

**Blue Ridge Parkway Wetlands
Spatial Data Development and Analysis**

Final Technical Report

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Summary

Accurate spatial data is essential in order make sound natural resource management decisions. Originally mapped by undocumented methods, the Blue Ridge Parkway had spatial data representing 83 wetlands within park the boundary. Unsure of the data's integrity, the Parkway requested that the data be validated and if necessary updated. Using Geographic Information Systems (GIS) analyses and mapping grade Global Positioning Systems (GPS) receivers, the spatial data representing these wetlands were updated. This report documents those efforts and highlights several wetlands facing pressure from current land use practices, within and outside of the park. In addition to updating the wetlands spatial data, additional watershed data were developed. While a watershed analysis of several wetlands was originally planned, the lack of available parcel data made this portion of the project impractical. Instead, 79 wetlands, including all of the wetlands initially represented by a point, were visited. Furthermore, the spatial representation for 82 wetlands was updated. These updated spatial data layers will enable the Blue Ridge Parkway to make land management decisions with the best available data.

Background

This report documents the data development methodologies that were used to update and expand pre-existing spatial data related to wetlands. Natural resources preservation is one of the essential goals of the National Park Service and having accurate spatial data is imperative in order to meet this goal. Furthermore, accurate spatial data lays the groundwork for future studies, allowing land managers to monitor changes that occur over time. The Blue Ridge Parkway (BLRI) extends 469 miles through Virginia and North Carolina and contains a wide variety of natural resources, one of which is wetlands. These wetlands are home to several threatened, endangered, and rare species, some species of which are only found along the BLRI. BLRI contacted North Carolina State University's Center for Earth Observation expressing an interest in validating and expanding the wetland spatial data they had. These wetlands had been mapped in the 1980's by undocumented methods. As a result, BLRI was unsure if a mapped wetland actually existed and what the accuracy of the spatial representation was. In addition BLRI was interested in expanding their spatial data to include the watersheds of the wetlands as well.

The objectives of this project were to delineate and map as many of the approximately 83 wetlands within the Blue Ridge Parkway in North Carolina and Virginia as possible and to conduct a watershed analysis for the highest priority sites.

Methods and Results

Data Mining: Initial efforts focused on data mining. Large amounts of geospatial data exist, but finding the right types and versions of data proved rather difficult. The park provided base vector data (park boundary, roads, mileposts, wetlands) however; all other data were downloaded from a variety of sources. Aerial photography for the North Carolina portion of the BLRI was downloaded from the North Carolina Department of Transportation (NCDOT), while aerial photography of the Virginia portion of the Parkway was downloaded from the University of Virginia's Geospatial and Statistical Data Center. The type of imagery (Color Infrared and True Color) and date of acquisition (1993-2000) varied widely. Digital elevation models (DEMs) of the North Carolina portion of the Parkway were downloaded from the NCDOT. The DEMs downloaded were derived from LIDAR data acquired for the North Carolina Flood Map Program. The spatial resolution of these data ranged from 20 to 40 feet, depending on geographic location. The DEM of the Virginia portion of the Parkway was downloaded from the USGS Seamless Data Distribution System. The spatial resolution of these data was ten meters. These two types of data (aerial photography and DEMs) represented the majority of the data downloaded, other types of downloaded spatial data included wetland data from the National Wetland Inventory (NWI), soils data from the US Dept. of Agriculture-Natural Resources Conservation Service, and contour lines from the NCDOT. Raster based land use/land cover datasets were collected, but were not used. Several agencies were contacted throughout the course of this project in an attempt to obtain parcel data for the counties the Parkway passes through. However, data collection

efforts for the watershed analysis were suspended due to the lack of accessible and available spatial data.

Preliminary Data Analysis: Data analysis was divided into two main tasks, wetland delineation and watershed delineation. Using the DEM, a Compound Topographic Index (CTI) was derived (Gessler et al., 1995). CTI calculates the upstream contributing area and the slope of the landscape to determine an area's (a pixel) wetness; much like a flow accumulation model. This process highlights depressional areas as well as broad flat areas. The results from this analysis were overlaid on aerial photography of the area, available soils data layers, and the pre-existing wetland data layer. The CTI results indicated wet areas, the soils data layer (if available) indicated hydric soils, and the aerial photography allowed for a visual check of the location. This effort provided a preliminary look at the locations of the pre-existing wetlands spatial data. In most cases the pre-existing wetlands spatial data were accurate in terms of the general location of the wetland. Typically, the mapped wetland encompassed a portion of a road or a developed area, such as a farm. In other cases the mapped wetland appeared to be too small. It should be noted that all of the Virginia wetlands were mapped only as a point, so this preliminary analysis was necessary to locate approximate areas where wetlands were likely to be found; as the next phase of wetland delineation involved field work.

Field Work: BLRI originally requested that as many wetlands as feasible be delineated with first priority given to the wetlands mapped as points. Given the inability to acquire parcel data to perform watershed analyses, it was decided that all wetlands would be visited. In the end, all but four wetlands were visited. Two wetlands were not accessible due to a closure around the Julian Price Park area, a wetland in the Doughton Park area was not visited due to time constraints, and the fourth wetland not visited was at the James River crossing. This wetland was not visited because the point was placed in the river. Both banks and the river are classified as a R2UBH wetland according to NWI (Cowardin et al., 1979).

At each wetland site visited, at least one GPS point was recorded, with three or more GPS points taken at a majority of the wetlands. At each GPS point, at least one digital photograph was taken. In addition to the photograph(s), notes were made about the canopy structure, any trees and bushes present and any hydrophytic plants seen from the point. Additional comments were recorded in order to document any resource damage (past, current, and potential). A tracklog was kept to document the path traversed by the field observer. In most cases the perimeter of the wetland area was walked.

