AGRICULTURAL ADVISORY BOARD
Special Meeting Minutes
June 27, 2011

Members present: David Bee, Justin Discoe, Dennis Goeltl, LuAnn Goodyear, Lew Grant, Jason Kraft, Val Manning, Minerva Lee, Brett Markham, Gail Meisner, George Reed, Richard Seaworth, Jon Slutsky, and George Wallace. Others present: Karen Crumbaker (Extension), Commissioner Lew Gaiter (County Commissioner liaison, and Linda Hoffmann (Staff liaison, Larimer County Planning & Building Division).
Member absent: Curtis Bridges

I. Val Manning, Chair called the meeting to order at 8:05 a.m.

II. The speakers for the meeting were not asked to arrive until 8:15. Linda Hoffmann distributed information about the Mountain View Feeders project which was scheduled to be considered by the Board of County Commissioners at 6:30 p.m. on Monday, June 27, 2011. A copy of the materials provided are attached as Attachment A.

III. Mark Easter from Save The Poudre presented information about the Facts About Farming white paper prepared regarding the proposed Northern Irrigation Supply Project (NISP). Members of the AAB posed questions during the presentation which were addressed by Mr. Easter. A copy of the PowerPoint slides used in the presentation are attached as Attachment B.

IV. Eric Wilkinson, Carl Brouwer and Brian Werner from Northern Colorado Water Conservation District presented information about the NISP project. A packet of information was provided to the AAB to aid the discussion. A copy of that packet is attached as Attachment C.

V. Following the guest presentations, Linda Hoffmann took notes on the AAB's comments about the information presented. The notes will be used by a sub-committee to begin to draft an opinion from the AAB regarding the Save the Poudre's Facts about Farming paper as requested by the Board of County Commissioners. The notes are attached as Attachment D. The AAB members who volunteered to serve as a sub-committee to draft the opinion are George Reed (chair), Richard Seaworth, Minerva Lee, Lew Grant, Justin Discoe, and David Bee. The sub-committee will bring a draft opinion paper to the next AAB meeting for consideration by the Board.

VI. Following a short break, the AAB discussed the possible Land Use code violation by the Mountain View Feeders for expanding a legal, non-conforming use without securing County approvals. Richard Seaworth moved, and David Bee seconded a motion to present a letter to the County Commissioners from the Ag Advisory Board in support of the Mountain View Feedyard. The motion passed unanimously. Discussion continued regarding the content of the letter. A motion was made by David Bee and seconded by Gail Meisner to submit the letter drafted by George Wallace. The motion passed unanimously. A copy of the letter is attached as Attachment E.

VII. The next AAB meeting will be held on July 13, 2011 at 12:30 p.m. at the CSU Larimer County Extension office.

VIII. The meeting was adjourned at 12:55 p.m.

Attachment A

- November 29, 1973 Feed Yards were added to the Open Zoning district as a use that required Special Review approval. They were called Commercial Feed Yards and defined as: A confined enclosure for the feeding and fattening of livestock where the average number of livestock exceeds 10 animals per acre of feed yard and where less than 50% of the roughage type feed is raised on the same farm premises.
- 1974 aerial identifies the feed yard at 5200 North County Road 19 in existence.
- 1981 aerial photo taken.
- September 23, 1985 the property was rezoned to Rural Estate. Feed yards were still listed as needing Special Review approval.
- January 9, 1986 a letter from Gerald L. White, Zoning Administrator for Larimer County, stated the feed yard was in existence prior to November 29, 1973 and is considered a nonconforming use. It stated in order to expand the capacity of the feed yard, the owner would need county approval.
- 1987 aerial photo taken.
- 2000 aerial photo taken showing additional confined enclosures added to the southern part of the feed yard operation.
- There are 2 parcels in its current configuration at a total of 28.75 acres

or boards his/her horse at the equestrian operation, his/her visits for lessons do not constitute an equestrian trainee visit.

Equestrian pasture boarding. Leasing or use of pasture for a fee and/or for an exchange of goods or services for the purposes of horse grazing, recreation, and turn-out where the same pasture area is made available to two or more horse owners.

Existing traffic-generating development. The most intense use of land within the 12 months prior to the time of commencement of traffic-generating development.

Expansion of a road. Any widening, intersection improvement, signalization or other capital improvement designed to increase an existing road's capacity to carry vehicles.

Facility, CMRS. The equipment, physical plant and portion of the property and/or building used to provide CMRS services. This includes but is not limited to cables and wires; conduits; pedestals; antennas; towers; concealed structures; electronic devices; equipment buildings and cabinets; landscaping; fencing and screening; and parking areas.

Facility, CMRS temporary. A CMRS facility designed for use while a permanent CMRS facility or network is being designed or built, or for a special event where many people attending are CMRS users.

Family. An individual or group of people living together who are related by blood, marriage or adoption.

Farm. Any parcel of land containing at least three acres used primarily for the commercial, soil-dependent cultivation of an agricultural crop, the facilities and storage necessary for the management of a commercial custom farming operation or the hauling of farm products, the raising of fish, bees, plants or animals or the raising of livestock, including horse breeding farms. This does not include feed yards, poultry farms, exotic animal farms or fur farms.

Farmstead. That portion of a farm, dairy, poultry farm, stable or exotic animal farm designated for accessory dwellings and other buildings necessary to the operation.

Fee administrator. The person designated by the county to be the primary person responsible for the administration of the collection of impact fees.

Fee payer. A person commencing traffic-generating development who is obligated to pay a transportation capital expansion fee in accordance with the terms of this code.

Feed yard. A confined enclosure for the feeding and fattening of livestock where the average number of animals exceeds ten animals per acre of feed yard and where less than 50 percent of the roughage type feed is raised on the same farm premises.

Feline hobby breeder facility. Any facility that produces or transfers no more than 18 cats per year or breeds no more than three litters per year.

500-year floodplain of the Cache La Poudre River. The geographical area of the Cache La Poudre River that has a 0.2 percent chance of flooding in a given year.

Flea market. A facility where stalls or sales areas are set aside and rented or otherwise provided and intended for use by various individuals to sell articles that are homemade, homegrown, handcrafted, old, obsolete or antique. It may also include the selling of goods at retail by businesses or individuals who are generally engaged in retail trade.

Flood or *flooding.* A general and temporary condition of partial or complete inundation of normally-dry land areas from:

1. The overflow of inland or tidal waters; and/or
2. The unusual and rapid accumulation of runoff or surface waters from any source.

Flood hazard area. The area delineated as Zone A, Zone AH, Zone AO and Zones A1 through A30 in those detailed studies which do not have a regulatory floodway defined. Also including area

6. Limitation on the duration of the use; and

7. Limitations on the hours of operation.

C. The county commissioners may require, as a condition of approval, that the applicant sign a development agreement (see section 12.6 (post-approval requirements) to ensure completion of any public improvements related to the approved special exception.
(Res. No. 07192005R010, Exh. A, 7-19-2005)

4.7.5. Minor deviations.

Technical, engineering or other considerations during construction or operation may necessitate minor deviations from the approved plans. The planning director may approve minor deviations if they comply with this code and are consistent with the intent of the original special exception approval. The planning director's approval must be in writing. The decision of the planning director can be appealed to the county commissioners.
(Res. No. 07192005R010, Exh. A, 7-19-2005)

4.7.6. Amendments.

Changes to approved special exception plans that the planning director determines are not minor deviations require approval through the special exception process. This requires a new application and receives full review under the process described below.
(Res. No. 07192005R010, Exh. A, 7-19-2005)

4.7.7. Process.

All applications for special exception require a pre-application conference, sketch plan review, a neighborhood meeting, planning commission review and county commissioner review. Each of these processes is described in section 12.2 (development review procedures). All county commissioner decisions concerning special exceptions must be recorded with the county clerk and recorder.
(Res. No. 07192005R010, Exh. A, 7-19-2005)

4.7.8. Post approval requirements.

A. Prior to beginning any construction or the commencement of the approved use, the applicant must comply with section 12.6 (post approval requirements).

B. Development improvements and construction must be approved and completed prior to commencement of the approved use. A building permit is required for the construction of any buildings or structures on the site.
(Res. No. 08102010R001, Exh. A, 8-10-2010)

Editor's note—Formerly, Res. No. 04102007R008, Exh. A, adopted Apr. 10, 2007, deleted § 4.7.8, which pertained to decisions of the board of adjustment are final. This section bore no history note.

4.7.9. Expiration of approval.

Special exception approvals automatically expire without a public hearing if the use is not commenced within three years of the date of approval.
(Res. No. 08102010R001, Exh. A, 8-10-2010)

4.8. NONCONFORMITIES*

4.8.1. Purpose.

This section governs uses, building and structures (except signs), and lots that were legally established prior to the adoption of this code but that do not comply with one or more requirements of this code. The provisions of this section are intended to recognize the interests of property owners in continuing and putting to productive use nonconforming uses, buildings, structures and lots while also encouraging as many aspects of such uses, buildings, structures and lots to be brought into conformance with this code as is reasonably practicable.
(Res. No. 09122006R002, Exh. A, 9-12-206)

4.8.2. Nonconforming use.

A nonconforming use is an existing use that does not comply with the requirements of this code but did conform to all applicable regulations in effect at the time the use commenced.
(Res. No. 09122006R002, Exh. A, 9-12-206)

*Cross reference—Buildings and building regulations, ch. 10.

Note—A land use that existed legally before the adoption of this code and does not comply with this code is considered a nonconforming use.

4.8.3. Nonconforming building or structure.

A nonconforming building or structure is an existing building or structure that does not comply with the requirements of this code but did conform to all applicable regulations in effect at the time the building or structure was constructed.
(Res. No. 09122006R002, Exh. A, 9-12-206)

4.8.4. Continuation of a nonconforming use.

A nonconforming use may be continued. Normal or routine repairs and maintenance of a building, structure or area containing a nonconforming use are allowed. Normal or routine repairs and maintenance do not include any repairs or maintenance that enlarge a building, structure or area containing a nonconforming use.
(Res. No. 09122006R002, Exh. A, 9-12-206)

4.8.5. Substitution of uses.

A nonconforming use may not be replaced by another nonconforming use.
(Res. No. 09122006R002, Exh. A, 9-12-206)

4.8.6. Discontinuance of a nonconforming use.

If a nonconforming use is discontinued for more than 12 consecutive months, the use may not be reestablished. If a question arises as to whether a nonconforming use has been discontinued, the property owner has the burden to show by competent evidence that the nonconforming use has not been discontinued.
(Res. No. 09122006R002, Exh. A, 9-12-206)

4.8.7. Continuation of nonconforming building or structure.

A nonconforming building or structure may continue to be used and occupied. Normal or routine repairs and maintenance of a nonconforming building or structure are allowed. A nonconforming building or structure may not, however, be repaired or altered in a way that would increase the degree of nonconformity with respect to this code.
(Res. No. 09122006R002, Exh. A, 9-12-206)

4.8.8. Reserved.

4.8.9. Destruction.

A. If a nonconforming building or structure is destroyed (i.e., incurs damages of more than 50 percent of the building or structure's replacement cost) by a calamity beyond the control of the property owner, other than a flood, the property owner may repair or replace the nonconforming building or structure, provided that he/she submits a complete building permit application within 12 months of the calamity. The nonconforming building or structure may only be replaced in the same location and size as the original building or structure. Nonconforming buildings or structures damaged or destroyed by flood must meet the requirements of subsection 4.2.2 (floodplain overlay district).

B. If a building or structure containing a nonconforming use is destroyed by a calamity beyond the control of the property owner, the property owner may reestablish the nonconforming use and may repair or replace the building or structure, provided that he/she submits a complete building permit application within 12 months of the calamity. The building or structure containing the nonconforming use and the nonconforming use may only be replaced in the same location, size and character as the original building or structure and use.
(Res. No. 09122006R002, Exh. A, 9-12-206)

4.8.10. Extension, expansion, enlargement or change in character.

A. A nonconforming use or a building or structure that contains a nonconforming use cannot be extended, expanded, enlarged or changed in character without the approval of the county commissioners.

B. A nonconforming building or structure cannot be extended, expanded, enlarged or changed in character without the approval of the county commissioners except where the building is nonconforming only as to a required setback and the following conditions are met:

1. The proposed addition is not more than 25 percent of the square footage of the original building and is not more than 1,000 square feet;

2. The proposed addition is outside the required setback; and

3. No portion of the original building or the proposed addition is within the future right-of-way identified by the Larimer County Functional Road Classification or the Colorado Department of Transportation.

C. A use that is nonconforming because it has been changed by regulation from a use by right to a use by special review or a use by minor special review cannot be extended, expanded, enlarged or changed in character without special review or minor special review approval by the board of county commissioners under section 4.5. In determining whether to approve the special review or minor special review, the county commissioners will consider the entire use, not just the elements of the use sought to be extended, expanded, enlarged or changed in character.

D. In determining whether there has been a change in character of a use, building or structure, the following factors may be considered:

1. Whether there has been a change in the nature, volume, intensity, frequency, quality or degree of the use, building or structure. (For example, has there been a significant increase in the number of employees or traffic volume; has there been a change in the days or hours of operation; or have the physical dimensions of the building or structure been increased);

2. Whether there has been a change in the activity, products or services. (For example, a dog grooming facility that has been converted to a retail store for pet supplies could be considered a change in the character of the use).

