AFO staff ranked each layer independently on a 1 to 10 scale based on perceived benefit or threat to federal trust resources. The AFO rank is the average score a layer received. The AFO rank for each layer is as follows:

<i>Beneficial Data Layers</i>	
Dataset	AFO Rank
SNHA sum	9.77
Wetlands	7.77
Natural Lands Density	6.33
Important Bird Areas	6.33
Habitat Priorities	5.88
Aquatic Rank	5.77
Wildland Charette	5.1
Managed Land	4.33
Indian Land	4.11
Critical Habitat	2.4

<i>Threat Data Layers</i>	
Dataset	AFO Rank
Impervious Surfaces	9.75
Dam Density	8.37
Discharge	7.12
Mining	6.87
Road Density	6.75
Insect and Disease Risk	5.25
Wind Power	4.5

To generate the final map, all data layers were multiplied by their AFO rank and summed by category (benefit or threat). The sum of the threat layers was subtracted from the sum of the benefit layers. The resultant layer was then classified into a 1 to 10 scale. A high score of 10

indicates an area that ranked high in the benefit layers (numerous benefits) but low in the threats layers (limited threats). A low score of 1 indicates an area that ranked low in the benefit layers but high in the threat layers. The classification of the final layer is as follows:

Class	Range of Values
1	-36.19 to -24.66
2	-24.65 to -19.04
3	-19.03 to -13.98
4	-13.97 to -8.91
5	-8.90 to -4.13
6	-4.12 to 0.93
7	0.94 to 6.55
8	6.56 to 12.73
9	12.74 to 19.2
10	>19.2 (max 35.51)

Incorporation of Aquatic Species Predictive Habitat Map Data

An initial concern of the strategic plan map was that it did not adequately address and rank aquatic habitats. To address these concerns, a prioritization of all streams in western North Carolina, based on Maxent model predictions of 146 different aquatic species, was incorporated into the strategic plan final map.

To better understand the spatial distributions of aquatic species in western North Carolina, AFO staff created predictive habitat maps for 146 different aquatic species (113 fish species, 19 mussel species, 14 crayfish species) using geographic information systems and maximum entropy (Maxent) modeling. Maxent is a machine learning technique that can be used to predict the geographic distribution of any spatial phenomena, including plants or animals. These maps were derived by comparing known species occurrences with a suite of stream or land-cover-derived environmental variables. AFO staff believe the maps provide an excellent coarse-scale look at the potential stream suitability of many aquatic species present in western North Carolina and hope that the mapping efforts can help prioritize stream systems and help illustrate the spatial distributions and conservation needs of aquatic species and habitats in western North Carolina.

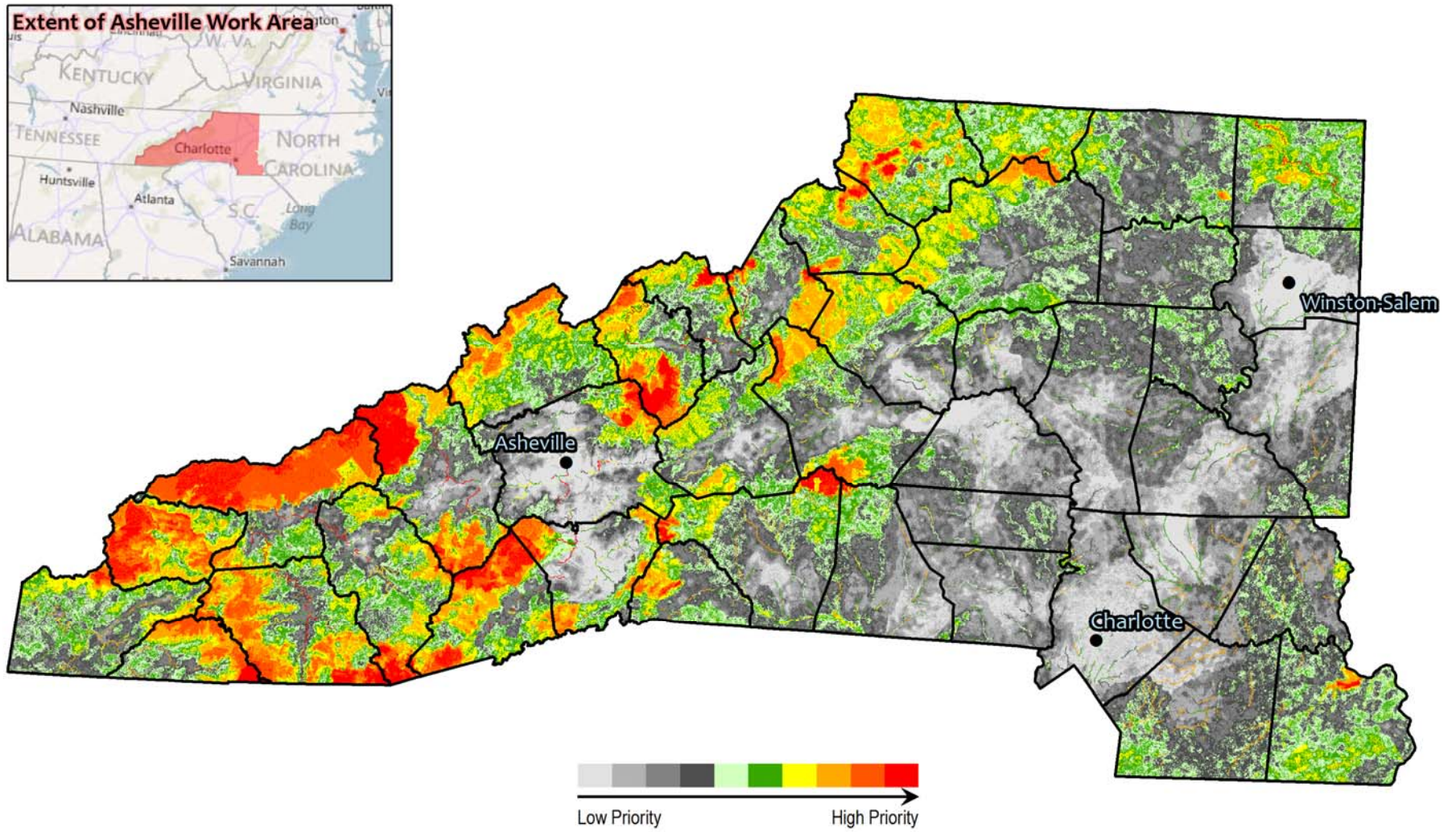
To create a work-area-wide prioritization of all streams in western North Carolina, all individual species Maxent model predictions were summarized. The work-area-wide prioritization ranks streams in western North Carolina based on species diversity and NatureServe Global Rank. The

NatureServe Global Rank provides an assessment of the condition of a species across its entire range and includes an estimate of extinction risk. The classification scheme is given below.

Value	Global Rank
1	≤ 2 G5 species
2	3-8 G5 species
3	≥ 9 G5 species
4	≤ 2 G4 species
5	≥ 3 G4 species
6	≤ 1 G3 species
7	≥ 2 G3 species
8	≤ 1 G2 species
9	≥ 2 G2 species
10	≥ 1 G1 species

The work-area-wide prioritization of streams in western North Carolina was incorporated into the strategic plan map by performing a Spatial Analyst Max calculation. The Maxent calculation maintains the maximum value of either dataset as the resultant calculation value. Therefore, when the stream prioritization layer was of higher value than the strategic plan map, the stream prioritization value was assigned and vice versa (Figure 2).

Figure 2. Map of Asheville Strategic Plan.



APPENDIX B

ENDANGERED AND THREATENED SPECIES FOR WHICH THE AFO HAS RESPONSIBILITY (2009)

RECOVERY PRIORITY	STATUS	SPECIES	LEAD FO	LEAD REG	LISTING DATE	RECOVERY PLAN DATE	REVISED PLAN DATE
MAMMALS							
6C	E	Carolina northern flying squirrel	ASNC	4	85-07-01	90-09-24	
18	E	Eastern cougar (=puma)	ASNC	5	73-06-04	82-08-02	
8	E	Gray bat	ASNC	3	76-04-28	82-07-08	
8	ECH	Indiana bat	ASNC	3	67-03-11	83-10-14	R3 draft
3C	ECH	Virginia big-eared bat	ASNC	5	79-11-30	84-05-08	
BIRDS							
REPTILES							
AMPHIBIANS							
FISHES							
11	TCH (XN)	Spotfin chub	ASNC	4	77-09-09	83-11-21	
MUSSELS							
5C	ECH	Appalachian elktoe	ASNC	4	94-11-23	96-08-26	
5C	ECH	Carolina heelsplitter	ASNC	4	93-06-30	97-01-17	
5C	E (XN)	Cumberland monkeyface pearl mussel	ASNC	4	76-06-14	84-07-09	
5	E	Dwarf wedgemussel	ASNC	5	90-03-14	93-02-08	
5	E (XN)	Finerayed pigtoe	ASNC	4	76-06-14	84-09-19	
8	E	James spinymussel	ASNC	5	88-07-22	90-09-24	
5	E	Pink mucket pearl mussel	ASNC	4	76-06-14	85-01-24	
5	E (XN)	Shiny pigtoe	ASNC	4	76-06-14	84-07-09	

RECOVERY PRIORITY	STATUS	SPECIES	LEAD FO	LEAD REG	LISTING DATE	RECOVERY PLAN DATE	REVISED PLAN DATE
5	E	Tan riffleshell	ASNC	4	77-08-23	84-10-22	
2C	E (XN)	Winged mapleleaf	ASNC	3	91-06-20	97-06-25	
SNAILS							
9	T	Noonday snail	ASNC	4	78-07-03	84-09-07	
INSECTS							
ARACHNIDS							
5	ECH	Spruce-fir moss spider	ASNC	4	95-02-06	98-09-11	
CRUSTACEANS							
PLANTS							
8	T	Blue Ridge goldenrod	ASNC	4	85-03-28	87-10-28	
5C	E	Bunched arrowhead	ASNC	4	79-07-25	83-09-08	
14	T	Dwarf-flowered heartleaf	ASNC	4	89-04-14		
8	T	Heller's blazingstar	ASNC	4	87-11-19	89-05-01	00-01-28
8	E	Morefield's leather flower	JAMS	4	92-05-20	94-05-03	
8	TCH	Mountain golden heather	ASNC	4	80-10-20	83-09-14	
3C	E	Mountain sweet pitcher plant	ASNC	4	88-09-30	90-08-13	
6	E	Roan Mountain bluet	ASNC	4	90-04-05	96-05-13	
5	E	Rock gnome lichen	ASNC	4	95-01-18	97-09-30	
2C	E	Schweinitz's sunflower	ASNC	4	91-05-07	94-04-22	
14	T	Small whorled pogonia	ASNC	5	82-09-09	85-01-16	92-11-13
5	E	Small-anthered bittercress	ASNC	4	89-09-21	91-07-10	
2	E	Spreading avens	ASNC	4	90-04-05	93-04-28	

