# The Chalk Creek Pressurized Sprinkler Irrigation Project: A Report of Effects

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## 1. Introduction

The scope of this report is to provide a brief analysis of the effects of the recently completed Chalk Creek Sprinkler Irrigation Project.

The Chalk Creek Sprinkler Irrigation Project has been an integral component of the Chalk Creek Water Quality Project. Its expected effect was to enhance water quality within the basin by eliminating irrigation return flows, reducing nutrient loading and reducing stream bank erosion along the main stem of lower Chalk Creek.

NRCS has been the lead agency from project implementation to completion. After a number of years of preliminary surveys, designs and securing construction easements, construction was initiated during the winter of 2001-02. The system involved the installation of 23 miles of pipe ranging in size from 36" to 1 1/2". The system was completed and began operation in May of 2002.

Benefits of the new system are numerous, however there are some negative aspects associated with the project that should be noted. Some were anticipated and others were not. Following is a description of some of the effects of the Chalk Creek Sprinkler Irrigation Project.

## 2. Effects to Agriculture

Throughout the completion of the project NRCS has been in contact with producers to determine the impact the new system has had on their operations.

After discussions with the irrigation company president and other producers in the area there were a number of common themes. These are presented below.

A. *Sprinkler irrigation has produced higher yields of production*. This is due to a number of factors. Sprinklers provide a more uniform/even distribution of water as opposed to flood irrigation. Slope/geography does not have such a negative impact. Because of the slope of these pastures, flood irrigation could not adequately distribute water; the water would simply run off before percolation could occur. Typically the top of the pastures would burn up by July because of the inability to keep water on them. Since the change to sprinkler irrigation the pastures have remained productive throughout the summer.

B. *Water turns were eliminated with the new system*. Under the old flood irrigation system there was down time waiting for water turns. Now with the new sprinkler system, as soon as the hay crop is out of the field watering can begin again; unlike past years where you may have to wait days for a water turn. Also there is no downtime for plant growth. Plants are actively growing all the time while sprinkling, unlike the flood system where plant growth, particularly grasses are retarded while the plants are submerged.

The new pressurized system has eliminated water turns and allowed producers to water at their convenience in addition to increasing overall production. This has eliminated the need for maintenance of ditches and head-gates associated with the old flood system.

This portion of the Chalk Creek ditch in the “narrows” illustrates one of the problems associated with the previous less efficient flood irrigation system. Here attempts were made to line the ditch with plastic in order to prevent water loss from seepage which resulted in significant water loss and ditch failure.

C. *Watering efficiency has increased providing numerous benefits*. The amount of water required to sprinkle irrigate the same amount of acreage that was once flood irrigated has been significantly reduced. Currently about 1000 acres of agricultural land are being irrigated with the system. All water that enters the pipe at the point of diversion is distributed and is not lost to percolation or evaporation from ditches. Water usage is down which in turn helps to maintain in stream flows. Chalk Creek Irrigation Company estimates that there has been a 40% savings annually in the amount of water used since converting from flood to sprinkle irrigation. The typical irrigation season in Chalk Creek under flood irrigation may have ended around mid July because of a lack of water and even earlier in drought years such as last year. In its first year of operation, one of the driest on record, the irrigation season was stretched through the entire summer. Numerous producers have commented that their crops would have burnt right up in 2002 under the old flood irrigation system.

D. *Private water held in storage was released throughout the summer from high mountain reservoirs*. This allowed shareholders of this private water to sell excess water to those who did not have shares of private water. This provided a double benefit by allowing private water shareholders to earn extra income from their excess water shares and at the same time provide water to non-shareholders whom otherwise would have been out of water. In addition the releases of private water helped maintain critical in stream flows above the diversion.

Above the diversion In-stream flows are significantly enhanced by privately owned water being released from a storage reservoir in the East Fork of Chalk Creek. View of new diversion structure across Chalk Creek in the narrows, 8/18/03.

E. *Reduction in the spread of noxious weeds*. Producers also mentioned that there has been a reduction in the spread of noxious weeds. With the old flood system the ditches acted as conveyors for weed seeds which could be carried throughout the lower valley by the flowing water in the ditches. Having the water enclosed in a pipe has reduced the infiltration and conveyance of noxious weed seeds.

F. *Increased cost for shareholders*. With the implementation of the project shareholders were faced with a significant cost increase. Assessments for water shares doubled from $20.00/share to $40.00/share to help pay for the system. In addition the cost of wheel-line or hand-line is a significant investment for producers, particularly those with smaller acreage amounts where the economic return is not great enough to pay for the investment in pipe.

G. *Over-watering is a potential problem*. A concern raised by the water master of the Chalk Creek Irrigation system and shared by others is that because there are no longer any water turns, and the convenience of sprinkler irrigation, some producers may now apply too much water onto their croplands. Producers now have unlimited access to their water and can water for as long as they want at anytime which could result in the over application of water. In addition, producers need to make sure that the recommended nozzle size is used for their crop type and soil. Many producers purchased used pipe and some have not checked or opted to purchase the correct nozzles.

