

# National Irrigation Water Quality Program Status Report -- Gunnison-Grand Valley Study Area

March 2004

The purpose of this document is to briefly summarize the status of the NIWQP's selenium remediation activities in the Grand Valley and Gunnison River Basin as of spring 2004. It also describes some of the assumptions, criteria, issues, and lessons learned since planning for remediation began in fiscal year (FY) 1995. The NIWQP has made a significant investment in resolving selenium-related Endangered Species Act (ESA) issues for Department of the Interior (DOI) projects in the area. Recent budget constraints have resulted in the suspension of several activities<sup>1</sup>. Recommendations are provided to describe some opportunities to address issues that are presently available, but may be lost as time passes.

## *Grand Valley*

### **1. Background**

The prime objective of the NIWQP in the Grand Valley is to avoid future conflicts for water users under Section 7 of the Endangered Species Act and to a lesser extent, the Migratory Bird Treaty Act, by taking action to reduce or eliminate impacts caused by selenium in irrigation drainage from Federal projects. The water use we seek to protect occurs through the Grand Valley Project, operated by the Grand Valley Water Users Association and Orchard Mesa Irrigation District. It also includes carriage water delivered to the Mesa County Irrigation District and Palisade Irrigation District through these Federal facilities.

Since 1991, data have been collected by the NIWQP in the Grand Valley<sup>2</sup>. Samples of water, sediment, food chain items (plants, invertebrates), fish, birds and bird eggs have been collected from ponds, drains, backwaters and streams. Although examined for an extensive list of contaminants (e.g. lead, mercury and zinc) and pesticides, selenium was found to be the major concern.

Selenium loading in the Grand Valley originates primarily from irrigation applications to the Mancos Shale and soils derived from the shale. This water is delivered through both Federal and non-federal delivery systems. Because of the tiering of Federal and non-federal canals on the north side of the Colorado River, it is impossible to separate the impacts of Federal project

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<sup>1</sup> Reclamation's FY 2005 appropriation request, as submitted for Congressional consideration, does not include funding that can be used for the NIWQP. The final outcome of the appropriation request is awaiting final action. Future funding beyond FY 2005 is also uncertain.

<sup>2</sup> A listing of NIWQP reports for the Grand Valley and lower Gunnison River Basin can be found in Attachment A.

irrigation from irrigation by the non-federal facilities. Additionally, the non-federal irrigation entities do not have the financial resources to participate nor do they feel an urgency to participate in selenium-remediation activities. Therefore, a decision was made that NIWQP would initially fund selenium remediation that was primarily for the benefit of endangered fish in the Grand Valley. Another decision was made to focus remediation on reducing suspected impacts to endangered fish, primarily because of the significant presence of ongoing fish recovery efforts and a recognized capability on the part of the NIWQP to effect improvements to the fishes' habitat. Impacts to migratory birds were deemed a less significant concern, but are addressed where they share habitat with endangered fish. The problem and needs statement adopted by the NIWQP Core Team for the Grand Valley are:

***Problem Statement:*** Selenium concentrations in Colorado River backwater and bottomland habitat in the Grand Valley are at levels that adversely affect reproduction in selenium sensitive species including some aquatic birds and endangered fish.

***Needs Statement:*** Reduce or prevent selenium impacts to fish and wildlife in Colorado River backwater and bottomland habitat in the Grand Valley.

These statements were developed when mainstem river concentrations were thought to be relatively low. With the continued drought, the Core Team realizes that in 2004, higher concentrations in the mainstem river may be more important than originally thought. Additionally, future water depletions (increases in in-basin consumptive use and trans-mountain diversions) in the upper Colorado River basin could also negatively affect these concentrations. The focus of any future remediation efforts may need adjustment based on these factors.

## **2. Strategic plan for the Grand Valley**

The NIWQP focus in the Grand Valley has been on reducing the selenium hazard that exists in a majority of the backwater and bottomland endangered fish habitat, adjacent to the Colorado River. The study team searched for remediation measures that are the most cost-effective and have little or no impact on affected stakeholders. A list of 24 prospective remediation sites, suspected of creating a selenium hazard for endangered fish, was initially developed. Sites were prioritized based on the following criteria, and, generally, one or two sites were selected for study at a time:

- number of endangered fish using the site
- frequency and duration of endangered fish use
- ease of construction access for remediation; i.e., a site owned by a government entity is initially preferable over a privately-owned site due to a lack of right-of-way issues.
- is cost-effective remediation possible or likely; i.e., can a significant reduction in the selenium hazard be accomplished at a reasonable cost?

If feasible and justifiable measures are identified for a site, remediation actions are implemented. The sites where actions have been implemented to date are discussed in Section 3 of this report. The list of remaining, un-studied sites is displayed in Section 5.

One recent development that may change some of the priorities in the future is the recent realization that mainstem Colorado River selenium concentrations in the 18-Mile Reach (downstream of the Gunnison River confluence) are significantly higher than in the recent past

(the 85<sup>th</sup> percentile for the 2002 and 2003 water years is greater than 8 ppb), probably due to the recent drought and associated low-flow conditions. Concentrations in food organisms consumed by endangered fish also increased substantially. The Core Team originally proceeded with remediation based on an assumption that flushing a backwater site with river water at 3-4 ppb selenium concentration is one of the most cost effective ways to meet an objective of 3 ppm selenium or less in food organisms. If the river concentrations continue to be higher, this objective may not be achievable; plus, the hazard created in the mainstem river may require additional source-control activities in the contributing drainage areas. Of course, future hydrologic variations tending towards higher runoff from upstream areas would lessen this concern.

