

HABITAT REPLACEMENT STRATEGIES FOR IRRIGATION SYSTEM IMPROVEMENTS ASSOCIATED WITH SALINITY CONTROL IMPLEMENTATION

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ABSTRACT

Implementation of irrigation system improvements such as canal lining or replacement with pipelines frequently results in the incidental loss of wetland habitat previously supported by seepage or spills from the inefficient system. Although the affected wetlands are typically non-jurisdictional in nature, the salinity control program authorizing legislation requires the replacement of lost wildlife habitat value. This paper discusses various strategies and approaches to address this issue, with particular emphasis on low cost, cooperative resolution. Examples of successful project implementation are provided, together with discussion of the potential ramifications of various long-term management approaches.

INTRODUCTION AND BACKGROUND

Brief Overview: Colorado River Salinity Control Program

The Colorado River and its tributaries provide municipal and industrial water to about 27 million people and irrigation water to nearly four million acres of land in the United States. The river also serves about 2.3 million people and 500,000 acres in Mexico. The threat of salinity is a major concern in both the United States and Mexico. Salinity (the presence of dissolved salts in fresh water) affects agricultural, municipal, and industrial water users. Although salinity control measures installed to date with US Department of Agriculture assistance control over 300,000 tons of salt annually, and control measures installed with Bureau of Reclamation assistance control nearly 500,000 tons each year, salinity in the Colorado River causes \$300 million per year in damages³.

In June 1974, Congress enacted the Colorado River Basin Salinity Control Act, Public Law 93-320, which directed the Secretary of the Interior to proceed with a program to enhance and protect the quality of water available in the Colorado River for use in the United States and the Republic of Mexico. In October 1984, Congress amended the original act by passing Public Law 98-569. Public Law 104-20 of July 28, 1995, authorizes the Secretary of the Interior, acting through the Bureau of Reclamation, to implement a basinwide salinity control program, working collaboratively with the seven Colorado River Basin states and the USDA Natural Resource Conservation Service as

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well as with local entities. The Secretary may carry out the purposes of this legislation directly, or make grants, enter into contracts, memoranda of agreement, commitments for grants, cooperative agreements, or advances of funds to non-federal entities under such terms and conditions as the Secretary may require.

This paper is focused on strategies for fulfilling the wildlife habitat replacement requirements associated with the salinity control program, drawing on the experiences of program implementation and management within the state of Utah by the Bureau of Reclamation, Provo Area Office (Reclamation).

Habitat Replacement Requirements

The Salinity Control Program's authorizing legislation, codified at 43 U.S.C. 1571-1599, contains a unique requirement to replace wildlife values foregone as a result of irrigation system improvements to reduce salt loading. In implementing the program, this means that habitat predicted to be lost as the result of a project must be replaced, even if environmental analysis pursuant to the National Environmental Policy Act does not predict significant effects to wildlife or habitat.

Irrigation systems in Utah and the rest of the arid western United States have been essential to human survival and agriculture since the 19th century settlement by European descendants. The irrigation canal could be considered the first and most important public utility in Utah. There are roughly 1,500 irrigation companies located in Utah, and many earthen, open ditch systems are still in use. Because these systems are the main source of the salinity problem in need of control, they are the focus of salinity program funding to facilitate replacement with pipelines and sprinkler irrigation systems. However, the authorizing legislation recognized that over the decades, the seepage from these canals has created linear wetland and riparian corridors which in turn have come to be relied on by wildlife; hence the statutory requirement that wildlife habitat is to be accounted for as the agricultural landscape changes.

Early salinity program implementation calculated habitat replacement requirements on an acre-for-acre basis, assuming that 100% of viable habitat along a canal or lateral would disappear after the canal was replaced with a pipeline. As the program has evolved, it has been recognized that qualitative rather than quantitative measurements are preferable. Habitat to be lost is surveyed and values assigned that can equate to the values of potential replacement property. The habitat value of a proposed replacement property must equal or exceed values of the wildlife habitat predicted to be lost as a result of a salinity control project. Qualitative analyses of proposed replacement habitat include location of the prospective replacement property (riparian corridors are preferred locations), its current condition, the potential for improvement of the property to benefit wildlife, and its viability as a long term habitat. The acquired property must be improved in a manner that equates to the values lost as a result of the salinity control project. The following are minimum requirements for habitat replacement for salinity control projects, as determined by Reclamation in coordination with state and federal wildlife agencies:

- There shall be no net loss of habitat function. This is to say that acreage amounts need not be the same, but that there is no net loss in total value to wildlife.
- A guarantee or reasonable assurance must be provided that the replacement habitat features will survive and function (e.g., with an assured water supply) for the life of the project, assumed to be 50 years. The replacement land must be protected through acquisition or easement, and long-term management and monitoring is necessary to assure that the needed wildlife values are maintained.
- Long-term management must assure that changing conditions over time (e.g. introduction or spread of exotic plant species) will not reduce the function of the site as wildlife habitat.
- Habitat replacement should be implemented in advance of project (pipeline) construction or otherwise, must occur concurrently.



Figure 1. The Huntington-Cleveland Irrigation Company's Cleveland Canal provides an example of wildlife habitat expected to be lost when the canal is replaced with a pipeline.

REPLACEMENT STRATEGIES

The approach to identifying the specific method for habitat replacement for each salinity control project follows the same guidelines generally used for wildlife management and environmental compliance. The ideal situation for any project is avoidance of impacts. Avoidance of impacts means not allowing impacts to occur in the first place. Although difficult to achieve for most salinity control projects, this is the preferred approach to project implementation—designing a project so that it doesn't cause impacts, and a resource remains unaffected and viable during and after project implementation. If avoidance of impacts to habitat can be achieved for a salinity control project, then there is no need to undertake habitat replacement for that project.

When impacts to habitat are unavoidable, then habitat replacement is required. Post-construction preservation of pre-construction existing habitat can be an acceptable means of fulfilling the habitat replacement requirements of the salinity control program. Preservation of existing pre-project habitat means designing and implementing a management plan that assures that the habitat will remain viable for the life of the project. For example, habitat along a canal which is also located near natural seeps or a natural watershed might be designated for preservation, with monitoring and management intervention (water supply, invasive species control, etc.) as needed.

Where avoidance and preservation are not feasible, then acquisition and improvement of replacement property is the required approach.

All of these strategies for fulfilling the salinity program wildlife habitat replacement requirements have been tried over the years, with varying degrees of success. The following section provides specific examples of habitat replacement efforts.

Leaving Canal Prisms Open to Capture Stormwater Runoff

Leaving canal prisms open, if successful, can provide the preferred 'in kind in place' replacement of wildlife values foregone. An abandoned canal prism, left open, might have the potential to capture sufficient snowmelt, residual water from adjacent areas, or storm and natural seepage water that could continue to support existing vegetation and wildlife habitat along the prism. Analysis is necessary to determine whether there are reliably sufficient water sources to support the vegetation types in place. Two examples of this approach are listed below.

Burns Bench Irrigation Company Salinity Control Project: The Burns Bench project, completed in 2004, replaced the Burns Bench Canal, Murray Ditch and Burton Ditch near Jensen, Utah. The total length of the canals replaced with pipeline was 11.5 miles. Canal seepage-induced wetlands were predicted to be impacted due to the elimination of the water source. The excavation and installation of the pipeline along the canal right of way removed grassy, herbaceous vegetation and shrubs serving as habitat to a number of endemic wildlife species. To replace habitat values foregone for wetland and riparian impacts, the canals were left open to collect runoff and spring seepage in order to

maintain and where possible expand the existing habitat in comparison to pre-project conditions. Most of the canal prism changed from bare soil to a vegetated community within one year (Lopez, 2009). Five years after project completion, annual monitoring by Reclamation continues to verify that the required habitat values are being maintained. This is consistent with general observations of abandoned canals-- when annual maintenance including clearing of vegetation no longer occurs, vegetation is established in the prisms within a year or two. In this particular project, common cattail (*Typha latifolia*), Fremont cottonwood (*Populus fremontii*) and coyote willow (*Salix exigua*) are abundant. Other abundant species include common reed (*Phragmites australis*), and Reed canarygrass (*Phalaris arundinacea*). The presence of these invasive species could be considered a double-edged sword- they do provide habitat value and for older projects, the management approach typically allowed invasives to remain in place, being controlled as necessary to prevent their spreading further. More recently, the management strategies for habitat replacement properties have included plans to replace invasive species with native species over time.

