

# WATERSHED ASSESSMENT AND PROTECTION PLANNING – FOR A HIGHWAY PROJECT? THE US 411 CONNECTOR EXPERIENCE

David Ashley

AUTHOR: Jordan Jones & Goulding

REFERENCE: *Proceedings of the 2007 Georgia Water Resources Conference*, held March 27–29, 2007, at the University of Georgia.

**Abstract.** The Georgia Department of Transportation's (GDOT) US 411 Connector Project in Bartow County, Georgia is the subject of an Environmental Impact Statement (EIS) prepared by Jordan, Jones & Goulding (JJG). The project area includes sub-watersheds of Pettit Creek and Nancy Creek, and studies of the creeks determined that habitat was present for the federally-protected Cherokee darter. Also, because the project area is in the Etowah River basin, terms of the proposed Etowah Habitat Conservation Plan (HCP) apply to the project.

In cooperation with the U.S. Fish and Wildlife Service (USFWS), the Environmental Protection Agency, the U.S. Army Corps of Engineers and other resource agencies, GDOT authorized JJG to prepare a watershed assessment for the sections of the Pettit Creek and Nancy Creek watersheds that would be potentially affected by the construction of the U.S. 411 project. Also, an Indirect and Cumulative Impact assessment was performed that looked at potential future impacts to the watersheds beyond the direct project impacts. Dr. Byron Freeman of the University of Georgia was consulted regarding studies he had previously performed on Cherokee darters in the vicinity of the project, and what the biological implications were for various levels of imperviousness.

As a result of the studies, the project was modified to reduce both direct and indirect and cumulative impacts. The number of bridges over waterways was increased, as well as the requirements for stormwater detention and management. These and other mitigation actions have led to workable solutions to Cherokee darter issues in the US 411 project area.

## INTRODUCTION

The US 411 corridor study area is located in Bartow County and includes the Pettit and Nancy Creek watersheds, both of which are tributaries to the Etowah River. Areas outside those drainage basins were not assessed; however, it is expected that areas downstream from the project, regardless of project alternative, would be impacted by subsequent changes in land use and imperviousness.

Beginning in 2002, the U.S. Fish and Wildlife Service (USFWS) established a study team to develop an HCP for the Etowah River watershed. The Etowah watershed is known to contain several protected aquatic species; moreover, degradation of water quality from suburban and urban growth is one of the main threats to these species. In order to meet one of its main goals of protecting the watershed, the HCP is developing a series of development guidelines and policies specifically dealing with stormwater runoff and soil erosion. Implementation of these policies would eventually be the responsibility of local government. As part of the overall watershed assessment completed for the HCP, Dr. Byron J. (Bud) Freeman, Director and Curator of Zoology from the University of Georgia, led teams of scientists to identify the more sensitive habitat areas throughout the watershed. Based on these surveys, Dr. Freeman suggested that the US 411 Connector project team also consider a smaller watershed within the project area that contained areas of habitat most suitable for the sensitive aquatic species.

JJG gathered background information to assist in determining stream conditions in the US 411 Connector project area. Information on the study area was summarized in an impacts assessment and used to develop the US 411 Connector Corridor Protection Plan. Figure 2 displays the watershed study area.

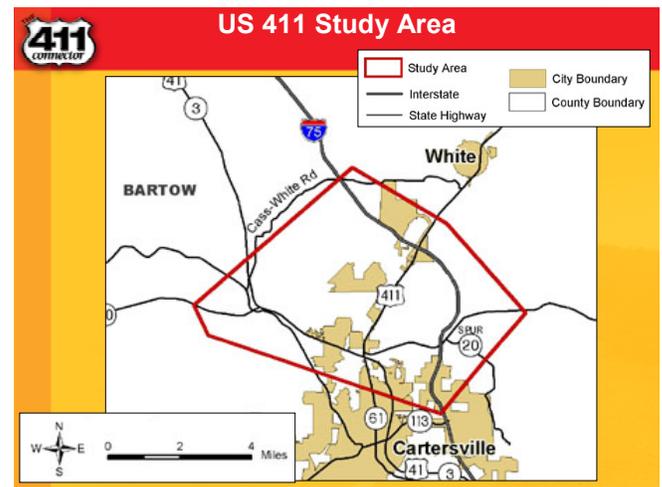


Figure 1: Study Area

## Aquatic Survey Report

The Aquatic Survey Report produced as part of the “Draft Ecology Assessment/Description of Jurisdictional Wetlands, Non-Wetland Waters of the U.S. and Protected Species Survey for the Georgia Department of Transportation” (2004), was reviewed for additional water quality information on the study area. No streams within the study area are listed on the State’s 303(d) list of impaired waters. However, there are several aquatic species listed on the Federal and/or State endangered species lists. One federally threatened species, the Cherokee darter, was identified in the study corridor.