RECOVERY PRIORITY	STATUS	SPECIES	LEAD FO	LEAD REG	LISTING DATE	RECOVERY PLAN DATE	REVISED PLAN DATE
7C	T	Swamp pink	ASNC	5	88-09-09	91-09-30	
9	T	Virginia spiraea	ASNC	5	90-06-15	92-11-13	
8C	E	White irisette	ASNC	4	91-09-26	95-04-10	

E - endangered

T - threatened

D - delisted

CH - critical habitat

XN - experimental nonessential population designation

APPENDIX C
REFERENCES AND CITATIONS

- Aguilar, R., M. Quesada, L. Ashworth, Y. Herrerias-Diego, and J. Lobo. 2008. Genetic consequences of habitat fragmentation in plant populations: susceptible signals in plant traits and methodological approaches. *Molecular Ecology*. 17:5177-88.
- Alderman, John M. 1994. Statuses of state listed freshwater mussel populations in North Carolina. *Proceedings of the Annual Conference of the Southeast Association of Fish and Wildlife Agencies*. 48:350-356.
- Anders, Constance M., and Zack E. Murrell. 2001. Morphological, molecular, and biogeographical variation within the imperiled Virginia spiraea. *Castanea*. 66(1-2):24-41.
- Auer, Nancy A. 1996. Importance of habitat and migration to sturgeons with emphasis on lake sturgeon. *Canadian Journal of Fisheries and Aquatic Sciences*. 53(1):152-160.
- Backlund, P., A. Janetos, and D. Schimel (convening lead authors). 2008. The effects of climate change on agriculture, land resources, water resources, and biodiversity in the United States. Synthesis and Assessment Product 4.3 Report by the U.S. Climate Change Science Program and the Subcommittee on Global Climate Change Research. U.S. Environmental Protection Agency, Washington, D.C. 362 pp.
- Baranski, Michael J. 1993. Natural areas inventory for the Yadkin river corridor in Davie, Davidson, and Rowan Counties, North Carolina. North Carolina Natural Heritage Program. Raleigh, NC. 68pp.
- Bauer, Jennifer A. 2011. Roan mountain: history of an Appalachian treasure. Natural History Press. Charleston, SC. 190pp.
- Blehert, David S., Jeffery M. Lorch, Anne E. Ballmann, Paul M. Cryan, and Carol U. Meteyer. 2011. Bat white-nose syndrome in North America. *Microbe*. 6(6): 267-273.
- Bogan, Arthur E. 2008. Global diversity of freshwater mussels (Mollusca, Bivalvia) in freshwater. *Hydrobiologia*. 595(1):139-147.
- Brenner, Deena, Gregory Lewbart, Martha Stebbins, and Dennis W. Herman. 2002. Health survey of wild and captive bog turtles (*Clemmys muhlenbergii*) in North Carolina and Virginia. *Journal of Zoo and Wildlife Medicine*. 33(4): 311-336.
- Bridle, Kenneth A., Shawn C. Oakley, and Ann Berry Somers. 1998. Inventory of the natural heritage of Forsyth County, North Carolina. North Carolina Natural Heritage Program. Raleigh, NC. 139pp.
- . 1998. Inventory of the natural heritage of Stokes county, North Carolina. 195pp.
- Brzyski, Jessica R. 2010. Isolation and characterization of microsatellite markers in the rare clonal plant, *Spiraea virginiana* (Rosaceae). *American Journal of Botany*. 97(4):e20-e22.

- Buchanan, Misty Franklin and John T. Finnegan, editors. 2010. 2010 natural heritage program list of the rare plant species of North Carolina. North Carolina Natural Heritage Program. Raleigh, NC.
- Bullock, J. F. 2003. The importance of southern Appalachian wetlands to breeding birds (Master's Thesis). Appalachian State University, Boone, NC.
- Burr, Brooks M., David J. Eisenhour, and James M. Grady. 2005. Two new species of *Noturus* (Siluriformes: Ictaluridae) from the Tennessee river drainage: description, distribution, and conservation status. *Copeia*. 2005(4): 783-802.
- Camp, C.D., W.E. Peterman, J.R. Milanovich, T. Lamb, J.C. Maerz, and D.B. Wake. 2009. A new genus and species of lungless salamander (family Plethodontidae) from the Appalachian highlands of the south-eastern United States. *Journal of Zoology*. 279(1):86-94.
- Citizens' Environmental Advisory Council. 1998. Inventory of the natural areas of Mecklenburg County, North Carolina. Mecklenburg County Parks and Recreation Commission. Charlotte, NC. 79pp.
- Clark, S. 2001. Birth of the mountains: the geologic story of the southern Appalachian mountains. U.S. Geological Survey. 23 pp.
- Clarkin, K., A. Connor, M.J. Furniss, B. Gubernick, M. Love, K. Moyan, and S.W. Muser. 2005. National inventory and assessment procedure for identifying barriers to aquatic organism passage at road-stream crossings. USDA Forest Service. National Technology and Development Program. San Dimas, CA.
- Coffman, J.S. 2005. Evaluation of a predictive model for upstream fish passage through culverts. (Master's Thesis). James Madison University.
- Confer, John L., Jeffery L. Larkin, and Paul E. Allen. 2003. Effects of vegetation, interspecific competition, and brood parasitism on golden-winged warbler (*Vermivora chrysoptera*) nesting success. *The Auk*. 120(1):138-144.
- Conservation Trust for North Carolina. 1995. Natural areas of buncombe county, North Carolina: a preliminary inventory. North Carolina Natural Heritage Program. Raleigh, NC. 279 pp.
- Convention on Biodiversity. 2011. The global strategy for plant conservation. Accessed November 2011. Available from: <http://www.cbd.int/gspc/rational.shtml>.
- Cope, W.G. and D.L. Waller. 1995. Evaluation of freshwater mussel relocation as a conservation and management strategy. *Regulated Rivers: Research and Management*. 11:147-155.
- Corser, Jeffrey D. 2001. Decline of disjunct green salamander (*Aneides aeneus*) populations in the southern Appalachians. *Biological Conservation*. 97(1):119-126.

- Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service, U.S. Department of the Interior, FWS/OBS-79-31.
- Delcourt, H.R. 1985. Holocene vegetational changes in the southern Appalachian mountains, U.S.A. *Ecologia mediterranea* Tome XI (Fascicule 1): 9-15.
- DeWan, Amielle, Natalie Dubois, Kathleen Theoharides, and Judith Boshoven. 2010. Understanding the impacts of climate change on fish and wildlife in north Carolina. *Defenders of Wildlife*. 218 pp.
- Dobony, Christopher A., Alan C. Hicks, Kate E. Langwig, Ryan I. von Linden, Joseph C. Okoniewski, and Raymond E. Rain. 2011. Little brown myotis persist despite exposure to white-nose syndrome. *Journal of Fish and Wildlife Management*. 2(2):190-195.
- Doll, B.A., G.L. Grabow, K.R. Hall, J. Halley, W.A. Harman, G.D. Jennings and D.E. Wise. 2003. Stream restoration: a natural channel design handbook. NC Stream Restoration Institute. NC State University. 128pp.
- Earley, Lawrence S. 2006. Swimming with the current: a guide to help local governments protect aquatic ecosystems while streamlining environmental review. North Carolina Wildlife Resources Commission. Raleigh, NC. 20pp.
- Eastern Brook Trout Joint Venture. 2008. Conserving the eastern brook trout: action strategies. 88pp. Accessed November 2011. Available: <http://www.easternbrooktrout.org/publications.aspx>
- Equinox Environmental Consultation and Design. 2002. Rough creek watershed natural resources inventory (Haywood County, North Carolina). The Southern Appalachian Highlands Conservancy. 47 pp.
- Euliss, Amy C., Melany C. Fisk, S. Coleman McCleneghan, and Howard S. Neufeld. 2007. Growth of the rare southern Appalachian endemic plant *Houstonia montana* (Rubiaceae) in contrasting habitat types. *Journal of the Torrey Botanical Society*. 134(2):177-187.
- Falk, Donald A., Constance I. Millar, and Margaret Olwell, ed. 1996. Restoring diversity: strategies for reintroduction of endangered plants. Washington, D.C. Island Press. 507 pp.
- Ford, W. Mark, Eric R. Britzke, Christopher A. Dobony, Jane L. Rodrigue, and Joshua B. Johnson. 2011. Patterns of acoustical activity of bats prior to and following white-nose syndrome occurrence. *Journal of Fish and Wildlife Management*. 2(2):125-134.
- Fox, Susan, Bill Jackson, Sarah Jackson, Gary Kauffmann, Mary Carol Koester, Robert Mera, Terry Seyden, Charles Van Sickle, Sealy Chipley, Jim Fox, Jeff Hicks, Matt Hutchins,

- Karin Lichtenstein, Kelsie Nolan, Todd Pierce, and Beth Porter. 2011. Western North Carolina report card on forest sustainability. USDA Forest Service Southern Research Station. Asheville, NC. 198pp.
- Frye, Christopher T. 1996. Inventory of the natural heritage of Iredell County, North Carolina. North Carolina Natural Heritage Program. Raleigh, NC. 127pp.
- Frye, Christopher T., and Timothy M. Goater. 1992. Yadkin river natural areas inventory: inventory and classification of the primary natural communities and wildlife habitats of the Yadkin river corridor in Davie, Forsyth, and Yadkin Counties, North Carolina. North Carolina Natural Heritage Program. 67pp.
- Gaddy, L.L. 1994. Natural areas of Henderson County: a preliminary inventory of the natural areas of Henderson County, North Carolina. Conservation Trust of North Carolina. Raleigh, NC. 179pp.
- . 1992. Natural areas inventory of the highlands region: inventory of the primary natural areas of the highlands township region, in Macon and Jackson Counties, North Carolina. 127pp.
- . 1987. A review of the taxonomy and biogeography of *Hexastylis* (Aristolochiaceae). *Castanea* 52(3):186-196.
- Gaffnet, Lisa, Jim Matthews, Dan Seriff, Sonio Perillo, Ed Menhinick, Eric Secrist, John T. Soule, and W. Ashley Conone. 2001. Lincoln county natural heritage inventory. North Carolina Natural Heritage Program. Raleigh, NC. 167pp.
- Glennon, Kelsey L., J.T. Donaldson, and Sheri A. Church. 2011. Evidence for hybridization between the endangered Roan Mountain bluet, *Houstonia purpurea* var. *montana* (Rubiaceae) and its common congener. *The Journal of the Torrey Botanical Society*. 138(3): 272-286.
- Glick, P., B.A. Stein, and N.A. Edelson, editors. 2011. Scanning the conservation horizon: a guide to climate change vulnerability assessment. National Wildlife Federation. 176 pp.
- Grumbine, R. Edward. 1990. Viable populations, reserve size, and federal lands management: A critique. *Conservation Biology*. Volume 4, No. 2. 127-132.
- Haro, Alex, William Richkus, Kevin Whalen, Alex Hoar, W-Dieter Busch, Sandra Lary, Tim Brush, and Douglas Dixon. 2000. Population decline of the American eel: implications for research and management. *Fisheries*. 25(9):7-16.
- Harris, J.A., R.J. Hobbs, E. Higgs, and J. Aronson. 2006. Ecological restoration and global climate change. *Restoration Ecology* 14:170-176.
- Heiman, Karin, Stephen Hall, and Harry LeGrand. 1993. Significant natural communities and rare plant and animal habitats of the Appalachian Trail corridor in North Carolina and

