A Review of the Likely Agricultural Impacts from the Northern Integrated Supply Project

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Introduction

The NISP participants have attempted to paint the NISP project as friendly to agriculture, when the opposite is true.

The four-county region where the project's participants reside contains some of the most valuable irrigated agricultural lands in North America[1]. Yet, the project's participants have already dried up at least 35,000 acres of farmland for their water supply, and they intend to dry up at least 40,000 acres more for future growth, while maintaining one of the highest per capita water use levels in the Front Range[2] [3]. Their existing land use plans call for sprawling exurban expansion across the agricultural landscape in low density development of between 1 and 4 persons per acre of land (Appendix A).

The NISP participants do not appear to have taken serious steps to reduce their per capita water use, conserve existing supplies, maximize water use efficiency, or protect agricultural lands. Contrary to the practice of most other water providers in the region, no conservation and efficiency measures are planned in the NISP water us projections, meaning that the already high water consumption rates would remain high for the foreseeable future.

In light of this, it is difficult to conclude that the participants are serious about reducing their impact on irrigated agriculture.

After reviewing the logic used in the DEIS[4] analysis of the farmland losses associated with the four alternatives, we find the methods used to be fundamentally flawed, with inaccurate factors applied for water delivery and on-farm efficiency, based on unfounded or questionable assumptions. The estimates of farmland lost do not include acres inundated by the proposed reservoirs or the non-irrigated farmland or rangeland taken out of production because of the action alternatives. It does not address the ag land taken out of production in order to develop land and sell tap fees to pay down the debt load required for this project.

We offer the following alternative analysis of the impacts to agriculture associated with NISP as well as the past and present land and water use policies of the NISP participants, including the impacts their

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[1] American Farmland Trust. 2000. *Farming on the Edge.* http://www.farmland.org/resources/fote/default.asp, viewed 9/1/2008.
[2] NISP DEIS.
[3] Western Resource Advocates. 2008. NISP Conservation and Efficiency Analysis. 2260 Baseline Road Suite 200, Boulder, CO 80302.
[4] U.S. Army Corps of Engineers. 2008. *Northern Integrated Supply Project, Applicant: Northern Colorado Water Conservancy District, Draft Environmental Impact Statement.* U.S. Army Corps of Engineers, Omaha District, 9307 South Wadsworth Blvd., Littleton, CO 80128-6901.

exurban expansion will have on agriculture under current land and water use policies. We organized the analysis of Ag Land impacts by the project participants into the following areas:

- Past and Present Ag Water Acquisitions by NISP Subscribers
- Proposed Exurban Expansion by NISP Subscribers
- Ag Land Impacts Associated with Alternative 1 (No Action Alternative)
- Ag Land Impacts Associated with Alternatives 2-4 (Action Alternatives)
    - *Farmland Losses from the Downstream Uses of the Grey Mountain Right*
    - *Ag Land Lost Due to Inundation by Reservoirs*
    - *Ag Land Impacted by Saline SPWCP water*
    - *Ag Land Developed to Finance NISP*
- Ag Land Impacts Associated with the Citizen's Alternative

Factors Used in all Sections of This Document

Refer to Appendix A for a detailed analysis of consumptive use for crops in the affected region, and the population density of the region.

An area-weighted mean of 17.3 inches (1.44 feet) per acre per year is used as the consumptive use for irrigation water applied to crops in the region[5,6,7].

A population density of 3.47 people per acre and a housing density of 2.73 people per household in the NISP participant's communities was calculated from the 2002 U.S. Population Census[8].

The NISP participants' region consists of roughly 63-67% irrigated farmland[5,6].

Impacts Common to All Alternatives: Land Lost to Exurban Expansion

In our Healthy Rivers Alternative[9] we estimated the NISP participants will reach a population of more than 440,000 residents by 2050. If their land use policies remain relatively constant and their population density remains at 3.47, they would occupy a land base of more than 127,000 acres. This is 76,000 acres more than their current land base. About 63% of the land in the NISP participants area is irrigated farmland, which is about 48,000 acres. If irrigation water is applied at 1.44 AF/acre, then about 69,000 AF of water formerly used for irrigation would become available through the development of this land.