### STREAM RECONNAISSANCE

The Nancy Creek watershed is located in the US 411 corridor area and drains the western portion of the study area. The portion of the watershed in the project area is approximately 4,194 acres and contains several unnamed tributaries that drain into Nancy Creek. Land use within the Nancy Creek watershed is primarily rural residential with some agricultural activities; additionally, commercial activities occur near US 41, US 411, and SR 293.

Pettit Creek is a relatively large watershed when compared to Nancy Creek, approximately 11,242 acres. The watershed drains the northeast portion of the study area and contains several unnamed tributaries that drain into Pettit Creek. The majority of the land uses in the area are rural residential, residential and agricultural. Several commercial activities are located near Interstate 75, US 41, US 411, and SR 20. Industrial activities are also located in the central portion of the watershed along Industrial Park Drive and US 411.

To assess the current in-stream conditions of the watersheds, an evaluation of water quality conditions in the study area was conducted in January, 2005. Sample collection was conducted at monitoring stations (shown on Figure 2) to determine ambient conditions. To properly summarize conditions in each watershed, ambient water quality data obtained at each monitoring station was tabulated and summarized by parameter. Water quality results, in conjunction with stream reconnaissance information gathered at each monitoring location, were used to summarize stream conditions and to determine potential impacts from land use activities within the watershed. Several critical reaches to the US 411 Connector project were identified in each watershed and were included in the stream reconnaissance evaluation.

