

# WOLF CREEK

NUCLEAR OPERATING CORPORATION

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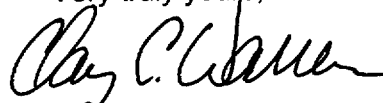
Subject: Docket No. 50-482: 2000 Annual Environmental Operating Report

Gentlemen:

Enclosed is the Annual Environmental Operating Report, which is being submitted pursuant to Wolf Creek Generating Station (WCGS) Facility Operating License NPF-42, Appendix B. This report covers the operation of WCGS for the period of January 1, 2000, to December 31, 2000.

If you should have any questions regarding this submittal, please contact me at (620) 364-4048, or Mr. Karl A. (Tony) Harris at (620) 364-4038.

Very truly yours,



Clay C. Warren

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Enclosure

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WOLF CREEK GENERATING STATION  
ANNUAL ENVIRONMENTAL OPERATING REPORT 2000

ENVIRONMENTAL MANAGEMENT ORGANIZATION

WOLF CREEK NUCLEAR OPERATING CORPORATION

P.O. BOX 411

BURLINGTON, KANSAS 66839

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## **1.0 INTRODUCTION**

Wolf Creek Nuclear Operating Corporation (WCNOC) has committed to minimizing the impact on the environment from operating Wolf Creek Generating Station (WCGS). The 2000 Annual Environmental Operating Report is being submitted in accordance with the objectives of the Environmental Protection Plan (EPP), Appendix B to the Facility Operating License NPF-42. The purpose of this report is to demonstrate that the plant operated during 2000 in an environmentally acceptable manner.

## **2.0 ENVIRONMENTAL MONITORING**

### **2.1 AQUATIC [EPP Section 2.1]**

#### **2.1.1 Impacts of Water Withdrawal on the Neosho River**

The owners of WCGS have contracted with the Kansas Water Resources Board to pump up to 9.672 billion gallons of water per calendar year to Wolf Creek Lake (WCL) from the tailwaters of the John Redmond Reservoir (JRR). A total of 3.942 billion gallons, or 41 % of the contracted allotment, was pumped during 2000. Of that total, 0.315 billion gallons, approximately 8 % of the total pumped, were used for auxiliary raw water. The remainder was transferred via the make-up pumps operated from May 29 through June 8, and from July 12 through September 27, 2000. Measurements at Burlington, Kansas, taken during 2000 by the United States Geological Survey, indicate that flows downstream of the WCGS withdrawal station in the Neosho River were not affected by makeup pumping activities. Consequently, there were no adverse impacts to the Neosho River attributable to WCGS pumping activities during 2000.

The WCGS Final Environmental Statement/Operating License Stage (FES/OLS, Section 5.6), NUREG-0878, postulated that make-up water withdrawal of 41 cubic feet per second during drought conditions would extend the duration and severity of low-flow conditions below JRR. This, in turn, was expected to reduce riffle habitat which would adversely affect the Neosho madtom, a federally listed threatened species. Neosho River flows at Burlington were maintained during make-up withdrawal activities; therefore, there was no impact to Neosho madtom habitats from WCGS water withdrawal during 2000.

#### **2.1.2 Oxidizing Biocide Discharges to Wolf Creek Lake**

Circulating Water System (CWS) Discharge:

Biocide use at WCGS was predicted to cause periodic, appreciable mortality in a conservatively estimated 40 acres of the discharge area to WCL. However, these impacts were not expected to meaningfully affect the overall biological productivity of the lake (FES/OLS, Section 5.5.2.2). The postulated biocide levels expected to cause the impacts were from 0.68 to 1.08 mg/l of total residual chlorine at the CWS discharge (FES/OLS, Section 4.2.6.1). Three 30-minute doses per day of 411 pounds of chlorine per dose were projected to produce these concentrations.

Impacts from actual biocide use during 2000 was considered to be less than postulated in the FES/OLS. A sodium hypochlorite and sodium bromide

formulation was used to control biological fouling in WCGS cooling water systems during 2000. Evaluations completed by WCNOG demonstrated that the sodium hypochlorite and sodium bromide formulation would not have greater impacts to the cooling lake environment than those expected from the level of chlorine use identified in the FES/OLS. All changes were reviewed and approved by the Kansas Department of Health and Environment (KDHE) prior to implementation.

