

## A. Project Summary

1. **Project Title:** Establish a Long Term Wetlands Monitoring Network in the Coastal Plain and Piedmont Regions of North Carolina
2. **Application track:** This is a track one application.
3. **Core Elements addressed:** 1.) Monitoring and Assessment, 2.) Regulatory activities, 3.) Restoration and Protection, and 4) Water Quality Standards.
4. **Actions related to core elements:** *Monitoring and Assessment:* Set 1, b, d. Set 2, b, c, d, e. Set 3, c. *Regulatory:* Set 3, b. *Voluntary Restoration and Protection:* Set 1, c. Set 3, b, c. *Water Quality Standards for Wetlands:* Set 2, a.  
**Activities related to the North Carolina Wetland Program Plan (approved in Jan. 2013):**  
*Monitoring and Assessment:* WPP Activities 1.2.b.iii (pg. 7), 2.1.b (pg. 9), 2.2.a.i (pg. 9), 2.2.b (pg. 9), 2.2.c (pg. 9), 2.2.d b (pg. 9), 2.2.e b (pg. 9), 2.3. b (pg.10), 2.3.b b (pg. 10), 2.3.c b (pg. 10) , 2.4.a b (pg. 10), 2.4.b (pg. 10), 2.4.c(pg. 10) , 2.4.d (pg. 10), 2.5.a (pg. 10), 2.5.b (pg. 10), 2.5.c (pg. 11) , 2.5.d c (pg. 11), 2.5.e c (pg. 11) , 3.1.a.i c (pg. 11) , 3.1.a.ii c (pg. 11) , 3.1.b.i c (pg. 12), 3.2.b c (pg. 12), 3.3.a c (pg. 12) , 3.4.a c (pg.13)
5. **Name of Applicant and DUNS number:** The North Carolina Department of Environment and Natural Resources (NC DENR), Division of Water Quality (NC DWQ), Surface Water Protection Section, Wetland Program Development Unit. DUNS number 809785280.
6. **Key personnel and Contact Information:** Rick Savage, 919-807-6475, [rick.savage@ncdenr.gov](mailto:rick.savage@ncdenr.gov) , James Graham, 919-807-6474, [james.graham@ncdenr.gov](mailto:james.graham@ncdenr.gov), and Lori Montgomery, [lori.montgomery@ncdenr.gov](mailto:lori.montgomery@ncdenr.gov), 919-807-6479.
7. **Geographic Location:** Multiple HUCs throughout the Piedmont region (Ecoregion 45) and the inner and outer Coastal Plain (Ecoregion 63 and 65) of North Carolina.
8. **Total Project Cost:** Federal funds - \$359,710.32, State matching funds - \$119,903.44; Total cost - **\$479,614**. This would be a three year grant.

9. **Abstract:** This grant proposes to formally establish a long term wetland monitoring network in the Coastal Plain and Piedmont ecoregions of North Carolina (NC). By establishing such a wetland monitoring network, long term data can be used to track changes in wetland condition/function over time and models can be developed to predict wetland condition as long term data is collected. This project will establish monitoring stations that can begin to produce information for evaluating climate change implications by looking at consistent changes in long term data across wetland types. By collecting long term data for various wetland types and comparing that data to data collected on a shorter term basis, reference wetlands can be established. This data can be used by regulatory agencies to determine potential success criteria for restored wetlands.

A partnership with the Albemarle-Pamlico National Estuary Program (APNEP) will establish several wetland monitoring sites in the APNEP watershed and will provide wetland monitoring data to mutually benefit both North Carolina Division of Water Quality (NCDWQ) and APNEP monitoring goals. Problem areas will be identified and wetland monitoring sites will be established to help determine what management actions may be needed. Establishing a wetland monitoring network in NC will encourage the establishment of a southeast region monitoring network in conjunction with work begin done with Alabama, South Carolina, and Georgia and to contribute to a national wetland reference monitoring network as discussed by the EPA. This effort will provide data to expand upon existing ambient monitoring efforts in NC and will assist with development of basinwide and watershed plans. By analyzing previously collected wetland data along with the long term wetland data collected by this project, informed management decision can be made to improve water quality in NC. Finally, analyzed monitoring data for informing regulatory programs, watershed plans, and guiding restoration efforts by developing a consistent method to tracking and sharing that data. Maps displaying monitored wetlands sites can be selected and all monitoring for that site can be displayed. A database of wetland profile data will be developed such that they represent reference wetlands by type and can be used to guide restoration projects.