In summary, the exurban development plans of the NISP participants would lead to the dry-up of about 48,000 acres of irrigated farmland. This amount of land is common to all of the alternatives, unless the NISP participants enact land use policies that raise population densities or protect irrigated farmland.

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[5] U.S. Department of Agriculture 2002 Census of Agriculture. http://www.agcensus.usda.gov/, viewed 9/1/2008.
[6] U.S. Department of Agriculture, National Agricultural Statistics Service. http://www.nass.usda.gov/, viewed 9/1/2008.
[7] Broner, I. and J. Schneekloth. 2003. *Seasonal Water Needs and Opportunities for Limited Irrigation for Colorado Crops.* Extension Bulletin 4.718, Colorado State University Extension Service, Fort Collins, Colorado.
[8] U.S. Census Bureau. http://www.census.gov/, viewed 9/1/2008.
[9] Save The Poudre Coaltion. 2008. *Healthy Rivers, Healthy Communities: A balanced proposal for the Cache la Poudre River in Colorado*. PO Box 22, Fort Collins, CO 80522. www.SaveThePoudre.org.

Land Use Changes

As urban areas grow, agricultural land is converted to urban or suburban development. Presumably, this land also has water rights attached to it. Based on a cursory reading of the Draft EIS, the Corp did not integrate these water rights transfers into future water demand projections.

Using Northern WCD's Draft Regional Water Demand Study, completed in 2000 as part of the South Platte Water Conservation Project (SPWCP), I estimate of the potential water available through these land use changes. The SPWCP demand study, which is integrated into the NISP action alternatives, estimates future water demands for cities and water agencies in Northern's service area, using existing land use plans. The land use plans for the cities vary – some project land use changes over a 10-year horizon, others, over a 30-year horizon; Northern did not develop a standardized time frame in its analysis.

Over the (10 to 30 year) time horizon, Northern projects that over 289,000 acres of agricultural land will be converted to urban or suburban land uses. The new urban developments are projected to have a total water demand of almost 265,000 AF/yr, based on zoning, types of development, and water use rates. The total water associated with these land conversions depends on consumptive use rates in agriculture; however, if each irrigated acre has a consumptive right to 1.44 AF, and irrigated farmland comprises about 63% of the land being developed, all future urban water demands would be met. Furthermore, the future urban and suburban water use rates in the SPWCP analysis are high estimates that reflect *today's* water use rates, not those after decades of conservation and efficiency measures are implemented.

In sum, the No Action alternative in the draft EIS should include the likely water use transfers resulting from ag to urban land use transfers.

Rotational Fallowing Programs

The NISP Draft EIS does not assess the potential for agricultural water leases to meet future demands. As opposed to "buy and dry" schemes, a rotational fallowing program may represent a source of water supplies in the Citizen's Alternative that does not have a net negative impact on rural, agricultural communities. The Super Ditch program in the Arkansas River basin – which has not yet been implemented –provides a reasonable model for estimating the potential for fallowing arrangements. The Super Ditch [not actually a ditch] is a *preliminary* cooperative agreement between several irrigation ditches in the lower Arkansas River basin. It is modeled after the Palo Verde rotational fallowing agreement in Southern California, under which farmers agree to fallow a portion of their land every year and lease their water to the municipal agency. In return, the farmers receive annual lease payments.

Under the Super Ditch scheme, participation by irrigators is voluntary; the Super Ditch analysis estimates a 65% participation rate, with participating farmers fallowing 25% of their land in any given year. The NISP Draft EIS estimates that 629,000 acres of agricultural land[10] is in "the region" – following the Super Ditch assumptions, approximately 102,000 acres would be fallowed in every year. The water available from a rotational fallowing agreement would depend on farmers' consumptive water rights and seniority. The projected, unmet firm demands for NISP participants, however, is 65,000 AF/yr in 2050 – if agricultural land has consumptive rights to 1.44 AF/acre, rotational fallowing would provide more than enough water to meet growing municipal demands.

Clearly, these assumptions are both broad and cursory – in all likelihood, only a portion of the 629,000 acres of agricultural land could practically be enrolled in a rotational fallowing agreement; we could

[10] These numbers are comparable with those in the SPWCP and the Metropolitan Water Supply Investigation study (1999).

refine this estimate by identifying target irrigation ditches. Furthermore, a rotational fallowing agreement may have physical challenges, including the location of water rights and need for storage; and institutional challenges, such as transaction costs and establishing an organizing/collective bargaining agency for the irrigation ditches. Both municipalities and agricultural communities benefit, however – municipalities are able to obtain water rights as their demand grows, and agricultural communities receive a dependable annual income (the Super Ditch analysis suggests that under rotational fallowing, the ag communities accrue net economic benefits).