3. Whether the new use, building or structure reflects the nature and purpose of the prior use or structure. (For example, an air strip used for seasonal crop dusting operations that is subsequently used only for recreational parasailing could be considered a change in the character of the use);

4. Whether the new use is different in kind on its effect on the neighborhood. (For example, has there been a change in environmental influences on the neighborhood, such as light, noise or air quality).

(Res. No. 09122006R002, Exh. A, 9-12-206)

4.8.11. Review Criteria for requests to extend, expand, enlarge or change the character of a nonconforming use, building or structure.

Except for requests involving special reviews or minor special reviews pursuant to subsection 4.8.10.C, to approve a request to extend, expand, enlarge or change the character of a nonconforming use, building or structure, the county commissioners must consider the following criteria and find that each has been met or determined to be inapplicable:

A. The proposed extension, expansion, enlargement or change will be compatible with existing and allowed uses in the surrounding area and be in harmony with the neighborhood.

B. The proposed extension, expansion, enlargement or change will not adversely affect property values in the area affected by the proposed extension, expansion, enlargement or change.

C. The proposed extension, expansion, enlargement or change will not impair the intent and purpose of this code and the master plan.

(Res. No. 09122006R002, Exh. A, 9-12-206)

4.8.12. Conditions of approval.

The county commissioners may impose conditions on a request to extend, expand, enlarge or change the character of a nonconforming use, building or structure to accomplish the purposes and intent of this code and the master plan; prevent or mitigate adverse effects on the public, neighborhoods, utilities and county facilities; and ensure compatibility of land uses. These conditions may include a requirement that some or all elements of the nonconforming use and/or that

some or all areas of a nonconforming building, structure or site be brought into compliance with the standards in Section 8 of this code.
(Res. No. 09122006R002, Exh. A, 9-12-206)

4.8.13. Process.

All applications for requests to extend, expand, enlarge or change the character of a nonconforming use, building or structure require a pre-application conference and county commissioner review. The planning director may require a neighborhood meeting if he/she determines that the meeting would benefit the county commissioners' review of the application. Each of these processes is described in section 12.2 (development review procedures).
(Res. No. 09122006R002, Exh. A, 9-12-206)

4.8.14. Nonconforming lots.

A. A nonconforming lot is a lot, parcel or tract of land that does not meet one or more of the requirements of this code and:

1. Was created by deed or other instrument of property transfer signed before May 5, 1972; or
2. Was approved by the county commissioners on or after May 5, 1972; or
3. Appears on a final plat of record approved by the appropriate authority at the time the plat was recorded. (See definitions, legal lot).

B. Nonconforming lots must meet all requirements of this code except minimum lot size and minimum lot width-to-depth ratio.
(Res. No. 09122006R002, Exh. A, 9-12-206)

4.9. SETBACKS, LOT REQUIREMENTS AND STRUCTURE HEIGHT

4.9.1. Setbacks from highways, county roads, and all other streets and roads.

A. *Highways.* Setbacks from state and federal highways are 100 feet from the right-of-way centerline or 50 feet from the right-of-way line, whichever is greater, except those highways noted below where the minimum setback is 130 feet from centerline of the right-of-way or 80 feet from the right-of-way line, whichever is greater:

1. U.S. Highway 287 from Fort Collins city limits south to the Boulder County line.
2. Colorado Highway 68 (Harmony Road) from Interstate 25 west to Highway 287.
3. Colorado Highway 14 (Mulberry Street) from Fort Collins city limits east to the Weld County line.
4. Colorado Highway 392 from Interstate Highway 25 east to the Weld County line.
5. U.S. Highway 34 from Mourning Drive east to the Weld County line.
6. Fort Collins Expressway and those portions of U.S. Highway 287 and Colorado Highway 14 north of Fort Collins city limits that are four lanes.
7. Colorado Highway 402 from Loveland city limits east to the Weld County line.

B. *County roads.* Setbacks from Larimer County roads, as identified and classified on the Larimer County Functional Road Classification Map, shall be measured from the original right-of-way centerline, before any additional right-of-way was dedicated, as determined by the county engineer, as follows:

Road Classification	*Measured from right-of-way centerline*
Arterial	110 feet *
Major collector	100 feet *
Minor collector	70 feet *
Local, numbered county roads	60 feet *

*Setbacks for additions to existing buildings which are nonconforming with respect to county road setbacks are eligible for an administrative variance procedure. See section 4.6.7.

1974 AERIAL


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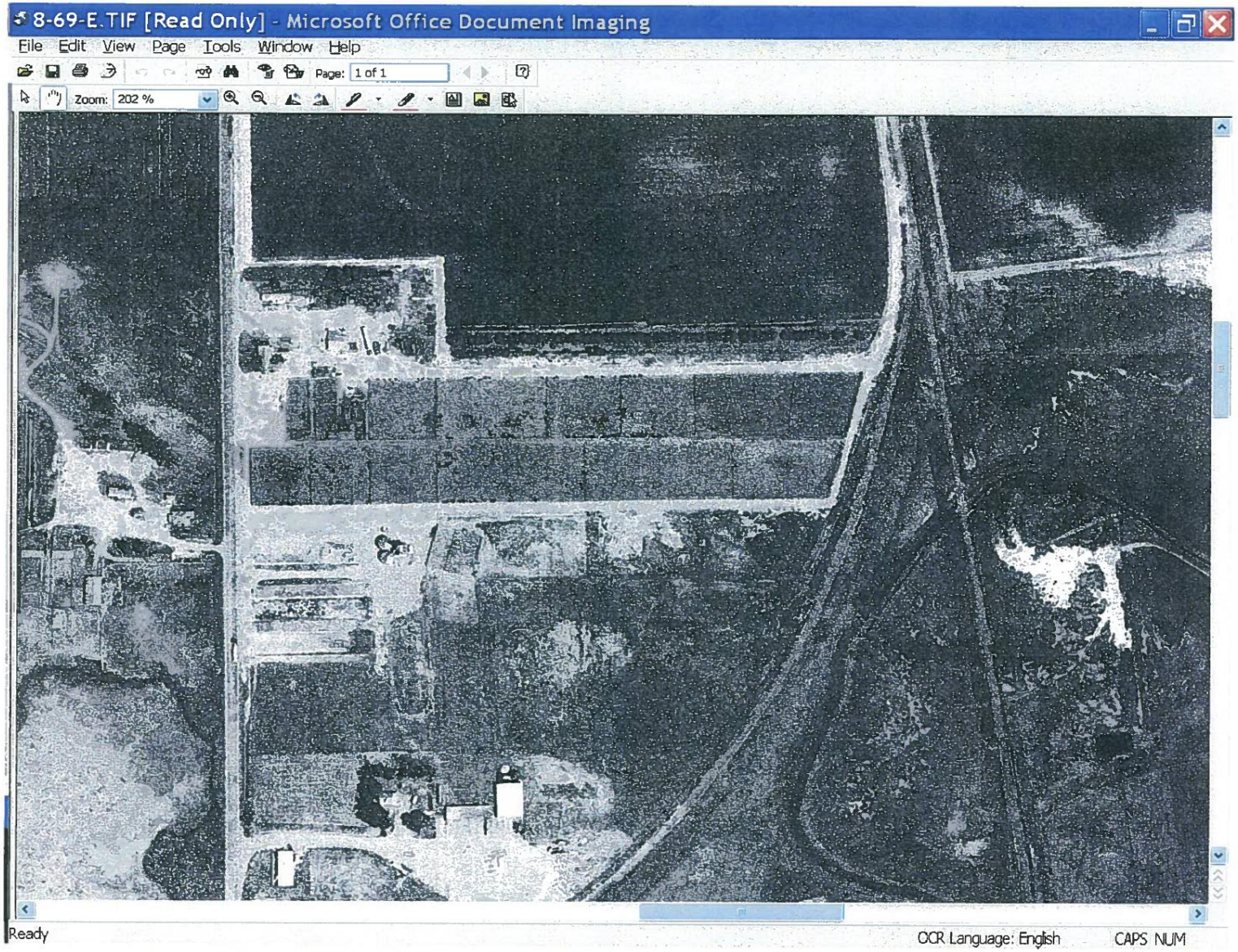
1981 AERIAL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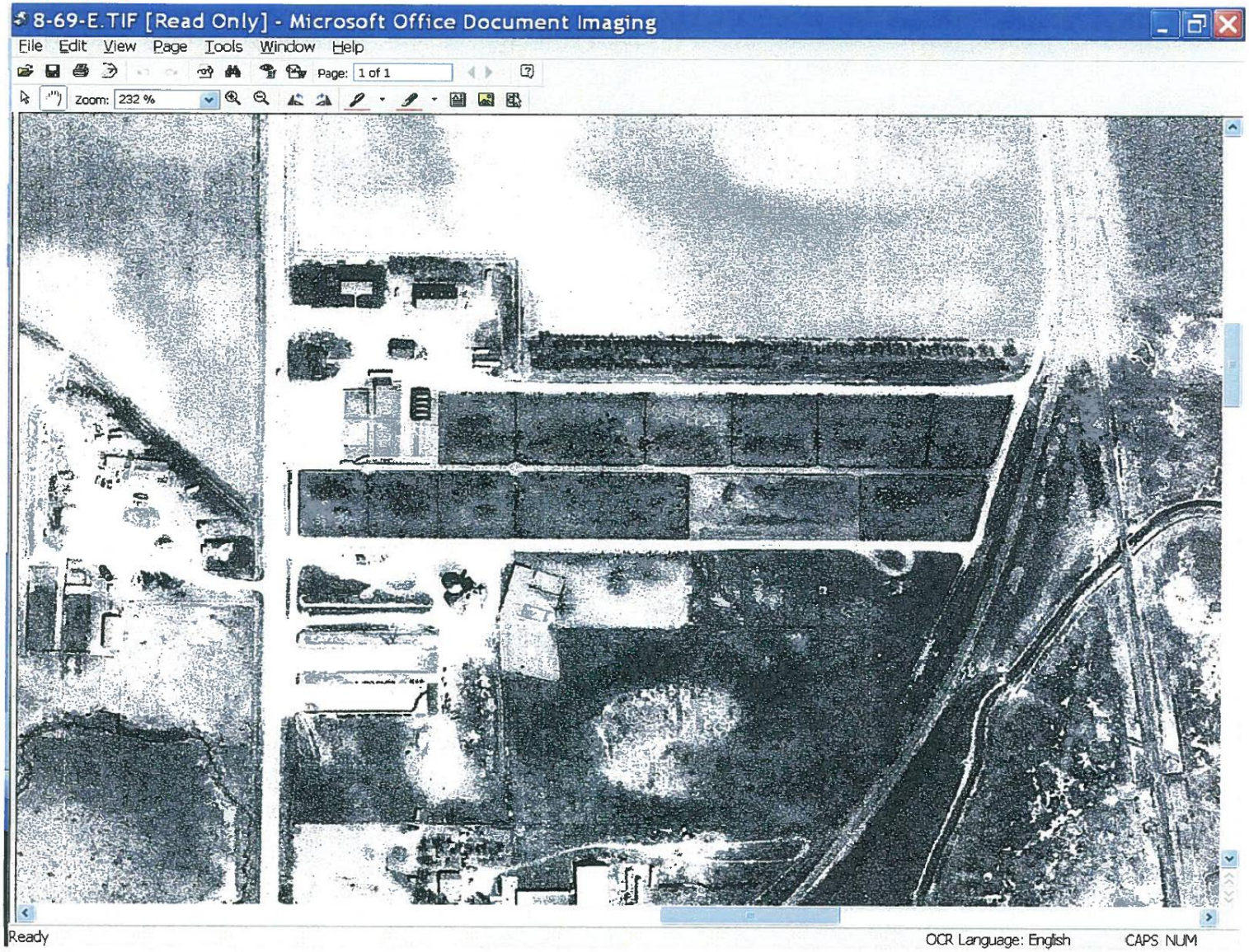
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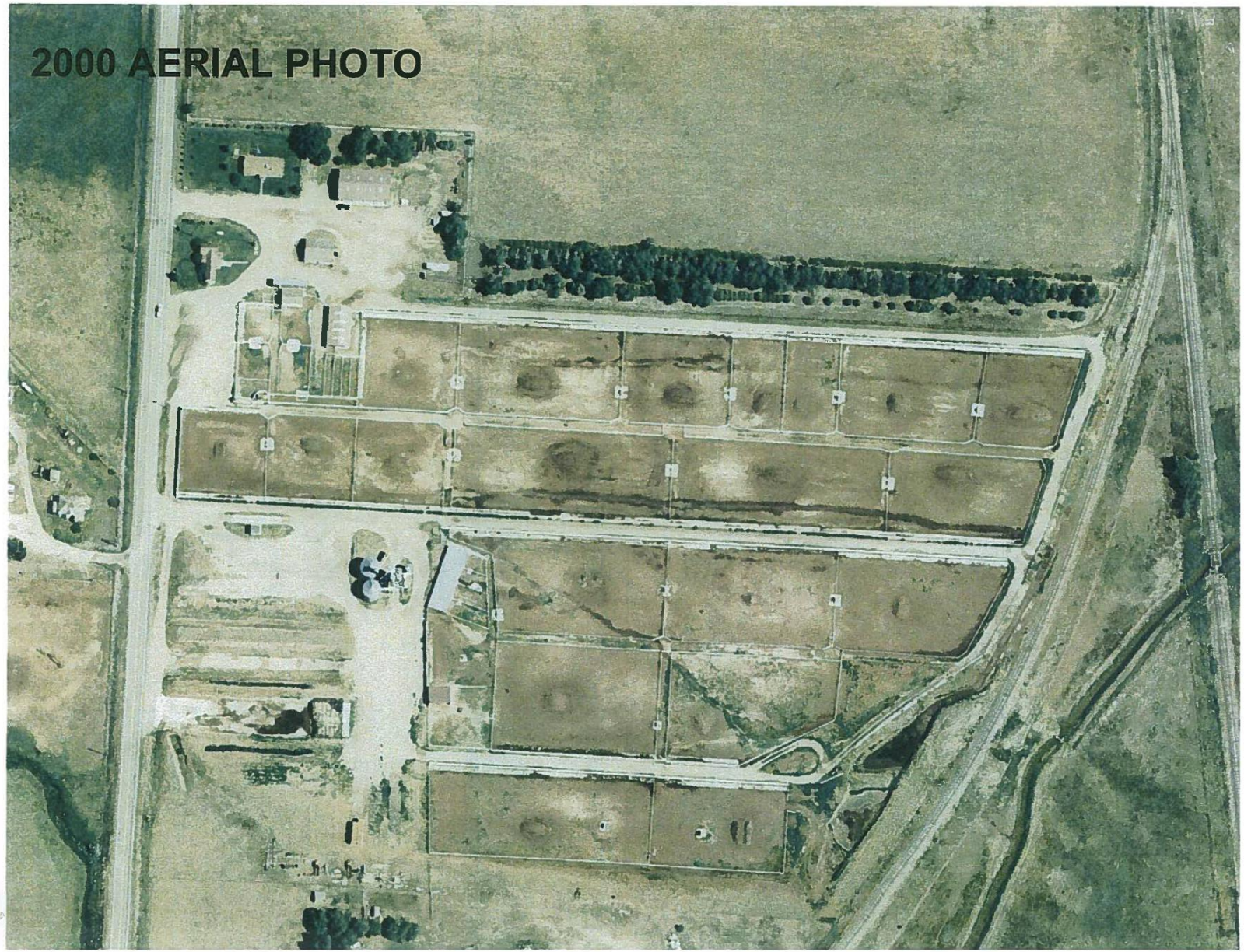