### **3. Remediation Progress in the Grand Valley**

Two sites have been remediated by the NIWQP in the Grand Valley, to date --- the Orchard Mesa Wildlife Area and the Colorado River Wildlife Area. Both of these sites are located along the Colorado River upstream of the Gunnison River confluence where mainstem selenium concentrations are still well below the standard. Planning and design activities have been completed for another site at the mouth of Adobe Creek, and the Panorama site was eliminated from further consideration.

#### ***A. Orchard Mesa Wildlife Area (OMWA)***

The OMWA is a 153-acre site located along the south bank of the Colorado River about four miles east of downtown Grand Junction. It is owned by the Bureau of Reclamation. The site was developed to replace wildlife habitat lost during the lining and piping of irrigation canals and laterals in the Grand Valley for salinity control purposes, and to protect endangered fish habitat. Selenium concentrations of up to 30 parts per billion (ppb) have been recorded in water samples from this area.

The OMWA was the first site in the Grand Valley to be targeted and studied for remediation by the NIWQP and was used as a pilot for future studies of the 23 other Grand Valley sites that the team planned to evaluate. A detailed planning process with extensive public involvement was conducted, and a complete range of remediation options was identified and evaluated. All the major categories of remediation options were considered including source control, treatment, diversion, dilution, and administrative (including land retirement). Many of the other Grand Valley sites to be evaluated have similar characteristics, and thus, general conclusions reached on what may be feasible are easily transferrable to those other sites. The Core Team hoped this initial work would make for a more simplified planning process for future sites. This process at the OMWA was time consuming, but it now provides a basis where planning for other sites can focus on the most logical measures. Please see Section 4 for some lessons learned from this exercise.

The initial remediation action at the OMWA involved the excavation of a flushing channel to the West Backwater in 2000. Further east on the property, the OM4 Drain conveys irrigation drainage from the Orchard Mesa Irrigation District through the wildlife area. In 2002, a diversion structure was constructed in the Drain to direct drain water into a pipeline paralleling the river to the east. The pipeline has turnouts and a connection to a section of gated pipe where the water is used to irrigate the flood plain and support new wetland

vegetation. The project has improved the habitat in the wildlife area, but does not create an additional hazard as standing water is minimized. Excess waters infiltrate into the soils (and eventually enter the river as diffuse inflows) or become tailwater which spills into two existing secondary channels of the Colorado River. Inlet channels were excavated to allow flushing flows from the river to enter and dilute high selenium concentrations that now occur in those secondary channels to reduce any hazards for endangered fish and other aquatic life. The cost to date for the improvements at the OMWA is approximately \$118,900, and the estimated annual expenditure needed to maintain the improvements is \$1,000. A plan to provide 4 years or more of future maintenance is presently under development which will hopefully help continue the remediation benefits for several years to come.

A post-project monitoring report, analyzing the effectiveness of the OMWA remediation efforts, is under development and is planned for completion in May 2004.

#### **B. *Colorado River Wildlife Area (CRWA)***

The CRWA is also a Reclamation-owned habitat replacement site for the Colorado River Salinity Control Program. This 200-acre property is located along the north bank of the Colorado River approximately four miles east of downtown Grand Junction (directly across the river from the OMWA). The first phase of an adaptive management approach to the selenium problem was implemented in April 2003 and involved excavating the inlet of a secondary channel to provide year-round flushing flows and encourage some scouring in the lower reach of the secondary channel during high-flow events to benefit the fish habitat. If monitoring indicates a need, additional measures may need to be considered at a future date. These measures might include construction of a water-control structure at the inlet to the channel.

Long term maintenance is required for the channel improvements and will involve periodically cleaning accumulated sediment from the inlet channel, and removing beavers and their dams. The cost to date for the improvements at the CRWA is \$18,300, and the estimated annual expenditure needed to maintain the improvements is \$1,000. A plan to provide 4 years or more of future maintenance is presently under development which will hopefully help continue the remediation benefits for several years to come.

#### **C. *Adobe Creek***

Adobe Creek is a north side tributary to the Colorado River located approximately eight miles west of downtown Grand Junction. At its mouth, the creek flows into a 0.8 - mile long secondary channel which is habitat for endangered Colorado pikeminnow. This site is made up of several privately-owned properties and one property owned by Colorado State Parks.

The recommended plan involves piping Adobe Creek south across an island to bypass contaminated drainage past the secondary channel. The river inlet to the secondary channel was to be excavated to increase inflow from the river. Recent revelations about higher selenium concentrations in the mainstem river may circumvent the plan's ability to meet the NIWQP's objective of 3 ppm in the food chain in the secondary channel. Plans and specifications were developed in the spring of 2003, but when NIWQP funding shortfalls occurred, a decision was made to postpone the contracting process indefinitely.

**D. *Sites eliminated.***

One site, known as Panorama (south side of Colorado River opposite Walter Walker State Wildlife Area), was studied and eliminated from further consideration due to site's limited accessibility for endangered fish use (thus, minimal anticipated benefits), and because there are other opportunities of more effective use of NIWQP funding.

