

**KANSAS WATER PLAN**

**Reservoir Restoration Demonstration Projects and Research**

**Policy Section  
Approved by the Kansas Water Authority**

**November 18, 2004**

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### **Reservoir Restoration Demonstration Projects and Research**

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#### **EXECUTIVE SUMMARY**

Kansans have made a huge investment in their small lakes and reservoirs and are counting on receiving their multiple benefits for decades to come. Twenty federal reservoirs serve as a public water supply source as do 35 municipal lakes and 10 multipurpose small lakes. These impoundments, along with the 51 state fishing lakes, also serve as the primary focus of water-based outdoor recreation in the State.

All lakes, natural or artificial, experience a life cycle in which the nutrient level of their water increases and sediment accumulates on the lake bed. This leads to an increased frequency of algal blooms which, in turn can cause taste and odor problems in drinking water and also limit recreational use of the reservoir. Ultimately, sediment deposition may severely reduce the water supply yield from a reservoir.

This Policy Section recommends that one or more small lake restoration demonstration projects be conducted and that results from two on-going studies at federal reservoirs be applied to development of a restoration plan at a reservoir that is part of the Kansas Water Marketing Program. Development of a model for predicting reservoir algal blooms and associated drinking water taste and odor problems is also recommended. Statutory change crediting revenue from the Clean Drinking Water Fee to the State Water Plan Fund for use in small lake and reservoir restoration and other programs beneficial to public water systems is also recommended.

#### **ISSUE DESCRIPTION**

The drinking water supply for many Kansans comes from federal reservoirs, municipal lakes or multipurpose small lakes. In addition, these reservoirs provide important flood control and recreational benefits. State fishing lakes continue to be an important recreational asset throughout Kansas. These benefits coupled with the general aesthetic appeal of lakes enhance the quality of life for local residents and help promote tourism and economic development as well.

Reservoirs experience an aging process in which their waters become more nutrient-laden as sediment deposition takes place. This leads to an increased frequency of algal blooms which may cause taste and odor problems in drinking water and also limit recreational use of the reservoir. Ultimately, sediment deposition may severely reduce the water supply yield from a reservoir.

Several small lakes have been hydraulically or mechanically dredged in Kansas to enhance recreation. These lakes include Ford County State Fishing Lake, Lone Star Lake (Douglas

County), Scott County State Fishing Lake, Lake Dabanawa (Jefferson County) and the Plainville Township Lake (Rooks County). While these and other projects provide insight regarding dredging costs and disposal of dredged material, it would be helpful to have a demonstration project that documents dredging costs and addresses environmental and other concerns in a public water supply setting.

The State of Kansas is participating in a study at El Dorado Lake which will investigate costs of dredging and dredged material disposal at a federal reservoir scale. Construction of sediment traps above the reservoir is also being investigated. Research at Oologah Lake in Oklahoma is looking at better integration of watershed and in-reservoir models to improve reservoir management for water quality and other factors. Most of the Oologah Lake watershed (Verdigris River) lies in Kansas.

Several watershed initiatives are underway in Kansas aimed at protection or restoration of reservoir water quality and limiting sediment deposition in reservoirs. Among these are two local stakeholder-government partnerships; the Cheney Lake Watershed Project and the Hillsdale Water Quality Project. The State has recently developed a strategy that will improve its ability to cooperate with local partners on watershed projects. Increased funding is being sought to facilitate this work. While watershed restoration and protection is beyond the scope of this policy section, it is an integral part of the overall effort needed to perpetuate the benefits provided by the State's small lakes and reservoirs.

A primary factor to be considered in deciding whether or not to restore a reservoir includes the cost of developing a new water supply source or recreation resource as compared with restoration of the present lake. Other factors may include lack of a suitable site for a new reservoir, land acquisition problems, presence of threatened or endangered species or historical sites, the desire to preserve community resources and maintaining the community's quality of life.

At issue is how the State of Kansas can best utilize ongoing research efforts coupled with new demonstration projects to evaluate establishment of an operational program for reservoir restoration.

