ID # (assigned by CSG): 12-S-18-NC

Please provide the following information, adding space as necessary:

State: North Carolina

Assign Program Category (applicant): Natural Resources  (Use list at end of application)

Program Name: NC Wetland and Stream Predictive Modeling
Administering Agency: NC Dept of Transportation/NC Division of Water Quality
Contact (Name and Title): LeiLani Paugh, Natural Environment Section, ICI/Onsite Mitigation Group Leader
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1. How long has this program operated (month and year)? Note: the program must be between 9 months and 5 years old as of April 5, 2012 to be eligible for this year’s award.
   Research began in the first quarter of 2009 and GIS layers were completed for the GIS layer update initiative May 2011 for wetlands and October 2010 for streams.

2. Describe the program:
   • Why was it created?
     The GIS based wetland and stream model development is a collaborative effort between NCDOT and NCDWQ with a two-fold purpose: to provide a reliable GIS data layer of wetlands and streams in North Carolina and to contribute to the Streamlining process for Federal highway projects.

   • Why is it a new and creative approach or method?
     The current process required complete field delineations across multiple corridors for wetlands and streams. The Streamline process suggested substituting GIS-based data for alternatives study and analysis instead of field delineations. However, the existing GIS data layers were not acceptable for this purpose because of the lack of consistency across any given area and lack of known accuracies.

     As part of two pilot projects, Carthage Bypass and Kinston Bypass, NCDOT teamed with DWQ to develop stream and wetland predictive models using LiDAR derived data to produce wetland and stream maps. NCDOT and NCDWQ also provided the dataset to CGIA for inclusion in the state directed Lenoir County GIS layer update.
What are the specific activities and operations of the program in chronological order?

NCDOT developed a logistic regression model using 20-foot DEM mosaics. These mosaics were created by NCDOT derived from bare earth LiDAR data available from NC Floodplain Mapping Program to analyze terrain derivatives such as slope, curvature, flow paths, and other parameters. Once the initial model was developed, NCDOT calibrated and refined the model with additional field data. NCDOT also conducted an accuracy assessment based on field data. The model was then applied across the Carthage Bypass study area and Lenoir County to produce a wetland data layer. The final map product is a wetland spatial dataset that is a combination of field-verified wetland and wetlands produced from modeling.

NCDWQ developed a logistic regression model based on the existing field data and corresponding landscape data generated in GIS. NCDWQ process was also one of initial model development, followed by calibration and accuracy assessment. The model was then applied across the Carthage Bypass study area and Lenoir County to produce a county-wide stream data layer, which will include flow duration and stream network accuracy. The final map product is a stream spatial dataset that is a combination of field-verified streams, streams produced from modeling, and larger order streams from the USGS 24K hydrography dataset.

Is it effective? Provide tangible results and examples.

Each of these pilot projects resulted in models for two ecoregions: Triassic basin and Sandhills from the Carthage project, Rolling Coastal Plain and Carolina Flatwoods from the Kinston project.

The models will allow for less field delineations within the study area and multiple corridors, thereby reducing costs and timeframe associated with a roadway project. Providing early and reliable identification of wetland and stream locations will allow for more flexibility in avoidance and minimization measures during the initial planning process. It will also allow for better communication with concerned citizens about the decision-making process related to protected resources.

The results of these models are being incorporated into a larger state sponsored effort to provide up-to-date GIS data layers for public and private use in many arenas beyond transportation needs including but not limited public safety, community planning, and stormwater controls.

The entrepreneurial efforts of NCDWQ and NCDOT staff have taken the desire for a reliable GIS-based data layer for wetlands and headwater streams sought after by all in the regulated and regulatory arena from concept to reality. The next steps currently being pursued are to expand the effort across the state and to provide a blueprint for others to follow as these data layers are used for specific project work.

Did this program originate in your state? Yes. If YES, please indicate the innovator’s name

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4. Are you aware of similar programs in other states? **No**  
   If YES, which ones and how does this program differ?

5. What limitations or obstacles might other states expect to encounter when attempting to adopt this program?

   The major limiting factors are the extent of LiDAR coverage, cost of computer hardware and software, staffing, funding and the limited knowledge base of how to translate LiDAR data to the wetlands of a specific area using statistical models. The main obstacles are to gain support from the regulatory agencies, management, and local entities to identify an appropriate project as a pilot, to develop appropriate and reasonable goals, to collaborate throughout the project, to promote a comfort level of the process and to recognize the model’s applicability.

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Use these as **guidelines** to determine the appropriate *Program Category* for your state’s submission and list that program category on page one of this application. Choose only one.

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