Project Management Plan

CLAYTOR LAKE ECOSYSTEM RESTORATION STUDY

New River Basin, Virginia

General Investigation

1. INTRODUCTION

The Claytor Lake Feasibility Study was authorized by resolution on May 10, 1962 by the following:

> *Resolved by the Committee on Public Works of the House of Representatives, United States, that the Board of Engineers for Rivers and Harbors review the reports on the Kanawha River, West Virginia, Virginia, and North Carolina, published as House Document Number 91, 74th Congress, First Session, with a view to determining whether improvements in the interest of flood control and allied purposes and related land resources on tributaries of the Kanawha and Elk Rivers at and in the vicinity of Charleston, West Virginia are advisable at this time.*

Approval of participation in the Feasibility Study by the US Army Corps of Engineers was based on the New River Basin Reconnaissance Study Report (Section 905(b)), dated October 2000. It evaluated the potential for Federal interest in implementing solutions to flooding, ecosystem degradation and other related water resource problems and opportunities in the New River Basin. One of the locations identified as a potential Federal project is Claytor Lake, Pulaski County, Virginia.

Funds to conduct the Section 905(b) (WRDA of 1986) Analysis were provided in the FY 2000 Energy and Water Development Appropriations Act (Public Law 106-60). House Report 106-253 contained the following language in support of the Appropriations Act:

> "*New River Basin, North Carolina, Virginia and West Virginia.* – The Committee has provided funding for a reconnaissance study of the New River Basin, North Carolina, Virginia and West Virginia. This effort will support the American Heritage River Initiative for the New River."

2. STUDY AREA DESCRIPTION

Claytor Lake a 4,500 reservoir, formed from the damming of the New River, sits just above the City of Radford. The dam forming the lake was completed in 1939 to produce electricity for the Appalachian Power Company. It still provides this service today and contributes to flood control along the New River. The lake and dam were named for Graham Claytor, a native Virginian and former vice-president of American Electric Power Company.

Claytor Lake State Park sits on the northern shore of Claytor Lake, just minutes from I-81. The park provides access to Claytor Lake as well as 472 acres of associated fields and woodland. Throughout the park, several nature trails provide access to a variety of habitats. The park's visitor center, located in the historic 1870s Howe house, includes several excellent displays of the area's history and ecology, including detailed interpretation on the diversity of fish found in the reservoir. The lakeshore is always worth checking when visiting the park since uncommon water birds could turn up at any time of year. Waterfowl are most prevalent during migration and winter months while gulls and terns are more likely during migration.

3. PHASES OF THE STUDY

The Project Management Plan (PMP) will provide a basis for managing tasks, costs and schedules. It will be an agreement by all parties on how to conduct the Claytor Lake Ecosystem Restoration Project Feasibility Study and guide the development and delivery of the feasibility report. As the Study progresses, the PMP will evolve to reflect changes in the project. The sponsor may request changes the PMP.

4. STUDY MILESTONES

Per ER 1105-2-2100 of the Policy Guidance Notebook, Appendix G, and per the guidance of LRD the Claytor Lake Ecosystem Restoration Study will include the following Process Milestones:

- FCSA Execution
- Teleconference with LRD
- FSM Package (PMP)
- AFB Package
- HQ Approval of PGM

As the project progresses, the milestones will be expanded.

5. STUDY PURPOSE & NEED

A reconnaissance study of the New River Basin in North Carolina, Virginia, and West Virginia was completed in October, 2000. The study purpose was to evaluate the potential for Federal interest in implementing solutions to flooding, ecosystem degradation, and other related water resource problems and opportunities throughout the basin. Support of the American Heritage Rivers Initiative for the New River basin was an additional purpose of the study.