South Lateral Salinity Control Project: The South Lateral project, completed in 2002, replaced with pipeline approximately 2.9 miles of the Duchesne Feeder Canal South Lateral near Bridgeland, Utah. The habitat replacement plan for this project identified 1.27 acres of riparian habitat along the ditch prism of South Lateral and 3.44 acres of side slope habitat along the hillside traversed by the lateral. The plan further stated that habitat replacement would not be required since these habitat acres would remain viable following piping of the lateral due to the seep water from a near hillside area. This habitat replacement plan was consistent with the stated preference of the U.S. Fish and Wildlife Service to avoid impacts where possible. Seven-plus years after project completion, replacement of wildlife values foregone has been achieved consistent with the management plan. Lower areas of the canal that are close to irrigation fields continue to support coyote willow (*Salix exigua*) and Fremont cottonwood (*Populus fremontii*). Other areas along the canal support some upland vegetation species.

It is worth noting that when dealing with small acreage amounts as with this project, it would be difficult to come up with a stand-alone replacement property that meets all the desired criteria, except by combining with a number of other small-acreage needs to establish a larger replacement property that fulfills the requirements for several projects.

It should also be noted, in using abandoned canal prisms for habitat replacement over the 50-year life of a salinity control project, that as urban development around canals occur, canal companies may fear liability issues leading to a need to fill in old prisms and/or abandon easements. In such cases, they would have to reinitiate coordination with Reclamation and the wildlife agencies to plan and implement an alternate habitat replacement plan.

Managing Abandoned Canal Prisms (Stormwater Supplemented as Needed by Irrigation Water) to Maintain Habitat

Simply leaving canal prisms in place does not guarantee that viable wildlife habitat will survive over the long term. Often, there is insufficient natural water to support mature cottonwoods and riparian vegetation that were created by canal seepage. Managing abandoned canal systems can be an acceptable means of preventing habitat loss resulting from salinity project implementation. This is the approach that was used for the Ferron salinity control project habitat management plan.

The Ferron Project watershed area covers 191,000 acres. It is located in Emery County, Utah. The salinity control project area included 8,747 acres of irrigated land. The entire canal system was replaced with pipelines and all laterals and sub laterals within the project area were eliminated. Sprinkler irrigation replaced flood irrigation on over 97% of the farms within the project area.

Predicted habitat loss due to the salinity control project totaled 60.5 acres. The Ferron Canal and Reservoir Company designed a habitat replacement project to maintain 131 acres of habitat (64.4 acres of that total to directly offset project impacts, and an additional 66.6 acres as assurance that project impacts would be offset for the life of the project, with the possibility that some of this acreage might be determined to be bankable for use by future salinity control projects) along or near abandoned canals as part of its salinity control irrigation project. Maintenance of these acres is accomplished by guaranteeing appropriate water supply so as to maintain existing habitat along the canal Right of Way. This water supply is anticipated to be met through natural means, or through inadvertent operational overflow of regulation ponds. If this is not the case, the canal company has committed to provide irrigation water consistent with existing water rights to ensure maintenance of this habitat. Where a proposed habitat replacement plan includes providing water from the irrigation company sources, the water must be diverted and used consistent with the company's existing water rights, or a change to water rights (such as a change in point of diversion and nature of use) must be sought from the state engineer. Alternatively, a new non-irrigation company water supply would need to be obtained and changed to make it viable for the habitat management plan.

Information acquired late in 2008 from monitoring and conversations with landowners along the habitat management area indicate a potential problem not foreseen when the habitat replacement project was approved. In the 5 years since the project was approved, vegetation within the canal prism has survived, and thrived, since the canals are no longer cleaned annually for water transportation use. As a result, vegetation at the ends of the canals is receiving less water, which could become problematic for some of the vegetation, especially mature cottonwoods. Follow-up with the canal company is needed to see what adjustments might be made to ensure long term viability of the habitat.



Figure 2. The Ferron Project's habitat replacement plan includes supplemented water in the abandoned canals when natural stormwater runoff is not sufficient to maintain vegetation, especially mature cottonwoods.

Acquire and Improve Property in Partnership with State or Local Agency, Turning Over Long Term Management to that Agency

Any property acquired for habitat replacement for a salinity control project must be managed to ensure that wildlife values are maintained for the life of the project. An ideal means of achieving the desired management is to partner with a state or local agency that desires oversight of and access to such a property. Reclamation has routinely coordinated on all wildlife replacement needs with the Utah Division of Wildlife Resources (DWR). Where both agencies' needs can be accommodated by a particular project's wildlife replacement requirement, meeting these joint needs becomes a high priority and a 'win-win' situation.