The WCGS National Pollutant Discharge Elimination System (NPDES, Number I-NE07-PO02) permit limits biocide discharges to levels lower than postulated in the FES/OLS. This permit was administered by the KDHE. The biocide level for the CWS was limited to a maximum of 0.2 mg/l, total residual oxidant (TRO), for a maximum of two hours per day. Compliance during 2000 was 100 percent. Actual oxidizing biocide dosages averaged approximately 32.1 pounds per day and the daily average TRO was 0.07 mg/l.

As a NPDES permit requirement, whole effluent toxicity testing was completed at the CWS discharge during a biocide treatment. Acute toxicity was not detected for the water flea (*Ceriodaphnia dubia*) and fathead minnow (*Pimiphales promelas*) exposed to the CWS effluent. No mortality to the test organisms occurred. Results from the whole effluent testing indicated that permitted biocide discharges during 2000 did not have adverse impacts on the cooling lake environment, and that actual biocide use has been less than the potential impacts evaluated in the FES/OLS.

#### Essential Service Water System (ESWS) Discharge:

The WCGS Service Water System (SWS) was discharged with the CWS and treated with identical biocides as the CWS. During 2000, a continuous diversion of approximately 17,000 gallons per minute of SWS flow to the ESWS was completed to provide microbiologically induced corrosion protection and sedimentation control. The KDHE established a 1.0 mg/l TRO limit for the SWS flow diversion through the ESWS. Measurements of TRO averaged <0.18 mg/l, and compliance with the NPDES limit in 2000 was 100 %. No fish mortality or water quality changes attributable to ESWS biocide discharges were observed. Based on this information, permitted biocide discharge during 2000 did not have appreciable effects on the cooling lake environment.

### **2.1.3 Cold Shock**

In the event of a rapid decline in plant power level during winter, fishes attracted to the WCGS heated discharge could experience mortality due to a quick reduction in body temperature (cold shock). In reference to licensing document evaluations, the WCGS EPP Section 2.1 (c) states, "Cold shock effects on fish due to reactor shutdowns could cause significant mortality to aquatic species in the cooling lake."

Two power level reductions and two reactor shutdowns occurred during 2000. The first power reduction occurred January 1, 2000, to support year 2000 (Y2K) contingency plans. The second reduction occurred on July 29, 2000, during repair of an offsite transmission line. The first reactor shutdown was due to an animal caused outage of the Unit Auxiliary Transformer, which occurred on September 4, 2000. The second reactor shutdown was a gradual power level

reduction for WCGS refueling purposes initiated on September 29, 2000. No cold shock effects were identified after these power level changes. Only the January 1, 2000, reduction occurred during winter conditions. The remainder occurred when water temperatures in the heated discharge were sufficiently high to cause fish to avoid the area, eliminating the potential for cold shock effects. Therefore, there were no impacts to fish from cold shock effects during 2000.

#### **2.1.4 Impingement and Entrainment**

Impacts of entrainment and impingement due to the operation of WCGS were projected to be significant, as indicated in the WCGS EPP, Section 2.1 (d). EPP Section 2.1 states that the NRC relies on the State of Kansas for determination of the need for monitoring entrainment and impingement impacts. Although the State of Kansas has not required WCGS to monitor entrainment and impingement impacts, periodic observations during 2000 indicated that fish impingement at the WCGS circulating water intake was negligible.

#### **2.1.5 Impacts of Wolf Creek Lake Discharges to the Neosho River**

The WCGS NPDES permit requires that WCL discharges be sampled on the first day of each discharge and weekly thereafter until the end of each respective discharge. Discharge limits were set for sulfates, chlorides, and pH (NPDES Outfall 004). Lake discharges in 2000 were from storm water runoff at the service spillway. In 2000, no NPDES violations at the lake's discharge occurred, and no detrimental effects have been identified to the Neosho River water quality due to lake discharges. Therefore, there were no adverse impacts to the Neosho River from WCL discharges identified during 2000.

### **2.2 TERRESTRIAL [EPP Section 2.2]**

#### **2.2.1 Control of Vegetation in the Exclusion Zone**

The composition and structure of vegetation in the 453 hectare (1120 acre) exclusion zone were selectively controlled to be compatible with the function and security of station facilities. Most areas in the immediate vicinity of the power block have been planted and maintained in a lawn-type condition. Other areas within the exclusion area have been mowed for security and aesthetic purposes. There were no changes in the management of the exclusion zone during 2000.