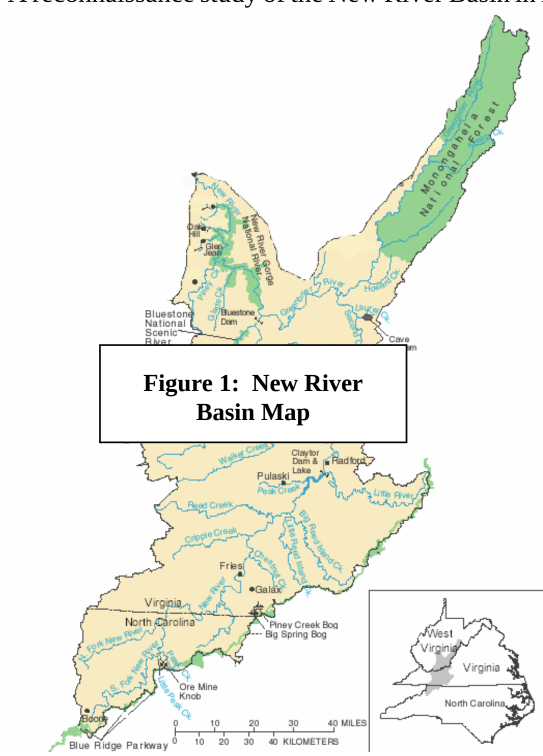

Figure 1: New River Basin Map

During the reconnaissance study five critical project focus areas within the basin were indentified, including the Claytor Lake project in Virginia. The normal lake infilling has degraded fisheries and wildlife functions and values, and recreational opportunities at this lake. The Corps is considering alternatives to restore degraded ecosystem components and would result in incidental recreation improvement opportunities. Ecosystem restoration will be undertaken with an eye toward regional ecosystem restoration needs. Proposed alternatives must contribute to National Ecosystem Restoration (NER) through restoration and improvement of degraded ecosystem structure, function, and dynamic processes to a less degraded and higher valued, naturally-sustainable condition with minimal maintenance. Alternatives must demonstrate a reasonable probability that such aquatic habitat improvements would contribute significantly to betterment of the basin's ecosystem. Recreation alternatives will be developed as they are found to complement and facilitate ecosystem restoration.

This 4,500 acre reservoir was built by the American Electric Power Company for hydroelectric power generation. Much of the lake shoreline has been sold by AEP to private interests for development. These developments often consist of seasonal house sites, launch ramps and small docking facilities. Problems identified at Claytor include the loss of open-water lake and embayments to sediment in-filling, impairment to boating and boating access due to sedimentation, trapping of drift and debris along shallow bars and benches (unavailable as aquatic cover), and the smothering of aquatic habitat and substrates. These factors have individual and synergistic impacts on the diversity of fish species, the condition of aquatic habitats and shorelines, as well as the aesthetic and recreational appeal of the lake. Ecosystem restoration alternatives for Claytor Lake must be formulated to meet the following needs:

1. Increase the diversity of Claytor Lake as a nursery population for important natural or threatened watershed fauna and flora.

2. Support a diverse in-lake aquatic community characterized by Blue Catfish, White Perch and Smallmouth Bass.

3. Discourage nuisance species proliferation through habitat development.

4. Encourage downstream movement of sediments through habitat development.

5. Improve the availability of swift-water riverine habitats, cover complexity (i.e., shading, large wood debris, undercut stream banks, boulders).

6. Improve degraded riparian habitat.

7. Increase the extent of the wetland fringe for the upper third of the lake.

8. Address aesthetic problems of denuded mud-flats through the use of landforms and materials that appear natural and facilitate recreational use.

9. Preserve residential access to waterborne lake recreation where it currently exists.

10. Separate developed recreation facilities (including docks) from habitat developments.

11. Preserve water resources as potential water supply.

12. Preserve and integrate Appalachian Power generation.

13. Accommodate future sediment management programs by others.

6. EXISTING CONDITIONS (Most likely future without project)

Claytor Lake was formed through the construction of Claytor Dam and impoundment on the New River upstream of Radford, Virginia. American Electric Power constructed Claytor Dam in 1939 for hydroelectric power generation. The 21 mile long, 4,500 acre lake has over 100 miles of shoreline and offers a variety of land and water recreational activities including hiking, camping, boating fishing, and water skiing.

The upper portion of the lake captures entrained sediment loads from the New River and has aggraded. Each year in the late fall – early winter, Claytor Lake is drawn down five feet. Drawdown is accomplished to facilitate shoreline maintenance. Areas of significant sedimentation and aggradation are exposed during drawdown. Primarily, in the upper 2 miles of the lake, sedimentation is greatest along the inside of the relic river meander bends. In the most upstream areas of the lake, sedimentation has built "point bars" that are now permanently exposed and vegetated by native herbaceous and woody emergent species. These areas are providing significant wildlife and wetland habitat value. Immediately downstream, sedimentation has smothered benthic habitat, reduced water depths and fisheries habitat and increased boating hazards.

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Minnow Branch to Allisonia Railroad Bridge was observed during 2005 field visits to have water depths of 3 to 30+ feet and extensive near shore fine sediment deposition; predominately along the inside lake bends as point bars. Embedded large woody drift and debris was observed in these areas with extensive vegetation; Willow, River Burch, Sycamore and Silver Maple. Exposed debris appeared to be used by songbirds, wading birds, waterfowl, and reptiles. Near bank herbaceous vegetation included rushes and sedges with water willow and cattails. Many shallow water areas were densely vegetated with native and nonnative rooted aquatics, e.g., Hydrilla, Elodea, Najas, etc. Local property owners have recently observed accumulations of large woody debris and fine sediments and requirements to dredge these sediments and to extend docking and mooring facilities to reestablish access to the lake.

