

NIWQP Kendrick Selenium Remediation Status Report

SUMMARY

The purpose of the NIWQP selenium remediation planning activities on the Bureau of Reclamation's Kendrick Project is to reduce or eliminate documented impacts to migratory birds, which have resulted from water pollution caused by irrigation drainage. A detailed study, completed in 1990, identified the following four remediation sites: Goose Lake, Illco Pond, Rasmus Lee Lake, and Thirty-three Mile Reservoir. Planning activities to remediate the four identified remediation sites have been suspended, and based on current budget projections, it appears planning activities may not be re-initiated in the near future and could be terminated. In the absence of future NIWQP planning activities, an ongoing local watershed planning effort could address selenium remediation at the four sites.

Although the Goose Lake and Rasmus Lee Lake sites have remained nearly dry for extended periods in recent years and bird usage is minimal, it appears the lakes may not remain dry in the long term and some impacts to migratory birds may exist. The area's precipitation was slightly above normal in 2003, and since the lakes partially refilled following moderate precipitation events, it appears the potential exists for the lakes to refill to higher levels during wet years. Whether this would result in significant impacts to migratory birds would depend on the extent and duration of water in the lakes, the re-development of a food supply within the lakes, and whether the birds were exposed to selenium during critical nesting periods. Regardless of future remediation actions, an issue exists regarding compensation for habit value lost due to changed conditions at these sites.

It appears the potential for impacts to migratory birds may continue to exist at the Illco Pond and Thirty-three Mile Reservoir sites, in the absence of remediation.

BACKGROUND

NIWQP investigations in 1986-87 (Reconnaissance Investigation of Water Quality, Bottom Sediment, and Biota Associated with Irrigation Drainage in the Kendrick Reclamation Project Area, Wyoming, 1986-87, Peterson, et al., 1988) identified elevated selenium concentrations in water, sediment, and biological samples collected within and adjacent to the Kendrick Project's Casper-Alcova Irrigation District (District) boundaries.

A detailed study, completed in 1990, provided additional information on the extent, severity, magnitude, effects, and exposure pathways of selenium associated with irrigation drainage. The study report (Detailed Study of Selenium in Soils, Representative Plants, Water, Bottom Sediment, and Biota in the Kendrick Reclamation Project Area, Wyoming, 1988-90, See, et al., 1992) identifies adverse effects in the form of impaired reproduction and embryonic deformities in migratory aquatic birds breeding in the Kendrick Project. The detailed study also provided data essential for the development of a remediation plan for the Kendrick Project. Four wetland sites were selected for remediation based on adverse effects to migratory aquatic birds

documented by the study. These sites include: Goose Lake, Illco Pond, Rasmus Lee Lake, and Thirty-three Mile Reservoir.

REMEDICATION PLANNING EVOLUTION

A variety of circumstances resulted in redirection of planning efforts and delays since remediation planning began in 1991. The primary causes for this have been funding constraints and changing site conditions. Although a positive aspect of the Kendrick planning effort has been the cooperative partnership method utilized for developing, funding and implementing the remediation plans, the associated funding mechanism has caused delays. Also, conditions at most of the remediation sites have changed significantly since NIWQP studies and planning activities began. A description of the stages of the remediation planning process, and the changes observed at the remediation sites follows.

Initial Planning and Original Preferred Alternative (1991 - 1996)

Remediation planning activities initiated in 1991 included extensive public participation and coordination between various federal, state, and local agencies. These activities were managed by a three-member Core Team consisting of representatives of the Bureau of Reclamation (Reclamation), the Fish and Wildlife Service (Service), and the Geological Survey (Survey).

Initially, plans included preparation of a combined project planning and National Environmental Policy Act (NEPA) document (environmental assessment) for submittal to Congress for authorization and funding of the remediation project. NIWQP planners presumed reimbursement of implementation costs associated with remediation would be imposed on the District, the principal Kendrick Project beneficiary.