The cost of a rotational fallowing program may be an additional benefit. Costs vary, depending on the quality of the transferred water (more saline water incurs higher treatment costs), location of the transferred water (if pipes and pumps are needed, the water becomes more expensive), and the term of the contract with the irrigation ditch company. In the Arkansas Basin, the estimated cost to lease an AF ranges from $435 to $595 (depending on the seniority of the water right). Projected treatment and conveyance costs range from $215 to $1,200 per AF. If costs in the South Platte basin are comparable, the total cost of providing 40,000 AF (the NISP firm yield) would range from $32,400,000 to $71,800,000. This is an *annual* cost estimate and does not include transaction costs or the cost of additional infrastructure/conveyance facilities.

Ag Land Impacts Associated with Alternative 1 (No Action Alternative)

The impacts of alternative 1 on irrigated land were analyzed in Appendix V, Northern Integrated Supply Project Memorandum titled "No Action Alternative Land Dry-Up Estimate (Revised)", dated November 29, 2007.

The NISP DEIS references the results of that analysis in many places (ES-5, ES-7, ES-11, ES-17, ES-18, 3-3, 4-13, 4-15, 4-17, 4-18, 4-45, 4-46, 4-47, 4-50, 4-57, 4-66, 4-84, 4-88, 4-123, 4-126, 4-140, 4-150 and 4-151). In twenty-one of these pages it cites the value as "69,200 acres" or "up to 69,200 acres", whereas in only two places it correctly cites the figures reported by the revised technical analysis done for the DEIS, showing it as "33,637 to 69,200 acres". The source of the 69,200 acre estimate is the original estimate done by HDR early in the process NEPA process. The 33,637 acre estimate comes from a revised estimate requested by the NCWCD and the U.S. Army Corps of Engineers, titled "No Action Alternative Land Dry-Up Estimate (Revised)", dated November 29, 2007.

The NISP DEIS offers no argument as to why the upper bound of 69,200 acres is more appropriate for analyzing Alternative 1. No uncertainty analysis is provided to help explain the accuracy of either figure. One cannot simply take the upper bound in any analysis of this type, and present it as the most likely scenario. In fact, it represents one of the two least likely scenarios (the other being the lower bound), assuming that the upper and lower bound conclusions were arrived at using a sound method and good logic. The use of this figure mirrors the nearly unrelenting bias in the document to claim the worst-case scenario as the most likely result from the no action alternative. It presents a skewed estimate on a complicated subject to a public that generally is not prepared to judge the accuracy of such a figure, and does not provide a balanced representation of the issue to the relevant decision-makers.

There are a number of major problems with the analysis in Appendix V, as follows:

1) The headgate diversion estimate of 1 AF per acre of irrigated land in the original (unrevised estimate) is far less than the actual amount typically used in the Northern Front Range. From Appendix A, regional consumptive use average for crops is 17.3 inches. System efficiency is typically 49% in the Poudre and South Platte basin (citation). Applying that efficiency level to 17.3 inches of consumptive

use means that an average of 2.94 feet of system water per acre of irrigated crops must be diverted at the headgate.

2) Per the analysis in Appendix A, the consumptive use for crops in the region is 1.44 AF per acre, not the 1 AF per acre referenced in the DEIS analysis.

3) System efficiency estimates in this document are far too high. (citation) describes combined system efficiency rates in the Poudre and South Platte Basin as 49%.

4) The HDR analysis uses a 0.5 acre foot per C-BT unit estimate when calculating the water available for irrigation. This artificially inflates the estimates of agricultural land loss for the C-BT portion of the analysis. Irrigators do not plant crops based on the firm yield of their supply – they plant crops based on the projected water available to them for a given year, including owned, rented, and prospects for "free river" water[11]. The historic yield of C-BT units has been 0.7 AF per C-BT unit, and whereas utility planners may use the 0.5 AF/unit estimate as a basis for planning and drought protection, the nature of the water economy of the region is that a portion of the irrigated land base comes in and out of irrigated agriculture every year in proportion to predicted water deliveries. When a municipality buys a unit of C-BT water, on average 0.7 AF of water per C-BT unit is taken away from agricultural uses, and about 0.49 acres of irrigated land that would have been irrigated with that water either goes out of production or must be irrigated with other water sources.
We believe that when the above factors are taken into account, the estimate of 33,627 – 44,836 acre estimate in the DEIS for alternative 1 impacts on agricultural lands should be revised downward to 23,059 acres as shown in Table 1.