Uplake from the Allisonia Railroad Bridge to Allisonia, VA., water depths varied form 1 to 11 feet with this reach of the lake being defined by recently deposited fine sediments which mantled terrace and relic channel areas. These deposits contain large woody drift and debris and aquatic, emergent, and riparian, vegetation. Shoreline property owners report frequent dredging, dock repairs, and extensions to maintain access to the lake. Additional lake, shoreline, terrace and uplands reconnaissance confirmed that embayment and adjacent riparian areas contained diverse functional high habitat quality environmental components of Claytor Lake.

Some aggraded areas also collect stumps and snags that were transported downstream during extreme flow events. The continued sediment deposition degrades the fisheries, wildlife and recreational function and value of Claytor Lake.

Sedimentation has smothered benthic habitat, reduced water depths and fisheries habitat, and increased boating hazards. Some aggraded areas also collect stumps and snags transported downstream during extreme flow events. The continued deposition of sediment degrades fisheries, wildlife and recreational functions and values.

In fact, the processes described for the Claytor Lake project are typical of impounded water bodies or lakes. Claytor Lake is undergoing a form of succession or change from a middle-aged (mesotrophic) system to an old aged (eutrophic) water body. This process of aging is characterized by increasing productivity-called eutrophication-and consists of the following steps:

Oligotrophic - characterized by low levels of nutrients, very little aquatic plants and algae, and clear water.
Mesotrophic - characterized by moderate levels of nutrients, moderate aquatic plant and algae growth, and diminished water clarity.
Eutrophic - characterized by high levels of nutrients, high plant and animal production, and poor visibility in the water column.

The ultimate fate of a lake basin is to become filled with sediment and revert back to terrestrial vegetation. Aging is typically driven by an accumulation of nutrients and sediment from runoff. However, Claytor Lake is an interesting mix of river and lake processes. The normal accumulation of nutrients by the Claytor Lake system is retarded by flowing water and constant discharges to the lower river. The end-state of this reservoir is unlikely to be of fast land from accumulated sediments. Instead, flowing water and channel equilibrium processes will ultimately exert themselves; preserving some form of a river channel along with a measure of open water behind the dam.

Today this sediment accumulation process is observed with a nascent river form in the upper reservoir. The developing aquatic conditions are functionally suspended between the clear sandy or gravelly bottom substrates of a fast-flowing river and nutrient rich habitats of the eutrophic lake. Instead, what has developed is more the nature of a poor quality river community characterized by embedded sediments, sweeping convex shoreline conditions (on the inside bends) and undeveloped riparian vegetation.

Ultimately, the sediment budget and water currents will facilitate build-up along the inside of river bends; encouraging channel formation and adjusting channel bottom depths to maintain bed-load equilibrium. To some extent channel shorelines will be characterized by overhanging vegetation and erosional habitat features. However, for the foreseeable future habitat conditions will limit the success of important river species of fish and mussels including the smallmouth bass and darters.

7. ALTERNATIVE SCREENING

Habitat improvement alternatives exist in two broad areas: 1) accelerate channel formation processes or reservoir aging processes; and 2) compensate for poor habitat conditions through structural habitat developments elsewhere in the system.

Accelerate Channel Formation Processes

Meander Restoration- Use features to move sediment and accelerate floodplain/wetland formation. Dredging along with the construction guide walls, sills, or vanes could create a narrow enough flow path for the water such that velocities remain high and sediment is carried deeper into the reservoir. These may function at the upper end of the lake. However, once backwater from the lake intersects the high-velocity flow induced by the structures, most of the sediment will drop out. This strategy has been examined for other reservoirs by use of a one-dimensional sediment transport model (e.g., WEST, January 2000). Many fish species (black bass, bluegill, black crappie, channel and flathead catfish, and perch) prefer the shoreline areas of the reservoir. Issues include bank stabilization along the outside of meander bends where flows may be accelerated to provide sufficient scour processes. The availability of materials for construction of flow training structures is not known.

Inside meander bends would accrete sediment at an increased rate with wetland and bottomland forest formation occurring over an abbreviate period of time. Channel substrates and accompanying recreational use of the channel may be restored to oligotrophic conditions within a few seasons.

