

# OCONEE RIVERS GREENWAY CRITICAL PATH ANALYSIS AS A PLANNING TOOL

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**Abstract.** Greenways, linear open space corridors, can act as water resource management tools. Athens-Clarke County is planning a greenway system along the Oconee Rivers. The project's size and complexity require an objective planning process such as a critical path analysis. MacProject II was selected as the computer application to build and manage the method. The use of a computer driven critical path analysis in greenway planning may be a new application.

## INTRODUCTION

Land use planning and water resource policy development are current issues. Georgia's Comprehensive Growth Strategies Act of 1989 encourages local governments to consider water resources among other planning elements in developing a comprehensive plan (Georgia State, 1992).

Rivers and their corridors are a vital natural resource. They perform a variety of critical functions such as controlling floods, trapping sediments, filtering out toxins and excess nutrients, and supporting rich assortments of wildlife and plant species (Labaree, 1992). The development of river-based greenways is becoming a popular option for communities to use and protect their waterways.

The approach to planning determines not only a community's success in establishing a greenway system but also the degree to which design is ecologically based. Effective greenway planning coordinates objective formulation, education, design, fund raising and property acquisition. All of these factors are vital in moving the project from concept to reality. This process can be facilitated by using a computer generated critical path analysis such as MacProject II.

Athens-Clarke County has appointed the Oconee Rivers Greenway Commission to initiate the planning process for the development and preservation of its

river resources. The paralyzingly complex project is structured so that the broad based commission members, scientists, politicians, and citizens, can understand and execute the plan. The Oconee Rivers Greenway planning process serves as an example of an application of a critical path method to water resource management.

## BACKGROUND

### The Oconee Rivers

Athens-Clarke is relatively rich in water resources with two forks of the Oconee River converging within the county boundaries. The area enjoys a relationship with its rivers typical of communities in northern Georgia. The rivers supply the public drinking water and receive treated sewage. As prime water resources, the Oconee rivers represent the life blood of the community.

The rivers are not spectacular in a wild and scenic sense, however they are lovely. Their gentle meandering is occasionally interrupted by fast moving shoals. Although most of their run is adjacent to development, the character of the rivers with their heavy canopy of hardwood forests is rural and untamed.

Dense vegetation along frequently steep banks prohibits casual users from accessing the majority of the rivers' corridors. Passive access is available, however, as most public parks are located along the rivers. Also adjacent to the rivers are the State Botanical Gardens and large parcels of University of Georgia lands. Low levels of active use has helped to facilitate the river's recovery from years of abuse. It has also fostered a disconnection between the community and their water resources.

An Oconee Rivers Greenway was designated as a feature of the 1974 Recreation-Open Space Plan (Aguar, 1992). However, economic and political

factors interrupted implementation. The local government reestablished its commitment to a greenway system in 1992 by appointing a commission to initiate planning. The goal of the Oconee Rivers Greenway Commission is the legal adoption of a community driven master plan and implementation strategy within five years. The newly structured commission faced a multitude of tasks to reach their goal. A plan for the greenway development process was required.

### **Greenways**

Greenways are systems or networks of connected lands that are protected, managed or developed to provide ecological, recreational and historical/cultural benefits (Fabos and Ahern, 1992). They are open space corridors that often take the form of a linear park or a series of linked spaces. Greenways are typically developed along natural systems such as river courses (Little, 1990).

Greenways provide flexibility in expressing a community's desires and regional needs. They reflect varying use intentions dependent upon the degree and type of development. Greenways can remain an inaccessible open space buffer, be simple walking paths, or be paved trails connecting programmed recreational facilities.

As growth continues, greenway systems represent many local benefits. Communities often look to greenways to improve water quality by providing percolation fields for storm water runoff. They offer needed open space buffers in high density areas. They can also control development inappropriately close to river corridors. Greenways can link existing parks thereby increasing recreational opportunities when acquisition of parkland is becoming too costly for most municipalities. Greenways represent an opportunity for communities to secure protection and use of river resources (Labaree, 1992).

Even on a regional scale, the unbuilt landscape is becoming increasingly fragmented into isolated 'natural' pockets. A regional greenway system could connect a network of open spaces. Linkage of the local greenway to a larger network could promote such regional benefits as conservation of river ecology and watershed functions, protection of biological diversity and preservation of fauna and flora corridors (Labaree, 1992).