2000 AERIAL PHOTO

Attachment B

NISP and Agriculture

If Built, the Northern Integrated Supply Project Would Severely Impact Agriculture in Northern Colorado

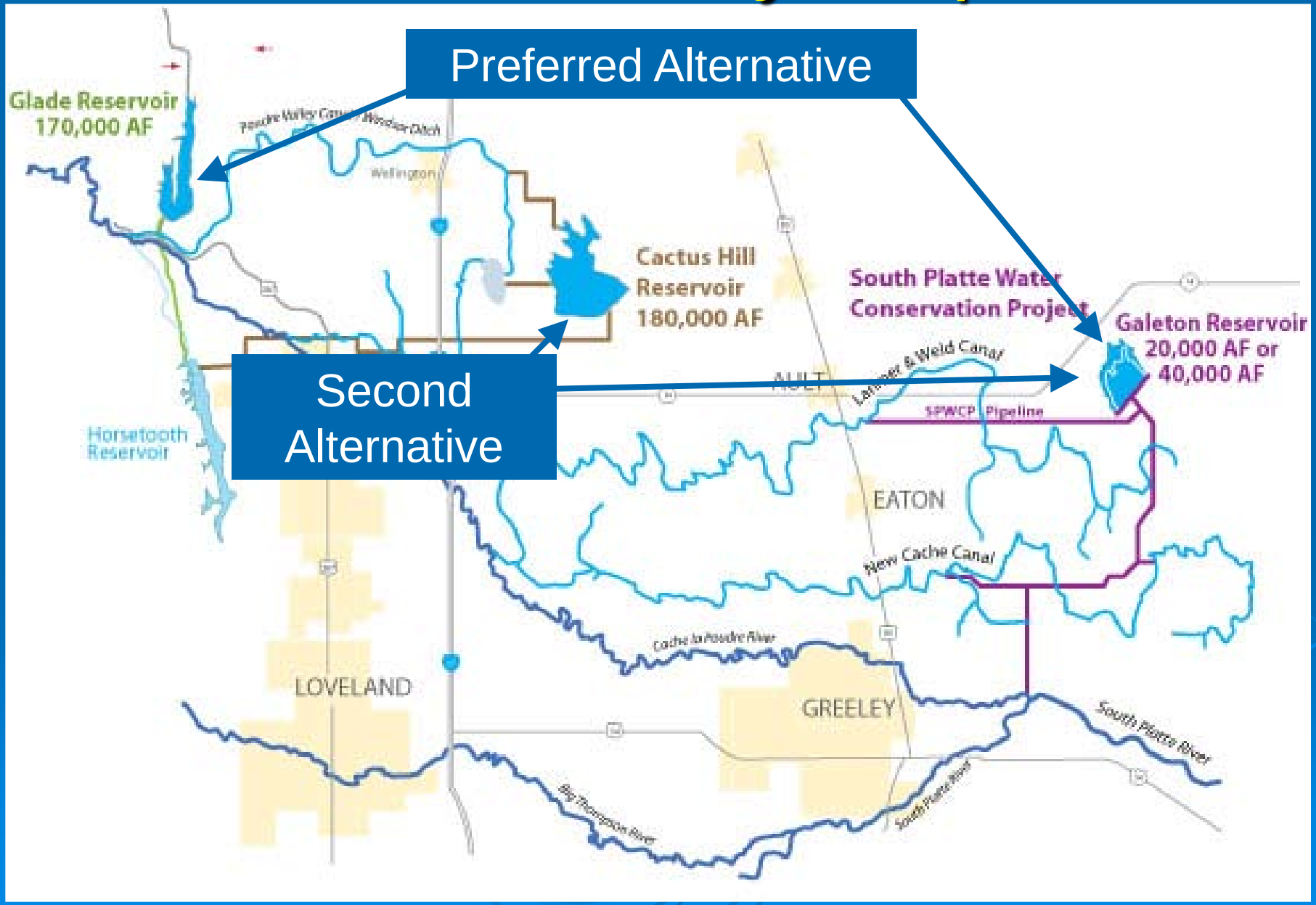
Mark Easter

For Save The Poudre: Poudre Waterkeeper

Outline

- Description of the NISP Project
- NISP Impacts on Agriculture:
  1. Accelerate subdivision of productive Ag land
  2. Increase salinization of farmed soils
  3. End *Free River* diversion opportunities
  4. Submerge and divide productive Ag land
  5. "Initial Fill" and drought year fill likely to come from Ag Water
- Reasonable alternatives to NISP

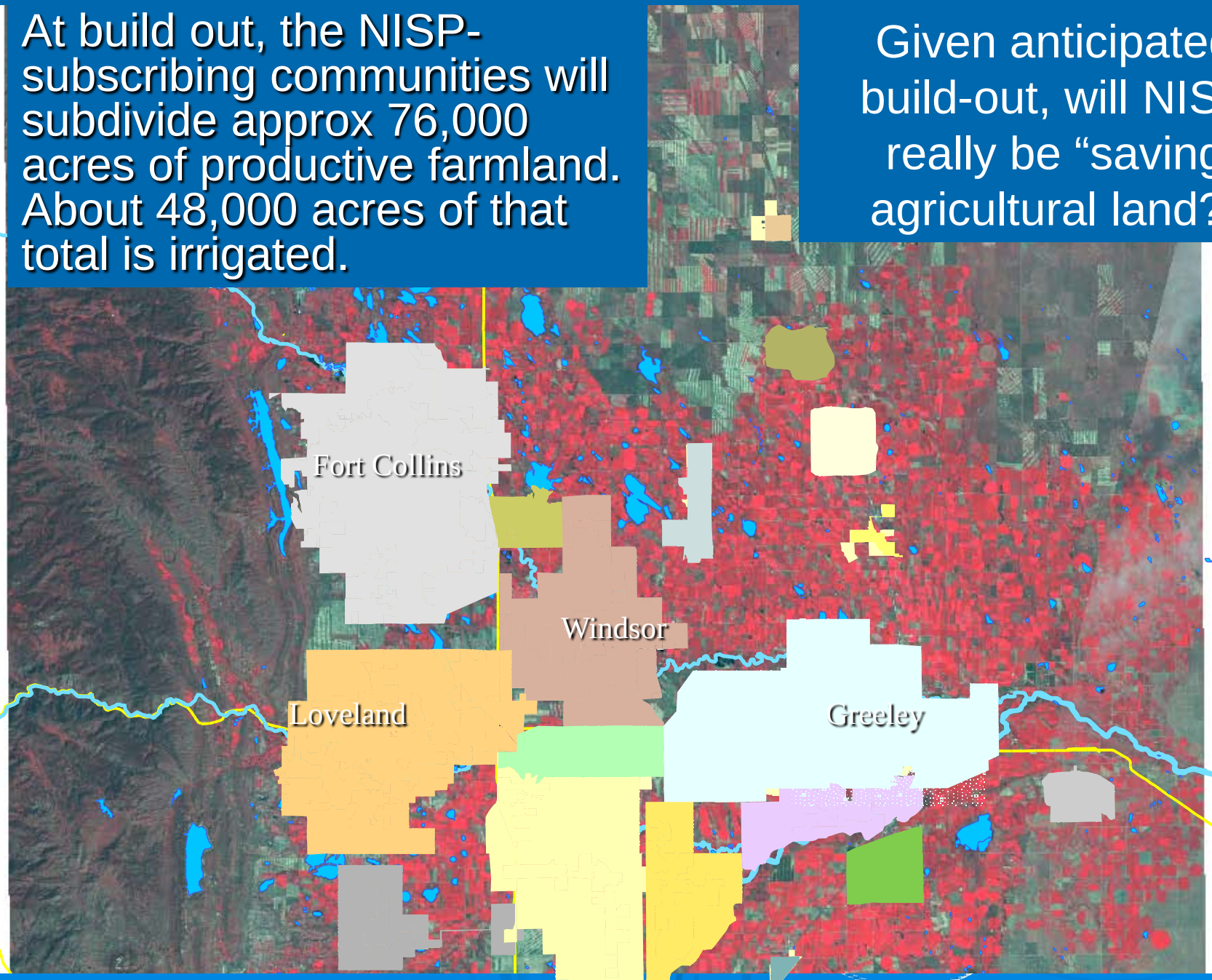
NISP as Currently Proposed



1. NISP would accelerate the subdivision of productive ag land in Northern Colorado

At build out, the NISP-subscribing communities will subdivide approx 76,000 acres of productive farmland. About 48,000 acres of that total is irrigated.

Given anticipated build-out, will NISP really be “saving agricultural land?”



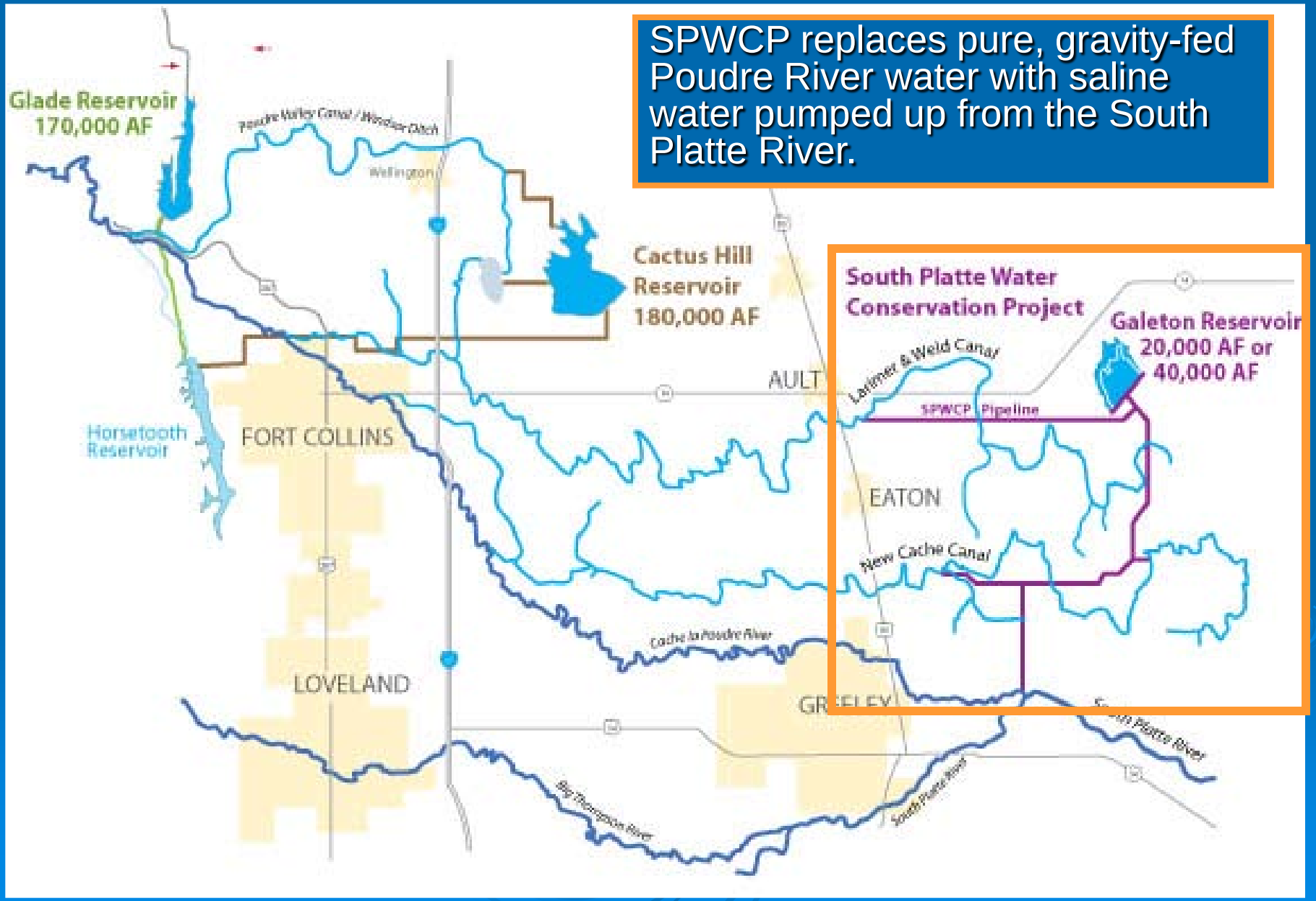
NISP Financing Plan Creates A Relentless Need to Sell New Taps

- At least $400 million of the project costs expected to be financed by revenue bonds.
- Bonds would be paid by tap fees, development fees, and water rate increases.
- Public debt like this must be serviced. Default is not an option.
- Subdividing Ag Land would essentially be the only way to service the debt.