Point Bars- The inside of meander bends are continually aggrading and developing into point bars. More natural, permanently exposed point bars could be developed. These areas could be built by dredging material from the adjacent channel area, and creating more stable functioning bar forms, while reducing navigation and recreation hazards. The created point bars in conjunction with a deeper and slightly more constricted flow area would provide a more self-sustaining channel. The point bar outslopes would be constructed on 10 horizontal to one vertical slopes to mimic the natural stable bars that have developed upstream. Bioengineering techniques would be used to help maintain a stable bar form and protect cross-channel shorelines. The created point bar areas would be planted with a diverse mixture of native herbaceous and woody emergent species such as sedges, rushes and willows to stabilize the bars. This would develop emergent wetlands increasing water quality, and providing fisheries and avian habitat. Vegetated areas would also trap sediment conveyed from the riverine portion of the New River prior to transport into the downstream portion of Claytor Lake.

This approach offers an opportunity to address under-utilized meander bend flats. However, the underlying issue of long-term aquatic habitat stability, shoreline conditions and deepwater habitat suitability are not addressed. Designers will need to ensure that velocities and river channel habitat conditions guide dredging decisions during point bar development. Rapid re-accumulation of sediment would result should a focus on point bar development over-deepen channel areas.. Designers may seek outside sources of sand, gravel and cobble to supplement on-site dredged sources and allow this approach.

The creation of the bar form would improve the local aquatic environment and restore navigation and recreation conditions to those similar to early lake conditions. Approximately 20 to 25 acres of emergent wetlands would be created. This alternative is another form of meander restoration mentioned above with similar results for channel performance. Depending upon the availability of materials on-site, this alternative would accelerate point bar and channel formation relative to the above alternative, with the potential for higher up-front costs.

Pool Manipulation- Some literature suggests that greater habitat and species diversity can be achieved with large lake level fluctuations as long as these are not too abrupt. Lake draw-down can certainly be used to achieve some measure of substrate scour and sediment movement through the system. However, this would be achieved at the expense of long-term habitat stability in the upper reaches of the reservoir.

Some or all inflowing sediment load may be hydraulically routed into deeper waters and beyond by techniques such as drawdown during sediment laden floods, off-stream reservoirs, sediment bypass systems and venting of turbid density currents. Operating at higher levels in the summer would provide more recreation area, increased lake perimeter, and perhaps more advantageous conditions for boat launching. However, environmental impacts would need to be considered, and higher pool levels would probably necessitate retrofit to some docks and/or ramps to the docks. Impacts to existing structures would also need to be evaluated.

Although higher pool levels would cause sedimentation to occur further upstream than at present (perhaps beyond the location of the impacted recreational facilities), the effect is expected to be small as most sediment is in motion during the larger events that occur in the winter. Pool drawdown during off-peak periods would cause erosion of existing deposits in the upper end of the lake when significant inflows occur and would have the effect of moving some of the stored sediment deeper into the lake. Sediment transport modeling would shed light on the effectiveness of this strategy, and has been used in other studies (e.g., WEST, January 2000). One example of an operating rule would be to draw down for high sediment delivery periods, and raise the pool elevation for low delivery periods. This regime may not coincide with power generation and demand requirements on the part of Appalachian power and would require further evaluation. Furthermore, significant questions exist about the potential for habitat and species diversity improvements. Draw-down timing would be challenged by spawning periods, power generation demands and downstream impacts.

<u>Develop Structural Habitats</u>

Use intensive habitat features to overcome limiting factors of poor riverine habitat for adult fishes. VDGIF considers the availability of habitat in Claytor Lake to be somewhat limited by the lack of structure in the reservoir (p. communication, Copeland). In the late 1980s, the VDGIF began considering alternatives to establish fish attractor habitat in the reservoir. Most recently, in December 2001, the VDGIF developed three fish reef sites along the reservoir shoreline at Claytor Lake State Park (see Figure 3-12). At these sites, VDGIF installed plastic drain pipe structures on the reservoir bottom in 8-10 feet of water and marked them with fish reef buoys.

8. FEASIBILITY STUDY TASKS

On 27 June 2005, the Local Sponsor, the Pulaski Board of Supervisors signed a partnering agreement with US Army Corps of Engineers, Friends of Claytor Lake, Appalachian Electric Power, Virginia Department of Game and Inland Fisheries, Virginia Department of Conservation and Recreation and the Radford Chapter of the Isaak Walton League to work together and participate with financial and in kind services for the Claytor Lake Ecosystem Restoration Project. This partnership is the basis for the local cost share portion of the feasibility phase.