The District submitted a remediation plan to Reclamation in 1994 which was based primarily on improving water management and conservation. The District's proposed plan was modified by an Interdisciplinary Study Team to incorporate additional measures identified as necessary for viable remediation.

After evaluating all remediation alternatives, the Core Team selected the modified District plan as the preferred alternative that would be implemented as a partnership effort between the NIWQP, Reclamation, and the District. The preferred alternative would not require Congressional authorization and funding, and reimbursement by the District as originally planned, since funding for most of the remediation would be provided by the District through an agreement between the District and the Wyoming Water Development Commission (WWDC).

Reclamation prepared a Memorandum of Understanding (Draft Memorandum of Understanding for Remediation of Irrigation Induced Selenium Contamination on the Kendrick Project, September 26, 1996) (MOU), with input from the District and WWDC staff, which provided for commitments by Reclamation and the District to implement the preferred remediation alternative. Reclamation submitted the draft MOU to the Department of the Interior's (DOI)

Billings, Montana Field Solicitor's Office in 1996, and then to the District in 1999. The MOU was never finalized due to delays and funding issues.

The original proposed remediation plan included construction of delivery system improvements (installing pipelines and lining canals) within the drainage basins of the four remediation sites. This would eliminate existing inflows to the sites from leaking open channel laterals, and would also create an account of "saved" water which could be used for remediation-related purposes.

At Goose Lake and Rasmus Lee Lake, the two largest and most contaminated sites, irrigation drainage would be eliminated or significantly reduced and cause the lakes to dry up. All open channel laterals within the basins would be lined or replaced with pipe, and the District would provide specific incentives to four irrigators within the basins to either install high efficiency sprinkler systems or transfer their water rights to land outside the drainage basins. The loss of wildlife habitat caused by drying up these two lakes would be replaced by the creation of a specific quantity of new wetlands at a site(s) within the general vicinity of the Kendrick Project.

At Illico Pond and Thirty-three Mile Reservoir, new pipelines would be installed to convey water from delivery system canals to the wetlands to flush and dilute selenium concentrations in water, sediment and the food chain to acceptable levels. Additionally, certain open channel laterals would be replaced with pipe, and on-farm irrigation return flows to the wetlands would be reduced by increasing irrigation application efficiencies using sprinklers, gated pipe, surge valves, etc. Incentives to install more efficient irrigation systems would be provided through existing local, state and federal programs. The extent of on-farm efficiency improvements would be unknown since a specific funding source for this was not identified.

NIWQP would fund all remediation related monitoring and Reclamation would fund the wetland replacement component of the remediation plan. The District would use funds provided by WWDC and other sources for all other remediation components (delivery system and on-farm improvements and water rights transfers).

Modifications to Preferred Alternative and Remediation Site Conditions (1996 - 2002)

In 1996, Reclamation's Wyoming Area Office began preparation of the Kendrick Selenium Remediation Environmental Assessment NEPA compliance document. The document's preferred alternative was based on the MOU as discussed above, and remediation site conditions documented through field investigations, aerial photography, surveys, etc. which were completed in 1993. Changing conditions at the sites, and other factors, resulted in modifications to the original preferred plan during the preparation and review of the document. A description of the remediation sites, and associated changes follows.

Goose Lake is located in a closed drainage basin of approximately 980 acres, of which approximately 160 acres are currently irrigated. It is situated on two separately owned parcels of land, and all irrigation drainage into the lake comes from these two property owners' operations and from delivery system

components. Prior to the development of irrigation, this lake was ephemeral and apparently held water infrequently and for short durations. During dry conditions the basin, or playa, probably provided minimal wildlife habitat value; however, during wet conditions the playa could have provided temporary habitat for aquatic migratory birds.