**4. Grand Valley assumptions/conclusions/lessons learned to date**

The following briefly describes some of what has been learned to date that may be helpful during future study efforts:

- The most important habitat for endangered fish is bottomlands and backwaters along the Colorado River which is often subject to high selenium surface and subsurface inflows from irrigation drainage and delivery system seepage.
- The OMWA remediation planning process served as a pilot project for the NIWQP in the Grand Valley, and much was learned about remediation in backwaters and bottomlands including the following:

**A. Source control is expensive and may not solve the problem.** Source control measures reduce but may not totally eliminate deep percolation and seepage where selenium is mobilized in irrigated areas, unless the entire contributing area is converted to very efficient irrigation methods. If only a portion of the groundwater contributions are eliminated, most backwater sites will continue to receive sufficient selenium contaminated drainage to be problematic. Given the funding limitations of this program and likely availability of other funding, it's more effective to utilize less costly dilution and diversion remedial measures in the backwater and bottomland habitat.

**B. The Colorado River is a dynamic system.** It does not generally make sense to spend significant dollars on "concrete" fixes within the flood plain, because the fixes may not be permanent. In the past, large discharge events have significantly changed river channels particularly in the 15-Mile Reach (Palisade to Gunnison River confluence). Some channels eventually fill with sediment and become part of the flood plain. It should be anticipated that this will continue. Some selenium trouble spots will come and go with natural river evolution. Long term maintenance of remediation improvements (flushing channels, diversions, etc.) will be needed to minimize selenium hazards for the fish at these sites.

**C. Any fix will have to meet various stakeholder's needs and criteria.** The prime stakeholders include landowners, water users, the Recovery Program and in some cases, the Grand Valley Selenium Task Force.

**D. Generally, the most cost effective fixes may involve drainage improvements or flushing.** Various remediation measures should be tested over a range of typical site layouts and conditions. Common sense, minimizing expenditures, and preserving the environmental function of the sites should guide the selection of a plan.

## 5. Other Grand Valley Sites that may require Remediation

(updated Oct. 2001)

The following seven sites (from downstream to upstream) are believed to be important endangered fish habitat and have sufficient data to identify a significant selenium hazard. They are ready for remediation studies.

- Paul Smith backwater at river mile 158.8 (north side of CO River)
- Walter Walker State Wildlife Area (north side)
- Backwater at Drain "D" (on 25 Road alignment; north side)
- Backwater near Pepsi plant (south side)
- Pond complex at 29 5/8 Road (north side)
- Pickup Pond (north side)
- Clifton ponds at ~ 32 ½ Road (north side)

The next 13 potential sites (from downstream to upstream) need more data to determine their remediation needs:

- Snooks Bottom (south side)
- Pond at river mile 159.9 (north side)
- Backwater at river mile 160 (north side)
- Walter Walker South backwater (south side)
- Connected Lakes (south side)
- Leach Creek pond (north side)
- Jarvis property backwater (north side)
- Backwater at river mile 179.6 (north side)
- Drain/backwater at river mile 179.2 (north side)
- Clifton Water Treatment backwater (north side)
- Backwater at river mile 182 (south side)
- Labor Camp (north side)
- Tilman Bishop Wildlife Area (south side)

Table 1 (page 13) contains additional information on each site (including location by river mile).

## **6. Coordination and opportunities with the Grand Valley Selenium Task Force**

The Grand Valley Selenium Task Force is a stakeholder group formed in 2002 to address violations of state water-quality standards for selenium in impaired stream segments on Colorado's 303(d) list. Presently, this involves the tributaries to the Colorado River through the Grand Valley. These tributaries serve as conveyances for irrigation drainage and several (e.g., Lewis Wash and Adobe Creek) flow into backwater habitat that the NIWQP has targeted for selenium reductions. Because of this overlap in objectives, the Core Team has been working with the task force to review potential selenium reduction measures. Based on findings and input from the Task Force, the State will develop Total Maximum Daily Loads (TMDLs) for these stream segments, site-specific standards, or a combination of both.

Reclamation has a vested interest in seeing this matter addressed in an appropriate and reasonable manner to protect Grand Valley Project water use. The Colorado Division of Wildlife is interested in these same tribs due to the presence of "species of special concern." This category is for fish where the population has not declined to threatened or endangered status, but whose continued existence is of concern. The State desires to prevent further declines in these species and their habitat, and subsequent ESA issues.

In April 2004, the Colorado 303(d) list will be expanded to include selenium in the mainstem Colorado River (below the Gunnison River confluence) and at Walter Walker State Wildlife Area. Overlap with the NIWQP's objectives can be expected to increase. Selenium-load reductions in the Gunnison River basin will be desirable to help address the mainstem Colorado River issue. Reclamation (under its Technical Assistance to States Program) has been providing some limited planning assistance to the Task Force. However, funding is very limited, and thus the assistance that can be provided is also. The Task Force is pursuing other resources, primarily from EPA's Section 319 funding.

Opportunities exist for some reductions in selenium loading and concentrations resulting from the efforts of the Task Force. Up to this time, the NIWQP has been working closely with both (Grand Valley and Gunnison Basin) stakeholder groups to identify reasonable, cost-effective, and implementable projects that accomplish the joint objectives of meeting the water-quality standards and protecting the fish. Although slow, the joint processes have generally been effective and the U.S. Fish and Wildlife and the Colorado Water Quality Control Commission have been very supportive. The process brings together people who are being asked to change how they do things. The NIWQP brought technical expertise and some funding capabilities. With NIWQP's recent reductions in funding and the suspension of activities in FY2005, NIWQP assistance will be lost, and the remaining partners (i.e., the Task Forces) can expect to have their effectiveness diminished. Some advice and technical assistance from the former Core Team members (BOR, USGS, and USFWS) may be vital to their continued progress.