B. **Project Description:** This proposal addresses several activities under the EPA Core Elements of Monitoring and Assessment, Regulatory Activities, Restoration and Protection, and Water Quality Standards for Wetlands which are listed in the following table:

### 1. Program Priorities

Set	Type of Set	Set Action	Grant Action
<b>Monitoring and Assessment</b>			
Set 1.	Goals	(b.) Define wetland monitoring objectives and strategies	A Wetland Monitoring Strategy will be completed with the Wetland Monitoring Network as a major focus and will be incorporated into NC's Wetland Program Plan.
Set 1.	Goals	(d.) Selection of core indicators for wetland condition / function	The development of vegetation, amphibian and macroinvertebrate wetland IBIs can be used as an indicator of wetland condition for both ambient monitoring sites and for restored mitigation sites.
Set 2.	Strategy Development	(b.) Monitor wetland resources by the development of the monitoring tools and specific wetland studies as specified in strategy	The Wetland Monitoring Network project will include development of a method for tracking wetland monitoring data and will provide a schedule for collecting data and tracking changes to wetland condition/function over time.
Set 2.	Strategy Development	(c.) Establish Reference Condition	Reference condition for wetland biota will be established through assessment and monitoring of various wetland types in the wetland monitoring network along a gradient.
Set 2.	Strategy Development	(d.) Track Monitoring data in a system that is accessible, updated on a timely basis, and integrated with other water quality data	A GIS-based map of monitored sites will be developed where sites can be selected and all related monitoring data can be displayed. A database of monitoring data that define reference sites will be developed to guide restoration/mitigation projects. Both will be updated as new monitoring data is acquired and new sites are monitored. Water quality data will be a key component and integration with other water quality data will be addressed.
Set 2.	Strategy Development	(e.) Analyze monitoring data to evaluate wetland condition/function or inform decision making.	Data from the Wetland Monitoring Network will be used to determine condition thresholds and baseline wetland data that can determine reference sites and be used to analyze changes in wetland extent and condition over time and to begin to study impacts of climate change.
Set 3.	Strategy Refinement	(c.) Improve site-specific management of wetland resources.	Reference sites will be established in the Wetland Monitoring Network and data collected can be used by regulatory agencies to develop success criteria for mitigation/restoration sites. Results can be used to encourage site specific restoration based on wetland type, function, and geographic location.

## 1. Program Priorities

Set	Type of Set	Set Action	Grant Action
<b>Regulatory</b>			
Set. 3	Strategy	(b.) Ensure that impact and mitigation lead to replacement of aquatic resources with similar structural, or functional or conditional attributes.	Conditional and Functional Assessment Methodologies will evaluate aquatic biota data collected from the Wetland Monitoring Network. These data can be used by regulatory agencies to establish performance standards and success criteria for mitigation sites. Reference sites for various wetland types will be established from the Wetland Monitoring Network. Monitoring methods and data can be used in the 401/404 permitting process both in terms of monitoring impacts and the use of reference conditions.

## Program Priorities

<b>Voluntary Restoration and Protection</b>			
Set 1.	Goals	(c.) Guidance on restoration and management techniques and success measures.	Evaluation of data collected from the Wetland Monitoring Network will provide information on specific wetland types and guide location selection for restoration and management success. This data can be used by regulatory agencies to develop performance standards based on reference sites that will be established. Monitoring techniques established can be used to monitor success of restoration activities over time.
Set 3.	Develop Strategy for Restoration	(b.) Improve natural wetland condition and functions through restoration.	The Wetland Monitoring Network will provide information that can be used by regulatory agencies to develop performance standards and success criteria from its reference sites to improve the function/condition of the restored sites and provide methodologies to monitor changes in water quality, habitat, etc. over time.
Set 3.	Develop Strategy for Restoration	(c.) Establish partnerships to leverage more restoration.	A key partnership with APNEP will support their conservation goals by the data collected from wetland monitoring network such that biodiversity, function, and populations of aquatic and wetland species are protected, restored, and enhanced.
<b>Water Quality Standards for Wetlands</b>			
Set 2.	Strategy Development	(a.) Gather and analyze monitoring data and other information that will become basis of water quality standards.	The Wetland Monitoring Network will establish reference conditions for defined wetland types in terms of functional/condition performance. There will be water quality data that can be used to help establish water quality standards with continued monitoring.