#### **2.2.2 Vegetation Buffer Zone Surrounding Wolf Creek Lake**

To create a 500 acre minimum buffer zone around WCL, agricultural production activities were curtailed in 1980 below an approximate elevation of 1095' Median Sea Level (MSL), eight feet above WCL normal operating surface water elevation (1087' MSL). Actual area of this buffer has been approximately 1500 acres. This border ranges from approximately 200 to 400 feet adjacent to the lake shoreline. Previously grazed or hayed native tallgrass areas were left undisturbed. Previously cultivated lands were allowed to advance through natural successional stages, or native grasses were reestablished in these areas. Land management activities included controlled burning to enhance and/or maintain the designated buffer zone with a naturally occurring biotic community. A minimum of 500 acres of the zone was maintained during 2000.

### **2.2.3 Herbicide Use for Maintenance of WCGS Structures**

Herbicides were used on transmission line corridors, gravel areas, railroad easements, and various land areas associated with WCGS. Application rates followed label instructions. All herbicides used were registered by the Kansas Department of Agriculture when purchased. No environmental impacts from herbicide treatment of WCGS facilities were identified. A summary of herbicide application is provided below.

The 69 kilovolt (KV) transmission line corridor on property associated with WCGS was sprayed to control undesirable brush and tree growth. Herbicides included Tordon K (EPA Reg. No. 6271917), Escort (EPA Reg. No. 352-439), and Arsenal (EPA Reg. No. 241-346).

In areas where bare ground control was desired, a herbicide mix of Karmex DF (EPA Reg. No. 352-508) and Oust (EPA Reg. No. 352-401) was used. Roundup Ultra (EPA Reg. No. 524-475) was also used for problem weed areas. These herbicides were used on various gravel areas, including the switchyard, protected area boundary, meteorological tower, storage tank berms, railroad beds, and storage yards.

Nuisance tree and brush growth was controlled with Tordon 22 K (EPA Reg. No. 62719-6), Tordon RTU (EPA Reg. No. 62719-31), Remedy (EPA Reg. No. 62719-70), Weed Pro 2,4-D (EPA Reg. No. 10107-31), and Roundup Ultra. Areas treated included the dam, spillways, railroad easements, and selected grassland areas around the cooling lake.

Four plants listed as noxious weeds by the Kansas Department of Agriculture were controlled on WCGS lands. These were serecia lespedeza, musk thistle, Johnson grass, and field bindweed. Serecia lespedeza was treated with Remedy and Weed Pro 2, 4-D. Musk thistle was controlled using Tordon 22K. Johnson grass was controlled with Roundup Ultra while field bindweed was controlled through normal farming practices by the tenants of the agricultural leases.

### **2.2.4 Waterfowl Disease Contingency Plan and Monitoring**

A waterfowl disease contingency plan was maintained to provide guidance for station biologists in the event of suspected or actual disease outbreaks. The contingency plan lists appropriate federal and state wildlife agency contacts to be made by WCNOG in the event of such problems. During routine environmental monitoring and surveillance activities taking place over this reporting period, no waterfowl mortality attributable to disease pathogens was identified.

### **2.2.5 Fog Monitoring Program [EPP Subsection 4.2.1]**

Visibility monitoring was initiated in December, 1983, and continued through 1987. The purpose of this study was to evaluate the impact of waste heat dissipation from WCL on fog occurrence along U. S. 75 near New Strawn, Kansas. The program was required through one year of commercial operation

that started in September, 1985. Upon conclusion of 1987 data collection, sufficient information was available to evaluate cooling lake fogging, and all commitments relevant to fog monitoring had been satisfied. The fog monitoring study concluded that operation of WCGS did not appreciably increase fogging incidents from that measured before operation.

During 2000, there were no reports of fogging incidents in the vicinity of nearby U. S. 75 from individuals or local agencies responsible for traffic safety. Periodic fogging caused by the cooling lake did occur during the winter months of 2000, but was restricted to the plant site. Implementation of mitigative actions or further monitoring was not warranted.