The need to perform the basic planning work does not go away. The USGS and Reclamation are being asked to fund related work out of other agency funding. Reclamation is providing assistance to both Task Forces under its Technical Assistance to States Program, and USGS has provided assistance under its Federal/State Cooperative Program. Reclamation projects may be impacted by water-quality standards/TMDL process. Reclamation involvement in the process may assure that reasonable requirements are set under a TMDL or that appropriate site-specific

standards are set. This is to ensure that Grand Valley Project operations are not unduly affected in the future.

7. **Other important issues and opportunities**

A. ***NIWQP role in addressing Recovery Goals***

Recovery Goals developed by the U.S. Fish and Wildlife Service for the razorback sucker and Colorado pikeminnow (August 2002) state that “Selenium is hypothesized as contributing to the decline of the endangered fishes of the Colorado River Basin. It is a factor that may inhibit recovery by adversely affecting reproduction and recruitment.” This document identified the following requirements:

Under Management Actions – “minimize adverse effects of selenium contamination on razorback sucker and Colorado pikeminnow reproductive success and survival of young and reduce deleterious levels of selenium contamination, if necessary”.

The document further states the effects of selenium contamination on razorback sucker and Colorado pikeminnow will be reevaluated, and if necessary, actions to reduce deleterious levels of selenium contamination will be identified and implemented. Delisting of these species will require “Deleterious levels of selenium contamination reduced to minimize adverse effects on razorback sucker and Colorado pikeminnow reproductive success and survival of young.”

The Recovery Goals document states “The National Irrigation Water Quality Program is addressing selenium issues in the upper basin by implementing remediation projects to reduce selenium levels in areas of critical habitat.” However, with the reduction of funding in 2003, NIWQP remediation activities were suspended in the Grand Valley.

B. ***Long term O&M of remediated sites***

Remediation improvements at the OMWA and CRWA are likely to require regular maintenance annually or even more often. This work is estimated to cost about \$2,000 a year for both areas. Maintenance will likely be required to remove sediment or vegetation that may impede the function of various improvements/facilities in reducing selenium concentrations. Needs will be dependent on the water year and the volume of flow through the flushing channels. Without regular maintenance, the remediation function of the improvements could be reduced or lost.

C. ***Meeting water-quality standards at Walter Walker State Wildlife Area***

Walter Walker SWA has always been a high priority site for selenium remediation for the NIWQP, because of its recognition as the most important endangered fish habitat in the area. Adjacent gravel-mining operations have largely addressed the issue over the last several years by intercepting and eliminating the ground-water source of selenium contamination to the wildlife area. The ground-water table was reduced, eliminating year-around ponds in the wildlife area, and thus, essentially eliminating the source of the selenium problem. It is unknown whether selenium in sediments may continue to create hazardous levels in food organisms consumed by endangered fish during flood events, or if these areas are now



covered by new clean sediment and inconsequential. At some point in the future, gravel operations may cease and the ground-water flow gradient will be re-established along with the selenium concern. The site is also scheduled to be added to the 303(d) list in 2004. Joint efforts with the Grand Valley Selenium Task Force could be very useful in identifying and implementing a permanent selenium-reduction plan at this location.

***D. Effects of changing land use***

One of the biggest unknowns concerning selenium in the Grand Valley is “what effects are significant land-use changes having on water quality (selenium and salinity loading)?” Changing land use may affect the amount, timing or methods by which irrigation water is applied to the land. There are differing opinions about whether these changes will increase selenium loading, decrease it, or maybe, it will remain about the same. Without some insights into the future load quantities, it’s difficult to plan remediation. A plan for a study (known as the “Changing Land-Use” study) is presently being formulated which will offer some answers about the long-term loading effects of growth. The study may also provide some insights into which BMPs local governments may want to consider in guiding wise development. Potential partners for such a study may include the Colorado River Salinity Control Program, the Gunnison River Basin and Grand Valley selenium Task Forces, cities, counties, USGS, Reclamation, and the Colorado River Water Conservation District.