One example of a project's habitat replacement needs resulting in a good fit with DWR's wildlife management goals is the Mallard Springs property. As noted above, small projects with small habitat replacement acreage requirements are not conducive to management by state wildlife agencies; such scattered, small parcels would be difficult to staff and fund. However, when a project (or combination of projects) has a large enough acreage requirement, an ideal situation exists for partnership. Such was the case with Mallard Springs in Duchesne County, Utah, about 1.5 miles southeast of the town of Myton.

Mallard Springs Property: The Mallard Springs Wildlife Management Area (WMA), now managed by the DWR, fulfills a 163-acre wildlife replacement requirement for the Duchesne County Water Conservancy District (DCWCD) Salinity Control Project (Phase I). This pipeline project replaced five existing open channel canals, totaling about 31 miles. The 160-acre property acquired for habitat replacement is part of the 247-acre WMA and was built in 1993 by Reclamation, with design input and coordination from DWR and the U.S. Fish and Wildlife Service. The property consists of emergent wetland vegetation in a series of depressions with an open water stream flowing through them. Each depression is connected by a 40-foot-long underground rock filled channel. Wet meadow areas are present at this property. The DCWCD is responsible for maintaining the irrigation system. DWR manages the property for waterfowl habitat and hunting, and it also supports a wide variety of birds and mammals.



Figure 3. The Mallard Springs Wildlife Management Area, which fulfills the habitat replacement requirement for DCWCD Salinity Control Project Phase 1, was a cooperative effort in which the applicant acquired the property, Reclamation worked with the State DWR and U.S. Fish and Wildlife Service to design and construct habitat improvements, and the State DWR manages the property.

Acquire and Improve Property in Partnership with a Non-Governmental Entity

In addition to partnering with state or local agencies, Reclamation has successfully partnered with non-governmental entities to fulfill habitat replacement needs. There is a

variety of mechanisms that can be used to assure management for wildlife for the life of the relevant salinity control project. One tool is execution of a conservation easement, filed with the county, which assures continued use of the property for wildlife habitat. An example provided below is the Wall Property in Uintah County, Utah. Another tool is partnership with a corporation, as was achieved with the Cottonwood Property in Emery County, Utah.

Wall Property: The Wall property south of Jensen, Utah totals 127 acres and serves as wildlife replacement for the DCWCD Salinity Control Project (Phase II) as well as the Union Canal Salinity Control Project. The DCWCD Phase II project replaced three canal systems totaling slightly less than 52 miles with pipeline, and required 53.78 acres of wildlife habitat replacement. The Union Canal project replaced 4.75 miles of canal and had a wildlife replacement requirement of 3.18 acres. In 2002, the U.S. Fish and Wildlife Service Utah Field Office recommended this property for the purposes of fish and wildlife habitat replacement for the Salinity Control Program (USFWS 2002.). The property was acquired by the DCWCD and was placed in a perpetual conservation easement filed with Uintah County in July 2003. DCWCD coordinates with Reclamation in implementing the management plan on this property, which includes selective grazing for whitetop control as well as other invasive species control. The habitat value of this property has dramatically improved over the past 5 years, and large numbers of migratory birds (including Sandhill cranes) and large and small mammals are commonly observed there. The location of this property within the designated critical habitat of four endangered Colorado River fish species adds to its value.



Figure 4. The Wall Property's wildlife habitat values have dramatically increased since implementation of the habitat management plan. Management includes strategic fencing, grazing to target control of whitetop, and longer range plans to control tamarisk and Russian olive.

Cottonwood Property: This 100-acre property is owned by PacifiCorp, and is located in Emery County, Utah. This property serves as wildlife replacement for the Castle Valley winter water and anticipated Cottonwood salinity projects. The winter water project consisted of replacing the winter stock water function of the irrigation canal with a piped, pressurized winter stock water distribution system. This allowed utilization of the canal to be terminated during the non-agricultural season, thus eliminating all winter seepage loss. This, in turn, eliminated all winter saline return flows associated with the canal.