#### **2.2.6 Wildlife Monitoring Program [EPP Subsection 4.2.2]**

A wildlife monitoring program was initiated in 1982 to monitor and assess waterfowl, waterbird, and bald eagle usage of WCL. This program included transmission-line collision surveys to assess collision mortality and determine potential mitigation needs. This wildlife monitoring program was to continue for at least two years following WCGS start-up (FES-OLS Section 5.5.1.2), which occurred during September, 1985. Upon completion of 1996 monitoring, sufficient data had been collected to determine waterfowl, waterbird, and bald eagle usage of WCL. Consequently, the wildlife monitoring program scope was reduced. The current program consists of reviewing WCL waterfowl and bald eagle survey data collected by the Kansas Department of Wildlife and Parks (KDWP). If review of the KDWP's data indicates usage has changed from that previously documented, then additional monitoring may be initiated, if warranted. This additional monitoring may include collision mortality monitoring.

Review of waterfowl and bald eagle monitoring data from the KDWP indicate that no significant usage changes occurred during 2000. Usage of WCL for the last quarter of 2000 increased when compared with recent years, but not when compared to past years with similar weather. The usage increase during the last quarter of 2000 can be attributed to cold weather and increased ice cover on nearby JRR. No disease outbreaks or substantial crop depredation attributable to waterfowl use of WCL was observed in 2000. No changes to the wildlife monitoring program were warranted.

#### **2.2.7 Land Management Program [EPP Subsection 4.2.3]**

Land management activities on all company-owned lands except within the 453 hectare (1120 acre) WCGS exclusion area were designed to achieve balances between agricultural production and conservation values. An annual management plan addressed needs and accepted techniques for land maintenance, soil conservation, and wildlife management. These included the repair or construction of soil conservation structures, wetland areas, and permanent vegetative covers. An environmental education area was improved and maintained as part of the land management program. A summary of the year 2000 land management activities appears in Section 4.1 of this report. The land management program continued in 2000 to balance agriculture production and conservation values.



### **3.0 ENVIRONMENTAL PROTECTION PLAN REPORTING REQUIREMENTS**

#### **3.1 PLANT DESIGN OR OPERATION CHANGES [EPP Section 3.1]**

Proposed plant design and operational changes which have the potential to affect the environment must receive an environmental evaluation prior to implementation. A summary of each modification or operating change which required an environmental evaluation in 2000 is presented below. There were no changes in station design or operation nor were there tests or experiments that involved an un-reviewed environmental question during 2000. There were no events identified that required changes to the EPP.

##### **Evaluation: Diversion of Water Seepage into Turbine Building**

This evaluation addressed proper routing that would prevent possible NPDES permit discrepancies or adverse environmental impacts due to ground water leaking into the turbine building basement through drain holes. The ground water source was suspected to be service water from a piping leak, and if so, potentially carried water treatment chemicals. A route to return the water to the service water discharge was required to eliminate a potential industrial wastewater bypass.

The collected water was routed to discharge to the normal SWS discharge to the CWS (NPDES Outfall 003). The SWS piping was repaired during the WCGS refueling outage in October, 2000. No adverse environmental impacts were expected or observed.

##### **Evaluation: Containment Integrated Leakage Rate Test Procedure Changes**

This evaluation demonstrated that no environmental permits would be violated, and that no adverse environmental impacts would result from allowing the use of temporary diesel air compressors during the Containment Integrated Leakage Rate Test. This test was completed during the refueling outage during October, 2000. The use of these diesel air compressors was acceptable under existing conditions of the WCGS Class II Air Operating Permit. Use of temporary air compressors had been evaluated and permitted by the KDHE. No permit discrepancies or adverse environmental impacts were identified.

##### **Evaluation: Biofouling Treatment Contingency Program**

This evaluation demonstrated that a biocide treatment program to control microfouling, asiatic clam, and potential zebra mussel fouling of WCGS systems and structures would not cause adverse environmental impacts. This control program was required by Supplemental Condition 6 of the WCGS NPDES permit. The EPP defers to the KDHE for regulating wastewater discharges, and this proposed program was provided to the KDHE for approval. The chemicals and listed treatment regimens in the program had been previously evaluated and approved by the KDHE. No adverse environmental impacts resulted from implementing the program.

### **Evaluation: Changes of Water Treatment Chemicals**

This evaluation demonstrated that changing the water treatment chemical supplier would not cause adverse environmental impacts. The EPP defers to the KDHE for regulating water quality discharges. The new supplier would provide different chemical products, which included ThruGuard 404, H-940, H-130M, CuproSTAT PF, and CL-50. These chemical products were evaluated, compared with previously approved chemical products, and found to be acceptable for use. The same discharge concentrations were to be used for the new water treatment chemicals as for the previous chemical products. The KDHE was notified of the product changes, and no adverse environmental impacts have been observed.