Final Data Analysis: The spatial data from the field work (GPS points and tracklog) were then used to create a new wetlands data layer. Relying heavily on the tracklog, GPS points, knowledge gained from the site visit, and aerial photography, new wetland polygons were created. The new wetland polygons were refined further using available contour line data. For three of the wetland sites not visited, contour lines, soil data, and aerial photography were used to create new wetland polygons. A new polygon was not created for the James River wetland. The final phase of the project, delineation of the wetlands watershed, was based on this new more accurate representation of the wetlands.

The final phase of the project focused on delineating the watershed and sub-watersheds of each wetland using the hydrologic modeling tool ArcHydro (Maidment, 2002) on the compiled DEMs. ArcHydro is a hydrological modeler available to the public for download. Several intermediate data layers were created by following a sequence of terrain preprocessing steps, with the final step requiring the input of a user defined point. This point represents the furthest downstream or down slope wetland location. The newly created wetland data layer was used to determine the placement of these points. The watershed of each point was then calculated and saved as its own data layer. A total of 82 watersheds were delineated. Several of the larger watersheds contain one or more smaller watersheds of wetlands located upstream. In addition to the wetland watersheds, adjacent watersheds as well as sub-watershed data layers were delineated and have been included with the final deliverables.

Field Observations: At each of the 82 wetlands sites visited, the field observer recorded information about past, current, and potential resource damage. Table 1 identifies wetlands that appear to be under pressure or potential threat from surrounding land use practices. The intent is simply to highlight these wetlands, not to address specific conditions or offer solutions. In Table 1, wetlands are identified by the nearest milepost and its official name, if one exists. Most wetlands do not have an official name.

Table 1. Wetlands of concern based on field observations.

Mile Post (Official Name)	Current Situation
MP 6	Run off from Visitor Center Parking lot
MP 11	Road cut caused, road run-off
MP 16 (Love Gap)	Active cattle farm on adjacent land, T&E species found outside park of the boundary
MP 63	Beaver influenced/caused
MP 86	Hydrophytic plants being mowed, tire ruts from tractors
MP 151	Development surrounds site, bordered by roads
MP 154	Active cattle farm just upstream, cattle can access stream
MP 156	Question the existence of a wetland
MP 160b	Beaver influenced/caused, most of wetland outside park boundary
MP 162	Culverts created or are destroying this wetland
MP 163	Beaver influenced/caused
MP 176	Recently cleared land adjacent to park boundary has increased the sediment load and caused channel erosion.
MP 194	Mowing within park boundaries (private) restricts hydrophytic plant growth
MP 213	Mowing within park boundaries (park service) drastically restricts hydrophytic plant growth
MP 215	Recently cleared land adjacent to park boundary causing stream channel erosion
MP 217b	Heavy sedimentation from upstream
MP 222	Surrounded by active pasture, heavy cattle influence, cattle can access stream at only one point

MP 231	Recent land clearing on adjacent land causing severe channel erosion
MP 238	Heavy cattle influence, unrestricted access to streams, powerline clearcut through middle of wetland area
MP 240 (Susan's Bog)	Heavy cattle influence, unrestricted access to springs and stream
MP Doughton Lodge	Heavy cattle influence, feeding area, unrestricted access to stream
MP 248	Hydrophytic plants in mowed area (park service)
MP 251	Cattle influence, unrestricted access to spring and stream
MP 276 (Deep Gap Bog)	New road has reduced or eliminated ground water flow, very dry site
MP 283	Cattle influence from adjacent property, run off, no direct access
MP 288	Several man-made trails, several brush piles too
MP Julian PP#5	Once a beaver caused wetland, not anymore
MP 298	Hydrophytic plants in mow zone (private) cattle influence too
MP 313	Bordered by roads, cut in half by road too, roads increase surface runoff, deep channel on south side of road
MP Linville Campground	Heavy flood damage, no wetland located
MP 340b	Located under powerline, lots of cut debris, run off from campground and development (gift shop, gas station)
MP 408 (Flat Laurel Gap Bog)	Run off from campground and developed area
MP 418	Road cut caused wetland, paved culverts, blocked drain, road run-off, all influence wetland plants and mosses
MP 422	Road run off
MP 425	Road cut caused wetland, road run off
MP 426	Road cut caused wetland, road run off, stone culvert
MP 427	Road run off
MP 432	Road cut caused wetlands, road run off
MP 456 (Soco Gap Wetland)	Surrounded by access road to parkway
MP 459	Road cut caused, road run off

Deliverables

- 1) One Personal Geodatabase containing three Feature Datasets:
Field_Work, contains two Feature Classes GPS points and Tracklog.
Watersheds, contains three Feature Classes, all resulting from the ArcHydro watershed delineation process.
Wetlands, contains two Feature Classes, the old and new wetlands.
- 2) FDGC compliant metadata has been created for each Feature Dataset and Feature Class.
- 3) A folder containing all digital pictures taken. All pictures have the same naming convention (BLRI_MPXX_X), most pictures are hyperlinked to the BLRI_field_gps feature class. Those photos not hyperlinked are included to document plants found at the wetland site.
- 4) An ArcMap document with the new wetland data and GPS points displayed and the hyperlinks set.
- 5) Additional data that was collected will be delivered as well. If metadata was available it will be included, no metadata was written for data collected. This data includes; aerial photography, contour line, DEM raster data, NWI, and soils data used as well as the Land-Use Land-Cover data collected.

References

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