Based on surveys and aerial photography performed in 1993, Goose Lake provided approximately 117 acres of total wetland habitat and 97 acres of open water at that time. Based on the location of a staff gage apparently used during the 1986-87 studies at a position significantly above the 1993 shoreline, it appears the lake's water level was higher in 1986-87 than in 1993. Due to changes in irrigation practices and drought conditions, the lake diminished in size during the period 1996-2002, and was essentially dry by mid-summer 2002. The lake partially re-filled the following spring, dried again during the summer of 2003, and partially refilled again during the fall of 2003.

In 1996, the irrigation method on a portion of the irrigated lands within the basin was converted from flood to sprinkler application, and the water rights for other previously irrigated lands were transferred to the Rasmus Lee Lake drainage basin. These improvements, as well as other less tangible changes in irrigation management, significantly reduced irrigation losses and waste, and apparently contributed to the physical changes observed at Goose Lake since 1996.

During the period 1999 to 2002, the Kendrick Project area experienced below normal precipitation, and Goose Lake's size diminished as discussed above. Based on specific conductance measurements taken during this period, and visual observations, it appears bird food sources were depleted as the concentration of dissolved solids became extremely elevated. During 2003, the area's precipitation was slightly above normal, and the lake partially refilled following precipitation events in the spring and fall. Based on this, it appears the potential exists for the lake to refill to higher levels during periods of significantly above normal precipitation, and for bird food sources to re-establish under lowered dissolved solids conditions. This could result in significantly higher bird use than observed in 2002 and 2003. However, whether this would result in significant impacts to migratory birds would depend on the extent and duration of water in the lake, the re-development of a food supply within the lake, and whether the birds were exposed to selenium during critical nesting periods.

Rasmus Lee Lake is an off-stream reservoir which was constructed for stock-watering and irrigation in the early 1900s. It was originally filled through a diversion from a nearby creek, and the diversion was apparently abandoned at some time after irrigation development. Rasmus Lee Lake's drainage basin is approximately 1,060 acres, of which approximately 200 acres are currently irrigated. The lake is located on Bureau of Land Management and privately owned land. Irrigation drainage which enters the lake is from the operations of

the two individuals that own the lake, from a third irrigator, and from delivery system components. The pre-irrigation wildlife habitat value provided by the lake is unknown, although it is assumed that when the reservoir contained water it provided habitat for aquatic migratory birds.

Based on surveys and aerial photography performed in 1993, Rasmus Lee Lake provided approximately 157 acres of total wetland habitat and 94 acres of open water at that time. During the period 1993-96, the water level at Rasmus Lee Lake was such that it discharged to the outlet channel during the irrigation season. Due to changes in irrigation practices and drought conditions since 1996, the lake level has not been high enough to discharge to the outlet channel and it has fluctuated seasonally at much lower levels than were observed prior to 1996. It has completely dried up every year during the late summer and fall since 1999, but has partially refilled each spring.

In 1995, an open channel irrigation delivery lateral located within the Rasmus Lee Lake drainage basin was replaced with a pipeline, and in 1996, the irrigation method on a portion of the lands within the basin was converted from flood to sprinkler application. Also, new lands were brought into production in 1996 under sprinkler irrigation. These improvements, as well as other less tangible changes in irrigation management, significantly reduced irrigation losses and waste, and apparently contributed to the physical changes observed at Rasmus Lee Lake since 1996.

The above discussion regarding the potential for Goose Lake to refill to a level which could result in higher future bird use also applies to Rasmus Lee Lake, for the most part.

Illco Pond is a component of a larger wetland complex that was apparently formed as the result of irrigation development adjacent to an abandoned railroad alignment which acts as an impoundment dike. The wetland's drainage basin is approximately 1,000 acres, of which approximately 200 acres are currently irrigated. It is situated on land owned by one individual and on a railroad right-of-way. Irrigation drainage into the wetland comes from the land owner's operations, from one other irrigator, and from delivery system components.

Based on surveys and aerial photography performed in 1993, Illco Pond provided approximately 6 acres of total wetland habitat and 4 acres of open water at that time. It appears the wetland's size was decreased slightly as a result of nearby roadway drainage improvements/repairs performed by local agencies in 1996.