Table 1. Revised irrigated cropland loss estimates associated with the no-action alternative in the NISP DEIS.

Headgate diversions = 2.94 AF per acre	
Land dry-up due to non C-BT agricultural water rights transfers	19,863
Land dry-up due to acquisition of C-BT units	7,638
TOTAL	27,501

This figure is one-third of the grossly overstated estimate used in the DEIS, and it has significant consequences for conclusions drawn on the environmental effects of Alternative 1. This alternative analysis must be considered in the selection of the least environmental damaging alternative required by 404(b)(1) guidelines.

Ag Land Impacts Associated with Alternatives 2-4 (Action Alternatives)

In this section we evaluate the likely extent of farmland loss from the direct and indirect impacts of the NISP project if it is built at current Front Range densities.

The NISP DEIS proposes to provide 40,000 AF of firm yield to the subscribers. In order to provide this water, approximately 43,000 AF of water would be diverted on average from the Cache la Poudre River. Approximately 20,000 AF of that water would come from the Grey Mountain Right for which NCWCD is decreed a conditional right. The remainder (approx 23,000 AF) would come from water used for agricultural irrigation from the Larimer & Weld and the New Cache canals.

[11] National Agricultural Statistics Service records for Weld County for 1997 to 2002 show a total drop in irrigated land of 26% in response to the drought and diminished available water supplies, with variation around the mean number of acres planted in this period of 10.6%.

Ag Land Lost Due to Inundation by Proposed Reservoirs

The DEIS did not address agricultural land losses from inundation. A balanced analysis of the impacts of the project on agricultural production should include these impacts. The footprint that the three proposed reservoirs (Glade or Cactus Hill, and Galeton) would inundate is currently used for crop production and livestock grazing[12]. Table 2 shows the figures described in the DEIS. Note that inundation of the Glade Reservoir site would cause the loss of at least 200 acres of irrigated cropland.

Table 2. Agricultural land losses due to inundation.

Alternative	Agricultural land losses (acres)
1	none
2	3,942
3	6,237
4.1	3,321 – 3,355
4.2	5,650

Ag Land Impacted by Saline SPWCP water

The Ag water transfers proposed for NISP consist of approximately 23,000 AF of water from the Larimer & Weld and the New Cache canals.

Using the same method as in the previous sections, we find that at least 16,140 acres of farmland would have to be irrigated with SPWCP water associated with alternatives 2 and 3, and roughly half that amount associated with alternative 4. This figure was calculated as follows:

23,000 AF ÷ 1.44 AF per acre = 15,972 acres

The NISP DEIS proposes mixing the highly saline SPWCP water in a 50/50 mix with clean Poudre River water before irrigating fields with the mixture. The DEIS does not provide the basis for this assumption, nor does it analyze the potential mixing ratios over the growing season, nor does it analyze the impacts that the additional agricultural water transfers from these ditches proposed by the NISP subscribers. In a meeting with NCWCD in April 2006, representatives of NCWCD described plans to execute at least two additional ag water trades that would exchange Poudre River headwaters water for SPWCP water. This would increase salt concentrations in SPWCP water and lead over time to a greater proportion of saline SPWCP water in the service region. Additionally, salt concentrations in the South Platte will increase as population increases upstream and the city of Aurora completes its Prairie Waters project.

A study of the SPWCP from 1999[13] showed that water salt concentrations would affect salt sensitive crops such as corn, alfalfa, sugar beets, and vegetables. These crops are grown on more than 70% of the irrigated acres in the SPWCP region (USDA NASS 2008). The salinity of the water would require water application rates up to 60% higher than normal in order to maintain crop yields. If the use of this highly saline water is not managed carefully, it could lead to the permanent salinization of 20% of the soils in the SPWCP service area, or 3,228 acres of irrigated farmland. If we assume that in the short

[12] Nichole Seltzer - NCWCD, personal communication 2006, and NISP DEIS.