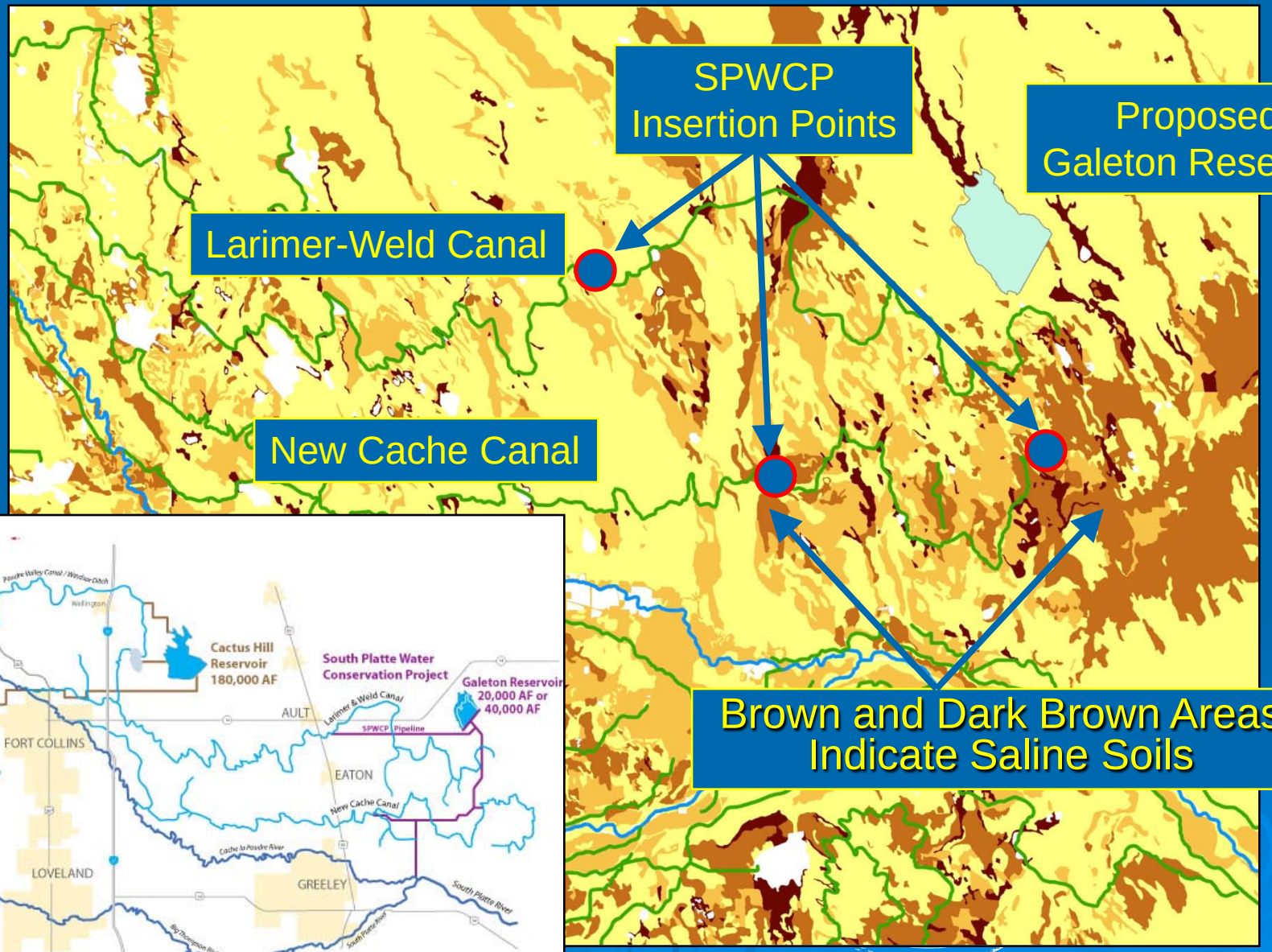
2. NISP would accelerate Salinization of Productive Crop Lands

Soil Salinity on the Northern Front Range

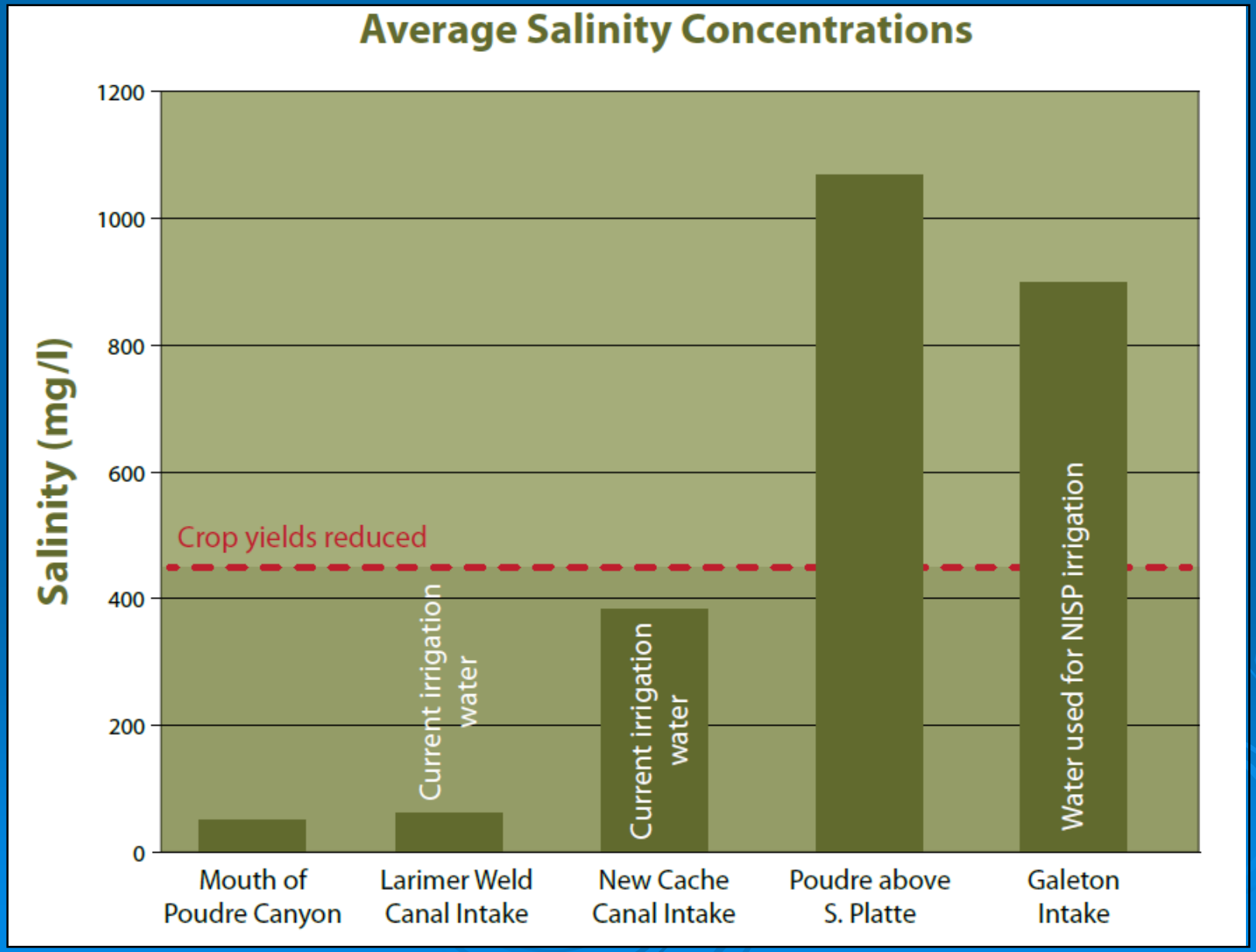
SPWCP and Soil Salinity



SPWCP and Soil Salinity



Salinity Decreases Crop Yields



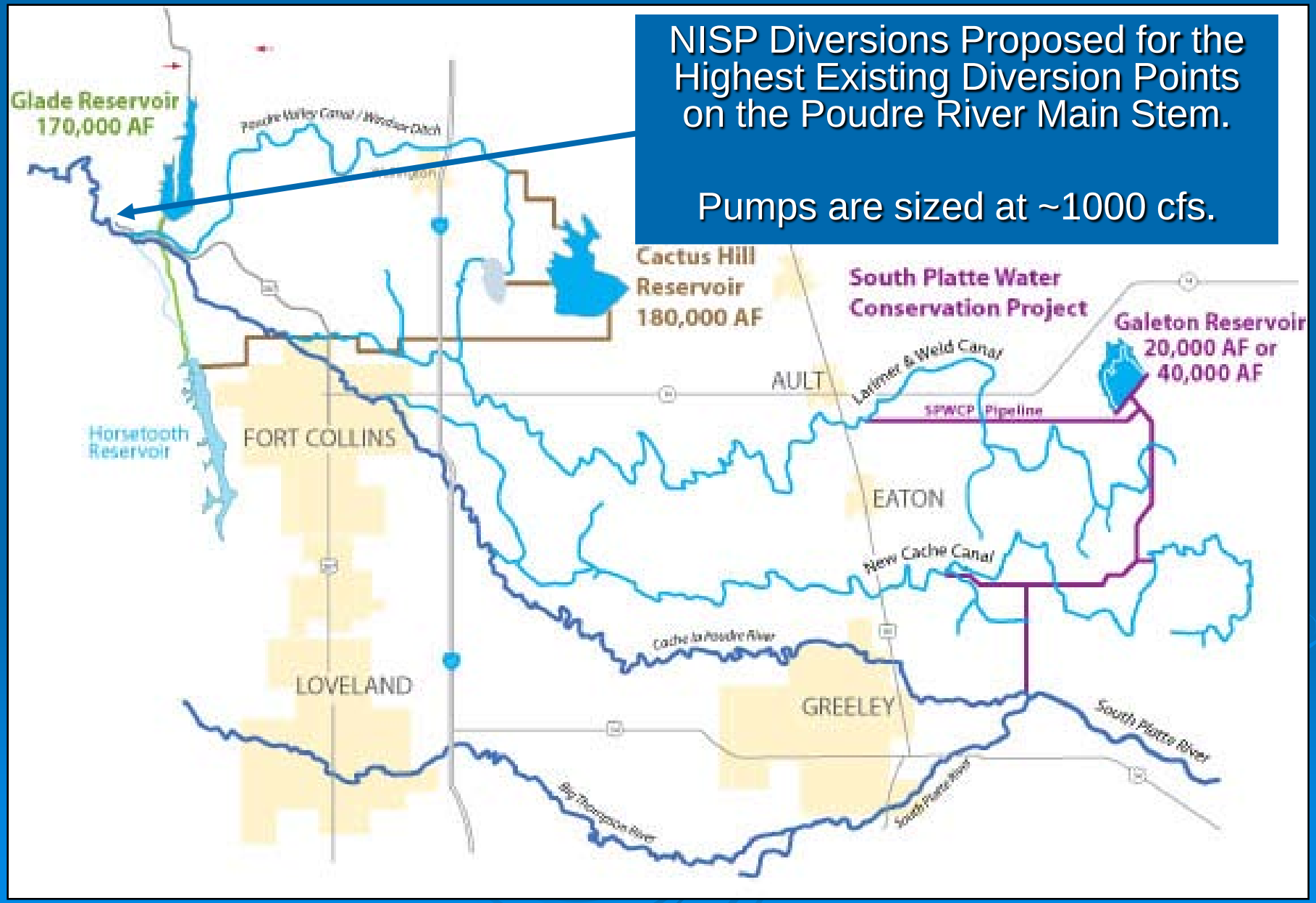
Soil Salinity on the Northern Front Range

- Salt concentrations in water delivered from Galeton likely to range 1000 – 2000 mg/liter. Current salt concentrations are ~50-400 mg/liter.
- 70% of crops in SPWCP region sensitive to salt.
- Maintaining yields requires more irrigation water.
- Up to 3,000 acres of irrigated land in the SPWCP region likely to be permanently lost from production.