### **Planning Greenways**

Effective greenway planning has gained international attention in the race for open space between preservation and development (Little, 1990). It is a lengthy and complicated process involving many overlapping systems, each of which requires a

partnership of various community factions. An effective planning process accomplishes objective formulation, education, design, fund raising and property acquisition.

Within each of these major task systems a host of subsystems exist. For instance, a communications venue and a series of public meetings must take place to generate and bring consensus on greenway objectives. The production and distribution of public relations materials and education programs achieve community participation in the greenway development process. Legal considerations such as non-profit status or connection with a land trust provides a framework for land acquisition, as well as a knowledge base in which environmental protection of resources is maintained. Solicitation of funding is an ongoing effort which supports the land acquisition, design and construction phases. Extensive landscape inventory and analysis, series of draft designs and solving accessibility issues are some of the tasks involved in design. Greenway implementation and management contains lengthy and complicated construction processes as well as development of plans for safety and maintenance. A successful greenway plan is one adopted by the local government, in itself an appreciable political process.

Greenways frequently have long embryonic phases. The systems and subsystems inherent in greenway planning may involve thousands of incremental tasks spread over many years. The multitude of tasks are both sequential and simultaneous requiring planning methods capable of charting direction and tracking project progress.

A greenways plan should be a physical document which exists independent of greenway membership or political climate. It lives as the greenway's business plan which serves to garner political, financial and public support. Because it must offer structure over time, it should be easily understandable to any who pick it up and be flexible in responding to surprise windfalls or setbacks.

### **Critical Path Analysis**

In project planning, critical path analyses attempt to establish the most efficient use of time and resources. Traditional uses of critical path analyses have been in connection with large military and construction projects (Lockyer, 1967). Flow chart organization is common in many aspects of environmental planning (Belknap and Furtado, 1967, Spann, 1975, SDC & ISSI, 1975, and Lusk, 1986). Computers are also becoming an important landscape planning technology (Fabos, 1988). The Oconee project, which merges these planning concepts with the additional features of a critical path method, may be

a new application of a computer driven critical path method for greenway planning.

Critical path analyses seek to define the network of tasks for accomplishing a goal. To build a critical path analysis, all of the tasks connected with completing a project are expressed. Tasks are then sequenced according to their dependence on previous and subsequent task accomplishment.

Including time and resource factors develops a critical path analysis from a simple flowchart. The time it will take to complete each task is estimated and assigned to the task. A diagram reveals the task sequence that requires the greatest time to execute. This is designated the critical path because delays in task completion along this path will postpone project completion. Resources such as manpower and funding are assigned to each task. Critical path analyses seek to maximize resources so that no individual resource is under used or over assigned.

#### MacProject II

MacProject II is a computer application designed to build and monitor critical paths. It has the ability to demonstrate project information in a variety of graphic formats such as bar graphs, histograms and matrices.

These features act as components of implementation and management plans (Spann, 1975). For instance, the critical path analysis can be produced as a bar chart diagram. Bar charts allow monitoring of task progress. As a subset, a bar chart can be produced describing the tasks of just one committee. Each committee can then focus on its tasks and monitor its progress.

A budget can be detailed in a matrix format for an entire project or by task subsystem. Resources can be viewed in a matrix or histogram. The matrix portrays

a resource's cost per month and time available. Histograms portray allocations of all the resources to reveal which may be under or over committed.

Different features provide a great deal of flexibility in terms of visual formats. As well, MacProject II allows ease of use because updates to one window will automatically revise information in all the various formats (Claris, 1989).

## APPLICATION

### Method

It has been noted that "most information systems which have failed to meet expectations were deficient in the design phase. Either user needs were ignored, or creation of the planned data base was prohibitively expensive, or adequate provisions were not made for updating the information system" (Spann, 1975, p. 14).

For the purposes of this paper, Critical Path Analyses, Pert and Gantt Charts were researched as possible methods for sequencing the many overlapping tasks to be accomplished with available resources. Additionally, several computer applications were reviewed for the ability to meet the project's scope and ease in use. The design of a critical path analysis, utilizing Macintosh, MacProject II, was decided upon to assist in the Oconee Rivers Greenway planning process.