Task 1. Determine Environmental Baseline Conditions

Methods: Review existing literature and information that includes the following:

- Lake morphology and shoreline development
- Existing conditions of tributary mouths and embayments
- Evolution of aquatic habitat in upper portion of lake
- Creel surveys
- Hydropower and drawdown effects on fish population
- History of fish introductions
- Fish Management plans
- Mussel counts
- Water quality standards and measurements
- Location of existing wetlands
- Federal and State threatened and endangered species
- Recreation resources
- Existing aerial photography and mapping

Method of Accomplishment: This task will be completed 60% by USACE and 40% by Local Sponsor

Total Estimated Cost: $58,750

Sponsors In-kind work: $23,500

Task 2: Hydraulic Studies

Method: Determine frequency of lake levels/seasonal variations in pool elevations. Duration of pool levels and water quality

Method of Accomplishment: This task will be completed 75% by USACE and 25% by the Local Sponsor

Total Estimated Cost: $75,000

Sponsors In-kind work: $18,750

Task 3: Sediment Testing for Hazard Toxic Radioactive Waste

Method: Phase I HTRW activities are performed to determine if there is a potential for any environmental concerns that may exist within the project area due to present and past property usage.

Method of Accomplishment: This task will be completed 100% by USACE

Total Estimated Cost: $17,750

Sponsors In-kind work: $0

Task 4: Formulate Project Alternatives

Method: Address identified problems, opportunities, and goals of aquatic ecosystem improvement at Claytor Lake. Formulation and evaluation of specific project alternatives according to Corps policies and regulations. Proposed alternatives must demonstrate a reasonable probability that such aquatic habitat improvements would contribute significantly to betterment of the basin's ecosystem.

Method of Accomplishment: This task will be completed 90% by USACE and 10% by Local Sponsor

Total Estimated Cost: $54,125

Sponsors In-kind work: $5,413

Task 5: Prepare Baseline Cost Estimates

Method: Evaluation of various aspects of cost including quantities and labor based on various proposed alternatives

Method of Accomplishment: This task will be completed 100% by USACE

Total Estimated Cost: $15,000

Sponsors In-kind work: $0

Task 6: Project Scoping with Resource Agencies

Method: Identify and analyze historical, physical, temporal aspects of the lake conditions

Method of Accomplishment: This task will be completed 50% by USACE and 50% FWS

Total Estimated Cost: $7,875

Sponsors In-kind work: $3,938

Task 7. Determine Project Benefits

Method: Economic analysis of project alternatives

Method of Accomplishment: This task will be completed 100% by USACE

Total Estimated Cost: $10,000

Sponsors In-kind work: $0

Task 8. Prepare Real Estate Plan

Method: Research property ownership and value based on courthouse records.

Method of Accomplishment: This task will be completed 30% by USACE and 70% by the Local Sponsor

Total Estimated Cost: $7,750

Sponsors In-kind work: $5,425

Task 9. Independent Technical Review

Method: Provides independent technical and policy compliance review of the project

Method of Accomplishment: This task will be completed 100% by USACE

Total Estimated Cost: $6,250

Sponsors In-kind work: $0

Task 10. National Environmental Policy Act (NEPA) – Environmental Assessment Process

Method: Preparation of the Environmental Assessment (EA) to include all significant resources that must be addressed such as Baseline archeological information, habitat/species identified, endangered species list and water quality information.

Method of Accomplishment: This task will be completed 10% by USACE and 90% by Local Sponsor through their partnership agreement. AEP will be completing an EA part of their FERC re-licensing activities.

Total Estimated Cost: $62,500

Sponsors In-kind work: $56,250

Task 11. Project Management

Method: General oversight and management of project by USACE to ensure project stays on schedule and within budget

Method of Accomplishment: This task will be completed 100% by USACE

Total Estimated Cost: $18,750

Sponsors In-kind work: $0

Task 12. Quality Control

Method: Review for policy compliance and technical accuracy

Method of Accomplishment: This task will be completed 100% by USACE

Total Estimated Cost: $12,500

Sponsors In-kind work: $0

Task 13. Engineering Technical Appendix

Method: All data prepared by Engineering Division that reflects the progress and results of the study

Method of Accomplishment: This task will be completed 100% by USACE

Total Estimated Cost: $31,250

Sponsors In-kind work: $0

Task 14. Public Involvement/Meetings

Method: Coordination of public input meetings including advertisement and meeting location.

Method of Accomplishment: This task will be completed 50% by USACE and 50% by Local Sponsor

Total Estimated Cost: $12,500

Sponsors In-kind work: $6,250

Total Project Cost	**$390,000**
50% Local Share	**$195,000**
Estimated In-Kind Services	**$116,526**

Additional Funds Needed	**$77,149**