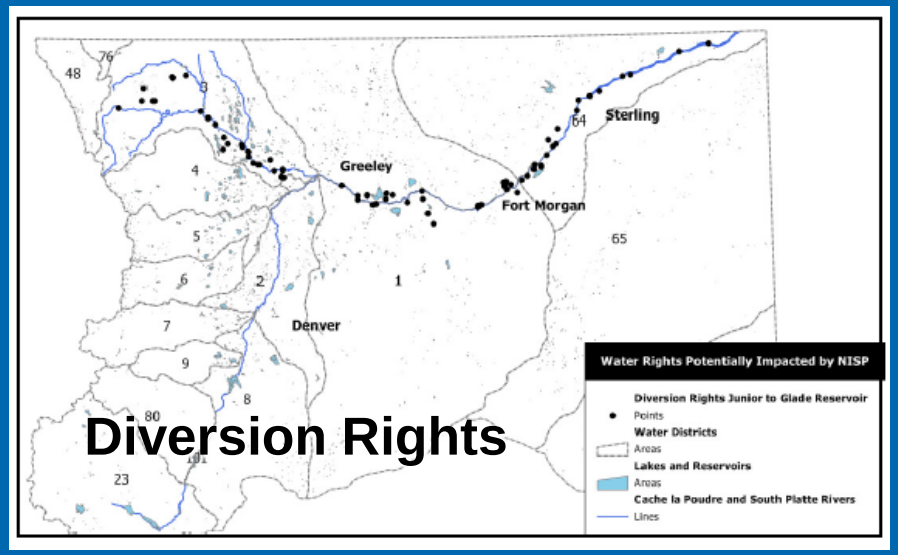
Source: NISP DEIS, USGS, USDA NASS, Colorado State University, other sources

3. NISP Would End Nearly All "Free River" Diversion Opportunities and Impact Many Existing Water Users

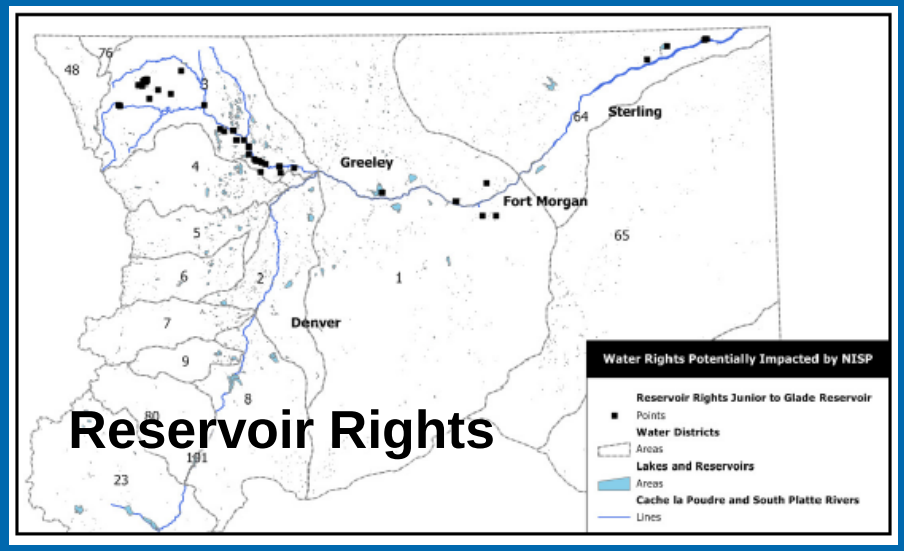
NISP and Free River Diversions



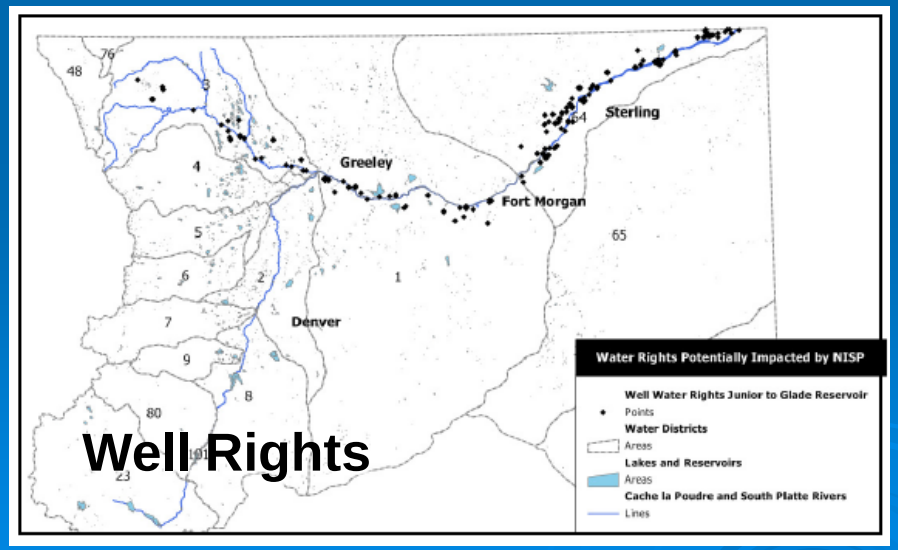
NISP Water is Currently Used by Agriculture



Diversion Rights



Reservoir Rights

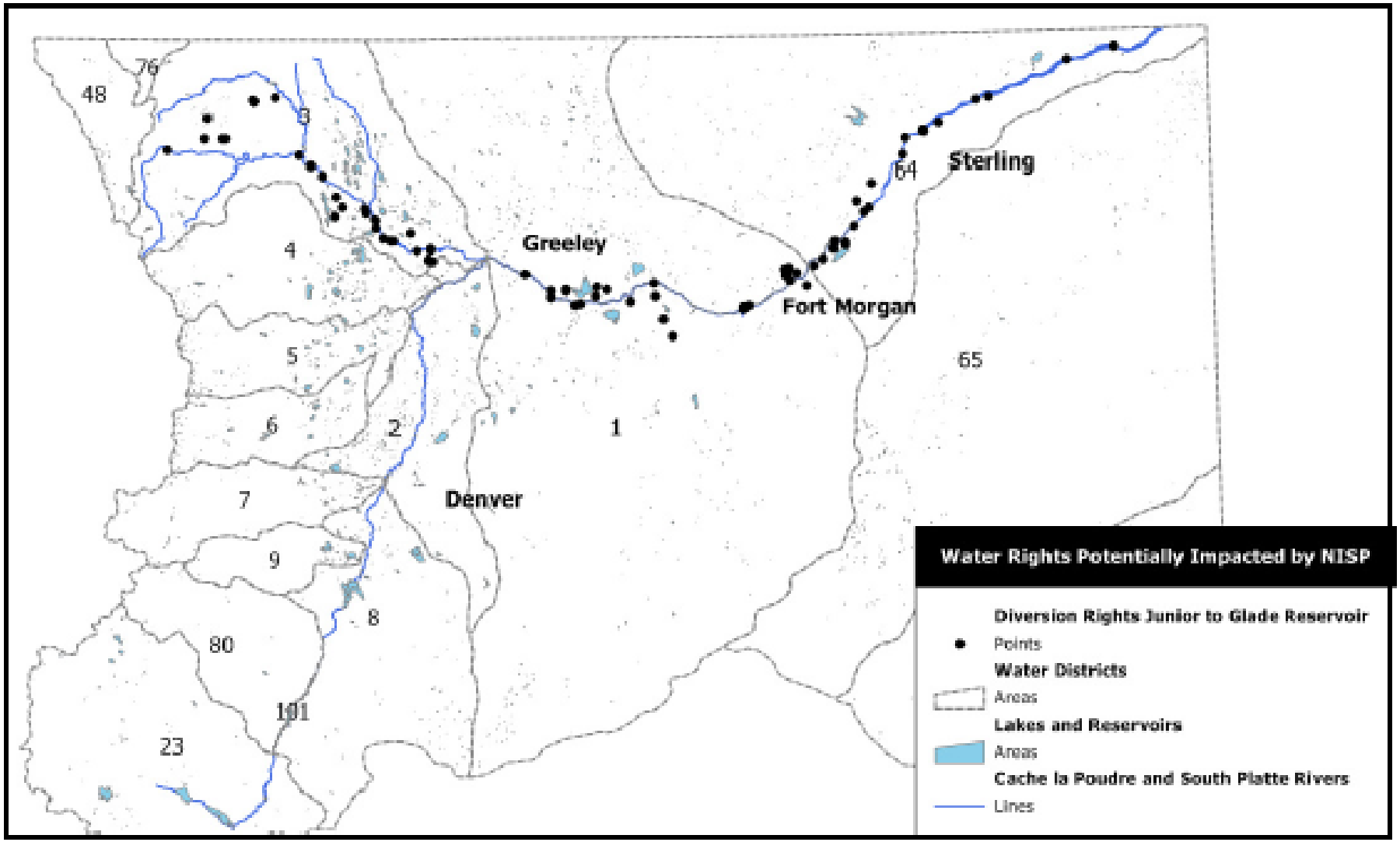


Well Rights

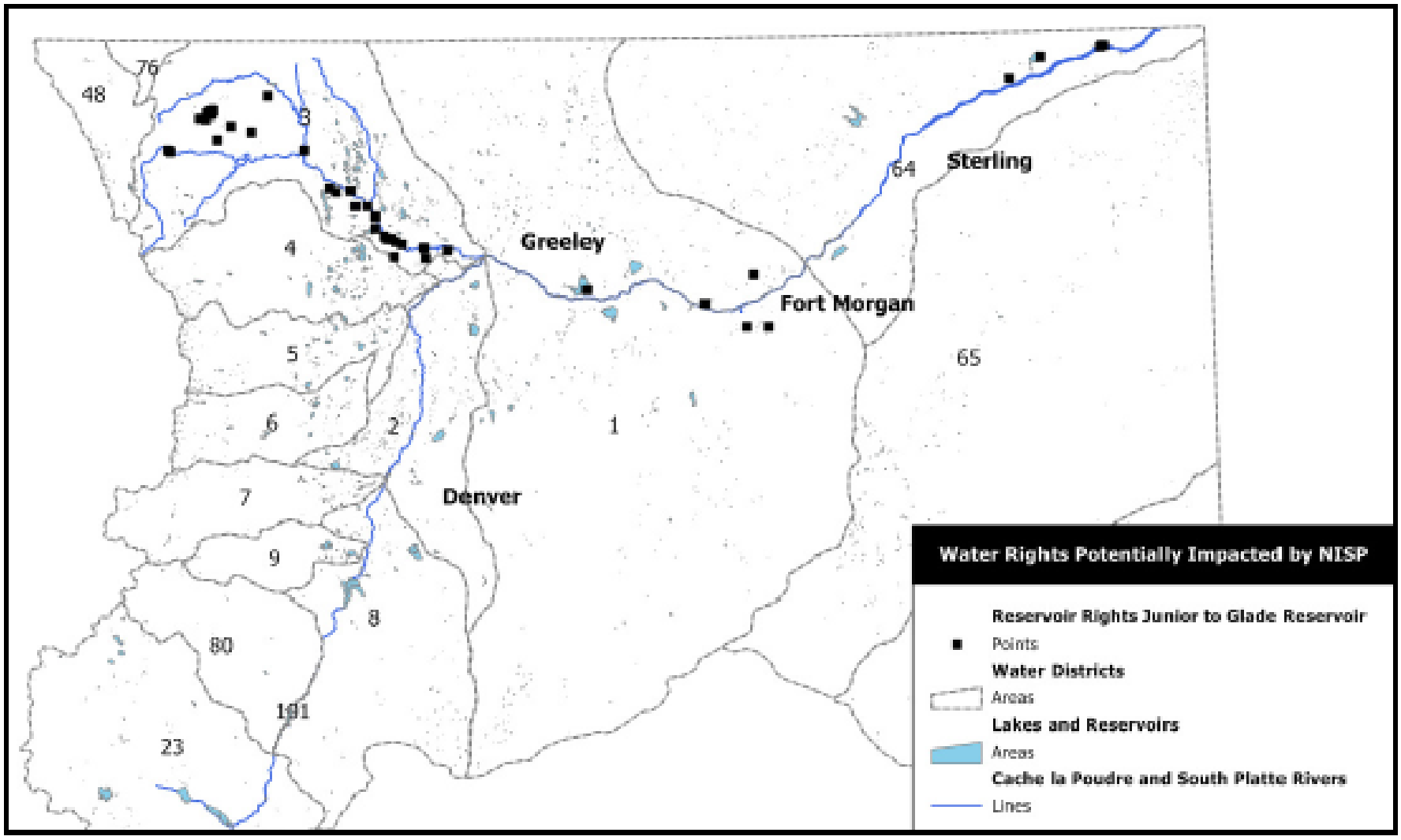
These graphs show existing ag, municipal, recreational and industrial water users who are utilizing water that would be taken by NISP.