Table 1 -- Prospective Backwater / Bottomland Remediation Sites

Study Area: *Colorado River / Grand Valley*

Revised: March 4, 2004

Site ID	River Mile (Side of River)	Site Name (type)	Used by endangered fish or Migratory Birds?	Is contamination the result of a Federal Irrigation Project?	Hazard Rating (High, Moderate, Low)		Past Amount of Fish Use (captures at or adjacent to site) CPM=Colorado pikeminnow RBS=Razorback sucker	Top 13 RIP Bottomlands Sites (yes or no) (G= gravel pit); PAS= Possible RIP acquisition site	Comments (PO = private ownership)	Remediation Priority/ Status
					Lemly	Ohlendorf				
SB	155.9-157.1 (S)	Snooks Bottom	Birds & fish	Partially	Need sediment	Waiting for invert. data	78-95 (7) CPM 96-98 (7) CPM	PAS	PO	
CP	156.5 (N)	Chevron Ponds	Birds	Partially	No info			PAS	PO	
PS	158.8 (N)	Paul Smith (backwater)	Fish & birds	Partially	H	M to H	78-95 (11) CPM	No (G)	PO-United Company	High
AC	159.1- 160.0 (N)	Adobe Creek (backwater)	Fish & birds	Partially	H	H	78-95 (5) CPM	No (rank = 19)	PO/State	High
RIG	159.9	Riggs	Fish & birds	Partially	L	L		PAS	PO	
T & F	160	Treecce and Forrester (pond)	Birds	Partially	L	L		PAS	PO	
FB	160.3 (N)	Forester's 19 Road (Backwater)	Fish & birds	Partially	L	L	78-95 (7) CPM	No	PO	
	163.1 -163.6 (S)	Panorama (Backwater)	Fish	Partially (from Uncompahgre Project)	H	H	78-95 (132) CPM 96-98 (146) CPM CPM use indicative of WWSWA use	Yes (rank = 6)	PO	Study complete- no remediation done
WWSWA North Pond	163.6 (N)	Walter Walker SWA North Pond	Fish & birds	Partially	H	H	78-95 (204) CPM (includes WW2 & 3) 96-98 (146) CPM	Yes (rank = 1) (G)	State owned	High
WWSWA channel back-water	163.3- 163.7 (N)	Walter Walker SWA channel	Fish & birds	Partially	M	M to H	One of last sites to be used by RBS	Yes (rank = 1) (G)	State Owned	High
	164.4 -166.0 (S)	Walter Walker South (Backwater)	Fish	Partially from mainstem river loadings	No rating info available.	No rating info available	78-95 (3) CPM	Yes (rank = 10)	PO	
CL	167	Connected Lakes	Fish and birds	Partially	Need fish analysis		Historically RBS		State Owned	
LCP	167.3 (N)	Leach Cr. Pond	Fish & birds	Partially	Insufficient data--Need Inverts	Insufficient data	78-95 (18) CPM 96-98 (6) CPM	No (G)		
D25W	168.7 (N)	Drain @ 25 Road nr Blue Heron (Drain "D")	Fish & birds	Partially	H	H	78-95 (37) CPM 96-98 (5) CPM	No	PO?; Close to what is believed to be spawning bar for CPM	High

Site ID	River Mile (Side of River)	Site Name (type)	Used by endangered fish or Migratory Birds?	Is contamination the result of a Federal Irrigation Project?	Hazard Rating (High, Moderate, Low)		Past Amount of Fish Use (captures at or adjacent to site) CPM=Colorado pikeminnow RBS=Razorback sucker	Top 13 RIP Bottomlands Sites (yes or no) (G= gravel pit); PAS= Possible RIP acquisition site	Comments (PO = private ownership)	Remediation Priority/ Status
					Lemly	Ohlendorf				
D25E	168.7 (N)	Drain @ 25 Road	Fish & birds	Partially	H	H	see above	No	See above	High
HAM/HD	169.4-169.7 (S)	Hammer's Backwater Pepsi Plant-Hammond's Island Backwater	Fish and birds	Partially (from mainstem river loadings)	M	L to M	78-95 (1) CPM 96-98 (1) CPM	Yes (rank = 10) (No)	PO	High
JAR	171	Jarvis Site	Fish	Partially	Need water and sediment				City Owned	
29 & 5/8	174.6 (N)	29 & 5/8 Road Pond	Fish & birds	Partially govt system carriage water	M to H	M to H	78-95 (15) CPM 96-98 (41) CPM (incl. Hot Spot complex)	Yes (rank = 12) (G)	State Owned	To be filled in by RIP
BES1	174.9	Slough		Partially	L to M	L to M			PO	High
HSPN	173.9-175.1	Pond North of Hotspot Pond	Birds & fish	Partially	M	M		PAS	PO	High
HSP	174.5 (N)	Hot Spot Pond	Fish & birds	Partially govt system carriage water	H	H	see above	Yes (rank = 12) (G)	partially state owned	High
OMWA	174.1 - 176.5 (S)	Orchard Mesa Wildlife Area-(A.K.A. Griffiths)	Fish & birds	Yes via OMID	M to H	M to H	78-95 (102) CPM 96-98 (87) CPM	Yes (rank = 9)	USBR owned (154 acres); 1 yr of data only	Remediation complete
PP	175.1-175.2	Pickup Pond	Birds & fish	Partially	L to M	L to M	78-95 (27) CPM 96-98 (4) CPM	PAS	PO	High
CRWA or HMB	175.3-176.6 (N)	Humphrey's - (south of CRWA; a.k.a. Island backwater )	Fish & birds	Partially govt system carriage water	M	M	78-95 (56) CPM 96-98 (28) CPM	Yes (rank =9)	State & private ownership	Remediation complete
CSP	177.7 - 178.2 (N)	Clifton Ponds - about 32.5 Road	Fish & birds	Partially govt carriage water	Need sediment		78-95 (11) CPM 96-98 (1) CPM Historic RBS site	Yes (rank = 3) (G)	Mesa County	High
PK1	179.6 (N)	Pikes Backwater-D ½ & 33 Road)	Fish	Partially govt carriage water	Insufficient data-Need Inverts	Insufficient data	78-95 (3) CPM 96-98 (7) CPM	Yes (included in Clifton Water Treatment site)	PO	
PK2	179.2 (N)	Pikes (drain)	Fish	Partially govt carriage water	Insufficient data-Need Inverts	Insufficient data	2 CSF	Yes (included in Clifton Water Treatment site)	PO	
	179.1 - 181.1 (N)	Clifton Water Treatment	Fish & birds	Partially govt carriage water	No rating info available	No rating info available	78-95 (18) CPM 96-98 (9) CPM	Yes (rank = 13)	City of Clifton	
	181.7 - 182.2 (S)	Jim Temple	Fish	Yes - OMID	No rating info available	No rating info available	78-95 (9) CPM 96-98 (3) CPM	Yes (rank = 11)	PO	