**3. Effects to local government**

A. *Conversion from flood to sprinkler irrigation dramatically reduced sewage infiltration*. In past years the Coalville City sewage treatment plant has consistently observed large increases in the volume of water entering the plant that coincided with the onset of irrigation season beginning in May of each year. Prior to the implementation of the Chalk Creek Sprinkler Irrigation Project the treatment plant was processing between 450,000-500,000 gallons of sewage/day during the irrigation season. This was due to irrigation water leaking into an antiquated sewage collection system. Beginning in May of 2002 with the irrigation project online the volume of water entering the plant dropped to 200,000-225,000 gallons of sewage/day, a 50% reduction in the amount of water entering the plant from prior years. It should be noted that Coalville City also replaced much of the old sewage collection system to reduce infiltration at approximately the same time they were installing their secondary system. Dennis Gunn, Coalville City sewage treatment plant operator attributes the 50% reduction in inflow equally to both the new irrigation system and new collection system.

The Coalville City Sewage treatment facility has benefited from dramatic reductions in irrigation infiltration, resulting in less cost and no longer overwhelming the system.

B. *Secondary water is available to Coalville City residents*. Coalville City had expressed interest in the Chalk Creek Sprinkler Irrigation Project from its outset because of its limited sources of water. Prior to the completion of the project many city residents have only had culinary water to water lawns and gardens. In drought years the city has had to place water restrictions on residents because of a shortage of drinking water. With completion of the project secondary water is now available to residents and it has reduced the demand on Coalville's culinary system.

Coalville City's new secondary water storage reservoir (left) provides additional storage capacity for the city's secondary water needs.

C. *The New system resulted in an increase in Coalville City resident's water fees*. In order to pay for the new system Coalville residents base water bill went from $10.00/month in January 2001 to $28.00/month in Feb. 2001. This fee is assessed all Coalville City residents. There is a one-time hookup fee of $500.00 charged to all that want to hook up to the secondary system. This fee provides a 1" connection for the property owner.

**4. Effects to the environment**

A. *Sprinkler irrigation has eliminated return flows to Chalk Creek*. Eliminating return flows to Chalk Creek was one of the primary water quality improvement objectives. Because water is now being applied through a sprinkler system, tail-water no longer flows into the stream from surrounding croplands. Prior to the system a great deal of return flows entered the stream carrying sediment and nutrients washed from croplands and pastures back into Chalk Creek. This had obvious detrimental effects to water quality. In addition return flows saturated unstable stream banks causing further degradation and bank erosion.

B. *Critically low in-stream flows during drought years*. One aspect of the project that was not anticipated was the effect drought would have on in-stream flows from the diversion point downstream to Coalville. Chalk Creek has historically maintained viable in-stream flows throughout the summer, even in critically dry years. Historically in-stream flows were maintained by return flows from irrigation tail water or water that subbed back up along the stream course from deep percolation and springs.

Water is now applied by sprinkler and encased in pipe; return flows are now eliminated below the diversion. For a period of about two weeks during the summer of 2002 stream levels dropped to critically low levels in early July. Almost all water was diverted at the diversion to meet water demands. This left approximately 5 miles of the stream from the diversion to Coalville essentially dry except for isolated pools. This occurred at a critical time of year when fish are stressed due to warm water conditions and decreased levels of dissolved oxygen. Once water stored in an upstream reservoir was released by mid July, in-stream flows below the diversion returned to levels that would support fish. It should be noted that this problem of de-watering the stream below the diversion would not occur in average years of precipitation because there would typically be excess water to move downstream past the diversion. During drought years there may be a critical window in July where demand for irrigation water may use all water supplied by Chalk Creek. This could result in the lower portions of Chalk Creek being de-watered until storage water is released.

During the months of July and early August flows in the stream can reach levels where most of the water coming down Chalk Creek is diverted for irrigation at the diversion shown above. Photos taken 8/18/03.

Below the diversion Chalk Creek is reduced significantly and may present stress problems for fish during drought years because of the elimination of return flows.

C. *Loss of riparian vegetation species from ditch-banks*. Irrigation ditches in lower Chalk Creek have been established for decades. Riparian vegetation such as large Cottonwoods, Hawthorns and other trees and shrubs have established significant distribution along the irrigation ditches. The tree-lined ditches provide significant wildlife habitat. The ditches have either been abandoned or filled in or no longer carry water. Because of the loss of water it is expected that there will be a significant decline in riparian vegetation along the ditches and a reduction in tree and shrub cover along the margins of these ditches.

Because irrigation water is no longer flowing in the ditches, it is expected their will be a significant decline and loss of trees and shrubs which have established themselves along irrigation ditches over the decades.

**Conclusion**

The Chalk Creek Pressurized Sprinkler Irrigation Project is producing the desired result of improving water quality in lower Chalk Creek. Additional benefits of the system to agriculture and Coalville City have proven invaluable as prolonged drought continues to grip the area. Drought has also manifest unanticipated environmental effects on the stream below the diversion. However, at this point in time the outlook for improving water quality in Chalk Creek looks better that it did a decade ago, in part due to this project.