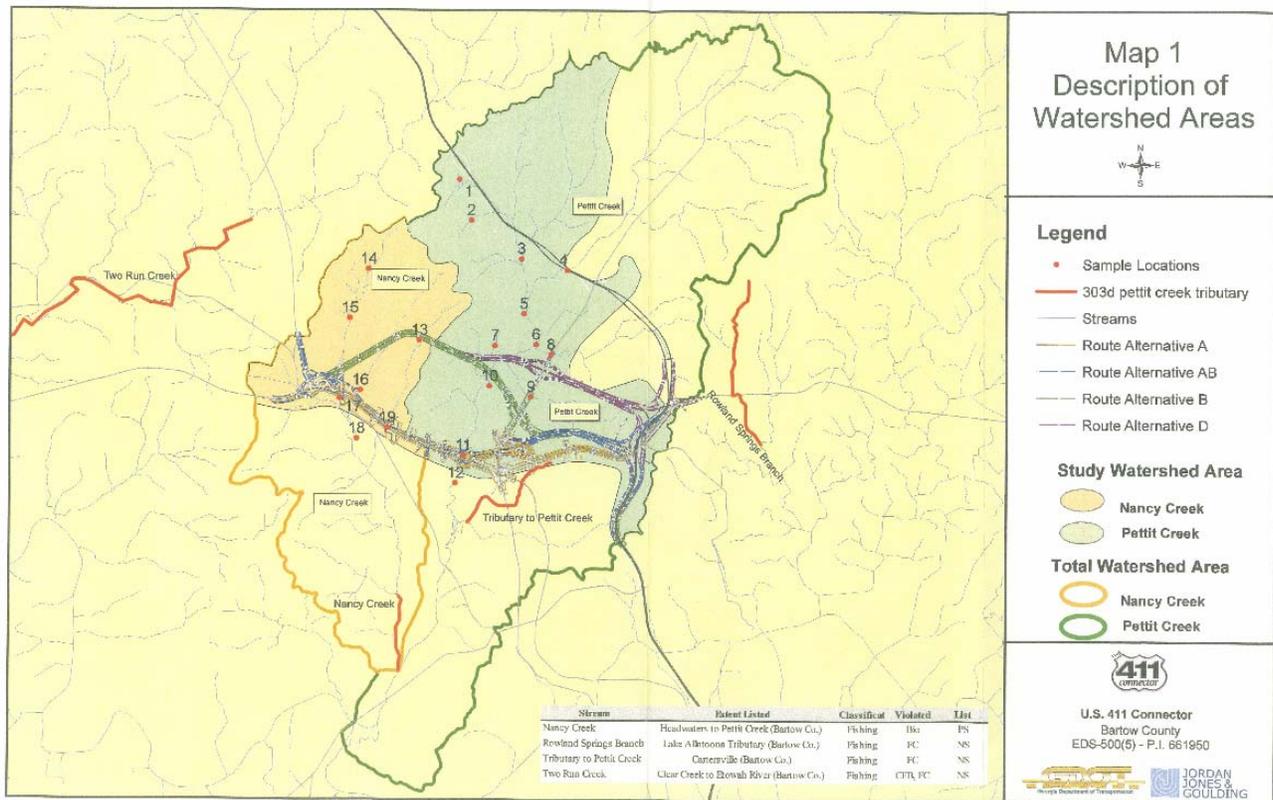


Figure 2: Watershed Study Area

## ALITY SUMMARY

A summary of the information obtained during the stream reconnaissance indicates that streams in the Nancy Creek watershed are in relatively good condition. In the Nancy Creek watershed, the vegetation buffer around the streams appears to help control sediment and runoff into the waterways. However, areas near US 41 had high specific conductance and pH values. High values of both of these parameters may indicate elevated levels of solids and salinity, and may also indicate commercial or industrial activities. Evidence of erosion was also noted.

The Pettit Creek watershed appears to be more degraded than the Nancy Creek watershed. Several locations measured within the study area had high conductance and pH levels. Levels were highest in locations measured directly downstream of Interstate 75 and near Industrial Park Drive. Both of these locations are in areas of intensive industrial land use. Evidence of bank erosion was noted in several locations within the watershed. In general, the Pettit Creek Watershed is in fair condition.

The water quality stressors evident in the study watersheds are conductance and pH. Degraded stream conditions result primarily from non-point sources of contamination. Overall, Pettit Creek watershed was more impacted than Nancy Creek watershed. Stream impacts appear to be directly related to the surrounding land use activities. See Table 1.

## FUTURE IMPACTS ASSESSMENT

The next step was to attempt to identify potential impacts on water quality resulting from the anticipated changes in land use resulting from construction of the US 411 Connector project. Land use conditions in 2004 were compared to predicted future land use conditions (2030).

As part of the US 411 Connector project Indirect and Cumulative Impacts (ICI) analysis, an expert panel was convened in September 2004 to review project concepts and other regional data, including population growth forecasts, current land use zoning and other development opportunity maps. Results of the expert panel discussions and exercises identified the following issues with regard to potential land use changes as a result of the US 411 Connector project:

- The distribution and intensity of land use change would be affected by both the route and type of highway improvement. In general, a limited access

facility would provide faster access to I-75, which would tend to increase the development potential of land west of the US 41/US 411 interchange for residential and industrial uses. This applies most to land along roads with existing connections to US 411.

- In contrast, an at-grade highway improvement would likely increase the commercial land use in the immediate corridor along the alignment. If a limited access freeway improvement were selected, commercial development would not locate along the alignment because it would lack immediate access. Instead, it would be drawn to the accessible land in the immediate vicinity of interchanges with existing at-grade highways.
- No matter which alternative is constructed, land use change is most likely to occur through expansion of adjacent uses of the same type. In other words, most of the new development would occur adjacent to existing areas of the same land use type.

## LAND USE AND IMPERVIOUSNESS

Many studies have shown that imperviousness is the greatest factor contributing to both water quantity (flooding) problems and water quality degradation. Imperviousness increases the amount of both runoff and pollutants to receiving water bodies. Existing land use data indicates that the US 411 Corridor Study area is currently 42.6-percent developed, corresponding to an estimated 14.2-percent imperviousness (assuming about 35-percent impervious cover for the developed areas). By watershed, Nancy Creek has 12.7-percent impervious area, while Pettit Creek has 15.7-percent impervious surface. Figure 3 illustrates the projected future land use in the project study area for the Preferred Alternative.