Site ID	River Mile (Side of River)	Site Name (type)	Used by endangered fish or Migratory Birds?	Is contamination the result of a Federal Irrigation Project?	Hazard Rating ( <u>H</u> igh, <u>M</u> oderate, <u>L</u> ow)		Past Amount of Fish Use (captures at or adjacent to site) CPM=Colorado pikeminnow RBS=Razorback sucker	Top 13 RIP Bottomlands Sites (yes or no) (G= gravel pit); PAS= Possible RIP acquisition site	Comments (PO = private ownership)	Remedia- tion Priority/ Status
					Lemly	Ohlendorf				
	182.9 -183.6 (N)	Labor Camp	Fish	Partially govt carriage water	No rating info available	No rating info available	78-95 (14) CPM 96-98 (14) CPM One of last sites to find RBS	Yes (rank = 5)	City of Palisade	
	183.3 - 184.2 (S)	CDOW - known as Steve Smith	Fish	Yes - OMID	No rating info available	No rating info available	78-95 (8) CPM 96-98 (5) CPM	Yes (rank = 12)	CDOW	

# *Lower Gunnison River Basin / Uncompahgre Project*

## **1. Background**

The primary objective of the NIWQP in the Gunnison River basin is to avoid future conflicts for water users under Section 7 of the Endangered Species Act and to a lesser extent, the Migratory Bird Treaty Act, by taking action to reduce or eliminate impacts caused by selenium in drainage from Federal irrigation projects. The water use we seek to protect occurs primarily through the Uncompahgre Project, operated by the Uncompahgre Valley Water Users Association. Irrigation under other Federal projects (Fruitgrowers, Bostwick Park and Paonia) in the lower basin is also a selenium contributor, but to a much lesser degree.

Data have been collected by the NIWQP since 1987 in the Uncompahgre Project area and lower Gunnison basin<sup>3</sup>. Samples of water, sediment, food chain items (plants, invertebrates), fish, birds and bird eggs have been collected from ponds, drains, backwaters and streams. Although examined for an extensive list of contaminants (e.g. lead, mercury, zinc) and pesticides, selenium was found to be the major concern.

The majority of the selenium loading in the Gunnison basin originates from irrigation applications to the Mancos Shale and soils derived from the shale within the Uncompahgre Project area. A decision was made by the Core Team and NIWQP management to focus remediation on reducing suspected impacts to endangered fish, primarily because of ESA concerns and the significant presence of ongoing fish recovery efforts. Impacts to migratory birds were deemed a less significant concern and may be addressed at some point in the future. The problem and needs statements adopted by the Core Team for the Gunnison River basin are:

***Problem Statement:*** Selenium concentrations in the lower Gunnison River are at levels that adversely affect reproduction in selenium sensitive species including some aquatic birds and endangered fish. Approximately 60% of the selenium loading is the result of irrigation return flows from the Federal Uncompahgre Project Area<sup>4</sup>.

***Needs Statement:*** Reduce or prevent selenium impacts to fish and wildlife in the lower

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<sup>3</sup> A listing of NIWQP reports for the Grand Valley and lower Gunnison River Basin can be found in Attachment A.

<sup>4</sup> The remaining 40% of the loading in the Gunnison River basin is from agricultural and non-agricultural sources outside of the Uncompahgre Project area. This area includes both Federal and non-Federal irrigation projects and facilities.

Gunnison River.

3. **Initial NIWQP Remediation – Montrose Arroyo Demo Project**

Early in the remediation planning process, the Core Team viewed lateral piping as potentially one of the best remediation measures for the Gunnison River basin. However, information was lacking on what effect such a project would have on selenium loading. In 1998, the NIWQP joined with the Colorado River Basin Salinity Control Program and the Uncompahgre Valley Water Users Association to replace 8.5 miles of unlined, leaky irrigation ditches with 7.5 miles of buried PVC pipe in the Montrose Arroyo basin, south of city of Montrose. The cost was about \$1.25 million. The results of the project were better than expected, reducing the selenium load from that basin by 27% (210 pounds annually) and salinity by 11% (2,500 tons annually). The project was completed at 25% under budget.

4. **Joint planning process with the Gunnison River Basin Selenium Task Force**

During the 1997-98 period, the NIWQP was looking to begin a planning process to identify remediation options and involve the stakeholders in implementing solutions. At the same time, due to changes in water-quality standards for selenium, the State and others were considering how to address violations of those standards in the Gunnison Basin.

In February 1998, the Gunnison River Basin Selenium Task Force was formed to address exceedences of the State’s water quality standard for selenium. This is “a group of private, local, state and federal interests committed to finding ways to reduce selenium ... while maintaining the economic viability and lifestyle of the lower Gunnison River basin.” The State facilitated the formation of this task force to help develop Total Maximum Daily Load (TMDL) allocations and solutions at the local level. The Task Force and the NIWQP joined forces in pursuit of their similar objectives. Over the last 6 years, they have worked jointly to identify and characterize selenium sources, evaluate remediation options, support demonstration projects, and involve the public in the process. The objective was to find and implement the most cost-effective solutions, not just in the Uncompahgre Project area, but throughout the lower Gunnison River basin.