## **BACKGROUND**

All lakes, natural or artificial, experience a life cycle in which the nutrient level of their water increases and sediment accumulates on the lake bed. Due to climatic, land-use, soils and other factors, this life cycle for Kansas lakes is short (decades-centuries) when compared to lakes in an environment such as northeastern Minnesota where this life cycle is on the order of millennia.

Over time, algal blooms resulting in drinking water taste and odor problems tend to become more frequent in response to increased nutrient levels. Sediment accumulation restricts recreational access to lakes and ultimately water supply yield is reduced.

Kansans have made a huge investment in their reservoirs and are counting on receiving their multiple benefits for decades to come. Twenty federal reservoirs serve as a public water supply source and also provide flood control, recreation and irrigation water supply benefits as authorized. The State has provided financial support for the construction of 10 multipurpose small lake structures since 1990 that contain public water supply storage.

These lakes commonly provide flood control benefits and often provide recreation opportunities as well. Thirty-five municipal lakes provide public water supply and many are also used for recreation. Fifty-one state fishing lakes were developed throughout Kansas, primarily before construction of the federal reservoirs, to provide water-based outdoor recreational opportunities. These state fishing lakes continue to be an important recreational resource.

The State of Kansas has contracted for the purchase of water supply storage in 13 U.S. Army Corps of Engineers reservoirs to support the Water Marketing and Water Assurance Programs. Eighty-six public water suppliers or industrial water users receive water through the Water Marketing Program, either as contract holders or secondary users. Forty-two public water suppliers or industrial water users are members of water assurance districts. In 2003 alone, the State made payments totaling \$2,128,369 to the federal government for storage currently in service.

Additionally, several public water suppliers, including the cities of El Dorado and Wichita, have contracted directly with the federal government for water supply from other federal reservoirs. More than 700,000 Kansans receive all or part of their drinking water from these federal reservoirs.

The State has provided financial support for the construction of 10 multipurpose small lake structures since 1990 that contain public water supply storage. Due to their recent origin, protection rather than restoration is the appropriate focus for the multipurpose small lakes. Thus, they are outside the scope of the recommendations made in this preliminary draft.

A 2001 study by the Kansas Water Office noted that the State of Kansas had 1.1 million acre-feet of water supply storage space under contract with the U.S. Army Corps of Engineers in 12 federal reservoirs at that time (Kanopolis Lake was added in 2002). It was estimated that by the year 2040, sediment accumulation will have reduced this amount to approximately 857,000 acre-feet, a rate of loss of 6,260 acre-feet per year. The total water supply yield from the 12 reservoirs is projected to decrease from just less than 700 million gallons per day (MGD) in 2001 to just over 400 MGD in 2040.

Data from the Kansas Department of Health and Environment's Lake and Wetland Monitoring Program suggest a general trend toward declining federal reservoir water quality due to nutrient loading since 1985. This nutrient loading comes primarily from watershed losses in the form of wastewater and overland runoff, and may be expected to correlate well with sedimentation and sediment loading.

Local, state and federal agencies along with non-governmental organizations have implemented many projects and programs in recent years that help improve reservoir water quality and diminish soil erosion and sediment accumulation. Among these are soil and water conservation programs, watershed restoration and protection projects, riparian area and wetland protection or restoration projects, local environmental protection programs and the establishment of total daily maximum loads for impaired water bodies.

### **Data Collection and Research**

Much completed or ongoing data collection and research is available to aid in demonstration project design and evaluation. Reservoir inflow, pool level and discharge information is collected by the U.S. Geological Survey. Water quality data for federal reservoirs and small lakes is collected through the Kansas Department of Health and Environment's Lake and Wetland

Monitoring Program. Periodic “sediment surveys” are conducted at the federal reservoirs by the U.S. Army Corps of Engineers and the Bureau of Reclamation to document water storage capacity loss due to sediment accumulation.