In addition, this proposal addresses several activities under the North Carolina Wetland

Program Plan for Wetland Monitoring and Assessment as specified in the following table:

## Wetland Program Plan Priorities for NC

**Objective 1: Refine and publish the NC DWQ wetland monitoring and assessment strategy, keeping it consistent with *Elements of a State Water Monitoring and Assessment Program for Wetlands* (EPA, 2003 & 2006).**

New WPP#	Activity
1.2.b.	Continue to use a consistent scientific methodology for monitoring wetlands, incorporating NWCA methods

**Objective 2: Implement a sustainable wetlands monitoring program consistent with the wetlands monitoring strategy and effectively communicate monitoring activities and results with interested stakeholders.**

New WPP#	Activity
2.1.b.	Develop and validate assessment tools to assist with monitoring of wetland sites and mitigation sites
2.2.a.	Establish a monitoring schedule for the types of wetland monitoring
2.2.b.	Establish the list of sites for North Carolina's Wetland Monitoring Reference Network
2.2.e.	Collect wetland monitoring data based on the established schedule
2.2.c.	Provide leadership for the establishment of a regional wetlands monitoring network in the Southeast
2.2.d.	Assist the EPA with the development of a national wetland reference network
2.2.e. and 2.2.a.i	Collect Ambient Monitoring data (rotating basin approach)
2.2.e. and 2.2.a.ii	Collect Basinwide/watershed data (need based, targeted monitoring)
2.2.e. and 2.2.a.iii.	Collect Random Monitoring data (~2 year intensive sampling)
2.3.b.	Utilize collected wetland data to develop typical profiles for wetland types and establish reference wetland parameters
2.3.c.	Develop metrics, based on the monitoring data, that can be utilized to support regulatory programs (e.g. IBI's)
2.4.a.	Evaluate, determine, and develop a means of sharing wetlands monitoring data electronically
2.4.c.	Report on wetland monitoring activities and results in the State's Integrated Water Quality report

New WPP#	Activity
2.5.a.	Draft an initial reporting format for showing baseline wetland condition and showing trends in wetland ambient conditions
2.5.b.	Use the various types of monitoring data (ambient, basinwide, random, and NWCA) and the data from the monitoring networks to establish baseline wetland conditions
2.5.c.	Use the various types of monitoring data (ambient, basinwide, random, and NWCA) and the data from the monitoring networks to show trends in the ambient conditions of wetlands
2.5.d.	Track quantity and quality of wetlands statewide (based on monitoring data) and assign wetlands to a categorical scale such as “good”, “fair”, or “poor” to indicate their condition.
2.5.e.	Identify changes in wetlands in order to establish a relationship between changing wetland and stream conditions (e.g. due to human impacts, climate change, etc.)

**Objective 3: Incorporate wetlands monitoring data into Agency planning, actions, procedures and regulatory programs.**

New WPP#	Activity
3.1.a.	Integrate wetland monitoring into other existing North Carolina monitoring programs
3.1.b.i.	Collaborate with NC DWQ Planning Section to evaluate opportunities for incorporation of wetland monitoring and assessment data into Basinwide Plans and TMDL development
3.1. B.ii.	Integrate wetland protection and restoration into Basinwide Plans and TMDL development
3.2.b.	Use monitoring protocols and data to support regulatory programs (e.g. 401 Water Quality Certification, Isolated Wetlands, Stormwater, NPDES, Non-discharge Wastewater, etc.)
3.3.a.	Use the monitoring data to establish guidelines for wetland mitigation project success criteria
3.4.a.	Guide stream and wetland mitigation planning with the particular goal of improving impaired streams (can identify wetland restoration sites that can improve water quality)

2.) Description of Need: This project will provide valuable information on the condition of wetlands within the Piedmont and Coastal Plain of NC. By establishing a Wetland Monitoring Network, data will be collected continuously and periodically in order to

monitoring changes in the condition/function of the wetlands over time, to help make better management decisions, and to build a model to predict wetland condition.