- Tennessee. North Carolina Natural Heritage Program. Raleigh, NC. 305pp.
- Herman, D.W. 2003. Status of the bog turtle, *Clemmys muhlenbergii* Schoepff, in the southern United States. U.S. Fish and Wildlife Service Report for Grant 14480004969126. Asheville, NC.
- Hilliard, Marisue. 2011. Environmental assessment: updating management direction and standards for prescribed burning Nantahala and Pisgah national forests, North Carolina. National Forests in North Carolina. Asheville, NC. 117pp.
- Hollingsworth, Robert G., and Fred P. Hain. 1991. Balsam woolly adelgid (homoptera: adelgidae) and spruce-fir decline in the southern Appalachians: Assessing pest relevance in a damaged ecosystem. *The Florida Entomologist*. 74(2):179-187.
- Hudy, Mark, Teresa M. Thieling, Nathaniel Gillespie, and Eric P. Smith. Distribution, status, and perturbations to brook trout within the eastern United States. Report to Eastern Brook Trout Joint Venture. 77pp. Accessed November 2011. Available: <http://www.easternbrooktrout.org/publications.aspx>
- Hunter, Chuck, Robert Katz, David Pashley, and Bob Ford. 1999. Bird conservation plan for the southern blue ridge (physiographic area 23). *Partners in Flight*. 101pp.
- Hunter, Malcolm, Jr., Eric Dinerstein, Jon Hoekstra, and David Lindenmayer. 2010. A call to action for conserving biodiversity in the face of climate change. *Conservation Biology* 24(5): 1169-1171.
- International Panel on Climate Change. 2007. *Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II, and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, Pachauri, R.K. and Reisinger, A. (eds.)] IPCC, Geneva, Switzerland, 104 pp.
- Jarvis, Jason D. 2011. Water quality in the upper little Tennessee River and its potential effects on the Appalachian Elktoe mussel (*Alasmidonta raveneliana*). Master's Thesis, Western Carolina University. Cullowhee, NC. 85pp.
- Jenkins, Robert E. 1984. Description, biology, and distribution of the spotfin chub, *Hypobis monarcha*, a threatened cyprinid fish of the Tennessee River drainage. *Bulletin of the Alabama Museum of Natural History*. 8:1-30.
- Jones, J.W., E. M. Hallerman, and R.J. Neves. 2006. Genetic management guidelines for captive propagations of freshwater mussels (unionoidea). *Journal of Shellfish Research*. 25:527-535.
- Keller, A.E., and T. Augspurger. 2005. Toxicity of fluoride to the endangered unionid mussel, *Alasmidonta raveneliana*, and surrogate species. *Bulletin of Environmental*

Contamination and Toxicology. 74(2): 242-249.

Klaus, Nathan A., and David A. Buehler. 2001. Golden-winged warbler breeding habitat characteristics and nest success in clearcuts in the southern Appalachian mountains. *The Wilson Bulletin*. 113(3):297-301.

LeGrand, Harry E., Jr., John T. Finnegan, Sarah E. McRae, and Stephen P. Hall, editors. 2010. 2010 Natural heritage program list of the rare animal species of North Carolina. North Carolina Natural Heritage Program. Raleigh, NC.

Louv, Richard. 2008. Last child in the woods: saving our children from nature-deficit disorder. 2nd ed. Algonquin Books. Chapel Hill, NC. 390 pp.

Lovich, Jeffrey E., Dennis W. Herman, and Kenneth M. Fahey. 1992. Seasonal activity and movements of bog turtles (*Clemmys muhlenbergii*) in North Carolina. *Copeia*. 4:1107-1111.

Matthews, Christopher R., and James H. Howard. 1999. Genetic variation in the federally endangered Schweinitz's sunflower, *Helianthus schweinitzii* T. & G. (Asteraceae). *Castanea*. 64(3):231-242.

Mawdsley, J.R., R. O'Malley, and D.S. Ojima. 2009. A review of climate-change adaptation strategies for wildlife management and biodiversity conservation. *Conservation Biology*. 23(5): 1080-1089.

McLaughlin, J.F., J.J. Hellermann, C.L. Boggs, and P.R. Ehrlich. 2002. Climate change hastens population extinctions. *Proceedings of the National Academy of Sciences*. 99:6070-6074.

Miller, James H., Erwin B. Chambliss, and Nancy J. Loewenstein. 2010. A field guide for the identification of invasive plants in southern forests. Gen. Tech. Rep. SRS-119. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 126pp.

Miller, James H., Steven T. Manning, and Stephen F. Enloe. 2010. A management guide for invasive plants in southern forests. Gen. Tech. Rep. SRS-131. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 120pp.

Menhinick, Edward F. 1991. The freshwater fishes of North Carolina. North Carolina Wildlife Resources Commission. Raleigh, NC. 227pp.

Moorhead, Kevin K., Rachel E. Moynihan, and Shannon L. Simpson. 2000. Soil characteristics of four southern Appalachian fens in North Carolina, USA. *Wetlands*. 20(3):560-564.

Moore, P.T., H. Van Miegroet, and N.S. Nicholas. 2008. Examination of forest recovery scenarios in a southern Appalachian *Picea-Abies* forest. *Forestry* 81:183-194.

- Moyer, Gregory R., J.D. Rousey, and M.A. Cantrell. 2009. Genetic evaluation of a conservation hatchery program for reintroduction of Sicklefin redhorse *Moxostoma* sp. in the Tuckasegee River, North Carolina. *North American Journal of Fisheries Management* 29:1438-1443.
- Murdock, N.A. 1994. Rare and endangered plants and animals of southern Appalachian wetlands. *Water, Air, and Soil Pollution* 77:385-405.
- Natural Resources Conservation Service. 1998. Stream Visual Assessment Protocol. National Water and Climate Center Technical Note 99-1.
- Newberry, Gillian. 1991. Factors affecting the survival of the rare plant, *Sagittaria fasciculata* E.O.Beal (alismataceae). *Castanea*. 56(1):59-64.
- Nickerson, Max A., Kenneth L. Krysko, and Richard D. Owen. 2002. Ecological status of the hellbender (*Cryptobranchus alleganiensis*) and the mudpuppy (*Necturus maculosus*) salamanders in the great smoky mountains national park. *Journal of the North Carolina Academy of Science*. 118(1):27-34.
- North Carolina Division of Water Quality. 2011. French broad river basinwide water quality plan. Accessed January 2012. Available from:
<http://portal.ncdenr.org/web/wq/ps/bpu/basin>
- 2011. New river basinwide water quality plan.
 - 2011. Roanoke river basinwide water quality plan.
 - 2010. Catawba river basinwide water quality plan.
 - 2010. Lumber river basinwide water quality plan.
 - 2010. Tar-Pamlico river basinwide water quality plan.
 - 2008. Broad river basinwide water quality plan.
 - 2008. Yadkin-Pee Dee river basinwide water quality plan.
 - 2007. Chowan river basinwide water quality plan.
 - 2007. Hiwassee river basinwide water quality plan.
 - 2007. Little Tennessee river basinwide water quality plan.
 - 2007. Pasquotank river basinwide water quality plan.
 - 2007. Savannah river basinwide water quality plan.
 - 2007. Watauga river basinwide water quality plan.
 - 2007. White Oak river basinwide water quality plan.
 - 2005. Cape Fear river basinwide water quality plan.
- North Carolina Natural Heritage Program. 2009. North Carolina natural heritage program biennial protection plan: list of significant natural heritage areas. North Carolina Department of Environment and Natural Resources. Raleigh, NC.
- 2002. An inventory of the significant natural heritage areas of Cabarrus County, North Carolina. 125pp.
 - 2001. Guide to federally listed endangered and threatened species of North Carolina. 72pp.

- North Carolina Wildlife Resources Commission. 2010. Tarheel wildlife: a guide for managing wildlife on private lands in North Carolina. Raleigh, NC. 80pp.
- . 2009. The economic impact of mountain trout fishing in North Carolina. 69pp.
- . 2008. Protected wildlife species of North Carolina. 8pp.
- . 2005. North Carolina wildlife action plan. 577pp.
- Noss, R.F., E.T. LaRoe III, and J.M. Scott. 1995. Endangered Ecosystems of the United States: a preliminary assessment of loss and degradation. U.S. Department of the Interior, National Biological Service, Biological Report 28, Washington, D.C. 58pp.
- Oakley, Shawn C. 2009. An inventory of the significant natural areas of Yancey County, North Carolina. North Carolina Natural Heritage Program. Raleigh, NC. 209pp.
- . 2005. An inventory of the significant natural areas of McDowell County, North Carolina. 218pp.
- . 2002. An inventory of the significant natural areas of Burke County, North Carolina. 193pp.
- . 2000. An inventory of the significant natural areas of Watauga County, North Carolina. 162pp.
- Oakley, Shawn C., and Alan B. Smith. 1996. A natural areas inventory of Haywood County, North Carolina. North Carolina Natural Heritage Program. Raleigh, NC. 197pp.
- Oakley, Shawn C., Harry E. LeGrand, Jr., and Michael P. Schafale. 1995. An inventory of mafic natural areas in the North Carolina piedmont. North Carolina Natural Heritage Program. Raleigh, NC. 252pp.
- Oakley, Shawn C., and C. Reed Rossell, Jr. 2003. An inventory of the significant natural areas of Cleveland County, North Carolina. North Carolina Natural Heritage Program. Raleigh, NC. 112pp.
- O'Dee, Scott H., and G. Thomas Watters. 1998. New or confirmed host identifications for ten freshwater mussels. Ohio Biological Society. Proceedings of the Conservation, Captive Care, and Propagation of Freshwater Mussels Symposium: 77-82.
- Ogle, Douglas W. 1991. *Spiraea virginiana* Britton: I. delineation and distribution. *Castanea*. 56(4): 287-296.
- . 1991. *Spiraea virginiana* Britton: II. ecology and species biology. 56(4): 297-303.
- Olson, David, Michael O'Connell, Yi-Chin Fang, Jutta Burger, and Richard Rayburn. 2009. Managing for climate change within protected area landscapes. *Natural Areas Journal* 29(4):394-399.
- Padgett, James E. 2010. An inventory of the significant natural areas of Alleghany County, North Carolina. North Carolina Natural Heritage Program. Raleigh, NC. 211pp.