[13] Gates, Timothey. 1999 [draft]. *Assessment of Water Quality for Irrigation Under the South Platte Water Conservation Project*. Under contracted project "Development of Recommended Water Quality Criteria for The South Platte Water Management Project", Submitted to Northern Colorado Water Conservancy District.

term, mixing mitigates about half of this impact, then about 1,600 acres of irrigated land would need to be retired because of salt buildup in soils.

If the SPWCP water is not very carefully managed (which the NISP DEIS does not state that it would do), using it would require applying up to 60% more water to crops in order to maintain existing yields. If we take the midpoint of this figure (30%), and assume that half of crops being irrigated are salt sensitive, the water transfer proposed by NISP would irrigate about 2,400 acres less land (30% of 15,972 ÷ 2) than is currently irrigated with Poudre River water.

In addition to the yield losses estimated by this study, the DEIS makes no mention of the fact that removing 43,000 AF of relatively pure Poudre River water from the South Platte River will further increase the salinity of the Platte with the same consequences, i.e., either yields must go down or water application rates increase. Another study[14] has shown conclusively that salinity in the lower South Platte River and its surrounding alluvial aquifer is already at a point where it is detrimental to both irrigation and drinking-water supplies.

We conclude that the DEIS analysis of the impact of saline SPWCP water on crop production is incomplete. It should address this issue by evaluating the impact of saline water on crop production, based on projected mixing ratios and water distribution models. We do not accept the assumption that the SPWCP water will be simply mixed with Poudre River water in a 50/50 ratio and distributed as such – the project participants must prove no salinity impacts on crop production and salt buildup in soils.

Additionally, the participants must model the impact that removing the Grey Mountain Right from the Poudre River would have on salinity of the South Platte River, and resulting consequences for potable and irrigation water supplies.

Farmland Losses from the Downstream Uses of the Grey Mountain Right

As an unappropriated water right, the Grey Mountain Right is subject to diversion by downstream users under the rules defined for "free river" water. On average, the Grey Mountain Right consists of approximately 20,000 AF of unappropriated water per year[15]. In years when the Grey Mountain Right is available, a small portion of the right might be diverted for agricultural purposes from the Poudre River above the confluence, and the remainder is likely diverted for agricultural purposes from the South Platte downstream of the Poudre River confluence, in Colorado and Nebraska.

Using the same method as in previous sections we find that approximately 13,889 acres of farmland will be permanently dried up from the action alternatives 2-4 in NISP.

20,000 AF ÷ 1.44 AF per acre = 13,889 acres

[14] Dennehy, K.F., Litke, D.W.,Tate, C.M., Qi, S.L., McMahon, P.B., Bruce, B.W., Kimbrough, R.A., and Heiny, J.S.. 1998. *Water quality in the South Platte River Basin, Colorado, Nebraska, and Wyoming*: U.S. Geological Survey Circular 1167, 38 p., http://pubs.usgs.gov/circ/circ1167/circ1167.pdf.

[15] Scott, J. and C. Paulson. 2003. *NISP Technical Memorandum No. 3: Review of Water Resources Information.*

Conclusions

It is simply a myth that the NISP project would help agriculture. The complexity of water use and water law in Colorado, and the high degree of demand in all sectors means that the Grey Mountain Right and virtually all other water sources in the state are already currently in use at some point by somebody.

The proponents of the NISP project are simply squeezing the water supply balloon — they claim NISP reduces pressure on Ag water supplies in the Poudre River basin, but in reality it increases pressure on irrigators drawing water from the South Platte River. And it places even greater pressure on South Platte Basin irrigators drawing from wells, who rely increasingly on the Grey Mountain Right and existing flows in the Poudre for their well augmentation.

We find that the area of agricultural land impacted by the NISP DEIS action alternatives compared with the no action alternatives is roughly the same.

Of the three, the Healthy Rivers Alternative 2 offers the greatest potential to reduce the impact on agriculture. Adopting comprehensive conservation and efficiency measures and implementing rotating fallow agreements with farmers reduces demand for agricultural water transfers, while providing a reliable income stream to irrigators. Adopting modest conservation measures to reduce water demand by 20% in 2050 would require 8,500 AF less water for the NISP participants. Increasing the proportion of their supply from rotating fallow agreements by 50% would require 12,000 AF less from agricultural water transfers.