Currently, 14 wetlands are being monitored on a long term basis. There are six Headwater wetlands (three in the Ecoregion 45 and two in Ecoregion 65 and one in Ecoregion 63) that were selected from the EPA funded grant (Baker and Savage, 2008, CD 974260). Eight wetlands were selected from a second EPA funded grant (Savage and Baker, 2010, CD-96422105). These wetlands include two Riverine Swamp Forests, two Basin wetlands (Ecoregion 63), two Bottomland Hardwood Forests, and two Basin wetlands (Ecoregion 45).

The data collected from these 14 wetland sites include semiannual water chemistry (metals and nutrients), as well as the pH, specific conductivity, and dissolved oxygen. Hydrology data is collected continuously by data loggers installed in the wetlands. Soil chemistry (nutrients and metals) is analyzed as well as basic physical parameters. Surveys of the vegetation, amphibians, and macroinvertebrates have been completed on all 14 sites and need to be sampled again and at regular periodic intervals in the future in order to assess changes over time and build a model to predict wetland condition/function.

The data collected from this existing monitoring network need to be analyzed for changes over time in order to detect disturbances/stressors due to human causes or potentially due to climate change. Increases in potential pollutants (metals, nutrients) could be indicators of stress. Amphibians and macroinvertebrates are known to be a sensitive indicator of habitat degradation (Micacchion, 2002). Sampling the biota periodically may reveal biotic or abiotic changes that result in population shifts from tolerant to intolerant species (or vice versa). By

monitoring a variety of wetland types over time, potential impacts from climate change for specific wetland types could be detected (Brinson, 2006). Monitoring wetlands using many of the measures currently used for wetlands monitoring are recommended to determine the effects of climate change (Kernan, et al, 2010). Monitoring wetland hydrology for climate change impacts as well as soil composition (becoming less organic wetlands can become a carbon source instead of a carbon sink) are discussed by Lovejoy and Hanna (2005) as important climate change parameters to monitor.

This grant also proposes to continue to support the 401/404 permitting process such as required monitoring of wetlands to ensure the minimizing of the proposed impact. Another use of wetland monitoring data is for establishing mitigation or restoration criteria by giving attention to the function and characteristics of a particular wetland type, such as the biota (vegetation, amphibians, and macroinvertebrates) or the hydrology over time. Finally, water quality data collected can provide information to inform decision making in considering development of numeric water quality standards for wetlands.

### 3.) Outputs, Outcomes, and Results:

#### **i.) Outputs**

- Analyze existing data along with data collected from the newly proposed sites to look for trends and changes overtime. Establish a methodology and a tracking system where these changes can be detected in a timely manner to aid in management decisions
- Resurvey of macroinvertebrates, amphibians, and vegetation as well as soil samples of the existing 14 wetland long term sites.
- Monitor measured parameters over time that may be indicators of climate change.

- Develop methods and procedures for monitoring wetlands that may be required for regulatory permitting and to provide data that can be used for success guidelines/criteria for mitigation projects.
- Develop a database to define reference conditions for wetland types that can be used by other agencies such as APNEP, NC EEP, NC DWQ Planning Section, etc., and to provide additional data to the EPA's NWCA wetland database.
- Develop a model that can predict wetland condition/function based on long term data.
- Establish a long term wetland monitoring network by adding additional wetland sites (emphasis on APNEP watershed) to the wetlands monitoring network (see Table 1 and Figure 1, attached) in order to increase the number of wetlands monitored in terms of geographic coverage (Ecoregion, see Table 2, attached) and in terms of wetland type.
- Encourage a southeast regional wetland monitoring network from the efforts of this project, through a combination of the Southeast Wetland Monitoring Intensification Grant and the Southeast Wetlands Workgroup by helping with data analysis/summary. Lay the groundwork for a national wetland monitoring reference network as discussed by the EPA (Sumner, 2012, personal communication).
- Identify problem areas such as the upper Cape Fear River (Rajbhandari, 2008) and establish wetland monitoring sites to help improve impaired waters and water quality.