- . 2008. An inventory of the significant natural areas of Caldwell County, North Carolina. 188pp.
- . 2006. An inventory of the significant natural areas of Rutherford County, North Carolina. 234pp.
- . 2004. Biogeographical, ecological, morphological, and micromorphological analyses of the species in the *Hexastylis heterophylla* complex. Master's Thesis. Appalachian State University. Boone, NC. 138pp.
- Pate, Sarah Jo. 2010. Phylogeography and mating system of *Spiraea virginiana* Britton: a multi-scale exploration of the biology of a threatened species. (Master's Thesis). Appalachian State University. Boone, NC.
- Pearson, Scott M. 1994. Landscape-level processes and wetland conservation in the southern Appalachian mountains. *Water, Air, & Soil Pollution*. 77:321-332.
- Pittillo, J. Dan, L.L. Gaddy, Robert Dellinger, Alan Smith, Gary Kauffman, and Paige Grithers. 1994. Natural areas inventory for Jackson County, North Carolina. North Carolina Natural Heritage Program. Raleigh, NC. 1766pp.
- Preston, K.L., J.T. Rottenberry, R.A. Redak, and M.F. Allen. 2008. Habitat shifts of endangered species under altered climate conditions: importance of biotic interactions. *Global Change Biology* 14:1-15.
- Randall, John, Ann Somers, and Mary Lipscomb. 1995. Natural areas inventory for Surry County, North Carolina. North Carolina Natural Heritage Program. Raleigh, NC. 168pp.
- Rayner, Douglas A. 1994. Inventory of the natural areas of the Pacolet area (Polk County, North Carolina and upper Greenville and Spartanburg Counties, South Carolina). North Carolina Natural Heritage Program. Raleigh, NC. 169pp.
- Roberts, J.H., A.E. Rosenberger, B.W. Albanese, and P.L. Angermeier. 2008. Movement patterns of endangered Roanoke logperch (*Percina rex*). *Ecology of Freshwater Fish*. 17(3):374-381.
- Roe, Kevin J. 2002. Conservation assessment for the round hickorynut (*Obovaria subrotunda*) Rafinesque, 1820. USDA Forest Service, Eastern Region. 8pp.
- Rosenbaum, Peter A., Jeanne M. Robertson, and Kelly R. Zamudio. 2007. Unexpectedly low genetic divergence among populations of the threatened bog turtle (*Glyptemys muhlenbergii*). *Conservation Genetics*. 8:331-342.
- Rutledge, D.T., C.A. Lepczyk, J.Xie, and J.Liu. 2001. Spatiotemporal dynamics of endangered species hotspots in the United States. *Conservation Biology* 15:475-487.
- Schafale, M.P. and A.S. Weakley. 1990. *Classification of the natural communities of North*

- Carolina: third approximation*. North Carolina Natural Heritage Program. Raleigh, NC. 325pp.
- Shute, J.R., Patrick L. Rakes, and Peggy W. Shute. 2005. Reintroduction of four imperiled fishes in Abrams creek, Tennessee. *Southeastern Naturalist*, 4(1): 93-110.
- Schwartzman, Edward. 2010. An inventory of the natural areas of Macon County, North Carolina. North Carolina Natural Heritage Program. Raleigh, NC. 421pp.
- . 2008. An inventory of the natural areas of Transylvania County, North Carolina. 413pp.
- Smith, A. 1993. A survey of mountain wetland communities. Report to the North Carolina Natural Heritage Program. 115pp.
- Smith, George F., and N.S. Nicholas. 1998. Patterns of overstory composition in the fir and spruce-fir forests of the Great Smoky Mountains after balsam woolly adelgid infestation. *The American Midland Naturalist*. 139(2):340-352.
- Smith, Peter, Ann Kelly, and Kristen Sinclair. 2006. An inventory of the significant natural areas of Avery County, North Carolina. North Carolina Natural Heritage Program. Raleigh, NC. 195pp.
- Somers, Ann Berry, Kenneth A. Bridle, Dennis W. Herman, and A. Barry Nelson. 2000. The restoration & management of small wetlands of the mountains & piedmont in the southeast: a manual emphasizing endangered and threatened species habitat with a focus on bog turtles. Watershed Science & Wetland Science Institutes of the Natural Resources Conservation Service, The University of North Carolina at Greensboro, and Pilot View Resource Conservation & Development, Inc. 152pp.
- Soule', Michael E. (Ed.). 1986. *Conservation biology: The science of scarcity and diversity*. Sunderland, MA: Sinauer Associates, Inc.
- Spira, Timothy P. 2011. Wildflowers and plant communities of the southern Appalachian mountains and piedmont: a naturalist's guide to the Carolinas, Virginia, Tennessee, and Georgia. University of North Carolina Press. Chapel Hill, NC. 521pp.
- Swanson, Drew A. 2012. Endangered species and threatened landscapes in Appalachia: managing the wild and the human in the American mountain south. *Environment and History*. 18(1):35-60.
- U.S. Fish and Wildlife Service. 2011. Draft environmental assessment and land protection plan for the proposed establishment of the southern appalachian mountain bog national wildlife refuge. Atlanta, GA.
- . 2011. Dwarf-flowered heartleaf (*Hexastylis naniflora*) 5-year review: summary and evaluation. Asheville, NC. 44pp.
- . 2010. Preliminary project proposal for southern Appalachian national wildlife refuge.

- Atlanta, GA. 33pp.
- 2010. Rising to the urgent challenge: strategic plan for responding to accelerating climate change. Washington, D.C. 32pp.
 - 2010. Morefield's leather flower *Clematis morefieldii* 5-year review: summary and evaluation. Jackson, MS. 12pp.
 - 2010. Schweinitz's sunflower (*Helianthus schweinitzii*) 5-year review: summary and evaluation. Asheville, NC. 27pp.
 - 2009. Winged mapleleaf spotlight species action plan. Twin Cities, MN. 10pp.
 - 2009. Carolina heelsplitter recovery action plan. Asheville, NC. 8pp.
 - 2009. Appalachian elktoe (*Alasmidonta raveneliana*) 5-year review: summary and evaluation. Asheville, NC. 22pp.
 - 2009. Gray bat 5-year review: summary and evaluation. Columbia, MO. 34pp.
 - 2009. Indiana bat 5-year review: summary and evaluation. Bloomington, IN. 45pp.
 - 2009. Post-delisting monitoring plan for the bald eagle (*Haliaeetus leucocephalus*) in the contiguous 48 states. U.S. Fish and Wildlife Service, Divisions of Endangered Species and Migratory Birds and State Programs, Midwest Regional Office, Twin Cities, Minnesota. 75pp.
 - 2008. Swamp pink (*Helonias bullata*) five year review: summary and evaluation. Pleasantville, NJ. 53pp.
 - 2008. Virginia big-eared bat (*Corynorhinus townsendii virginianus*) 5-year review: summary and evaluation. Elkins, WV. 21pp.
 - 2008. Small whorled pogonia (*Isotria medeoloides*) 5-year review: summary and evaluation. Concord, NH. 26pp.
 - 2007. Dwarf wedgemussel *Alasmidonta heterodon* 5-year review: summary and evaluation. Concord, NH. 27pp.
 - 2007. Strategic habitat conservation and the power of partnerships: strategic plan for the partners for fish and wildlife program, 2007-2011 southeast region. Atlanta, GA. 88pp.
 - 2003. Monitoring plan for the American peregrine falcon: a species recovered under the endangered species act. Portland, OR. 53pp.
 - 2001. Bog turtle (*Clemmys muhlenbergii*), northern population recovery plan. Hadley, MA. 103pp.
 - 2000. Recovery plan for *Liatris helleri* heller's blazing star. Atlanta, GA. 32pp.
 - 1999. Indiana bat (*Myotis sodalis*) revised recovery plan: agency draft. Ft. Snelling, MN. 53pp.
 - 1998. Recovery plan for the spruce-fir moss spider (*Microhexura montivaga*). Atlanta, GA. 28pp.
 - 1997. Recovery plan for Carolina heelsplitter (*Lasmisgona decorata*) Lea. Atlanta, GA. 36pp.
 - 1997. Winged mapleleaf mussel recovery plan (*Quadrula fragosa*). Fort Snelling, MN. 359pp.
 - 1997. Recovery plan for rock gnome lichen (*Gymnoderma lineare*) (Evans) Yoshimura and Sharp. Atlanta, GA. 45pp.
 - 1996. Recovery plan for Roan Mountain bluet (*Hedyotis purpurea* (L.) Torrey & Gray var. *montana* (Small) Fosberg). Atlanta, GA. 52pp.
 - 1996. Recovery plan for the Appalachian elktoe (*Alasmidonta raveneliana*) Lea. Atlanta,

