NORTH GEORGIA ENVIRONMENTAL DATABASE COMPILATION FOR CUMULATIVE IMPACT ASSESSMENTS OF RESERVOIRS

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Abstract. In the course of processing numerous permit application packages for Section 404 and Section 10 permits, the US Army Corps of Engineers, Savannah District, Regulatory Branch must prepare case documents to analyze the affects of issuing these permits. Due to the increasing number of large and complex projects, a larger area of effect must be considered in determining whether cumulative impacts are significant. Access to available data is important in completing the National Environmental Policy Act (NEPA) process, and in processing applications uniformly and with scientific basis. To increase our ability to assess cumulative impacts, we have initiated a data collection effort that will allow us to assess the effects of project proposals, along with past, present and reasonably foreseeable future actions, as defined by the Council on Environmental Quality. Savannah District coordinated with key state and federal agencies, and non-governmental organizations to develop a list of parameters that each agency feels is requisite in determining cumulative impacts. This presentation will address our efforts to gather data layers for assessing cumulative impacts of reservoir projects in the State of Georgia.

INTRODUCTION

The U.S. Army Corps of Engineers (USACE), Savannah District, Regulatory Branch, in association with Dial Cordy and Associates, Inc. is developing a Geographic Information System (GIS) based environmental database index beginning with six watersheds in Georgia. The six watersheds included in the project area are the Chattahoochee, Flint, Ocmulgee, Coosa, Tallapoosa, and Oconee.

The purpose of this project is to collect and compile applicable environmental data available from all potential sources, including but not limited to State and Federal agencies, academic institutions, counties and municipalities, and private firms. This data will be used to assess cumulative impacts of water resource projects (i.e. proposed dams and/or reservoirs) in relation to permitting and regulatory procedures implemented by USACE that could affect water quality, water quantity, rivers, streams, wetlands, riparian areas, and aquatic habitats within state watersheds that have sustained increasing development in recent years.

The National Environmental Policy Act (NEPA) of 1969 and its implementing guidelines under the President's Council on Environmental Quality (CEQ) requires Federal agencies to evaluate the potential of proposed project actions to result in direct, indirect, or cumulative impacts to the environment. Cumulative impacts can be defined as the result of the compounding of the effects of all actions over time. Thus, the cumulative impacts of an action can be viewed as the total effects on a resource, ecosystem, or human community from that action, and all other activities affecting that resource, no matter what entity (federal, non-federal, or private) is taking the actions (CEQ, 1997).

This database compilation effort will assist USACE in processing permit applications in a uniform and scientifically-based approach by addressing not only the potential impacts of a proposed project action, but the significance of these impacts in conjunction with past, present, and reasonably foreseeable future actions. The goal of this project is to produce an end-user product with readily accessible data that is represented in a geographic and temporal format in conjunction with a query or trends analyses database. It is the analyses of permitting and regulatory activities combined with the spatial representation of physical data trends that would enable USACE to evaluate the potential of a given permit or application to result in direct, indirect, or cumulative impacts, and to achieve its mission regarding the comprehensive management of water resources.

A comprehensive environmental geodatabase for watersheds in Georgia will benefit natural resource managers and facilitate the decision-making process

regarding the cumulative impacts of water resource projects. Specifically, compiling spatial and tabular datasets representing many environmental parameters into a singular, integrated geodatabase will provide a tool allowing quick answers to site-specific questions. This would be a dynamic, evolving tool, changing over time as more data becomes available and as the delineation and attributes of existing datasets require updating. The most significant value of such a geodatabase will be the ability to perform trend analyses on multiple parameters simultaneously and apply this information to establish not only regulatory water resource practices, but to examine the interrelated resources and conditions that constitute the environment as a whole. The three most important site specific questions a comprehensive geodatabase will be able to answer are; 1) what are the existing conditions, 2) how have these conditions changed over time, and 3) how will these conditions change in the future, either in un-impacted conditions without constraints, or under prospective conditions given a defined set of impacts and constraints.

This report documents the sources and formats of available resource data required for the GIS compilation project. In addition, options for various analytical approaches are presented herein.