**ii. Outcomes:**

- Increased understanding of how wetland condition relates to biotic integrity and how documenting changes over time can lead to better management strategies.
- Baseline data can be used to establish biological reference condition for wetlands in terms of vegetation composition, amphibians and macroinvertebrates.
- Data can be used by regulatory agencies as guidelines/criteria for determining success of restoration/mitigation based on reference sites in the wetland monitoring network.
- Increased understanding of how to use long term wetland monitoring data as indicators of stress due to human disturbance or due to climate change.
- Increased understanding of how rapid assessment methods can be early indicators of changes in wetland condition/function.
- A data tracking system will improve availability of monitoring data for regulatory and resource agencies as well as private stakeholders with interest in restoration planning.

### **iii. Link to EPA Strategic Plan:**

This project's objectives and outcomes will support the EPA Strategic Plan. The Wetland Monitoring Network will monitor wetlands in NC where rapid development is taking place and is in need of protection/restoration. A framework will be developed to use biotic and abiotic data that show changes in wetland condition and function over time. By detecting wetland changes that indicate stress (human caused or climate change), better management decisions in a more timely manner. NC DWQ will look to partner with the APNEP, NC EEP, NC DWQ Basinwide planning, and US Army Corps of Engineers to protect the quality of wetland and achieve the goals of the EPA Strategic Plan. Analyzed wetland monitoring data will be tracked and shared with other state and Federal agencies for their use. This will be done by providing a selectable map of monitored sites where data can be displayed and developing a database of wetland profiles by wetland type to be used for restoration/mitigation purposes. All of these efforts will work to increase wetland acreage and to minimize wetland loss.

### **iv. Tracking Outputs and Outcomes:**

During the initial stages of this project, a detailed timeline will be developed to ensure progress will be tracked and reported. Bi-yearly status reports will be submitted to the EPA. Regular staff meetings will be held to address upcoming issues and events related to the project. Data collected in the field will be maintained in a database and analyzed throughout the collection period. Data management and laboratory work associated with vegetation, amphibian, and macroinvertebrate taxonomy will be performed by DWQ staff as the samples are collected and delivered to the laboratory to insure accurate and timely results. Soil and water samples will be delivered to the laboratory by DWQ staff according to proper holding

times as determined by laboratory protocol. A final report will be submitted to EPA describing the results of this project. Results and products will be shared with regulatory and resource agencies and the regulated community at technical conferences or other meetings.

#### 4. Project Tasks:

This proposal seeks to add additional wetlands sites to 14 existing monitoring sites to establish a long term Wetland Monitoring Network. Figure 1 (attached) shows wetlands currently monitored by NC DWQ. Additional sites for expanding the long term monitoring network would be chosen from these sites, in coordination with the APNEP. Approximately 20 wetland monitoring sites would be added to the existing 14 sites, which are summarized in Table 1 (attached). We propose to add two to four isolated wetlands (Baker, et al 2013) in Ecoregions 63 and 65. Several sites from the 2011 National Wetland Condition Assessment (NCWA) would also be selected to include a variety of wetland types, such as Salt Marshes and Pocosins. Wetland monitoring sites will also be established at identified problem areas such as instances of high nutrients in the upper Cape Fear River (Rajbhandari, 2008). Finally, some restoration/mitigation sites may be chosen to be in the wetland monitoring network based on special considerations such as the results of the ELI project referenced previously.

The actual selection of the wetlands will be based on location, whether the wetland could be in danger of being impacted by humans or climate change, whether wetlands that could serve as reference sites to other wetlands, and variation in wetland type. Tables 1 and 2 show the wetlands by type and ecoregion. By establishing a Long Term Wetlands Monitoring

Network, North Carolina can provide leadership to other states in the southeast region (EPA Region 4) that may be encouraged to do the same. The major tasks for this project include:

1. Add up to 20+ additional wetland sites to the current 14 as described above (see Table 1 and Figure 1, attached). Extensive use of mapping (GIS), and data already collected will be used to select the additional wetland sites and potential revisits to the sites.
2. Resurvey the vegetation, amphibians, and macroinvertebrates and collect soil samples on the current 14 sites where long term data is being collected.
3. Develop a Quality Assurance Project Plan (QAPP) addressing all quality assurance needs (e.g. staff training, sample handling/analyses, data handling, database structure, etc.).
4. Collect data from the added wetland sites (up to 20+) which will include surveying the vegetation, amphibians, and macroinvertebrates, collect water and soil samples for analysis and install automated data loggers for monitoring wetland hydrology. Three rapid assessment methods will also be used (USA-RAM, ORAM, and NCWAM).
5. Timely submission of required progress reports (twice a year) to the EPA.
6. Analyze the data from the current 14 sites, looking at changes over time, such as a degradation of the amphibian or macroinvertebrate population and a change in the vegetation composition or soil or water chemistry. Analysis of the rapid assessment methods will also be used to determine their value in detecting changes in wetland condition/function. Potential indicators of climate change impact will be explored.
7. Develop a predictive model by analyzing long term wetland data to detect trends that could indicate changes in the condition/function of the wetland due to human impact or to climate change.
8. Distribute the results of this project to, EPA's NWCA, NC EEP, NC DWQ 401/404 permitting unit, the Army Corps of Engineers, APNEP, NC DWQ Basinwide Planning Program and other agencies as needed. This will involve development of a database of wetland monitoring data that define reference conditions for certain wetland types.

5.) Partnership Information:

The NC DWQ 401 Water Quality Certification Program will provide input on where the wetland monitoring data can be used for mitigation guidelines or where the monitoring procedures need to be used special Certification conditions. The NC EEP and the NC DWQ Basinwide Planning Program will have access to our data for inclusion in the development or

updating of watershed or basinwide plans. The Southeast Wetland Workgroup for Region 4 will be significant partner and will be used as a vehicle for encouraging other states to join in on creating a Regional Wetland Monitoring Network. APNEP will be a major partner with the wetland monitoring network providing input on monitoring sites. APNEP will also be able to use the data to meet monitoring program goals as indicated by the attached letter of support.

6. Milestone Schedule:

<b>Milestone/Task Schedule</b>	
<b>Month</b>	<b>Task Number and Description</b>
1-8	1. Write Quality Assurance Project Plan 2. Select new wetland sites (up to 20+) to be added to the Wetland Monitoring Network 3. Site reconnaissance if necessary, and property owner contact 4. GIS analysis and mapping of sites as needed. 5. Start resurveying the current 14 sites. 6. Start data management process combining old and new data for purposes of analysis and tracking and sharing.
8-18	7. Start data collection on the additional wetland sites that are added to the network (up to 20+). 8. Data entry and management 9. Involve partners as needed and establish new partners if advantageous. 10. Develop selectable map of monitored wetland sites to provide wetland monitoring data.
18-24	11. Finish survey work of the new wetland sites and continue the collection of water chemistry samples and hydrology data 12. Summarize data and prepare for analysis of the 14 existing wetland sites. 13. Develop database of wetland profile data based on wetland type for purposes to help decision making by the regulatory community and to guide restoration/mitigation projects.
Biannually	14. Submit progress reports.
24-36	15. Additional analysis, continuation of long term monitoring using existing staff. 16. Preparing the final data analysis of wetland change over time. 17. Complete selectable map with updated data and database of wetland profiles data. 18. Prepare and submit final report to the EPA.

7. Detailed budget Work plan:

This project is a three year project, funding one Environmental Specialists and one Environmental Senior Specialists for 2 years (work spread over the three years). There will be extensive field travel to the wetland sites to collect the monitoring data (travel breakdown provided in budget (\$7200)). At least one professional conference will be attended by each specialist (\$2200). The major supply costs will be the addition of 20 or more data loggers (\$21000) for measuring the hydrology of the wetlands (and to replace aging ones), a new desktop computer for performing the GIS tasks associated with the mapping of the wetland sites and intensive data analysis (\$1000), a field laptop computer (\$500) for downloading hydrology data and a new mapping grade GPS unit (\$3000) and miscellaneous supplies (\$500). The contractual work will primarily be lab analysis for soil and water and potentially a temporary employee (\$45000). The in-kind state match will include an Environmental Specialist who can provide help with the climate change analysis of the data and other state personnel in the regional offices who will help check the status of the wetland sites, help with the surveys, and provide local knowledge of the land use to the Wetland Monitoring Network.

8. Restoration Demonstration Project Information: N/A

9. Programmatic Capability/Technical Experience/Qualifications:

The NC DWQ Program Development Unit (PDU) provides data used to inform regulatory decision making for the Division's 401 Certification, Isolated Wetland, and Riparian Buffer protection programs with the goal of improving the program's overall consistency, effectiveness, and efficiency. The staff uses professional expertise in aquatic ecosystems to

provide scientific data for management decisions, policies, project reviews and approvals, enforcement actions, and evaluation of wetland status and trends. The PDU staff has successfully completed various EPA Wetlands Program Development Grants focused on wetland and stream assessment and protection which are detailed in Section C below.