The U.S. Geological Survey in cooperation with the State of Kansas and others has been conducting sediment studies at Kansas reservoirs aimed at providing an in-depth baseline of information for further assessments. Examples of these include water quality studies of the Cheney Reservoir watershed and the Lake Olathe watershed. Research regarding sediment sources (surface erosion vs. channel-bank erosion) is the next step. A contract for this study has been signed by the USGS and the State.

The U.S. Army Corps of Engineers has two ongoing studies in Kansas related to reservoir restoration. The Oologah Lake Watershed Feasibility Study is sponsored by the Tulsa, OK Metropolitan Utilities Authority. Tulsa relies upon Oologah Lake as its water supply source and has been experiencing taste and odor problems. Oologah Lake is located on the Verdigris River in Oklahoma, but most of its watershed lies in Kansas. This Feasibility Study includes in-lake data collection, reservoir water quality monitoring, watershed modeling aimed at developing a basin-wide tool for evaluation of stream/lake response to watershed-based corrective measures. A key objective of this study is the integration of watershed and in-reservoir models to provide an enhanced tool for reservoir management. This study is currently in the second year of an expected five-year effort. Funding for this study is entirely from non-Kansas sources.

The Kansas Water Office, the City of El Dorado and the U.S. Army Corps of Engineers have been cooperating in an Ecosystem Restoration Feasibility Study of El Dorado Lake and its watershed. The first goal of this study is to identify effective reservoir restoration and protection measures to ensure long term availability of storage space for public water supplies in federal reservoirs, using El Dorado Lake as a pilot. The second goal is to identify watershed restoration and protection needs and determine opportunities to implement effective management practices.

An important element of the El Dorado study, apart from documenting the current situation, will be to develop cost estimates for restoration alternatives such as dredging and construction of sediment traps. This study is scheduled for completion in May 2006. The Kansas share of study costs has already been paid.

Questions being addressed by the El Dorado and Oologah studies need to be answered before an operational restoration program at federal reservoirs is implemented.

### **Programs and Funding**

The Kansas Multipurpose Small Lakes Program is authorized to provide financial assistance for renovation of small lakes that provide public water supply and which also serve either recreational purposes or flood control purposes, or both. This program is managed jointly by the State Conservation Commission and the Kansas Water Office. The Kansas Department of Wildlife and Parks provides technical and financial assistance to communities with public lakes (Community Lakes Assistance Program) to enhance the fisheries resource and associated recreational opportunities at the lake.

The U.S. Army Corps of Engineers may participate in reservoir restoration projects at its own reservoirs or at small lakes as provided by law. Section 1135 of the Water Resources Development Act of 1986 (Small Ecosystem Restoration) provides for the restoration of a

degraded ecosystem through modification to existing Corps' structures, operations, or implementation of restoration measures in affected areas. The non-federal cost-share is 25 percent on such projects. Section 206 of the Water Resources Development Act of 1996 (Aquatic Ecosystem Restoration) provides for the restoration of degraded aquatic ecosystem structure, function and dynamic processes at non-Corps' projects to a less degraded, more natural condition. The non-federal cost-share on these projects is 35 percent.

A Clean Drinking Water Fee is paid by public water systems in the amount of \$0.03 per 1,000 gallons of water sold. A portion of the revenues collected are credited to the State Highway Fund, with most credited to the State General Fund. Legislation introduced in 2004 (House Bill No. 2484) would credit all Clean Drinking Water Fee revenues to the State Water Plan Fund starting January 1, 2007. This bill would also require that these revenues be used to protect and restore lakes used as sources for public water supply systems and other purposes as specified in the bill. While House Bill No. 2484 passed the House in the 2004 session of the Kansas Legislature, it will need to be reintroduced in the 2005 session if it is to be considered again.

While the effects of sediment accumulation were considered in reservoir design, the true long-term dependency upon these reservoirs for water supply and other benefits was perhaps not fully appreciated at that time. Now, this dependency is becoming more obvious and the importance of extending the useful life of our reservoirs is apparent. An independent review of the Kansas Water Marketing and Water Assurance Programs conducted in 2002 recognized this. This review questioned the long-term viability of program resources (reservoir water supply storage) and asked what steps were being taken to slow down the "depreciation" of the reservoirs.