Prior to critical path analysis design, the five year goal was established in a commission session. Important factors such as resources, times and interdependencies were identified and a first network draft was produced.

The initial critical path analysis was organized along committee functions. Each committee reviewed

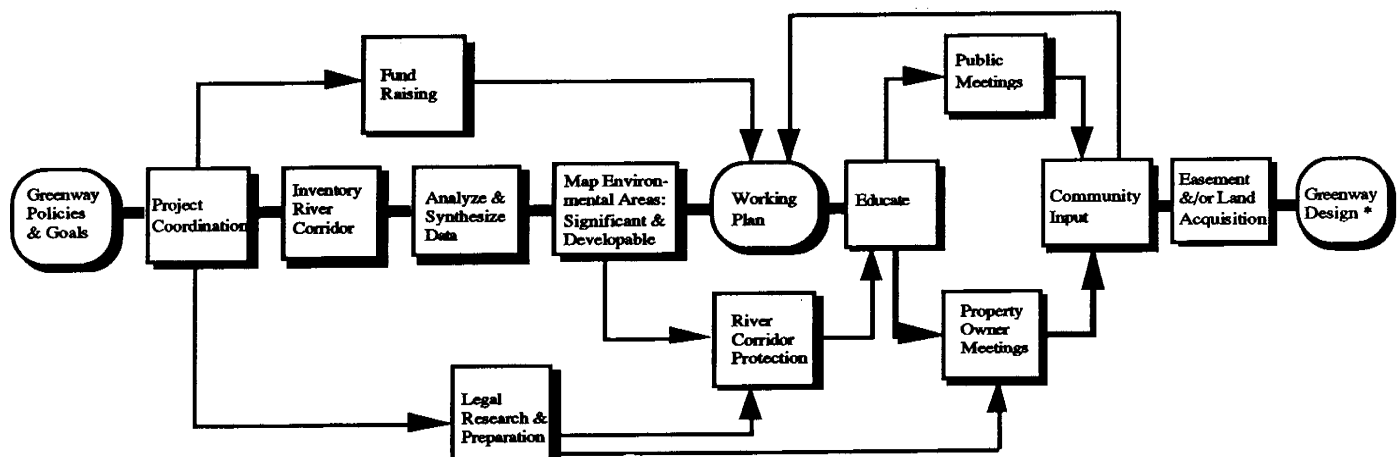


Figure 1. Overview diagram of a Critical Path Analysis for the Oconee Rivers Greenway Commission. Each box illustrates a super-task system by which a host of individual tasks are represented. (\* Five Year Goal.)

its task path for fallacies and omissions while attempting to incorporate the community's needs. Committee chairs confirmed task sequencing and assigned task durations acting as the 'local experts' for the most accurate source of resource capability. For this reason, statistical computations of task duration estimates were disregarded because those most familiar with job requirements are more mathematically accurate than statistical manipulations of probabilities and variances (Lowe, 1969). While the computer application facilitates revisions at any stage, correcting errors at this point is important in generating commitment to the planning structure and hence, execution of the planning process (Spann, 1975).

Subsequent CPA designs show task relationships in pure sequencing logic which is the point at which the project's true critical path is depicted and represents the system's model. An effective design will be: 1) explicit; 2) intelligible; 3) capable of accepting change; and 4) capable of being monitored (Lockyer, 1967). A simplified critical path analysis for the Oconee Rivers Greenway is depicted in Figure 1. The darker lines delineate the critical path. Each task box represents 'super tasks' which, although not shown, have been further delineated into subsystems of related tasks. The complete diagram that depicts the hundreds of tasks is too large to insert within this paper.

#### SUMMARY

A critical path analysis logically sequences the tasks required to meet a goal. It represents the task network as an understandable flow-chart type diagram. MacProject II provides ease of use so that several network design scenarios can be examined prior to commitment to a final planning process. The Oconee Rivers Greenway Commission's use of critical path analysis to reach its five year goal is an ongoing experiment. Although factors such as leadership to keep members on task and further changes in political support will influence progress, the method's viability ultimately is dependent upon whether the Commission continues to use the critical path analysis planning tool or adopts an alternate planning method or chooses to proceed with no plan. The value of a computer driven critical path analysis model as a planning tool will be effective if updates in task organization remain easy, progress is monitored and published, and it is understandable enough to execute.

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