DWQ staff has successfully completed numerous Wetland Program Development Grants over the past 10 years including projects on stormwater management and natural wetlands, aquatic life in intermittent streams and wetlands, biological monitoring for stream and wetland mitigation projects and several wetland monitoring efforts as previously mentioned. Rick Savage has extensive experience in the wetland monitoring for over eight years (resume attached) and James Graham has extensive experience as an Environmental Specialist and was a major participant in the NWCA (resume attached).

#### 10. Transfer of Results:

Information from this project will be disseminated at professional meetings such as the Society for Wetlands Scientists and the Association of State Wetland Managers. Information from past grants has been presented in these forums both as single talks and as portions of symposia. The results of this study will be presented at Region 4 Wetland Workgroup meetings and potentially at a National Wetland Assessment Workgroup meeting. Final results will be submitted as a Final Report to EPA and may also be submitted to a peer-reviewed journal.

**C. Past Performance:** In addition to the projects specified below, NC DWQ has successfully completed and submitted final reports for five Wetland Program Development Grants (WPDGs) (CD 95415509, CD95415609, CD95415709, CD95415809, CD95471111) and one

Implementation Grant (WL96435005) over the past three years. Data collection, data analysis, and drafting of final documents are also taking place on nine additional WPDGs that have been issued since early 2009. NC DWQ consistently submits timely semiannual reports to the EPA providing updates on the status of all active WPDGs. These projects have included documentation of a significant nexus between headwater streams and navigable waters, assessment of wetland and stream mitigation projects, tracking system upgrades, development of compliance and mitigation monitoring programs, several wetland monitoring efforts which are presently underway, and multiple training efforts.

***EPA National Wetland Condition Assessment (NWCA):*** NC DWQ participated in the NWCA and surveyed 47 wetland sites across the Coastal Plain of NC (Ecoregions 63 and 65). NC DWQ staff (Rick Savage and Virginia Baker) helped with the training of the Southeastern states at the EPA facility in Pensacola, FL. Site survey data was submitted to the EPA as requested.

***Southeastern Wetland Monitoring Intensification Grant*** (CD 95449910): This grant is currently in progress with Alabama and South Carolina as partners in this multi-state grant to monitor ten wetlands in the Coastal Plain (Ecoregion 65) and ten wetlands in the Piedmont (Ecoregion 45) as an extension of the NWCA work. The EPA granted extensions to adjust the award period to coincide with field sampling season and to allow time for participation in the NWCA.

D. **Quality Assurance/Quality Control:** A Quality Assurance Project Plan will be provided.

E. **Invasive Species Control:** Field equipment will be carefully cleaned between sites to avoid introducing pathogens in the water or spreading exotic plant or animal species between sites.

## REFERENCES

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Appendix:

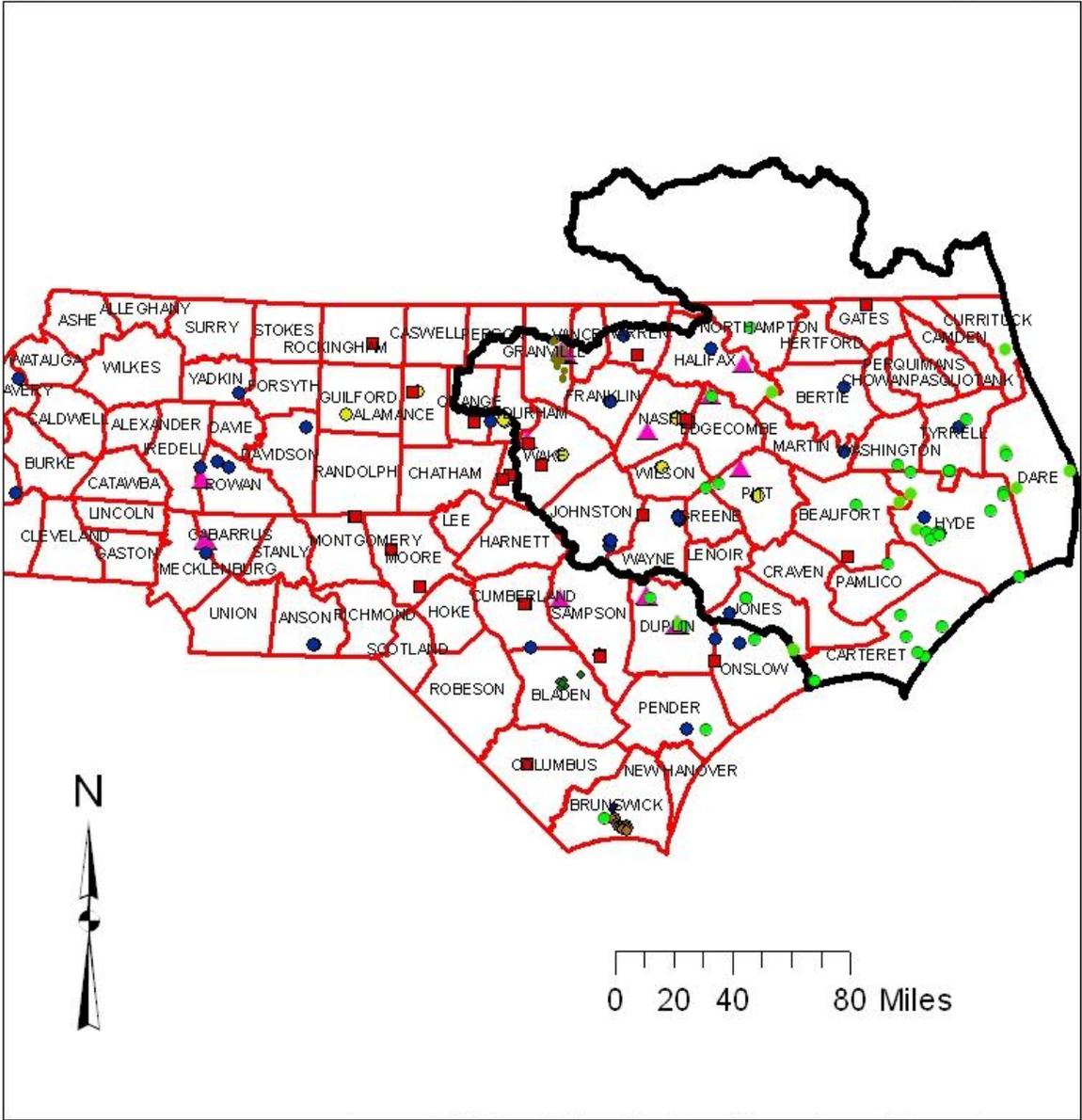
**Table 1: Potential Wetlands for Wetland Monitoring Network by Wetland Type, Number of Wetlands, and Ecoregion.**

<u>Wetland Type</u>	<u>Number of Wetlands</u>	<u>Ecoregion</u>
Riverine Swamp Forest	4	63
Riverine Swamp Forest	2-3	65
Bottomland Hardwood Forests	4-5	45
Headwater Wetlands	3	45
Headwater Wetlands	2	65
Headwater Wetlands	1	63
Basin Wetlands	2	45
Basin Wetlands	2	63
Salt Marshes	4-5	63
Isolated Wetlands	1-2	63
Isolated Wetland	1-2	65
Pocosins	2	63

**Table 2: Wetlands in the Monitoring Network by Ecoregion  
and the number of NWCA sites selected.**

<u>Ecoregion</u>	<u>Number of Wetlands</u>
45	9-10
63	12-17
65	5-7
NWCA sites	12-16

**Figure 1: Wetlands Monitored by the NC Wetland Monitoring Program**



**Legend: Wetland Sites Monitored by various EPA grants**

- ◆ brunswick\_hydro\_IW
- ◆ bladen\_hydro\_IW
- NWCA\_BaseSites\_Sampled-2011
- NWCA\_OversampleSites\_Surveyed2011
- Site\_Locations\_HeadwaterWetlands\_Grant1
- New Headwater\_Boundary
- EII\_Mitigation\_Sites\_AApoints\_8-31-12
- ▭ GranvilleBoundryPoly
- ▲ Intensification\_Grant\_SWMG\_JG