### **Evaluation: Chemical Addition Tank Coordination with NPDES Requirements**

This evaluation documented that WCGS has been properly following conditions set forth in the NPDES permit, and that potential discharges of toxic chemical compounds would not adversely impact the environment. The EPP defers to the KDHE for regulating water quality issues. Specific NPDES areas evaluated for potential discharges were Special Conditions 14a and 14b. These addressed activities associated with discharges of pollutants identified in the NPDES permit application, but had no limits established. It was concluded that compliance with WCGS procedures would prevent violation of NPDES requirements.

Potential discharges of two toxic chemical compounds were also reviewed, and it was concluded that concentrations as used would not cause adverse environmental impacts. Worst case scenarios were identified and potential discharge paths were evaluated for sodium molybdate and Nalco 1355. These compounds were used as corrosion inhibitors. Both chemicals were previously reviewed and approved for use at WCGS by the KDHE. In the scenarios, it was shown that the maximum concentrations of sodium molybdate that might be discharged to the environment would be below the no-observed-effect concentration, and the maximum concentration for Nalco 1355 would be below the 96 hour LC<sub>50</sub> toxicity check for fathead minnow (*Pimephales promelas*) and bluegill (*Lepomis macrochirus*). (LC<sub>50</sub> is the lethal concentration whereby 50% of the population survives after 96 hours.) Therefore, NPDES permit violations would not result from the scenarios evaluated, and no adverse environmental impacts would result.

### **Evaluation: Scale Conditioning Agent Discharges**

This evaluation demonstrated that the use and discharge of scale conditioning agents for the Steam Generators would not cause adverse environmental impacts and would not violate the NPDES permit. The scale conditioning agents included hydrazine, EDA, and bipyridyl. These chemicals were previously evaluated and approved by the KDHE for use at WCGS. The discharge path for the process was to the waste water treatment facility, where dilution would cause the chemical concentrations to be below harmful levels. Subsequent discharge to the CWS discharge flow (NPDES Outfall 003) would further dilute the chemical to below detection limits. Consequently, no adverse environmental impacts were expected or observed.

## **Evaluation: Repair and Replacement of Rip-rap on Dam**

This evaluation documented that rip-rap repair and replacement on the main dam would not cause adverse environmental impacts. The project was evaluated by the U. S. Corps of Engineers, which determined that the project was authorized by Nationwide Permit Number 3. The nationwide permit required compliance with a water quality protection plan. There were no threatened or endangered species in the vicinity of the project. All general conditions applicable to the nationwide permit were addressed. No adverse environmental impacts were expected or observed.

### **3.2 NON-ROUTINE ENVIRONMENTAL REPORTS**

#### **3.2.1 Submitted Non-routine Reports**

There were no environmental reports involving significant non-routine impacts submitted to the NRC during 2000.

#### **3.2.2 Unusual or Important Environmental Event Evaluations**

No unusual or important environmental events reportable according to specifications in the EPP were identified during 2000.

### **3.3 ENVIRONMENTAL NONCOMPLIANCES [EPP Subsection 5.4.1]**

Non-radiological environmental noncompliances or noteworthy events were documented and evaluated in accordance with WCNO's Corrective Action Program, using Performance Improvement Requests (PIRs). A PIR is WCNO's administrative vehicle for corrective action. Events evaluated included NPDES issues, wildlife caused transformer outage, hazardous/oily waste issues, an open burning exemption issue, equipment calibration discrepancy, and boating safety assurances during lake monitoring. All the documented events were determined not to be reportable pursuant to EPP criteria.

## **4.0 SUMMARY OF ENVIRONMENTAL INVESTIGATIONS AT WOLF CREEK GENERATING STATION**

### **4.1 2000 LAND MANAGEMENT ACTIVITIES**

This document presents the 2000 activities for the WCGS land management program. The EPP requires a land management program that will implement conservation and wildlife management techniques to attempt to balance production and conservation values (EPP Section 4.2.3). Values beyond meeting EPP requirements were also realized. The program objectives were to:

- a. conserve or improve both agricultural and natural resources,
- b. foster good relations with local agricultural and natural resource communities,
- c. satisfy licensing requirements,
- d. improve the appearance of the company's lands, and
- e. enhance, for educational purposes, the natural resources of the Environmental Education Area (EEA).

These objectives were attained as explained below.