DATA COLLECTION APPROACH

By contacting applicable sources of geospatial and raw data relating to natural resources or environmental parameters relevant to the watershed study area in August 2002, the primary goal was to acquire datasets and GIS layers that contained:

- Permitted wetland losses, and the mitigation required
- Estimated wetland and stream loss due to construction
- Historical (pre-1970s) wetlands and stream loss data that would enable trends analyses
- Areas with degraded water quality, and the limiting degradation factor
- Existing water intakes (including potable, agricultural, and industrial intakes), along with outfalls and quantity data for the outfalls.
- Proposed water intakes, reservoirs, or other proposed water resource related projects
- Aquatic areas containing threatened, endangered, or special status species, critical spawning habitats, and designated trout waters
- Locations of federal or state-listed threatened, endangered, or special status terrestrial species
- Delineations of federal and state-owned lands, as well as conservation lands
- Areas of high population growth
- Cities, counties, or municipalities with water conservation ordinances
- Groundwater yield data by county
- Average flow and low flow data from stream gages
- Hazardous waste sites
- Watershed percent impervious surface
- Contiguous forest loss
- Biological sampling and monitoring stream quality assessments

Data sources included, but were not limited to federal, state, and local agencies, academic institutions, private firms, regional planning and development centers, nonprofit organizations, and county planning departments. Primary agencies and organizations consulted included: U.S. Geological Survey (USGS), Georgia Department of Natural Resources (DNR) and DNR's Environmental Protection Division (EPD), U.S. Environmental Protection Agency (USEPA), U.S. Fish and Wildlife Service (USFWS), Georgia's State Heritage Program, Georgia Institute of Technology (GA Tech), University of Georgia (UGA), Atlanta Regional Commission (ARC), Georgia's Regional Development Centers (RDCs), and the private consulting firms of Tetra Tech, Inc. and CH2M Hill. Many agencies submitted datasets. Some data such as the National Hydrography Dataset and other files were available for download from the Georgia GIS Clearinghouse, UGA's Natural Resources Spatial Analysis Laboratory, USGS's National Water Quality Assessment Program, and Georgia's Environmental Resources Digital Data Atlas.

RESULTS

Available GIS data formats include coverages, shapefiles, and other Arc/Info, ArcGIS, or ArcView software compatible files. Readily available GIS files primarily pertain to areas with degraded water quality; potable/industrial/agricultural water intakes and outfalls; Q3 flood hazard data and digital floodplain data; federally or state-owned lands and conservation lands; census files containing population growth patterns and socioeconomic indicators; hazardous waste sites; stream reaches and stream flow data for rivers or streams with a greater annual flow than 400 cubic feet

per second (cfs); stream monitoring locations and gage data; trout waters; county and state boundaries; and contours and digital elevation models (DEMs).

Limited GIS-format data is available for threatened and endangered (T&E) species through DNR's Wildlife Resources Division and Fisheries Division; there is a paucity of data regarding special status species, critical habitats, and spawning. Much of the field studies that have been conducted have only resulted in notes and raw data, some of which is available in tabular format. GIS data primarily exists for the northwestern portions of the State where stream surveys have been conducted and the relevant data entered into GIS format. Available data for the remainder of the State regarding threatened and endangered species would be confined to paper USGS quarter quadrangles (QQs), which can be hand scanned. The level of detail on these paper maps is unknown to date, and they would likely have to be acquired from regional division offices.

No GIS files are currently available pertaining to permitted wetland losses and the associated required mitigation. While USACE maintains a permitting database with report generation capabilities, the majority of these files do not contain information such as latitude-longitude coordinates that would make the data easily geo-coded and spatially represented. Reports and records would need to be investigated for information that could be spatially represented. Generic GIS data for locations and classifications of wetlands is readily available from USFWS' National Wetlands Inventory (NWI), though much of this data has not been ground- truthed and the level of detail would vary depending upon the geographic location and the level of wetland studies for a given area.

No data is presently available pertaining to historical wetland and stream loss, and little data is accessible regarding contiguous forest loss or impervious surfaces in the study area. UGA is currently in the process of scanning and orthorectifying aerial photographs for the years of 1974, 1985, 1992, and 2002 that provide 60-meter resolution land use and land cover (LU/LC) imagery. When completed, these Digital Ortho Quarter Quadrangle (DOQQ) datasets would provide an excellent source of historical comparisons to assist in identifying and analyzing trends regarding historical wetland and stream loss, surface water impoundments, open water acreages, contiguous forest loss, land development, and impervious surfaces.

The 1998 GIS LU/LC dataset has already been completed by UGA and is available from the Georgia GIS Clearinghouse. Other sources such as ARC currently provide GIS-based LU/LC files for its 10-county region. Additional sources of LU/LC data include a joint agency effort conducted in 1992 – the interactive National Land Cover Dataset, and the Multi-Resolution Land Characteristics (MRLC) 1992 and 2001 Dataset, which is based on Landsat imagery and available for purchase via FTP download or CD-Rom.