- GA. 38pp.
- 1995. Ecosystem management plan for the southern appalachian ecosystem. Asheville, NC. 10pp. plus attachments.
 - 1994. Morefield's leather flower *Clematis morefieldii* recovery plan. Atlanta, GA. 21pp.
 - 1994. Recovery plan for Schweinitz's sunflower (*Helianthus schweinitzii*). Atlanta, GA. 35pp.
 - 1993. Recovery plan for spreading avens (*Geum radiatum*) Rafinesque. Atlanta, GA. 37pp.
 - 1993. Dwarf wedge mussel (*Alasmidonta heterodon*) recovery plan. Hadley, MA. 48pp.
 - 1992. Small whorled pogonia (*Isotria medeoloides*) recovery plan. 1st revision. Newton Corner, Massachusetts. 77pp.
 - 1992. Virginia spiraea (*Spiraea virginiana* Britton) recovery plan. Newton Corner, MA. 47pp.
 - 1992. Roanoke logperch (*Percina rex*) recovery plan. Newton Corner, MA. 35pp.
 - 1991. Swamp pink recovery plan. Newton Corner, MA. 56pp.
 - 1991. Recovery plan for small-anthered bittercress (*Cardamine micranthera* Rollins). Atlanta, GA. 27pp.
 - 1990. Appalachian northern flying squirrels recovery plan. Newton Corner, MA. 53pp.
 - 1990. Mountain sweet pitcher plant recovery plan. Atlanta, GA. 39pp.
 - 1990. James spinymussel (*Pleurobema collina*) recovery plan. Newton Corner, MA. 39pp.
 - 1987. Recovery plan for the blue ridge goldenrod (*Solidago spithamaea* Curtis). Atlanta, GA. 40pp.
 - 1985. Recovery plan for the pink mucket pearly mussel *Lampsilis orbiculata* (Hildreth, 1828). Atlanta, GA. 55pp.
 - 1984. Recovery plan for the tan riffle shell mussel *Epioblasma walkeri*. Atlanta, GA. 66pp.
 - 1984. A recovery plan for the Ozark big-eared bat and the Virginia big-eared bat. Twin Cities, MN. 119pp.
 - 1984. Recovery plan fine-rayed pigtoe pearly mussel *Fusconaia cuneolus*. Atlanta, GA. 77pp.
 - 1984. Recovery plan for the tan riffle shell mussel *Epioblasma walkeri*. Atlanta, GA. 66pp.
 - 1984. Recovery plan for the noonday snail (*Mesodon clarki nantahala*). Atlanta, GA. 33pp.
 - 1983. Mountain golden heather (*Hudsonia montana*) recovery plan. Atlanta, GA. 36pp.
 - 1983. Recovery plan shiny pigtoe pearly mussel *Fusconaia edgariana*. Atlanta, GA., 78pp.
 - 1983. Bunched arrowhead Recovery Plan. Atlanta, GA. 37pp.
 - 1983. Recovery plan for spotfin chub (*Hybopsis monacha*). Atlanta, GA., 60pp.
 - 1982. Gray bat recovery plan. Denver, CO. 143pp.
- Ward, Sara, Tom Augspurger, F. James Dwyer, Cindy Kane, and Christopher G. Ingersoll. 2007. Risk assessment of water quality in three North Carolina, USA, streams supporting federally endangered freshwater mussels (unionidae). *Environmental Toxicology and Chemistry*. 26(10): 2075-2085.

Weakley, A.S., and M.P. Schafale. 1994. Non-alluvial wetlands of the southern Blue Ridge: Diversity in a threatened ecosystem. *Water, Air and Soil Pollution* 77: 359-383.

Williams, James D., Melvin L. Warren, Jr., Kevin S. Cummings, John L. Harris, and Richard J. Neves. 2011. Conservation status of freshwater mussels of the United States and Canada. *Fisheries*. 18(9): 6-22.

Williams, R. David, J. Edward Gates, Charles H. Hocutt, and Gary J. Taylor. 1981. The hellbender: a nongame species in need of management. *Wildlife Society Bulletin*. 9(2):94-100.

Wilson, Christopher R. 2003. Woody and arboreal habitats of the green salamander (*Aneides aeneus*) in the blue ridge mountains. *Contemporary Herpetology*. 2003(2): 1-6.

APPENDIX D
STAFF ACTION PLANS

Mark A. Cantrell

Introduction. As in previous years, my activities will be diverse, but focused primarily on conservation of river resources. My efforts will concentrate on providing tangible benefits to trust resources across a wide geographic area, employing principles of SHC. My work will focus on review of FERC licensed projects locally, and participation in the Science and Data Committee of SARP on a regional basis. Though many of the FERC relicense efforts of the past years are not yet issued, I expect favorable benefits will be forthcoming for our efforts to conserve federal trust resources. The following outline reflects an ambitious attempt to work with others to conserve the most important resources through priority actions.

Application of Functional elements of SHC. Incorporate SHC into my regular activities, focusing on priority conservation actions. I plan to work to explicitly incorporate SHC principles into monitoring and adaptive management schemes at FERC projects, making regular reassessments of monitoring results, conservation actions, with a focus on improving efforts to achieve conservation objectives. The Pee Dee Diadromous Fish Habitat Characterization and Assessment project is an example, using the best science to measure, guide and achieve fish restoration. This assessment will allow us to refine our biological goals for specific river reaches for American shad and American eels.

FERC

Tapoco. Coordinate with FERC, BIA, SOL, NPS to implement the settlement agreement, with all parties, as well as respond to Alcoa requests for technical assistance for compliance with numerous Articles and Conditions set in the new license.

- Monitor compliance and sampled ecological effects of the new license.
- Monitor effects of high flow events.
- Serve on Board of The Tallassee Fund and The Cheoah Fund Board. Solicit proposals, coordinate meetings, award grants. Assist in establishment of priorities. Review proposals. Submit reports to FERC.
- Review shoreline development projects. Develop mitigation measures.

Catawba-Wateree

- Intervene in proposed amendments to project boundaries on the Catawba-Wateree project. Coordinate with FERC, BIA, NPS, SOL, Charleston FO, and RO.
- Review shoreline development projects. Develop mitigation measures.
- Participate in Habitat Enhancement Program as Board Chair. Review proposals.
- Review site plans for eel ways, conduct annual site visit, monitor compliance with fishway study plans.

Santee Accord. Coordinate with RO, SOL, Charleston FO and Fisheries in implementation of diadromous fish restoration strategy for Santee Basin.

- Coordinate with NMFS Charleston Office, South Atlantic FRO, and SOL.
- Conduct American shad and American eel monitoring at Upper Santee River.
- Attend Board and Technical Committee meetings to implement the Accord. Review proposals and work plans for the 10-year Action Plan.

Nantahala Area Projects.

- Coordinate with FERC, BIA, SOL, USFS, NCWRC on Nantahala relicensing projects. Monitor compliance with BO for Franklin Project operation.
- Monitored compliance during Dillsboro Dam restoration. Conducted mussel surveys and relocation at Dillsboro Dam. Monitored BO terms and conditions.

Yadkin-Pee Dee Project. Implement revised study plan for habitat characterization and assessment. Coordinate with SOL, Raleigh FO, So. Atlantic FRO, NMFS, NC, SC, and Progress Energy. Monitor temperature and flow monitor network across the basin.

Keowee-Toxaway.

- Coordinate with Charleston FO and SC DNR regarding early relicensing studies, shoreline concerns.
- Review shoreline development projects. Developed mitigation measures.
- Attend relicensing meetings and site visits.
- Comment on PAD, Recreation Use & Needs Study.

Assisted other Service Field Offices with FERC licensing issues.

- Assist Athens FO, Charleston, FO, Raleigh FO, Fisheries with study design, fish monitoring recommendations as needed hydroelectric projects.

TVA

- Coordinate with TVA Heritage staff, TVA Management, Daphne FO, Athens FO, and Cookeville FO on fish sampling, T/E locations.
- Comment on TVA land management plan and transmission corridor assessment.

HCPs AND CONSERVATION PARTNERSHIPS

- Monitor compliance with bald eagle HCP for Pinsto, Inc., at Lake Wylie, and Crescent Resources, LLC, at Lake James. Coordinate HCP monetary assurances with RO.
- Coordinate with Duke Power and NCWRC on Candidate Conservation Agreement for sicklefin redhorse (yes, it is still in the works).
- Represent the Service on Cumberland Forest Resources HCP for multiple species on the Plateau.

TRIBES

- Assist Eastern Band of Cherokee Indians with tribal grants program issues. Review proposals. Prepare NEPA/ESA for RO.

- Assist Eastern Band of Cherokee in planning efforts for natural resources management plan.
- Assist Eastern Band of Cherokee in surveys for fish and mussels.
- Assist WATR and LTWA with fish weir programs with EBCI students.

LISTING

- Conduct 5-yr status review for Yadkin River Goldenrod
- Assist R5 with 12-month finding for American eel

CONTRACTS

- Serve as project officer on ongoing contracts/grants. Monitor contract activities. Provide technical assistance and manpower to CFI in brood stock collection for development of propagation protocols for Sicklefin redhorse.
- Attend annual USGS – Coop Meetings, TN, NC.

WORKSHOPS/PRESENTATIONS/TRAINING

- Contribute articles to Keowee-Toxaway newsletter.
- Contribute articles to Catawba-Wateree Relicensing newsletter.
- Respond to reports about mountain lions, cougars, panthers, etc.
- Respond to media (newspaper, radio, TV) inquiries regarding FERC projects (e.g., Dillsboro Dam removal) and fish restoration.

<p>FERC and related</p> <ul style="list-style-type: none"> • Sicklefin redhorse population estimates, monitoring • Complete Resource Category 1 - Piedmont Shoals • Tallassee Fund Board –spring and fall meeting • Cheoah Fund Board – spring and fall meeting • Respond to various ERs for FERC projects • Santee Accord Board and Technical Committee <ul style="list-style-type: none"> ○ Investigate barrier at Rimini R/R trestle debris ○ Map and characterize shad spawning habitat • Catawba-Wateree (P-2232) <ul style="list-style-type: none"> ○ new license? • Tuckasegee/Nantahala <ul style="list-style-type: none"> ○ new licenses? • Keowee-Toxaway relicensing • Ward Mill Dam monitoring • Yadkin-Pee Dee <ul style="list-style-type: none"> ○ Implement Diadromous Fish Agreement <ul style="list-style-type: none"> ▪ Complete habitat characterization and assessment ▪ Assist Lassiter Mill Dam removal 	
	Apr/May/Aug/Sept
	TBD
	May 2011, implement SA
	Required - July
	Required
	July/Aug 2011
May 2011	
HCPs	
<ul style="list-style-type: none"> • Monitor compliance at Pinsto, Crescent 	Required

• Assist Charleston FO with Carolina heelsplitter	Discretionary
Field Work	
Dillsboro Dam removal – monitoring	May/Oct
Chucky madtom surveys	July
Lake sturgeon monitoring	Feb/June/Oct
American eel sampling – fall, spring	May/Nov
Collect stream temperature data	Monthly
Collect stream and floodplain stream level data	
Cheoah River annual monitoring	August
Little Colorado River	June 2011, Oct
Meetings	
NC Ecological Flows	Required
SARP	Required
NC AFS – March 2011	Papers
Participate in state and regional fish and mussel workshops - Southeastern Fishes Council Priority Rivers manuscript - TN Fishes March 2011	IDP