Remediation options have been developed at a pre-feasibility (appraisal) level of detail drawing from existing information where available, supplemented by some limited research. The Task Force weighed in with their preferences as to which measures would be most acceptable to the local stakeholders. In order to determine the number and scope of the measures to include and to meet the goals, targets for selenium loading reduction (in pounds per year) were developed and are shown below:

Goal no. 1: Meet water-quality standards (85th percentile value of 4.6 ppb)

*Reduction needed:* Gunnison River at Whitewater: 5,500 pounds/year  
Uncompahgre River at Delta: 5,900 pounds/year

Goal no. 2: Meet the NIWQP objective of 3 ppm in food organisms:

*Reduction needed:* Gunnison River at Whitewater: approx. 13,000 pounds/yr.  
(Note: the total load from the Gunnison basin is about 20,000 pounds/year.)

Two alternative plans were under development to meet the two goals when NIWQP funding was severely reduced in the spring of 2003. Measures being included in each plan were to be described in terms of scope or size (e.g., number of miles of ditches or acres of land treated) and coupled with an estimate of the potential load reduction effect.

Beyond the anticipated effects on the lower Gunnison River, implementation of one of these alternatives was also anticipated to have positive effects on the mainstem Colorado River below the Gunnison confluence. This reach is not yet on the State's list of water-quality impaired segments [303(d) list], but is expected to be added in April 2004.

Despite the reductions and anticipated elimination of NIWQP participation, the Task Force is attempting to continue its work. However, this is becoming more difficult due to reduced presence of other critical parties. These critical parties are also facing funding limitations. The Task Force primarily obtains funding from Section 319 grants for staff and various demonstration projects, and is currently receiving assistance from Reclamation under its Technical Assistance to States Program. USGS has contributed matching funds in the past. Other stakeholders contribute time for meetings and other activities to further the goals of the Task Force.

After the realization that irrigation from the new Devils Thumb Golf Course was possibly negating loading reductions by lateral piping and other projects, the Task Force and the NIWQP became much more interested in non-agricultural sources of selenium and their effects. Using Section 319 funding, the Task Force is pursuing the development of Best Management Practices (BMPs) to reduce seepage and deep percolation from various non-agricultural sources including golf courses, lawn watering, ponds, and septic leach fields. Should Task Force efforts continue to decline, and not be capable of implementing and supporting limits on development and new non-ag sources of selenium, stakeholders are likely to raise questions about the futility of pursuing further selenium reduction efforts in the lower Gunnison River Basin.

**4. Current Demonstration projects**

Several demonstration projects and studies are underway to evaluate the effectiveness and ability to implement some potential selenium reduction measures. They involve various task force participants, the NIWQP and others as shown below:

<u>Measure</u>	<u>Participants</u>	<u>Planned completion date</u>
<u>polyacrylamide</u> (a.k.a. PAM) - sprayed into irrigation ditches to reduce seepage	<ul style="list-style-type: none"> <li>• UVWUA</li> <li>• NIWQP</li> <li>• USBR Water Mgt. &amp; Conservation Program</li> <li>• Colorado R. Water Conservation District</li> </ul>	3 <sup>rd</sup> quarter, FY04
<u>pond lining</u> to reduce seepage (appraisal - level report)	<ul style="list-style-type: none"> <li>• Natural Resources Conservation Service</li> <li>• USBR Science &amp; Technology Program</li> <li>• USBR Technical Assistance to States Program</li> </ul>	3 <sup>rd</sup> quarter, FY04
<u>phyto-remediation</u> to remove selenium from the top soils	<ul style="list-style-type: none"> <li>• Task Force with Section 319 funding</li> <li>• USBR Technical Assistance to States Program</li> <li>• NIWQP (ground-water data collection)</li> </ul>	Possibly 4 <sup>th</sup> quarter, FY04
<u>hydrogel</u> - to reduce water use & deep percolation	<ul style="list-style-type: none"> <li>• Task Force with Section 319 funding</li> </ul>	2 <sup>nd</sup> quarter, FY04
<u>center-pivot sprinkler</u> - to reduce water use & deep percolation	<ul style="list-style-type: none"> <li>• Colorado River Basin Salinity Control Program (Basin States Cost Sharing Program)</li> </ul>	2004

Table 2. Demonstration projects and studies in the Uncompahgre Valley

Each of the measures being studied or implemented involves controlling the source of selenium mobilization with the goal of reducing the load in the lower Gunnison River and thus, selenium concentrations.

**5. Remediation Progress and Current Status**

The remediation that has occurred to date in the Gunnison basin includes the effects of the Montrose Arroyo Demo Project and some yet unquantified effects of the demonstration projects mentioned above.

The Montrose Arroyo Demo Project reduced selenium loading from that small basin by 27% and resulted in a reduction of almost 4% of the target reduction (5,500 lbs./year) needed for the Gunnison River basin. The success of the project has led to the UVWUA and other Task Force participants obtaining Congressional write-ins in FY2003 and 2004 (\$677 and \$697k, respectively, after reductions for Reclamation’s underfinancing cuts) to support similar projects on the east side of the Uncompahgre River. The FY2003 and 2004 funding has been obligated to



the UVWUA through a Cooperative Agreement. These funds are being offered as a cost share in a proposal by the UVWUA (submitted in February 2004) to Colorado River Basin Salinity Control Program for piping approximately 21 miles of laterals in an area southeast of Montrose.