Source: NISP DEIS, Colorado State Engineer's Office

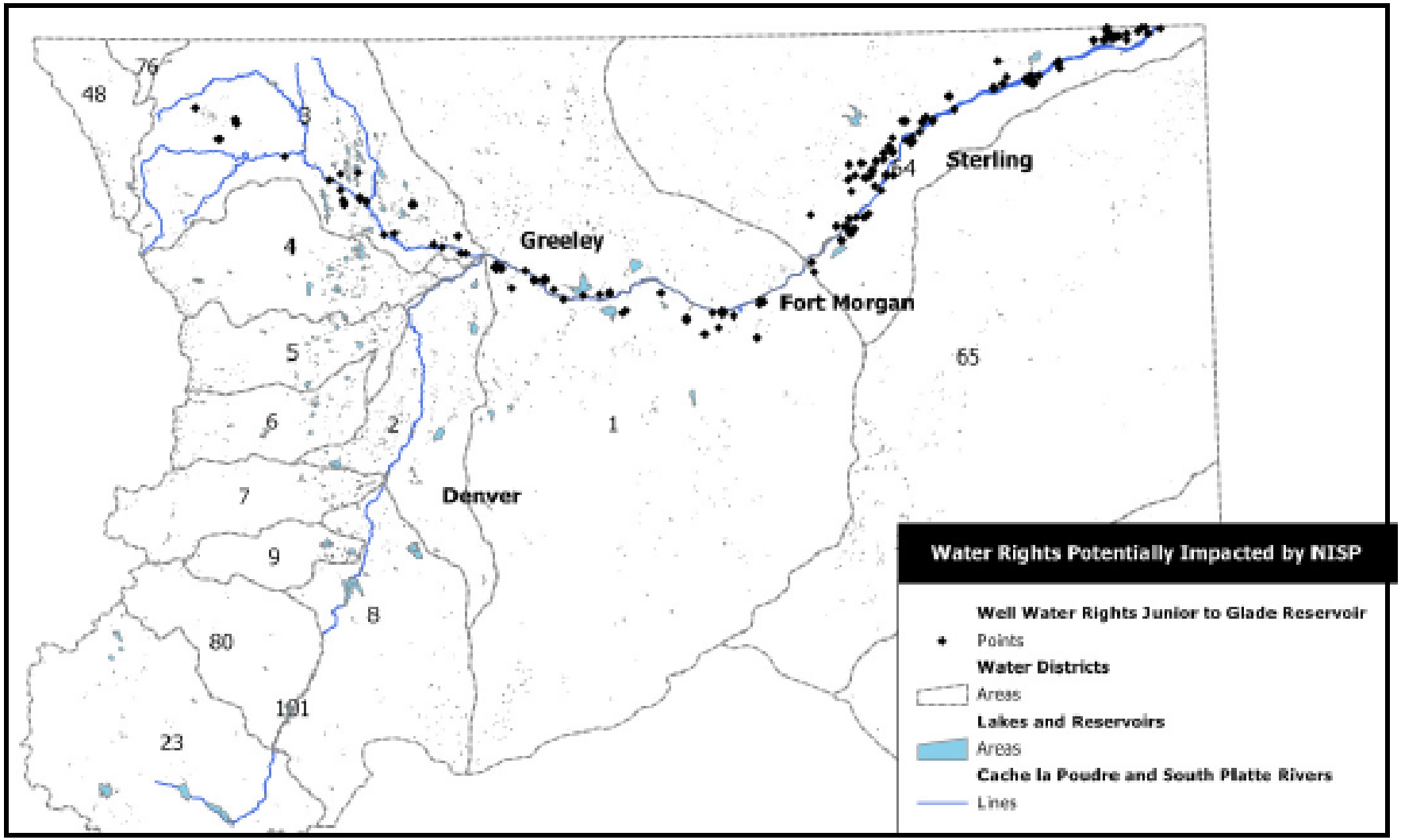
Current Diverters



Current Reservoir Rights



Current Well Augmentation Rights



4. NISP Would Submerge and Divide Productive Ag Land

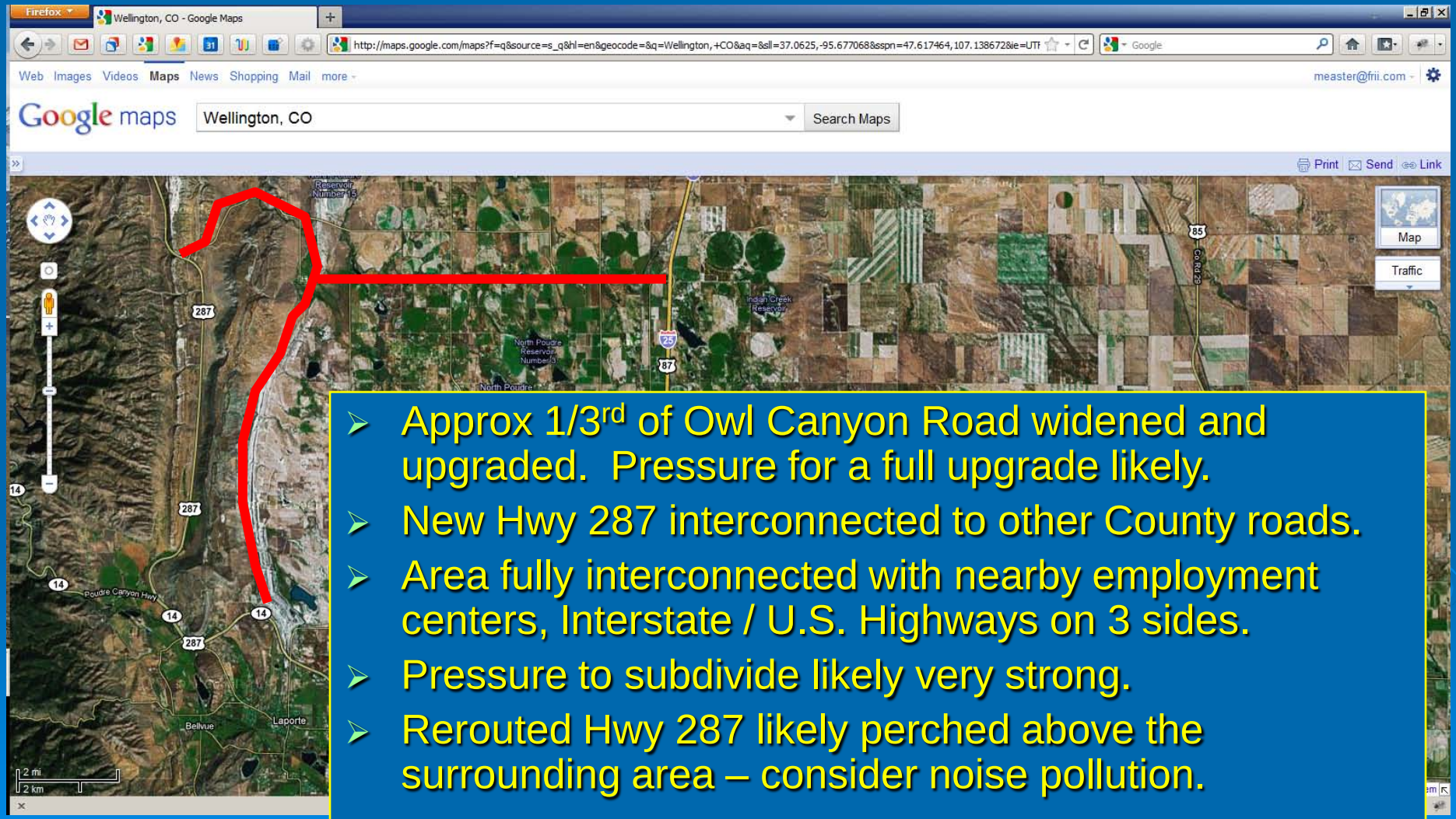
Direct Ag Land and Other Impacts

- NISP proposed reservoir sites and pipeline routes currently support a mix of livestock grazing and dryland agriculture.

- Direct impact to at least 5,000 acres expected.

- Oil & Gas Production at proposed Galeton site:
  - 6 currently producing wells
  - 28 additional permitted wells
  - 4 abandoned wells
  - Additional 80 permitted and producing wells within 1 mile of the proposed reservoir footprint.

Farm Land Fragmentation – Northern Larimer County



- Approx 1/3rd of Owl Canyon Road widened and upgraded. Pressure for a full upgrade likely.
- New Hwy 287 interconnected to other County roads.
- Area fully interconnected with nearby employment centers, Interstate / U.S. Highways on 3 sides.
- Pressure to subdivide likely very strong.
- Rerouted Hwy 287 likely perched above the surrounding area – consider noise pollution.

5. The “Initial Fill” and Drought-Year Diversions into Glade and Galeton Reservoirs Are Likely to Come from N. Colorado and West Slope Ag Water.

"Initial Fill" and "Operational Flexibility"

- NISP DEIS states and NCWCD officials confirm – intent is to use up to **100,000 AF of Ag water to help fill Glade**.
- Project operators requesting "Operational Flexibility" to utilize **other water sources** during drought years.
- Likely other water sources would be the Colorado and Poudre Rivers.
- Consider however that the proposed location of Glade and Cactus Hill allows storage of water from 4 watersheds – the Colorado, North Platte, Laramie or Cache la Poudre Rivers.

Conclusion: NISP Would Severely Impact Agriculture in Colorado

Permanent Losses	**Acreage Impact**
- Accelerated Development	76,000
- Soil Salinization	3,000
- Loss of “Free River”	11,000
- Reservoir, Pipeline Construction	5,000
Recurring Periodic Losses	
- “Initial Fill”, “Operational Flexibility”	56,000

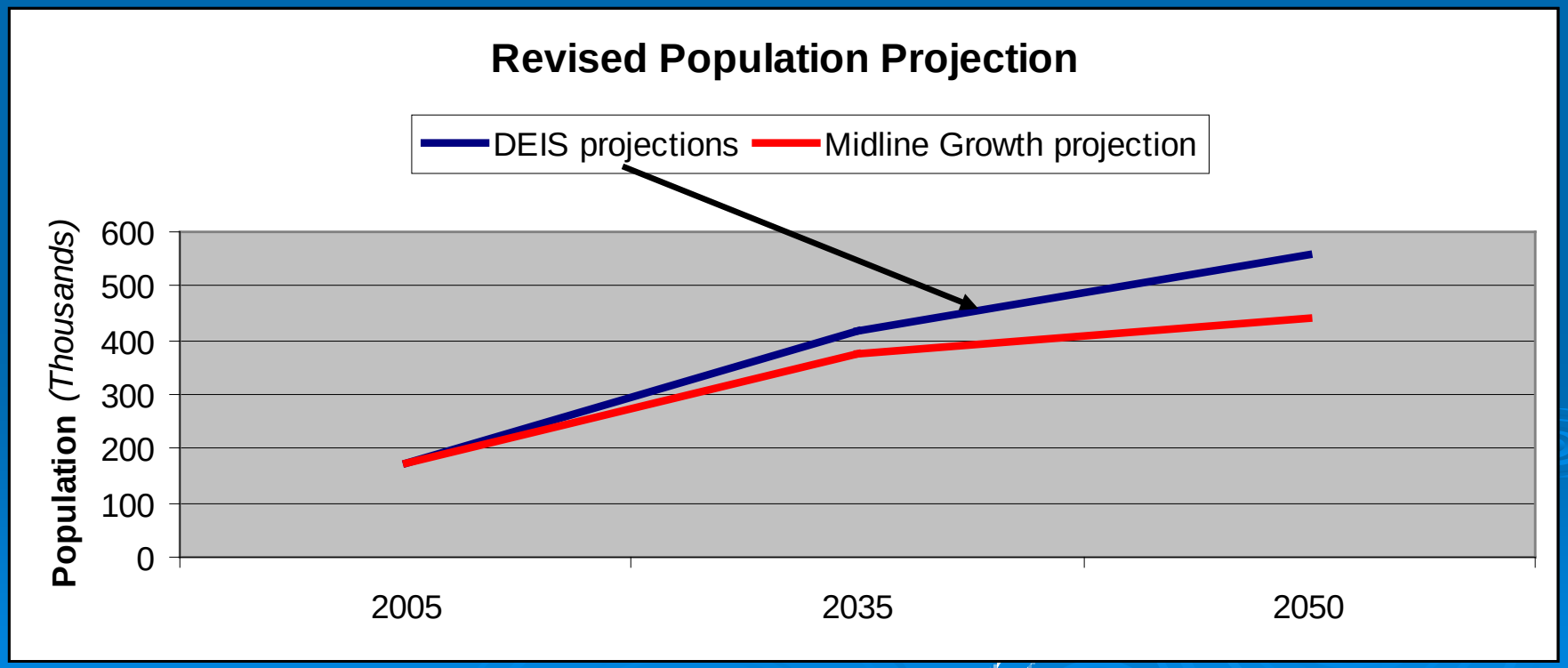
The Healthy Rivers Alternative

We Can and We Must Meet our Future Water Needs Without Ruining Our Rivers

- Accurate, Rational Demand Forecasting
- Conservation and Efficiency
- Use Development-Displaced Ag Water
- Water Sharing Agreements with Agriculture
- Use downstream storage capacity
- Water Reuse
- Water Systems Integration
- Limited Ag Water Transfers

Healthy Rivers Alternative (HRA): Revised Growth Projections

Population growth in NISP cities will almost certainly to be ***much lower*** than DEIS projections.