John Fridell

M = Mandatory; D = Discretionary

Recovery (Strategic Plan Goal 1, Objective B.3.):

1. Carolina heelsplitter (Recovery priority 5C; “Spotlight Species”)
 - 1.1. Revise 5-year review (M)
 - 1.2. Monitor status of surviving populations (D)
 - 1.3. Expand holding and controlled propagation to maintain genetic stock from additional populations in danger of becoming extirpated and for population augmentation and reintroduction (D)
 - 1.4. Threat analysis of Pee Dee River below Blewitt Falls Dam and Mountain Creek in Richmond County to determine their suitability to serve as long-term refugia for the species; develop experimental population designation; reintroduce and monitor (D)
2. Tar spiny mussel (Recovery priority 5C; “Spotlight Species”)
 - 2.1. Revise 5-year Review (draft submitted 2010)
 - 2.2. Monitor populations (D)
 - 2.3. Expand holding and controlled propagation to maintain genetic stock from additional populations in danger of becoming extirpated and for population augmentation and reintroduction (D)
 - 2.4. Complete threat analysis for Little Fishing Creek/Fishing Creek population and augment population (D)
 - 2.5. Conduct threats analysis of Swift Creek (Tar River system) and Little River (Neuse River system) to determine suitability for population augmentation (D)
 - 2.6. Evaluate the potential for reintroduction into Swift Creek in the Neuse River system
3. Appalachian elktoe (Recovery priority 5)
 - 3.1. Determine cause and halt decline in Little Tennessee River (D)
 - 3.2. Establish holding and controlled propagation for population augmentation (Cheoah, Cane, and possibly Little Tennessee Rivers) (D)
 - 3.3. Work with LE on violations in the Tuckasegee and Cane Rivers (D)
 - 3.4. Site-specific Management Plans for Little Tennessee River and French Broad River (D)
 - 3.5. Dam removals on Cane River (D)
 - 3.6. Monitor relocations in North Toe and Tuckasegee Rivers (D)
 - 3.7. Monitor recruitment into the former impoundment on the Tuckasegee River at Dillsboro
4. Dwarf wedgemussel (Recovery priority 5)
 - 4.1. Assess/monitor populations (D)
 - 4.2. Develop Conservation Bank (D)
 - 4.3. Establish holding and controlled propagation for population augmentation/reintroduction (D)

5. James spiny mussel (Recovery priority 5)
 - 5.1. Assess/monitor populations (D)
6. Roanoke logperch (Recovery priority 5c)
 - 6.1. Assess/monitor populations (D)
 - 6.2. Survey for additional sites (D)
7. Noonday snail (Recovery priority 9)
 - 7.1. Assess/monitor population (D)
8. Once listed, develop recovery plans for the Sicklefin redhorse and Magnificent ramshorn

General high-priority conservation actions that apply to all above species (D):

- Continue working with partners to establish conservation easements and restore forested buffers and in-stream habitat. These efforts should be focused primarily on the best of the remaining populations and areas identified as most likely to provide long-term refuge to the target species (i.e., areas most protected from the effects of: 1) wastewater discharges, development and other land-use activities; and 2) drought, water temperature rises, and other climate change impacts on water quality and quantity (also supports Strategic Plan Goal 1, Objective A.; Goal 2, Objectives A., B., and C.; and Goal 3, Objective B.).
- Continue working with state and local governments to implement protective regulations/ordinances for addressing the impacts and threats from development and other land disturbance activities (e.g., work closely with state and local partners to develop, encourage public support for, and effectively implement protective water quality management strategies such as protective stream designations and site-specific plans like the those required by *North Carolina Procedures for Assignment of Water Quality Standards* Rule 15A NCAC 02B.0110) (also supports Strategic Plan Goal 2 A., B., and C.; and, Goal 3 B.).
- Continue analyzing threats to the species and measures for offsetting these threats (e.g., determine species specific vulnerability to commonly discharged wastes such as ammonia, and heavy metals, pharmaceuticals, etc., for which present discharge limits may not be protective of mussels).
- Determine intra- and inter-population genetics. This information is necessary to estimate the relative viability of populations, to provide guidance for augmentation and reintroduction efforts, and inform other potential management actions.
- Continue habitat, life history, and captive propagation studies aimed at specific conservation applications, including: water temperature tolerances and optimal range; in-stream flow requirements, DO requirements, and specific impacts from altered flow regimes; support continued controlled propagation experiments with congeneric surrogates and/or permit work directly with target species.

Other needs: State regulation of water withdrawals and use of ATVs within stream channels.

Listing (Strategic Plan Goal 1, Objective B.7.):

1. Magnificent ramshorn (draft candidate elevation package submitted April 2011; Listing priority 2)
 - 1.1 List and designate critical habitat
2. Sicklefin redhorse (Listing priority 5)
 - 2.1 List and designate critical habitat (current settlement agreement requires proposal in 2013 and final rule in 2014)
3. Greenfield ramshorn (Listing priority 2)
 - 3.1. Resolve taxonomic issue
 - 3.2. Elevate to candidate status (D)
 - 1.3. List and designate critical habitat (D)
4. Yellow lance (Listing priority 2 or 5, depending on outcome of status surveys)
 - 2.1. Complete status surveys (D)
 - 2.1. Resolve taxonomic issues (D)
 - 2.2. Elevate to candidate status (D)
 - 2.3. List (D)
5. Atlantic pigtoe (Listing priority 5)
 - 3.1. Transfer lead to Region 5 (Otherwise: Elevate to candidate status and list) (D)
6. Conduct status/monitoring surveys for other species of concern (D)

General (applicable to all SOC): Implement conservation actions to improve status and conduct life history, genetic, and other research/studies (D)

Prelisting Recovery (Strategic Plan Goal 1, Objective B.2.):

1. Sicklefin redhorse
 - 1.1 Implement conservation actions necessary to preclude the need to list – e.g., controlled propagation for reintroduction/range expansion; population augmentation if determined necessary from genetic studies to improve genetic health; pursue physical barrier removal (i.e., fish ladders, dam removal, etc.); etc. (D)
2. Magnificent ramshorn and Greenfield ramshorn
 - 2.1 Expand captive holding and propagation (NCWRC hatchery and NC Vet College)
 - 2.2 Acquire burrow pit pond(s) for establishing populations
 - 2.3 Work with local governments and landowners to restore water and habitat quality of streams and pond systems formerly providing habitat of the species, reestablish populations of the species within its historic range and protect these populations from existing and future threats

Section 7 Consultation (Strategic Plan Goal 1, Objective B.1.):

1. Conduct section 7 consultations for federal activities (other than FHWA/NCDOT) involving the Carolina heelsplitter in Union County, NC (“M” as far as whether or not the office carries out these consultations, but could be “D” as to whether I am the one with the lead for conducting the consultation.)
2. Provide technical assistance to office staff and staff in other offices involving species for which I have the lead (D)
3. Provide technical assistance to other agencies, consulting firms, developers, etc., for species for which I have the lead (M)

Other

Respond to information requests from the media and the public (D)

Assist NCWRC with reintroduction of nonfederally listed, nongame aquatic species

Note: My actions are somewhat prioritized within each program (i.e., recovery, listing, prelisting, etc.), but not by program. Although I have identified most of the listing, recovery, and prelisting actions above as discretionary (D), all of these activities are mandated (M) by the section 4 of the Act (the Secretary of the Department of the Interior *shall* identify and list species as E or T and develop and implement recovery plans/actions; and, we have listing, delisting/reclassification, and recovery priority guidelines, published in 1983 in the *Federal Register*, to follow in determining which species should receive priority for limited resources). However, because we have multiple species within each priority level and directives under other sections of the Act, (e.g., sections 6 and 7 require cooperation with the states and other federal agencies, respectively), we have some discretion as to the which species we direct our resources and can take advantage of opportunities for listing and recovery that present themselves through state and other federal actions. Also, though recovery tasks are prioritized within our recovery plans, we have discretion over the types of activities we implement to achieve the tasks and objectives outlined in our recovery plans.

Mark Endries

Goal 1: Conserve Priority Trust Resources.

A. Migratory birds and their habitat.

1. Generate needed GIS data and GIS-based research products needed to assist with the conservation of migratory birds and their habitat.

B. Endangered and threatened species.

1. Generate needed GIS data and GIS-based research products needed to assist with the conservation of endangered and threatened species.
2. Create a predictive habitat map for *Hexastylis*.
3. Create a predictive habitat map with Lori Williams for the Eastern hellbender.
4. Create predictive habitat maps with Lori Williams for salamanders.

C. Wetlands and streams.

1. Generate needed GIS data and GIS-based research products to assist with the conservation of wetlands and streams.

D. Diadromous fish.

1. Generate needed GIS data and GIS-based research products needed to assist with the conservation of diadromous fish.

Goal 2: Work Toward the Conservation and Restoration of Priority Ecosystems.

A. Participate in ecosystem-level partnerships and planning efforts.

1. Assist with the GIS needs of the Appalachian LCC.
2. Generate needed GIS data and GIS-based research products needed to assist with ecosystem-level partnerships and planning efforts.

- B. Incorporate the conservation of high-priority ecosystems (priority areas designated as 7 to 10 on the attached map) into office programs.
 - 1. Continue working on refining the strategic plan map.
 - a. Incorporate aquatic mapping project results in the strategic plan map.
 - b. Modify existing data layers as new data becomes available.
- C. Develop and continually update a GIS database to inform actions/decisions related to ecosystem-level issues (e.g., large-scale threats, such as energy development, introduced pests, etc.).
- D. Promote strategic plan map and other GIS projects to highlight priority ecosystems.

Goal 3: Using the Service’s Climate Change Strategic Plan as a Guide, Identify and Address the Most Pressing Climate Change Challenges within the Purview of the AFO.

- A. Work toward becoming carbon neutral.
 - 1. Utilize the tools of GIS to contribute to a reduction in carbon use (e.g., GIS analysis replaces field work).
- B. Understand and manage climate change impacts on priority resources, based on the priority resources identified in Goal 1 and spatially identified on the attached map.
 - 1. Generate needed GIS data and GIS-based research products needed to assist with understanding and managing climate change impacts on priority resources.

Susan Cameron

Goal 1: Conserve Priority Trust Resources.