Table 3. Summary of agricultural lands impacted by NISP compared with the Healthy Rivers Alternative 2.

Irrigated Agriculture	Irrigated Acreage Lost	Dryland Acreage Lost	Total Ag Acres Impacted
NISP DEIS No Action Alternative			
Ag Water Transfers	20,938	-	20,938
C-BT Transfers	6,563	-	6,563
total	**27,501**	-	**27,501**
Alternative 2-4 (Action Alternatives)			
Grey Mountain Right Diversion	13,889	-	13,889
Soil Salinity Impacts	1,600	-	1,600
Saline Irrigation Water Impacts	2,400	-	2,400
Reservoir Development	200	3,121 -6,037	3,321 – 6,037
total	**18,089**	3,121 -6,037	**21,210 – 24,126**
Healthy Rivers Alternative, Option 2[16]			
Ag Water Transfers	10,972	-	10,972

[16] From Save The Poudre Coalition's analysis of the impacts of NISP on Agriculture, at 1.44 AF/acre, 15,800 AF of water would irrigate about 10,972 acres of land in the Poudre River basin.

C-BT Transfers	5,000	-	5,000
Rotating Fallow Agreements	-	-	-
total	**15,972**	-	**15,972**

Appendix A

From Table 4, the consumptive use of water on irrigated land in the affected area is 17.3 inches (1.44 AF feet) per acre, derived from the cropland acreages in the four-county region from which agricultural water rights were bought for their existing water use portfolio.[7, 17, 18, 19]

Table 4. Acres of irrigated cropland by county, with area-weighted mean crop requirements for the region.

Crop	Boulder	Larimer	Morgan	Weld	total	Irrigation Water Consumptive Use (inches)	crop area as % of total area
Corn for Grain	2,492	6,784	64,626	71,778	145,680	15.0	29.1%
Corn for Silage	1,045	5,822	11,507	50,947	69,321	14.4	13.8%
Wheat for Grain	759	1,422	9,718	11,049	22,948	9.1	4.6%
Barley for Grain	1,820	3,262	520	13,290	18,892	4.4	3.8%
Sunflower Seeds				2,173	2,173	4.4	0.4%
Dry Beans	147	1,489	2,754	19,581	23,971	11.1	4.8%
Potatoes				965	965	20.8	0.2%
Sugar Beets	1,256	2,796	2,753	16,759	23,564	22.0	4.7%
Forage	16,912	25,451	32,227	101,403	175,993	23.8	35.1%
Vegetables	636	3,500	1,272	12,219	17,627	10.3	3.5%
total/mean	**25,067**	**50,526**	**125,377**	**300,164**	**501,134**	**17.3**	**100%**

We analyzed the farmland loss required for this new development in order to estimate the direct agricultural land losses from construction required to finance the project. To do this, we consulted the Colorado State Demographer's office to determine the population densities using U.S. Census Bureau data, for the communities shown in Table 5.

Table 5. Population, area, and population density from several communities in Northern Colorado.

Community	Population	area (square miles)	Density (people/acre)
Fort Collins	118,652	47.1	3.94
Loveland	50,608	25.5	3.10
Greeley	76,930	30	4.01
Longmont	71,093	21.8	5.10
Windsor	9,896	15	1.03
Erie	17,000	15	1.77
Lafayette	23,197	8.9	4.07
Fort Morgan	11,034	4.5	3.83
Fort Lupton	4,787	4	1.87
Eaton	2,690	1.9	2.21
totals/means	**385,887**	**173.7**	**3.47**

Mean population-weighted density for the NISP participant's region is 3.47 people per acre.

[17] USDA Census of Agriculture. 2008. http://www.agcensus.usda.gov. Accessed July 27, 2008.
[18] USDA National Agricultural Statistics Service. http://www.nass.usda.gov. Accessed July 27, 2008.
[19] Rachel Barta, Israel Broner, Joel Schneekloth and Reagan Waskom. Spring, 2004. *Colorado High Plains Irrigation Practices Guide: Water Saving Options for Irrigators in Eastern Colorado*. Colorado Water Resources Research Institute.