## **POLICY ISSUES, OPTIONS AND RECOMMENDATIONS**

At issue is how the State of Kansas can best utilize ongoing research efforts coupled with new demonstration projects to evaluate establishment of an operational program for small lake and reservoir restoration.

### **Options**

Status quo – Continue to rely upon ad hoc research efforts and restoration initiatives. Projects tend to be "stand-alone" with no coordinated effort to seek funding, share results, develop project protocols etc.

Coordinated Program – Use ongoing research and selected demonstration projects to develop baseline information and models for application at additional reservoirs and for evaluating reservoir restoration needs and proposals.

### **Recommendations**

The coordinated program is recommended. Specific recommendations include:

#### Small Lake Restoration:

1. Conduct a small lake restoration demonstration project to investigate the cost, benefits, logistics, and other factors involved in dredging or otherwise renovating one or more small public lakes that provide local public water supply and recreational benefits and also provide intrinsic economic development value. Contaminant analysis and disposal

of dredged material should be included.

Reservoir Restoration:

2. Review results from the Oologah Lake and El Dorado Lake studies to assist in the development of a reservoir restoration plan at a federal reservoir in Kansas that is part of the Kansas Water Marketing Program.
3. Develop a predictive model for determining the occurrence and duration of algal blooms and associated drinking water taste and odor problems in reservoirs.

Proposed Funding Source:

4. All revenue collected through the Clean Drinking Water Fee should be credited to the State Water Plan Fund and used as one funding source to finance and conduct small lake and reservoir restoration projects and other programs beneficial to public water systems including on-site technical assistance.

**Plan Implementation**

Legislative Action – Legislative authorization and funding for a small lake restoration demonstration project is needed (Recommendation No. 1). A bill also needs to be introduced which credits Clean Drinking Water Fee revenues to the State Water Plan Fund (Recommendation No. 4).

Congressional Action – Congress must specifically authorize and fund U.S. Army Corps of Engineers Ecosystem Restoration projects at non-Corps' facilities such as municipal lakes.

Administrative Action – Criteria for the selection of a small lake demonstration project need to be developed.

Financial Requirements – The estimated total cost for proposed dredging demonstration projects at Cedar Lake (Olathe, Kansas) or Mission Lake (Horton, Kansas) is on the order of \$5-6 million. Demonstration projects at other small lakes would have similar costs. Other recommendations would cost less to implement. Local cost-share in addition to other sources of funding will be required.

In May 2004, the Governor's Natural Resources Sub-cabinet approved a budget for FY 2006 Kansas Water Plan Projects that includes \$80,000 for reservoir restoration. This would complement other available funds. The Kansas Legislature will need to take action appropriating the requested funding.

Other potential sources of funding include local project sponsors, the U.S. Army Corps of Engineers, the USDA Natural Resources Conservation Service, the U.S. Geological Survey, the Environmental Protection Agency, the Kansas Department of Wildlife and Parks and the U.S. Fish and Wildlife Service.

Transfer of Clean Drinking Water Fee revenues to the State Water Plan Fund would make additional funding available for small lake and reservoir restoration.

Implementation Schedule – State Fiscal Year 2006 funding for small lake and reservoir restoration would be available starting July 1, 2005. Revenue from the Clean Drinking Water Fee would be credited to the State Water Plan Fund starting July 1, 2006.

Work on the reservoir restoration plan and the algae bloom predictive model could begin July 1, 2005, if project methodologies had been completed.

Corps of Engineers' participation in a small lake demonstration project would need specific Congressional authorization and funding. The earliest this would likely be available would be the start of Federal Fiscal Year 2006 (October 1, 2005).

## **REFERENCES**

Please see Kansas Water Plan Background Paper No. 69 for additional information regarding Reservoir Restoration.