According to DNR's Water Resources Division, no GIS data is currently available regarding water conservation ordinances for the study area, or from other federal or state-level agencies. Some Regional Development Centers do have partial records that would have to be obtained and geo-coded into a spatial format.

The quality and level of detail of the available data reflects the broad spectrum of sources. In general, more recent and complete data exist for the more urbanized areas of the study watersheds. For datasets that are available in GIS format, the scales can vary between 1:15,000 to 1:250,000 and the formats of the files can vary significantly. In other cases, data that would prove instrumental to USACE's data collection and subsequent compilation effort is still in the developmental or accuracy review phases and is not currently available. Security sensitive material such as the location of public potable water intakes will still need to be gathered. USACE will also need to determine which raw data sets requiring in-house agency research, review, and subsequent data entry time are instrumental to the project.

COMPILATION AND ANALYSIS

USACE will continue to acquire applicable data and coordinate with agencies and organizations to obtain datasets. Additionally, the 1999 Color Infra-Red DOQQs will be made available from GA Tech's Center for Geographic Information Systems. Other data may be available for the cost of the media or for direct purchase.

Based upon the information compiled to date, two different approaches can be taken. The first alternative is to continue with the data collection and compilation efforts as originally specified resulting in a compilation effort that would take approximately through September 2003 to complete given the volume of data, the varying degrees of quality, and the different data formats that must be compiled. This also includes time estimated for the necessary data accuracy reviews. It should be noted that compilation efforts cannot begin until the DOQQs are received, and the GIS data and metadata standards are established.

Because this alternative would only contain the 1998 LU/LC dataset developed by UGA, such a compilation would not include the datasets necessary to adequately conduct trend loss analyses or perform queries regarding a project's direct, indirect, or cumulative impacts upon water resources and the human environment. To adequately assess losses regarding wetlands, reservoirs and other impoundment areas, contiguous forest loss, and impervious surfaces; aerial photographs from 1974, 1985, 1992, and 2002 need to be hand-scanned and orthorectified. It is the historical comparisons of these images that would serve as the primary tool in assessing natural resource trend loss data, and thus, cumulative impacts. This material is currently under development at UGA, where forested wetland loss, open water acreages, and water impoundment acreages are presently under study.

A second alternative would be to acquire through coordination with UGA, the historical aerial DOQQs. UGA would require funding to complete the hand scanning and orthorectification of this data. This alternative is designed to incorporate analytical components into the end-user GIS database product, which would include trends analysis tools to address potential project impacts from a regulatory and permitting aspect for the USACE. The focus of such trends analyses would be on selected biotic data, wetland losses, open water/stream losses, water quality degradation, and areas impacted by impoundments. Hydrologic and hydraulic analysis would still be required for the evaluation of any given proposed water resource action.

CONCLUSIONS

Agency coordination efforts will continue to identify and pursue additional sources of geospatial data, and the presence of raw and/or tabular data that could be reviewed and incorporated into geospatial formats.

Based upon the desired end-user GIS database product with a capacity to perform queries and serve as an analytical tool for USACE in regulatory and planning procedures and permit review processes, we believe a significant step in the success of the project would be to obtain the LU/LC historical aerials from UGA. Because these DOQQs are in the processing stage at an academic research facility, funding would be required for these datasets to be hand scanned and orthorectified.

Data collection efforts will continue to allow time for the delivery of the DOQQs to be used as base maps from GA Tech, and for UGA to complete the digitizing and accuracy checks on the historical aerials. Database development and compilation efforts would begin subsequently to allow for establishment of data and metadata standards, the submittal of a draft database index and GIS compilation, addressing comments and questions, and for quality assurance/quality control checks of the data. With this approach, the USACE would be able to implement the end user product in the latter part of 2003.

Even with this effort, the available information will be limited, thus limiting the scope of the ultimate cumulative impact analysis performed for a given project. With each subsequent project analysis, the information base would be expected to increase, and over time, the ability to conduct more comprehensive cumulative impact analysis in Georgia, should improve dramatically.

LITERATURE CITED

Council on Environmental Quality. 1997. Considering Cumulative Effects Under the National Environmental Policy Act. Council on Environmental Quality, Executive Office of the President, Washington, D.C. 64p.