The Cottonwood Creek Restoration and Mitigation Project involved the protection and restoration of wetland and riparian habitat on land along Cottonwood Creek. The project was jointly designed and implemented by PacifiCorp, Reclamation, DWR, and the Emery Water Conservation District, and this cooperative group meets annually to review the overall status of the property and plan any needed management or maintenance activities. This property consists of natural wetland, riparian, and upland areas along the Cottonwood Creek floodplain which were enhanced by the addition of rock sills in the creek. Based on the success of this project, PacifiCorp is continuing to coordinate with Reclamation, DWR, and water users in the Price-San Rafael Salinity Control Project Area to explore prospective future habitat replacement projects.



Figure 5. The Cottonwood Property habitat replacement plan provided a combination of enhancement of natural riparian features, a man-made pond, and vegetation management to create a thriving wildlife habitat.



Figure 6. A Great Blue Heron using Cottonwood Creek within habitat property, May 2009

Partnership with Private Landowners to Dedicate Lands and Water to Wildlife Habitat

Exploring all possibilities to establish successful wildlife replacement for salinity control projects, one proposal approved by Reclamation involved a set of agreements between the irrigation district and private landowners whereby the landowners agreed to manage portions of their privately owned properties for the benefit of wildlife. The risk of landowners not fulfilling their agreed upon responsibilities for the life of the project was foreseen by the proposing irrigation company, and they signed agreements with 'backup' landowners who would be willing to participate in the future, should the need arise, to maintain the required acreage and habitat quality. In approving the Wellington Project habitat replacement plan, Reclamation observed its potential value of enhancing local appreciation for wildlife and wildlife habitat, and so far, this has proved to be the case. Landowners who had not previously paid particular attention to the flora and fauna on their farm began to take the time to observe the wildlife and gain some appreciation for the value of preserving habitat.

Wellington Properties: The properties managed for habitat replacement for the Wellington salinity control project are located in and around Wellington, Utah. Unlike all other habitat replacement activities overseen by Reclamation, which only served to fulfill requirements for 'off farm' salinity control improvements, these properties include sufficient acreage to also serve as habitat replacement for the 'on farm' portions of the Wellington salinity control project. The Wellington project replaced approximately 28.1 miles of canals with pipeline and used a combined on/off farm system (sprinklers) to improve irrigation efficiency. The project also involved the installation of a winter water delivery system for livestock.

The Wellington properties managed for wildlife total 199.4 acres. After initial design of the project was completed by DWR, the Wellington Canal Company (WCC) contracted with Price River Soil Conservation District (PRSCD) to plan and supervise the implementation of those wildlife enhancement acres. The goal was to achieve a surplus bank of wildlife enhancement acres up to and beyond the 50-year commitment. Monitoring of the properties thus far has shown that while there were isolated failures in terms of planting of specific vegetation, overall the properties are maintaining the necessary values and function to replace the wildlife values lost as a result of the salinity control project.



Figure 7. A portion of the Wellington Project habitat replacement plan located on private property.



Figure 8. View of habitat along Wellington Canal, maintained as part of the Wellington Project's habitat replacement plan.

As noted in the discussion of the Ferron Project, the dedication of water to a habitat replacement project must be consistent with existing irrigation company water rights or an approved change would need to be made to these water rights, or a new water right must be obtained and moved to the project. There are a variety of possible approaches, depending on the size of the property being managed for the benefit of wildlife. For example, small parcels on private land could benefit from the irrigation of a pasture which could occur under existing unmodified water rights. Where crops are irrigated, adjacent habitat has been observed to receive enough return water to not only survive, but thrive. Although return flows might have benefits to wildlife in some circumstances, the issue of salinity loading need to be carefully considered. Larger projects of several hundred acres would likely not be viable without dedicated water rights.

CONCLUSION

In over 15 years of overseeing salinity control projects, Reclamation's Provo Area Office has worked with the applicants and state and Federal wildlife officials to assure appropriate wildlife habitat replacement for each project. A variety of different strategies has been pursued, and while there have been isolated cases where habitat did not achieve and sustain predicted values, overall, all of the different strategies have shown at least 'average' success. On the whole, we conclude based on our experience to date that the most successful projects are those with large acreage, fulfilling requirements for more than one salinity control project, undertaken in partnership with another agency or entity that has an interest and the ability to assure long term viability of habitat values.

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