The ICI panel prepared maps as part of the exercise to identify the locations of predicted development through 2030. These were composited into a single future land use map for each alternative. Imperviousness was estimated by finding the area of all anticipated increases for each land use category, including commercial, industrial, and residential, by alternative. These areas were then multiplied by an impervious factor determined for the land use category by the Atlanta Regional Commission. The calculated future impervious areas were then added to the current impervious levels to determine the total. Finally, the total imperviousness was divided by the total study area to determine the percentage of imperviousness. The future imperviousness values were estimated for each US 411 Connector alternative in both the study watershed and the

sensitive aquatic study watershed. Imperviousness calculation results indicated that future imperviousness will range from 17.1%-22.9%, depending on the alternative.

According to Dr. Byron Freeman, Cherokee darters are sensitive to imperviousness levels as low as 4% and impacts to the fish community are evident at 10%. Based on these observations, current imperviousness levels of the watershed may be impacting Cherokee darter population. Further, the imperviousness of future land use scenarios may continue to impact the watersheds within the study area. BMPs would need to be implemented for any route alternative developed.

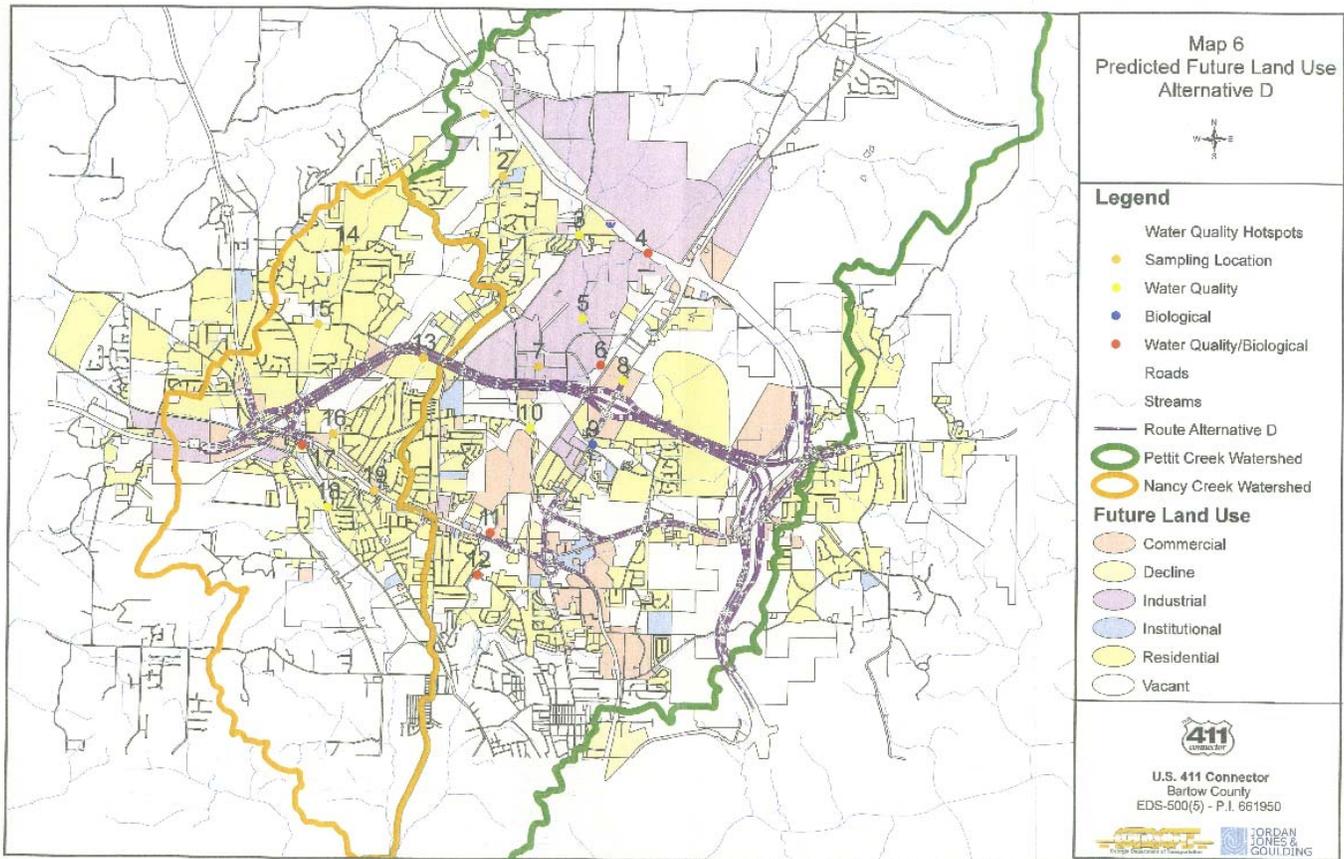
### STUDY FINDINGS

The development scenarios forecasted by the expert panel imply that the Pettit Creek and Nancy Creek watersheds will be impacted to some degree by any of the project alternatives selected, including the no-build scenario. The panel's most important finding was that

the project is in a rapidly developing area that would clearly continue to develop with or without the project.

The expert panel predicted that the existing commercial, industrial and residential areas will continue to expand. The existing roadway network would continue to serve mainly local traffic, which is the impetus for expanding commercial development. Currently, SR 20 and US 411 provide connections to I-75. The proposed US 411 Connector would not be a new connection to I-75, which is the main reason that the project is not anticipated to significantly affect the intensity of growth in the corridor. The improved connection will serve mostly through traffic that would not contribute significantly to the future land development in the corridor.

The results of the water quality data, biological data, referenced aquatic data, and calculated percent impervious predictions generated from future land use were used to determine that Alternative D would create the least impact to the study watersheds.