A. Migratory birds and their habitat.

- Serve on AMJV technical committee
- Assist NCWRC w/ monitoring priority bird species(e.g., GWWA, PEFA)
- Respond to inquiries from the public and requests for presentations on migratory birds

B. Endangered and threatened species.

- Spruce-fir moss spider
 - serve as national species lead
 - convene group of biologists interested in working on SFMS to share information and identify priority recovery actions (NRLI practicum)
 - finalize 5-year review after receiving comments back from Atlanta
- Carolina northern flying squirrel
 - serve as national species lead
 - work with state to develop long-term monitoring protocol
 - assist NCWRC with monitoring efforts
 - finalize 5-year review after receiving comments back from Atlanta
- Bats
 - serve as NC lead on Indiana, Virginia big-eared and gray bats
 - assist NCWRC w/ summer mist-netting and winter hibernacula surveys
 - serve as NC Service liaison on WNS issues
 - provide technical guidance on decontamination
 - assist NCWRC w/ revising the NC WNS Response Plan
 - assist NCWRC with disease surveillance
 - coordinate NC WNS working group
 - participate in national WNS conference calls and annual meeting
 - work with partners to secure funding for WNS
 - assist with bat blitz planning and execution
 - work with state and federal partners to expand Anabat surveys in an effort to collect additional baseline data; organize and participate in Anabat training sessions for federal and state partners and volunteers
- Bog turtle
 - serve as regional lead on bog turtle issues
 - assist NCWRC w/ monitoring
 - work to improve communication with counterparts working on northern bog turtle population
 - participate in Project Bog Turtle
- Administer section 6 grants for NCWRC
- Respond to 2011 Recovery Data Call

- Assist with monitoring for other species of concern (e.g., Eastern hellbender, green salamander, golden-winged warbler)
- Solicit proposals and secure funding for projects/research that will help recover listed species and advance our knowledge of other species on concern
- Review section 10 permit applications and assist partners submitting permit applications and receiving their permits
- Provide technical assistance to office staff, staff in other offices, other agencies, consulting firms, developers, etc., for species for which I have the lead
- Respond to information and media requests from the public and work with staff to proactively provide education opportunities
- Assist other offices with petition responses (e.g., bats, GWWA)
- Respond to FOIAs

C. Wetlands and streams.

- Serve as part of core team for Proposed Mountain Bog Refuge
- Assist with bog restoration efforts in NC

D. Diadromous fish.

No work planned

E. Native American resources.

- Assist EBCI Wildlife Department with surveys for bats and other species of concern
- Assist with consultations with EBCI

Goal 2: Work toward the Conservation and Restoration of Priority Ecosystems.

A. Participate in ecosystem-level partnerships and planning efforts.

- Serve on AMJV technical committee
- participate in SAMAB
- Stay informed about development and progress of Appalachian LCC and assist with prioritizing work
- Continue and increase involvement in efforts to protect high elevation habitats including spruce restoration efforts
- Participate in NC Bat Working Group, Southeastern Bat Diversity Network, PARC and PIF
- Serve on the USFS restoration steering committee and wildlife working group.

- B. Act consistently with the principles of SHC.
 - Begin incorporating SHC into work (e.g., NRLI practicum on spruce-fir moss spider will explicitly use the SHC model to prioritize/evaluate work on the spider)
- C. Incorporate the conservation of high-priority ecosystems (priority areas designated as 7 to 10 on the attached map) into office programs.
 - Many of the species for which I have the lead occur in high-priority ecosystems. As a result, I am incorporating conservation of many of our highest-priority ecosystems through my work with these and other imperiled species

Goal 3: Using the Service’s Climate Change Strategic Plan as a Guide, Identify and Address the Most Pressing Climate Change Challenges within the Purview of the AFO.

- A. Work toward becoming carbon neutral.
 - Submit application for situational telework
 - Participate in office’s efforts to reduce energy and water consumption around the workplace.
- B. Understand and manage climate change impacts on priority resources, based on the priority resources identified in Goal 1 and spatially identified on the attached map.
 - Assist WRC with WAP revision to incorporate climate change.
 - Serve as wind energy contact in the AFO
 - Work to understand and address climate change impacts on priority species and habitats.

Activities include:

 - work with partners to increase spruce restoration efforts in the Southern Apps (to provide resiliency)
 - deploy data loggers to monitor microhabitat conditions in spruce-fir moss spider habitat
 - incorporate climate change into public presentations
 - use NHP climate change tool in work activities

Other

- Graduate from NRLI
- Participate in other training courses/activities
- Serve as on Professional Development Committee of NC Chapter of The Wildlife Society

Bob Butler

High-Priority [scale]; M = Mandatory; D = Discretionary

- Finalize 5-Year Review on *Lampsilis abrupta*, Pink Mucket, for RO [national] (M)
- Initiate 5-Year Review on *Erimonax monacha*, Spotfin Chub, for RO [regional] (M)
- Monitor status of six mussels and one fish for which I have national recovery lead [national] (M)
- Vie for recovery project funding by soliciting research proposals from colleagues [various] (M)
- Maintain perpetual contact with colleagues regarding management decisions, research needs, directions, priorities, etc., for imperiled mollusks, fishes, and crayfishes [various] (M)
- Finalize *Obovaria subrotunda*, Round Hickorynut, status review (sole author) [national] (D)
- Distribute/otherwise make available/compile ongoing updates on the working document “Plan for the controlled propagation, reintroduction, and augmentation of freshwater mollusks of the Cumberlandian Region” (chair) [regional] (M)
- Publish “Conservation status of mussels of United States, Canada, and Mexico” (co-author) [international] (D)
- Publish “Freshwater mussel taxa of the family Unionidae described from Florida and upstream drainages in Alabama and Georgia” (co-author) [regional] (D)
- Complete first draft of “Freshwater mussels of Florida” (co-author) [state] (D)
- Edit manuscripts of colleagues for publication [national] (D)
- Assist partners with annual *Erimonax monacha*, Spotfin Chub monitoring in Little Tennessee River, NC [local] (D)
- Assist partners with mussel sampling in various regional rivers [state] (D)
- Attend annual workshops/symposia for Freshwater Mollusk Conservation Society [international] (D)
- Attend several annual state/regional rare mollusk, crayfish, and fish meetings [various] (D)
- Attempt to remain up-to-date on the scientific literature [various] (D)
- Attempt to maintain some level of expertise in aquatics conservation issues [international] (D)
- Assist partners on developing regional strategies for the controlled propagation, reintroduction, and augmentation of freshwater mollusks and fishes [regional] (D)
- Focus efforts in areas/activities for which I: 1) have the most expertise, 2) can make the greatest contribution towards, and 3) can work at the highest scale level (big picture) as possible [various] (D)
- Minimize trivial matters that rob my time of completing aforementioned High-Priority activities [various] (D)

Low Priority [scale] (mandatory = M, discretionary = D):

- EOY database updates (e.g., ECOS, ROAR) [national] (M)
- Commenting upon various strategies having little to do with my program area, lead species, level of expertise, or interest [various] (M/D)
- FO strategic plan [local] (M/D)

- Assisting other Service staff in areas for which I have little expertise (e.g., HCPs, section 7, contaminants) [various] M/D
- Annual DOI Learn training updates [national] M
- Assist partners with fish sampling/habitat assessment in Rockcastle River, KY [local] (D)
- Organize my reprint library [international] (D)

Anita Goetz

1. Assist Partners with and identify projects for PFW Program annually in priority watersheds and habitats, where funding will aid in the recovery of listed and rare species and other federal trust resources (M)
2. Administer and manage grants and cooperative agreements for funded projects (M)
3. Ensure project compliance with PFW Program Policy (M)
4. Provide technical assistance to project design and implementation (M)
5. Report project accomplishments results in HabITS (M)
6. Develop and manage conservation partnerships (M)
7. Leverage conservation dollars and efforts as needed for projects (M)
8. Provide outreach related to the PFW Program (M)
9. Develop strategic landscape based plans and projects based on Service National, Regional, Program and AFO priorities, especially those outlined in Strategic Plans (M)
10. Assist Fisheries with management of projects funded through Fish Passage and SARP (D/M)
11. Monitor Projects Funded (M)
12. Provide technical assistance to USDA for Farm Bill related programs (M)
13. Assist species experts with listed species surveys of PFW/SARP/FP funded project sites (M)

Goal 1: Conserve Priority Trust Resources.

Current Active Projects (receiving flex funding):

1. Decline of Appalachian Elktoe in the Upper Little Tennessee River (USGS and WCU)
2. Collection and Propagation of *Sagittaria fasciculata* (NC Botanical Garden)

Active Projects (ARRA Funds 2009) to be completed:

1. Barrier Removal/Upper Little Tennessee River (two sites) LTWA
2. Raccoon Creek Stream Corridor Restoration, GA (various sites) TNC
3. Upper Nolichucky River Conservation (various sites) BRRCD
4. Mountain Bog and Stream Restoration (Upper French Broad/various sites) CMLC

Active Projects (PFW Office Allocation Funding and RO Landscape-level Funds):

1. Upper Little Tennessee River (LTLT GRIP and Various Sites)
2. Coosa Prairie Restoration (TNC GA)
 3. Conasauga Water Quality Improvement using Ag-BMP's (TNC-GA)
4. Raccoon Creek Conservation (TNC GA)
5. Upper Coosa Stream and Rare Habitat Restoration (Chestatee-Chattahoochee RC&D)
6. Ray Hearne IEP Eradication (Sandymush, NC)
7. Children of Miriam Hearne IEP Eradication (Sandymush, NC)
8. Chickamauga Cave Gate and Signage (Ringgold, GA)
9. Upper French Broad River (CMLC Various Bog and Stream Sites)
10. Toe River Valley Watch Stream Corridor Restoration (Upper Nolichucky)
11. Blue Ridge RC&D/ Upper Nolichucky Stream Corridor Restoration (Cane River Dam)
12. Upper Little Tennessee River Barrier Removal (LTWA Various Sites)
13. Hiwassee Watershed Stream Corridor Restoration (HWC, Various Sites)

14. Old Field Creek Restoration, NCNR

Current Active Projects (receiving FP/SARP Funding):

1. Barrier inventory and assessment, upper Little Tennessee River above Franklin
2. Etowah River Tributary Fish Passage, GA (bridge redirected from Moreland to Etowah River)
3. Cotton Dam Removal and Beans Creek Restoration
4. Barrier Inventory and Assessment, upper Nolichucky River
5. Cane River Dam Removal and Stream Restoration

Goal 2: Work Toward the Conservation and Restoration of Priority Ecosystems.