Grasslands at WCGS consisted of areas leased for grazing and hay production and other areas maintained for regulatory compliance, soil conservation, and wildlife. Areas adjacent to WCL, approximately 1500 acres, exceeded the 500 acre buffer zone of "naturally occurring biotic communities" referenced in the EPP. Approximately 1,328 acres of native range land were leased for grazing in 2000 with 11 separate lease agreements. Leases specified rotation programs, season lengths, and maximum grazing rates. By controlling these variables, range quality was maintained at levels which provided optimum wildlife value and long term rent generation.

Approximately 462 acres were leased to 12 local farmers for hay production in 2000. Hay meadows were managed for high quality production by requiring hay to be cut by July 31 and bales removed by August 31. No late cutting was allowed.

Fire has always been an integral part of the prairie and was used to control woody brush invasion, control less desirable cool-season grasses or weeds, increase wildlife value, and to increase prairie vigor and production. Prescribed burning was completed on approximately 1088 acres during 2000. It was a relatively inexpensive and environmentally compatible method of meeting these objectives.

Management of cropland reduced soil erosion, maintained rent income, and increased wildlife benefits. Conservation farming, terracing, and wildlife strip management continued to help achieve the objectives. A total of 1278 acres of cropland was leased to 11 local farmers in 2000. Consistent with past years, the cropland lease contracts specified that common conservation practices be followed. On fields with appropriate terraces to follow, contour farming was required. Double-cropping, i.e., producing two crops on the same acreage during the same season, was generally prohibited because this practice usually increases soil loss. Fall tillage of crop residues was prohibited except for certain instances, such as tillage necessary for fall planting of wheat, plowing of terraces and deep tillage practices to improve productivity.

Activities at the EEA were designed to improve wildlife habitat and increase the public's chances to view a greater variety of wildlife. Tree and shrub planting, wildlife food plots, controlled burning, and trail improvements were a few of the techniques employed. The EEA has drawn a large amount of attention and continues to be well suited for educational purposes.

#### **4.2. 2000 ZEBRA MUSSEL MONITORING ACTIVITIES**

Zebra mussels were not found at shoreline monitoring sites in the Neosho River or WCL. In addition, the mussels were also not known to inhabit any Kansas waters during 2000. One adult zebra mussel was found at a Mid-America Energy Company power plant on the Missouri River near Sioux City, Iowa in April, 1999. This is the first reported finding of a zebra mussel in the Missouri River upstream of St. Louis. Zebra mussels were also found on a recreational boat by a marina employee in February, 2000, before the boat was launched at Lake of the Ozarks in Missouri. Zebra mussel introduction to WCL will most likely be caused by WCGS pumping activities from the Neosho River, from being transported on recreational boats, or from fish stocking activities. Water quality parameters in the Neosho River and WCL indicated that conditions were conducive for zebra mussel survival and growth. Because of the ability of this mussel to quickly inhabit and foul plant water systems after infesting WCL, monitoring for the initial presence of zebra mussels in the vicinity of WCGS was recommended to continue.

### 4.3 2000 FISHERY MONITORING ACTIVITIES

The results obtained from fishery monitoring of WCL during 2000 indicate that the potential for gizzard shad impingement at the cooling water intake screens has remained low. The primary objective of the monitoring was to measure fish population dynamics to determine shad impingement potential. The fishery assessments targeted gizzard shad, the predator species that feed on them, and impacts due to angling.

Catch frequencies of young gizzard shad increased slightly, but remained low during 2000. Consequently, no impingement problems developed. Increased impingement potential from greater production of shad in 1994 and 1995 did not develop. The 1994 and 1995 year-class adults were nearing the end of their expected life span, resulting in fewer of the larger shad being sampled.

The 2000 monitoring revealed that the predator populations showed signs favorable for continued shad control. Predator populations, as a whole, showed signs of being prey limited, indicating that shad numbers were being controlled. Growth rates and body conditions tended to be low. Catch rates increased from past years, and recruitment was evident for many predator species. Predator populations assessed were white bass, wiper hybrids, largemouth bass, smallmouth bass, white crappie, and walleye.

Angling impacts to the predators' shad control benefits were also assessed. The catch-and-release philosophy being stressed at WCL has made the limited harvest compatible with continued shad control. Continued low body condition of smallmouth bass and walleye justified altering the length and creel limits for these species. No adverse impacts to the fishery resulting from angler harvest were observed.