In 2000, a portion of the irrigated lands within the Ilco Pond drainage basin were converted from flood irrigated pasture to flood irrigated crop land. This included contour and furrow improvements which apparently resulted in improved irrigation efficiency.

Thirty-three Mile Reservoir is an on-stream reservoir which was constructed prior to irrigation development for stock-watering and irrigation purposes. It is located on the South Fork of Casper Creek, which has a drainage basin estimated at approximately 100,000 acres and approximately 1,000 acres within the basin are currently irrigated. It is situated on land owned by a single individual and irrigation drainage from this individual's operations is a relatively small portion of all irrigation drainage within the basin. Other irrigation drainage into Casper Creek South Fork above the reservoir is from numerous on-farm and delivery system sources.

Based on surveys and aerial photography performed in 1993, Thirty-three Mile Reservoir provides approximately 72 acres of total wetland habitat and 22 acres of open water. The physical conditions of the reservoir have remained relatively unchanged since 1993.

The most significant changes, as discussed above, are those which have occurred at Goose and Rasmus Lee Lakes. As these changes progressed, concerns were identified regarding the wetland replacement component of the remediation plan. A team consisting of Reclamation, Service and Wyoming Game and Fish Department (WGFD) representatives was formed in 1996 to identify potential wetland projects to achieve adequate habitat replacement. Several potential sites have been evaluated, including sites suggested by the District, but a feasible wetland replacement site has not been agreed upon.

Although a specific wetland replacement site, replacement size, and water supply has not been identified, the Service and WGFD documented site requirements and the Core Team has agreed to a replacement quantity "goal" strategy using available Reclamation funds. The site requirements are identified in the WGFD Deputy Director's January 16, 1997 letter to Reclamation's Wyoming Area Manager, and the "goal" concept is discussed in the NIWQP Manager's October 31, 2002 memorandum to Reclamation's Wyoming Area Manager. Also, the Service's overall position on the wetland replacement issue is documented in their Cheyenne, Wyoming Field Supervisor's September 4, 2001 memorandum to Reclamation's Wyoming Area Manager.

In addition to changed site conditions, the planning process was affected by more direct circumstances associated with the proposed primary funding source for the proposed remediation plan. Specifically, the total anticipated funding amount could not be secured within the originally planned time frame, and this resulted in delays to the remediation planning process. The District received some WWDC funds in 1997 for design of irrigation delivery system improvement remediation components, and for water savings and cultural/historical analyses. The District also arranged for the Natural Resources Conservation Service to assist with the

delivery system design and the water savings analysis. The District's cultural/historical consultant submitted their analysis to Reclamation in 1997, but design plans and water savings analyses results were never formally submitted to Reclamation.

Additional funding by the WWDC was contingent on the implementation of the proposed Platte River Basin Habitat Recovery Plan currently being developed under a cooperative agreement between the states of Colorado, Nebraska, and Wyoming, and the DOI. The "Cooperative Agreement for Platte River Research and Other Efforts Relating to Endangered Species Habitat Along the Central Platte River, Nebraska, July 1997" specifies (Appendix A, Tab 2a, Section I.D) that the State of Wyoming will assist the District to address selenium contamination as a mitigation component for reduced drought protection which the District would experience under the proposed habitat recovery program.

The Draft Environmental Assessment for the Kendrick Selenium Remediation Project addressing NEPA compliance at all four remediation sites was completed by Reclamation's Wyoming Area Office, and distributed to the Core Team and Interdisciplinary Team Members for review in 2000. Due to staffing constraints, Reclamation's Wyoming Area Office subsequently requested that future drafts of the document be produced by Reclamation's Denver Technical Service Center.