Participate in Watershed/Other Group/Partnerships to leverage resources:

1. GRIP, Upper Little Tennessee River
2. Nolichucky Watershed Partnership
3. Upper Little Tennessee Watershed Partnership (formerly LTNPS Team)
4. Franklin-Fontana Watershed Plan
5. Conasauga Restoration Group
6. Southern Blue Ridge Fire Learning Network
7. Mills River Watershed Partnership
8. Watershed Association for the Tuckasegee River

Provide Regional Support:

1. SE Stream Restoration Guidelines Document (in fourth draft)
2. Proposed Conasauga National Wildlife Refuge (Planning)
3. Proposed Mountain Bog National Wildlife Refuge (Planning)

Provide AFO Support:

1. Strategic Plan Revision

Goal 3: Using the Service's Climate Change Strategic Plan as a Guide, Identify and Address the Most Pressing Climate Change Challenges within the Purview of the AFO.

1. Continue to telework when possible.
2. Continue barrier inventory and assessment work in priority watersheds.
3. Working with key partners, develop and implement the Aquatic Organism Passage Workshop II.

Bryan Tompkins

M = Mandatory; D = Discretionary

I. Emergency Action (Contaminants, Train Derailment, Spill Response, Fish Kill, etc.) (M)

A) Listed Species Impacted

B) No Listed Species Impacts

II. Section 7 Compliance (M) – reviewing projects that may affect listed species or critical habitats. This includes all actions of project review including site visits; preparing and/or reviewing EIS, EA, or other correspondence; attending meetings, etc.

III. Projects that impact rare or high quality habitats (as supported by the original strategic plan), floodplains, and/or riparian buffers (D)

IV. Impoundment Projects (D) I believe I have played an important role in working with the Corps and state in denying permits or changing designs to avoid impacts from these projects. I have spent a good deal of time over the last few years working on these projects, researching and providing information to Corps and DWQ.

V. Conservation Planning, Green Infrastructure, and city/county government outreach (D)

VI. Public Outreach Activities (D)

VII. Listed Species Survey/Monitoring Assistance (D)

VIII. Stream Restoration Projects (D)

IX. Projects in Urban/Densely Developed Areas or low quality habitat with no federal or state listed species (D)

Mara Alexander

Allen Ratzlaff

Difficult to do as it is somewhat dependent on what comes in the door. Highest priority is given to projects affecting listed species and or rare habitats (both NEPA and section 7). After that, it is a matter of scale; generally the projects affecting the biggest area and or the rarest habitat come next. Bryan and I have streamlined stuff so much now that the priorities are really already set. Low priority gets little time and thus more time can be devoted to other projects.

The problem for us is that the “saved” time does not come in large chunks (an hour here and there). However, I think we can use it to get more field time reviewing projects where we have made recommendations to make sure our recommended and required mitigation is being followed.

I would also like to get time to work with the state to get them to quit recommending invasive exotics for erosion control.

Marella Buncick

The following are my performance measures with NCDOT. The measures primarily speak to being responsive to project level reviews and needs associated with keeping projects on schedule. Within each of these specific areas, I look for opportunities to aid recovery activities for listed species and advocate for large scale conservation.

1. Document Reviews and Agency Responses

Service will provide reviews and/or Agency responses for each action required by the Service or when requested by NCDOT within the established timeframes for the following actions:

- Needs Analysis (determination or discussion of specific Service issues regarding an individual project)
- Wildlife Resource Inventory and Impact Assessment
- Review of Biological Assessments
- Issuance of Biological Opinions
- Alternative Analysis Guidance and Review (Preliminary and Detailed)

2. Agency Scoping and Schedule Changes

Service will attend project scoping meetings, as required or when requested by NCDOT. Every effort should be made to attend in person with appropriate time spent reviewing and preparing for each meeting. If attendance is not possible, comments should be provided prior to the meeting, if materials are distributed in advance.

3. North Carolina Interagency Resource Team (NCIRT) and the FHWA

Service shall respond to requests from the NCIRT and/or FHWA within 25 calendar days when required or requested by NCDOT.

4 Project Meetings

a. Service will attend field meetings and site visits, where issues of concern have been identified by the Service or as requested by NCDOT. Every effort should be made to attend in person with appropriate time spent reviewing and preparing for the meeting. If attendance is not possible, comments should be provided prior to the meeting, if materials are distributed in advance.

b. Upon request for comment and/or review of project-level issues, the Service will participate in meetings (as necessary) and will transmit (via letter or e-mail) all issues of concern in response to such requests within 25 calendar days from the date of request.

c. The Service will attend monthly Agency Coordination meetings.

5. Continuous Improvement

The Service will participate in continuous improvement initiatives and teams, including continuous improvements sponsored by NCDOT, FHWA, NCILT and other interagency partnerships, as requested by NCDOT. In addition, the Service will participate in the development and implementation of NCDOT and Service guidance to assist in the realization of means and measures to improve identification and/or coordination on issues that affect permitting that would otherwise result in delays and inefficiencies.

Jason Mays

M = Mandatory; D = Discretionary

Strategic Plan Goal 1, Objective A.1.:

- Provide North Carolina Department of Transportation (NCDOT) with technical assistance as necessary to restore, enhance, manage, and protect priority migratory bird habitat and species

Strategic Plan Goal 1, Objective B.1.:

- Conduct consultation with Federal Highway Administration and Army Corp of Engineers concerning North Carolina Department of Transportation projects.
 - 8.1. Conduct formal and informal consultation (M)
 - 8.2. Respond to requests for technical and conservation planning assistance (M)
 - 8.3. Review permit requests for projects not directly affecting listed species (D)
 - 8.4. Assist NCDOT biologist with survey efforts for threatened and endangered species (D)
 - 8.5. Participate in efforts to enhance and streamline the consultation process (D)
 - 8.6. Conduct periodic site visits to ensure compliance with conservation measures (D)

Strategic Plan Goal 1, Objective B.4.:

- Assist NCDOT and Ecosystem Enhancement Program (EEP) to select sites for onsite mitigation, and stream and wetland restoration that maximize benefit for multiple species and ecosystems (D)

Strategic Plan Goal 1, Objective B.6.:

- Participate in planning and implementation of NCDOT environmental research program (D)

Strategic Plan Goal 1, Objective C.1-2.:

- Provide NCDOT with technical assistance necessary to avoid and mitigate impacts to wetlands/streams, with emphasis preserving the highest quality areas as habitat for species (M)
- Assist NCDOT and EEP in selecting wetlands and streams for restoration that can serve as habitat for priority species (D)

Strategic Plan Goal 2, Objective A.1.:

- Continue participation in local faunal working groups (D)

Strategic Plan Goal 2, Objective B.4.:

- Work with NCDOT to establish monitoring protocols for roadside species so that they are consistent with efforts by other ecosystem-level partnerships and planning efforts (D)

Strategic Plan Goal 2, Objective C.5.:

- Identify high-priority ecosystems that are affected by transportation infrastructure and work with partners, NCDOT and FHWA, to develop guidance on addressing those stressors (D)

Strategic Plan Goal 3, Objective B.4.:

- Incorporate climate change into the baseline discussion for consultations involving federally listed species. Assist NCDOT with avoidance and mitigation planning that accounts for climate change as a stressor.

Nancy Cole

I serve as a support staff person for the AFO, handling various tasks. I (1) Edit and proofread documents. (2) Serve as timekeeper, checking for accuracy and maintaining time and attendance records. (3) Prepare and verify travel authorizations and vouchers as needed and maintain travel records. (4) Inventory and maintain property records. (5) Maintain file guide and handle all filing. (6) Compile supply orders for the office, verify their receipt, and distribute items appropriately. (7) Process all mail, promptly circulating items to staff. (8) Maintain postage meter/scale and mailroom supplies. (9) Take minutes at staff meetings and distribute to staff. (10) Serve as receptionist for the office.

To help our office meet its goals and objectives, I try to serve our staff efficiently and in a timely manner, adjusting my workload when necessary and doing whatever it takes to get the job done. As the AFO begins to use its Strategic Plan, I am willing to modify my duties in order to ensure the Plan's successful implementation.

Laura Rogers

My priority is to keep abreast, as much as possible, on what staff are working on, what their individual priorities are, what the office priorities are, what WO/RO priorities are, and then determine how they relate to each other in order to prioritize my work. I try to assist staff every way possible to obtain funding; answer budget questions; obligate grants and contracts; purchase necessary supplies; assist with GovTrip, Quicktime, personnel issues, etc.; and as much as possible make work life as smooth as possible for everyone. My priorities are directly related to biologist/office/RO priorities and therefore change accordingly. I know this statement is fairly general but the nature of my position requires me to adjust priorities constantly as needed. I could say that budget is my Number 1 priority, but many times it gets pushed to the bottom of my stack so I can help or accomplish another task.

I can envision as the Strategic Plan is developed that some of my duties will be eliminated/added to/streamlined in order to facilitate becoming more efficient and more productive. I am very open to any changes that will aid this process.

APPENDIX D

TABLE OF ACRONYMS AND ABBREVIATIONS

AADT - Annual Average Daily Traffic
ACRES - Assessment, Cleanup and Redevelopment Exchange System
AFO – Asheville Ecological Services Field Office, U.S. Fish and Wildlife Service
AFS – Air Facility System
ALCC – Appalachian Land Conservation Cooperative
BIOCLASS -
EO – Element Occurrence
EPA – Environmental Protection Agency
FCIP - Federal Career Intern Program
GIS – Geographic Information System
HUC – Hydrologic Unit Code
IBI - Index of Biotic Integrity
ICIA - Integrated Compliance Information System
ISRN – Integrated Statewide Road Network
JV – Joint Venture
LCC – Land Conservation Cooperative
LCG – Large-Quantity Generators
MAX_IMPOUND - Maximum Impoundment Capacity
MRDA – Mineral Resources Data System
NCDAMS – North Carolina Dams
NCDENR – North Carolina Department of Environment and Natural Resources
NCDOT – North Carolina Department of Transportation
NCDWQ – North Carolina Division of Water Quality
NID – National Inventory of Dam
NPDES – National Pollutant Discharge Elimination System
NPL – National Priorities List
NWI – National Wetlands Inventory
PCS – Permit Compliance System
RCRA - Resource Conservation and Recovery Act
RMP – Risk Management Plan
SHC – Strategic Habitat Conservation
SALCC – South Atlantic Land Conservation Cooperative
SAMAB – Southern Appalachian Man and the Biosphere
SARP – Southeastern Aquatic Resource Partnership
SERVICE - U.S. Department of Interior, Fish and Wildlife Service
SNHA – Significant Natural Heritage Area
SOC – Special Order by Consent
SSTS – Section Seven Tracking System (Pesticides)
STEP – Student Temporary Employment Program
TSC – Total Storage Capacity
USDA – U.S. Department of Agriculture

USFS – U.S. Forest Service
USGS – U.S. Geological Survey