Source: U.S. Census Bureau, Colorado State Demography Office, NISP DEIS

Conservation can meet the Majority of our Needs to 2050

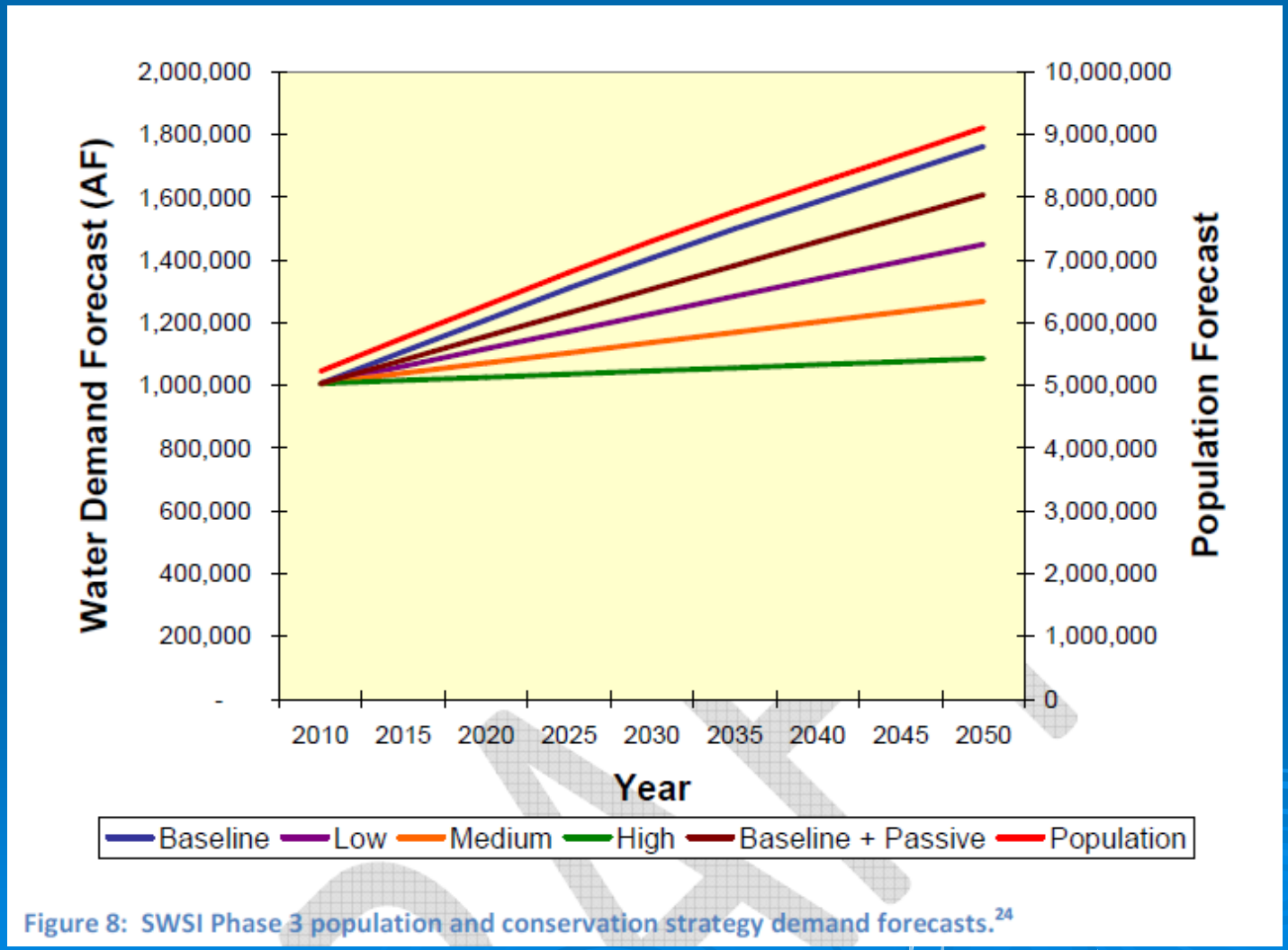


Figure 8: SWSI Phase 3 population and conservation strategy demand forecasts.[24]

Source: Colorado Water Conservation Board

Economic Benefits of the HRA

Healthy Rivers Are Economic Engines

- ***Support Agriculture:*** Municipal water conservation, Muni-Ag partnerships reduce demand for water, taking the pressure off of agriculture for water supplies.

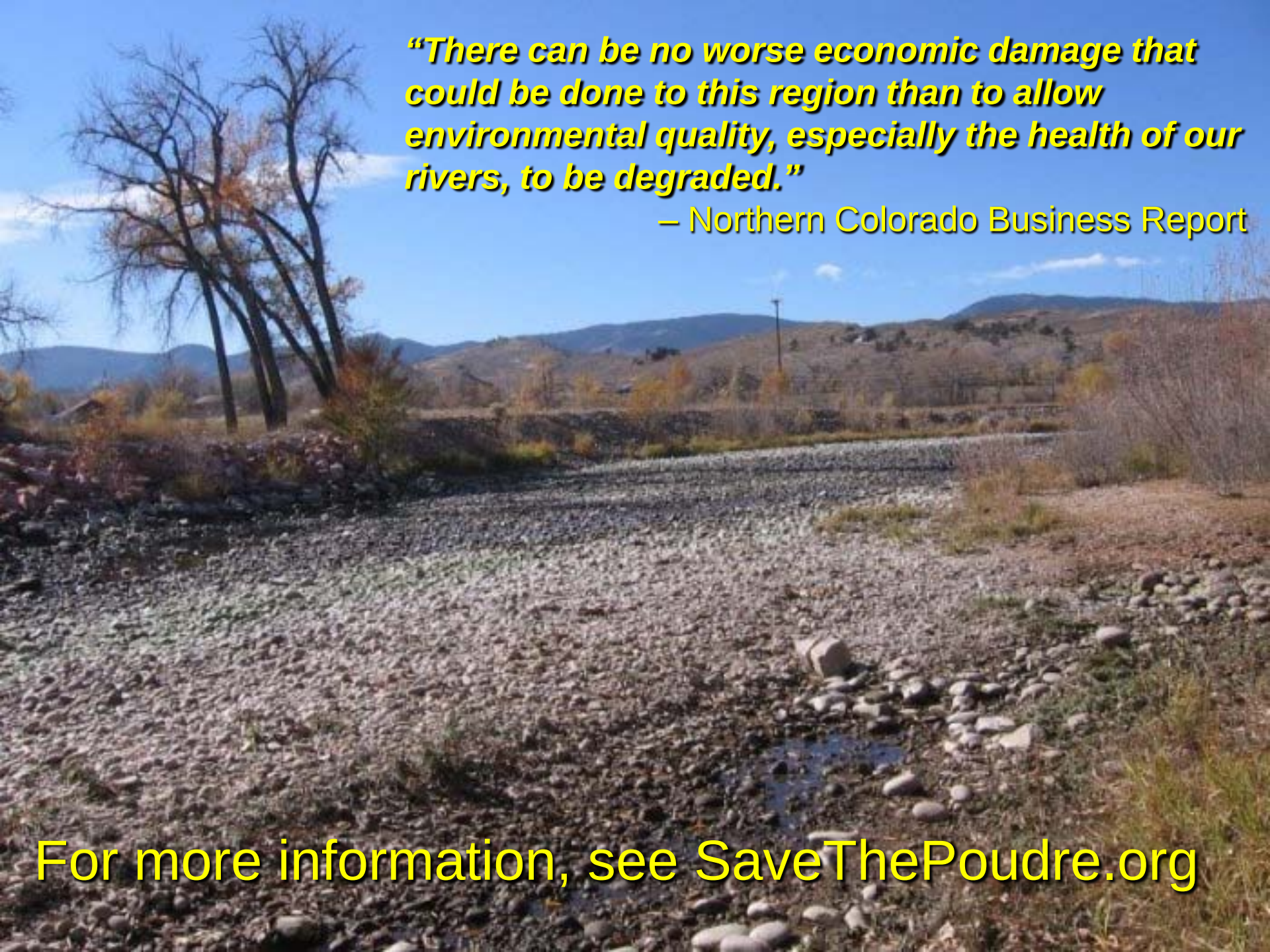
- ***Cost Avoidance:*** At least $250 million in avoided water/sewage treatment costs for the City of Fort Collins, unknown but substantial costs expected for Windsor, Timnath, Greeley, Boxelder Sanitation, others.

- ***Reduced public debt:*** The HRA is based largely on a “pay as you go” approach, reducing need for borrowing.

Comparison: HRA vs. NISP

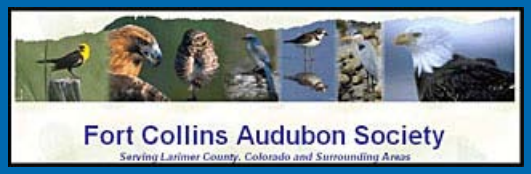
Comparison Table: HRA vs. NISP

Comparison Item	NISP	Healthy Rivers Alternative
Total Cost	$700 - $800 million plus finance charges of ~$400+ million	~$450 million
Total Cost per Acre Foot	$18,000 plus finance charges of ~$10,000/acre foot	~$11,000
Total Acres of Irrigated Agriculture Taken Out of Production	~123,000 (65,000 permanently)	~25,000 acres (growth area only)
Total Acre Feet of Water Removed from the Cache la Poudre River	40,000 acre feet	0
Environmental Impacts to Poudre River through Fort Collins	Extensive "Violate Clean Water Act"	Minimal to none Makes Restoration Possible


“There can be no worse economic damage that could be done to this region than to allow environmental quality, especially the health of our rivers, to be degraded.”
– Northern Colorado Business Report
For more information, see SaveThePoudre.org

Conservation Partners

This presentation and the research behind it were supported in numerous ways by the following organizations:



Northern Integrated Supply Project

Key statistics

- 15 participants
  - 4 water districts and 11 cities and towns
  - Current population = 200,000
  - Estimated population by 2030 = 400,000
  - 15 have reduced water consumption by 30% since 1988

- 40,000 af yield

- Estimated cost = $490 million
  - $12,000 to $13,000 per af

- Glade Reservoir
  - 170,000 af
  - 1,700 surface acres
  - 1,200 cfs maximum diversion off Poudre river
  - Involves 8-13 miles of U.S. Highway 287 relocation
    - $38 - $40 million

- Galeton Reservoir
  - 45,000 af
  - 200 cfs maximum diversion off S. Platte river

- Without NISP
  - 60,000 irrigated acres additional dry up
  - $27 million loss in crop production annually

NISP

Northern Integrated Supply Project

Northern Water.

"Infrastructure is a necessary but insufficient ingredient to quality of life. In order to live healthy lives, our built environment must also be practical and well designed. It is not enough to build more infrastructure – it must also be done smartly."

American Society of Civil Engineers. Colorado's 2008 Infrastructure Report Card

NISP would do just that ...

NISP Northern Water
Northern Integrated Supply Project

What NISP is

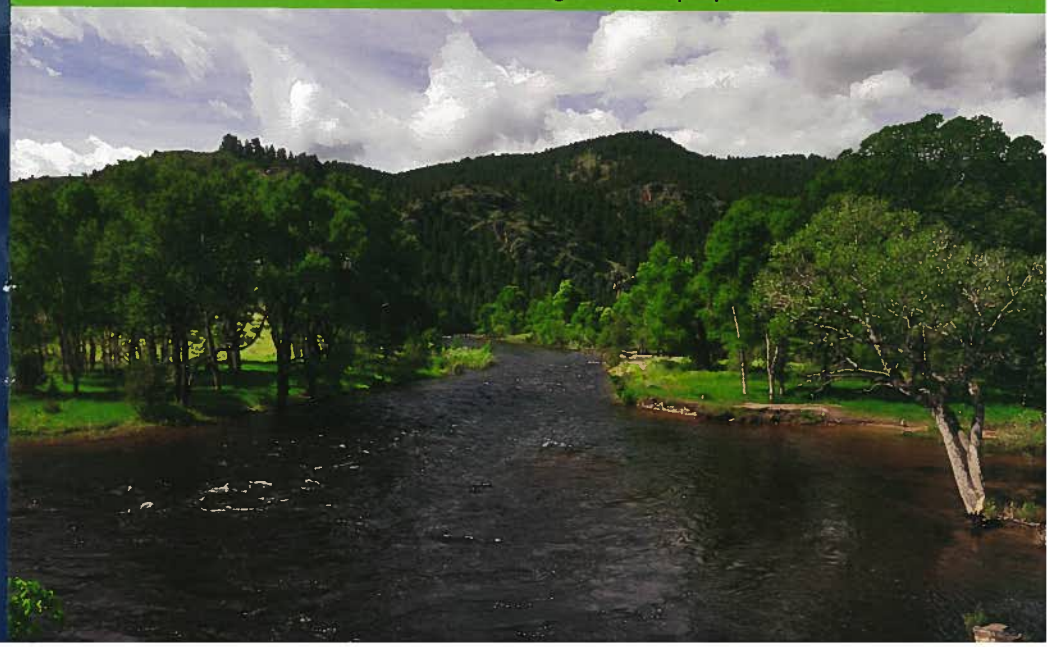
NISP IS A WATER SUPPLY PROJECT. These projects have been used throughout the world for centuries to provide water supplies to citizens, agriculture and other industries.

Water projects include infrastructure, such as reservoirs and pipelines. NISP is integrated because it includes two proposed reservoirs, Glade and Galeton, that would operate together to help ensure clean, reliable water supplies for the future of hundreds of thousands of citizens in Northeastern Colorado.

The water that would fill Glade and Galeton reservoirs is available to Coloradoans now, but without the storage capabilities NISP would provide, that water will continue to leave the state.

NISP is smart water development, not only because of how it would operate, but also because it makes sense economically and environmentally.

In 2009, more than 90,000 acre feet of water left Colorado that would have been available for NISP storage, had the project been online.



Who NISP is for

IT'S A FACT: People want to live in Northeastern Colorado, which touts diverse opportunities for both work and play.