As the potential availability of WWDC funding for remediation became uncertain due to delays in the Platte River Cooperative Agreement process, the Service began advocating interim remediation measures. As a result, Reclamation and WWDC approached the District with the concept of moving forward with Illco Pond and Thirty-three Mile Reservoir plans to flush and dilute selenium concentrations using existing NIWQP funds and District labor. This would require two NEPA compliance documents: one first to cover the Illco Pond and Thirty-three Mile Reservoir sites, and then a second later to cover the other two sites. The District was receptive to this proposal, but questioned the level of certainty that the proposed dilution rates would achieve satisfactory results.

Further Modifications to Remediation Plan (2002 - 2003)

Based on environmental assessment review comments and the District's concerns regarding the proposed dilution plans for the Illco Pond and Thirty-three Mile Reservoir sites, it was decided further water quality data collection and analyses were needed. Based on these further analyses, which were completed in 2002, it was determined the proposed dilution plans were not feasible at the Thirty-three Mile Reservoir site. The Core Team has discussed other alternatives with the District, but a feasible option has not been identified. Alternatives identified include permanently draining the reservoir and mitigating its stock-water and wildlife value, periodic temporary draining of the reservoir combined with flushing/dilution, and diverting the creek around the reservoir combined with flushing/diluting.

Since Goose and Rasmus Lee Lakes have remained nearly dry during the past several years, and during refill periods the lakes do not appear to provide significant food sources for aquatic birds,

the continued need for remediation has been questioned. In an attempt to address this, bird counts were performed in 2002 and 2003. The counts indicate minimal usage relative to bird use documented during the previous studies.

Since the water quality data collected at Illco Pond in 2001 showed a decrease in selenium levels, the District requested additional water, sediment, and biota data be collected to verify remediation was still necessary. This request was approved, and data collection activities were completed in September 2003. Analyses of the water and sediment data indicate no statistically significant change from 1988-95 data. Although the selenium concentrations are lower in biota collected in 2003 than in previous years, concentrations in pondweed and aquatic invertebrates remain above the dietary threshold for sensitive species of aquatic migratory birds, and common carp levels remain above the threshold for adverse effects.

CURRENT STATUS AND LOCAL SELENIUM EFFORTS

In anticipation of possible funding restrictions, the NIWQP Coordinators provided guidance in 2002 to the Core Team regarding NIWQP remediation priorities and associated work plan proposals which effected the Core Team's remediation planning strategy. Specifically, ongoing remediation construction projects and remediation planning associated with sites with endangered species impacts were given highest priority. Then, in response to greater than expected 2003 funding reductions, and based on the established NIWQP priorities, guidance was provided which resulted in postponement of most Kendrick Project remediation planning activities. The Core Team has notified the District and WWDC of this, and informed them they will be contacted if and when remediation planning is re-initiated.

Based on discussions with WWDC representatives, it appears any funding which becomes available to the District for selenium remediation in association with the Platte River Cooperative Agreement effort could be used for other purposes in the absence of an NIWQP remediation planning effort. Specifically, it appears the District may have opportunities to leverage these funds to implement a watershed management plan being developed as discussed below.

Local Selenium Remediation Activities

In 2000, the Wyoming Department of Environmental Quality (WDEQ) included the four remediation site wetlands, the North Platte River downstream of the Kendrick Project, and seven tributaries and drains within the Kendrick Project in their Clean Water Act Section 303 (d) list of impaired water bodies (with selenium identified as the contaminant).

In response to the 303 (d) listing of these water bodies, the Natrona County Soil and Water Conservation District applied for and received a grant through the WDEQ to develop a watershed management plan to address selenium contamination in the Kendrick Project. The watershed planning committee solicited input on the development of the watershed management plan from the District, the Kendrick Core Team, Reclamation and other federal and state

agencies. The Core Team has had minimal involvement in this effort since the proposal stage.

The watershed planning grant application specifically identified the four remediation sites as areas not to be covered in the planning effort. The logic for this being that NIWQP would remediate the contamination at these sites. In the absence of NIWQP activity, the watershed planning effort may need to consider the four remediation sites.