**Figure 3: Projected Future Land Use**

## MITIGATIVE ACTIONS

The proposed US 411 Connector lies entirely within Priority Area Two as defined by the Etowah HCP. Runoff limits in Priority Area Two are set at the equivalent of 5% total impervious cover, which mandates new developments to employ storm water management practices that make the site act as if it had no more than 5% impervious cover (with the remainder forested). The HCP emphasizes infiltration of stormwater runoff near its source as part of a comprehensive stormwater treatment system.

The USFWS further requested that the runoff from 2-year storms be treated to protect the Cherokee darter and minimize impacts to its habitats. In Bartow County, a 2-year storm event corresponds to 3.9 inches of rainfall, or 1.71 acre-feet per linear mile of the proposed roadway development.

Runoff control BMPs can be implemented individually or collectively to form a water quality treatment system. Two options were determined to be feasible for controlling the runoff for the US 411 Connector project.

The first option is to direct the runoff into an enhanced swale system along both sides of the road where runoff is treated. This option eliminates the need for roadway gutters and storm water ponds. If a maximum ponding depth of the swales is assumed as 18 inches, the estimated bottom width of the swale must be approximate 4.7 feet (on each side of the roadway) in order to meet the HCP runoff standards.

The second option is to install a storm water pond to treat the runoff through settling. A storm water pond to detain and treat 95% of the runoff volume increase from one linear mile of the project will require a land area of approximate 0.57 acres if a 3-foot ponding depth is assumed. A stormwater pond also carries the benefit of providing protection to downstream channel banks.



**Figure 4: Pettit Creek near Gilreath Road**

At the time of this writing it is uncertain which of the runoff control measures will be selected, although Option 1 appears to be most feasible. In concert with the other mitigative aspects of the project, such as a commitment by GDOT to bridge all streams with potential Cherokee darter habitat, the project will be able move forward to the benefit of all concerned.

## LITERATURE CITED

- Jordan, Jones & Goulding, Inc. (for GDOT), August 2005, Draft Supplemental Environmental Impact Statement, EDS-500(5), P.I. 661950, Bartow County, US 411 Connector.
- Jordan, Jones & Goulding, Inc. (for GDOT), August 2005, Watershed Assessment Technical Memorandum, EDS-500(5), P.I. 661950, Bartow County, US 411 Connector.
- Jordan, Jones & Goulding, Inc. (for GDOT), August 2005, Ecology Assessment/Description of Jurisdictional Wetlands, Non-Wetland Waters of the US, and Protected Species Survey, EDS-500(5), P.I. 661950, Bartow County, US 411 Connector, Preferred Alternative.
- Dr. Byron J. Freeman, Director and Curator of Zoology, University of Georgia Personal Communication, January 13, 2005 Project Meeting.