The next steps in the planning and implementation of additional remediation measures to meet the basin-load reduction goals would involve:

- Finishing the nearly complete appraisal-level report for the NIWQP entitled “The Potential for Significant Selenium Reductions in the Gunnison River Basin” The purpose of this document is to provide NIWQP and other decision makers with information to assess the potential for significantly reducing selenium loading and thus concentrations in the Uncompahgre and lower Gunnison Rivers. It should also provide some recommendations on needed actions and future studies.
- Working with the task force to prioritize selenium reduction projects and obtain funding and cooperation to implement those projects.
- Working with counties and cities to implement the Best Management Practices (BMPs) currently being developed for non-agricultural sources of selenium.

## 6. **Other important issues and opportunities**

### A. *NIWQP role in addressing Recovery goals*

Recovery Goals developed by the U.S. Fish and Wildlife Service for the razorback sucker and Colorado pikeminnow (August 2002) state that “Selenium is hypothesized as contributing to the decline of the endangered fishes of the Colorado River Basin. It is a factor that may inhibit recovery by adversely affecting reproduction and recruitment.” This document identified the following requirements:

Under Management Actions – “minimize adverse effects of selenium contamination on razorback sucker and Colorado pikeminnow reproductive success and survival of young and reduce deleterious levels of selenium contamination, if necessary”.

The document further states the effects of selenium contamination on razorback sucker and Colorado pikeminnow will be reevaluated, and if necessary, actions to reduce deleterious levels of selenium contamination will be identified and implemented. Delisting of these species will require “Deleterious levels of selenium contamination reduced to minimize adverse effects on razorback sucker and Colorado pikeminnow reproductive success and survival of young.”

The Recovery Goals document states “The National Irrigation Water Quality Program is addressing selenium issues in the upper basin by implementing remediation projects to reduce selenium levels in areas of critical habitat.” With the anticipated elimination of NIWQP funding in FY2005, NIWQP studies, data collection, and coordination activities with task forces will be suspended in the Lower Gunnison River basin. However, “write-in” funding obtained by the UVWUA<sup>5</sup>, potential funding from Reclamation’s Salinity Control Program,

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<sup>5</sup> This funding is the result of Congressional “write-ins” for FY2003, 2004 and possibly 2005 to the Bureau of Reclamation’s appropriations bill.

funding of the Natural Resources Conservation Service's Environmental Quality Incentives Program, and other efforts of the Task Force should lead to further selenium reductions in the basin.

***B. Effects of changing land use***

As in the Grand Valley, one of the biggest unknowns concerning selenium in the Gunnison basin is “what effects are significant land-use changes having on water quality (selenium and salinity loading)?” Changing land use may affect the amount, timing or methods by which irrigation water is applied to the land. There are differing opinions about whether these changes will increase selenium loading, decrease it, or maybe it will remain about the same. Without some insights into the future load quantities, it's difficult to plan remediation to meet some goal. A plan for a study (known as the “Changing Land Use” study) is presently being formulated which will offer some answers about the long-term loading effects of growth. The study may also provide some insights into which BMPs local governments may want to consider in guiding wise development. Potential partners for such a study may include the Colorado River Salinity Control Program, the Gunnison Basin and Grand Valley Selenium Task Forces, cities, counties, and the Colorado River Water Conservation District.

## **Gunnison-Grand Valley Core Team Observations and Recommendations**

### **Relative importance of various Grand Valley vs. Gunnison Basin remediation actions**

The Core Team continues to believe that NIWQP remediation actions are more productive in the Grand Valley (than the Gunnison Basin) because significant reductions in selenium concentrations in the most important habitat (backwaters and bottomlands) will be most beneficial to endangered fish. Concentrations in these backwater/bottomland habitats can be much higher than the river itself because of the greater relative proportion of contaminated irrigation drainage. In low-flow or drought years (such as 2002), the benefits of Grand Valley remediation may be reduced by higher mainstem concentrations, but these projects are not designed to be totally effective in such extreme years.

### **Recommendations:**

There are several actions/opportunities that the Federal agencies and others should consider in the absence of a NIWQP in the Gunnison basin and Grand Valley:

1. Support the “Changing Land-Use” Study to answer the question: “what effect are land-use changes having on water quality?” This is needed to provide information for future remediation planning by non-Federal entities and for wise land-use planning decisions by local governments.
2. Where possible, support/implement selenium reduction measures that have positive effects on concentrations in both the lower Gunnison River and in the mainstem Colorado below the Gunnison River confluence .
3. Continue monitoring of muscle plugs and loads/concentrations at important locations
4. Fund technical assistance for both Task Force groups to facilitate local initiatives and see that reasonable measures are employed or site specific standards are developed.
5. Seek Recovery Program funding to reduce selenium hazards in important endangered fish habitat sites. (Currently, selenium reduction measures are being implemented as part of the Recovery Program’s habitat restoration work on the Green River.)
6. Improve understanding of the connection between selenium in water and food organisms.
7. Ensure continued O&M funding for completed Phase V projects in the Grand Valley to prevent loss of remediation accomplishments.

## Attachment A

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