The 15 cities and water districts that are paying for and would receive water from NISP are together facing a doubled population within the next 20 to 40 years. The region is in serious need of water to support the cities, farms and businesses that make it a great place to live.

Participant & permitted yield

1 Fort Collins-Loveland Water District (3,000 AF)
2 Windsor (3,300 AF)
3 Left Hand Water District (4,900 AF)
4 Erie (6,500 AF)
5 Evans (1,600 AF)
6 Central Weld County Water District (3,500 AF)
7 Fort Lupton (3,000 AF)
8 Fort Morgan (3,600 AF)
9 Morgan County Quality Water (1,300 AF)
10 Eaton (1,300 AF)
11 Severance (1,300 AF)
12 Lafayette (1,800 AF)
13 Firestone (1,300 AF)
14 Frederick (2,600 AF)
15 Dacono (1,000 AF)

Northeastern Colorado water providers cannot rely solely on precipitation Mother Nature provides – an average of about 15 inches a year.

Compare that to other areas: the Midwest at 40 inches a year and the East Coast at 50. Storage helps water users get through dry seasons as well as periods of drought.

With the area's semiarid classification in mind, water providers and others have been tracking growth projections and the resulting demands. Groups such as the Northern Regional Water Coalition, which included water providers and citizens, held discussions in the late 1990s about critical regional water issues and potential strategies to address them.

The catalysts that sparked the formal decision to move forward with NISP included the 2000 Regional Water Demand Study, the Statewide Water Supply Investigation and other research that all pointed to one conclusion: More people will be living in Colorado in the future, and they will require more water.

Why NISP is preferred

WATER PROVIDERS must meet demand challenges by balancing conservation and new water supplies. One measure alone is not enough.

Selecting NISP as the preferred solution took a lot of work and analysis. The project participants reviewed more than 200 options to supplement their water supplies. After extensive study, they decided NISP is the best option.

NISP will help keep kitchen faucets and school water fountains flowing. And it will support area businesses, which depend upon reliable water supplies to thrive. The water from NISP also has the power to drive Colorado's new energy economy. After all, it takes water to manufacture power, including solar and wind.

NISP at the same time would lessen the impacts of population growth on the region's robust agricultural economy. Weld County, which would receive water from NISP, was ranked eighth in the nation for ag production in the U.S. Department of Agriculture's 2007 Census of Agriculture at $1.54 billion annually.

Without NISP, growing cities will have few, if any, alternatives beyond buying farmers' water rights to meet their future water needs.

Glade and Galeton area map

Glade Reservoir
- 5 miles long
- 260 feet deep
- 170,000 acre-foot capacity
- 1,700 surface acres
- 1,200 cfs diversion off Poudre River

Galeton Reservoir
- 2 partner ditch companies
- 45,000 acre-foot capacity
- 2/3 of NISP's 40,000 acre-foot annual yield
- 200 cfs diversion off South Platte River

NISP
Northern Water
Northern Integrated Supply Project

GLADE RESERVOIR would be northwest of Fort Collins. Glade would be filled with Poudre River water, and would likely offer recreation such as boating, fishing, camping and hiking.

GALETON RESERVOIR would be northeast of Greeley. It would be filled with South Platte River water to replace agricultural users' water that has historically been diverted from the Poudre River.

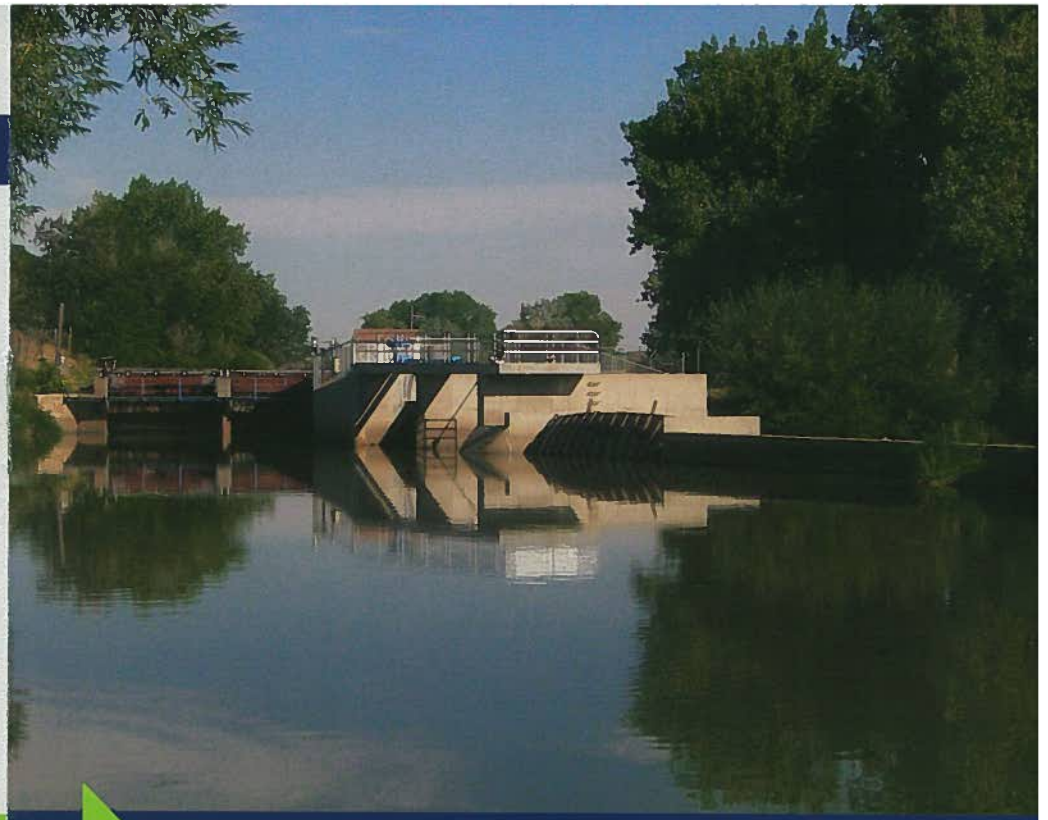
How Glade would work

GLADE RESERVOIR would divert water from the Poudre River. The diversions would occur during high flow seasons using a water right secured in 1980 for the benefit of Northeastern Colorado.

The Poudre River diversion would be near the canyon mouth below the sections designated in 1986 as wild and scenic.

Once diverted, the water would move through an existing canal before it is pumped to Glade Reservoir, where it would be stored for delivery to participating water providers.

Glade, which would be slightly bigger than Horsetooth Reservoir, would be north of the intersection of U.S. Highway 287 and Colorado Highway 14. A 7-mile stretch of 287 would be rerouted.



NISP water would be diverted at the Poudre Valley Canal, below. The Larimer & Weld Irrigation Co., headgate at right, is integral to NISP.

How Galeton would work

GALETON RESERVOIR would be in the plains northeast of Greeley. It is the key feature of what is called the South Platte Water Conservation Project and the reason NISP is "integrated" with two reservoir operations.

The key to Galeton's operation is an "exchange" of water. The reservoir would be filled with diversions from the South Platte River. This water would be delivered via pipelines to the Larimer & Weld Irrigation and New Cache la Poudre Irrigating companies.

The two ditch companies already divert water from the Poudre River, but with NISP a portion of that water would instead be diverted directly into Glade. The water that the companies did not receive from the Poudre River would in turn be delivered from Galeton.

This exchange amounts to about one-fourth of the ditch companies' total supply. By acting in partnership with agriculture, NISP would provide new water for cities and industries without taking away water rights used to irrigate crops.

A partner with agriculture

CITIES HURTING FOR WATER frequently purchase farmers' water rights, causing farms to "dry up" and often cease production. This has a ripple effect throughout the economy.

By supplying an alternative source of much-needed water for cities and towns, NISP would decrease the region's need for ag dry-up.

NISP would also provide supplemental water supplies to water districts that would deliver water to dairies, feedlots and other ag-related end users.

What do the people who know and respect agriculture have to say about NISP and its benefits?

"NISP is a project that embodies what agriculture is looking for – a way to continue to exist with urban development."

Jim Miller, Colorado deputy commissioner of agriculture

"If we don't store water for growth, that water is going to come from agriculture."

Don Ament, former Colorado commissioner of agriculture

"If we don't build this, it's taking a step backwards."

Mike Hungenberg, Board President, New Cache la Poudre Irrigating Company

Under review

UNDER FEDERAL LAW, NISP must go through the National Environmental Policy Act review process, which includes the requirement to mitigate for the project's environmental impacts.

NISP would have the flexibility to provide a variety of mitigation measures, including those that might focus on flows and associated river habitat. NISP participants are working with other state and federal agencies to discuss details.

NISP entered the federal review process, which requires approval from the U.S. Army Corps of Engineers, in 2004. The first Corps report, called the Draft Environmental Impact Statement, came out in 2008. The Corps is also working on a second, or supplemental, draft EIS. The agency will then issue a decision on how or whether the project can proceed.

"Today is our generation's turn to step up to the plate. It's our generation's turn to say: We're moving forward; we're going to do something for our children and our grandchildren; we're going to build NISP."

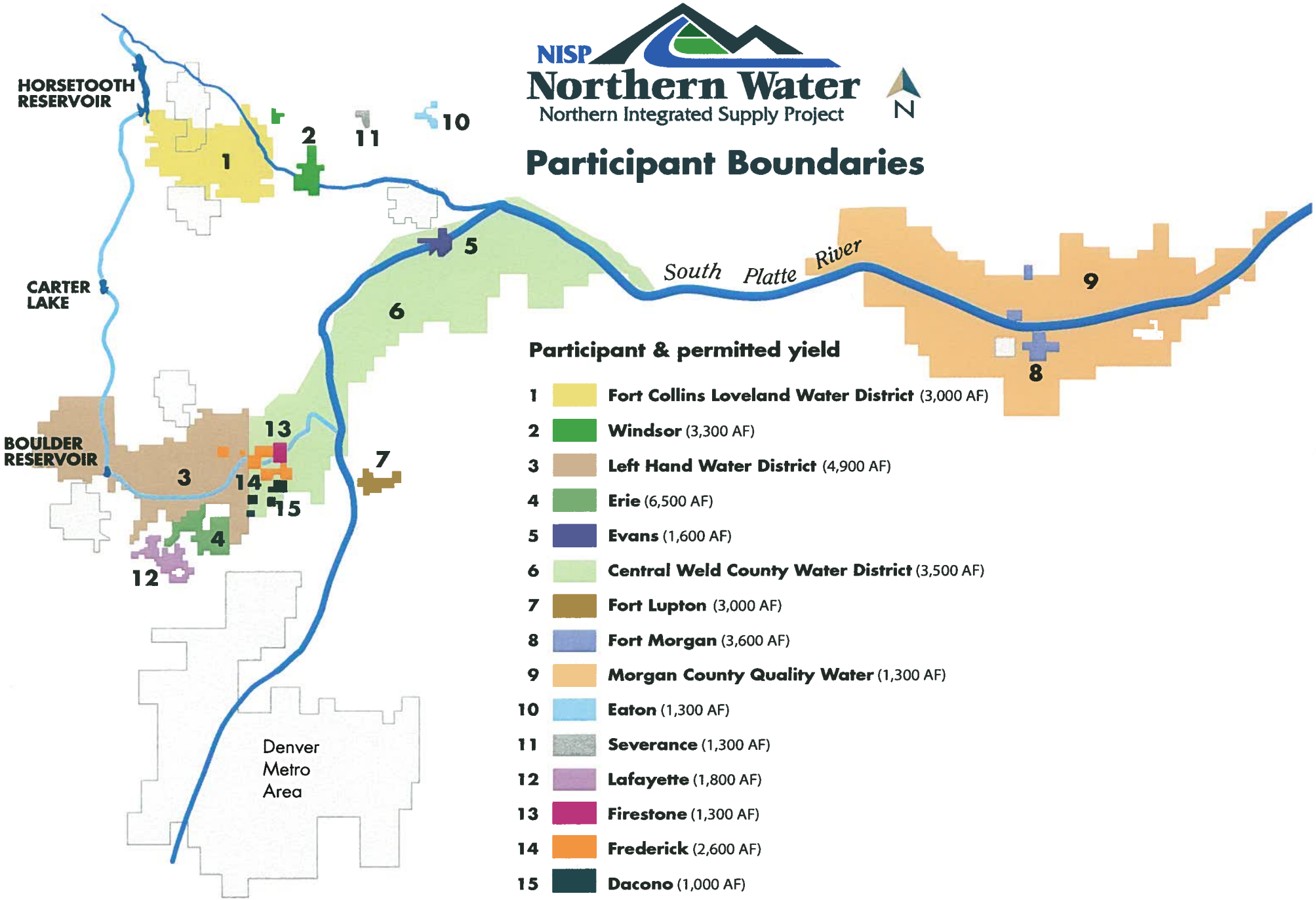
Sean Conway, Weld County commissioner

NISP

Northern Integrated Supply Project

NISP
Northern Water
Northern Integrated Supply Project

For more on NISP, including the latest news and publications,
visit www.gladereservoir.org or call 970-622-2229.


NISP
Northern Water
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N
Participant Boundaries
HORSETOOTH RESERVOIR
CARTER LAKE
BOULDER RESERVOIR
South Platte River
Denver Metro Area
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Participant & permitted yield
1 Fort Collins Loveland Water District (3,000 AF)
2 Windsor (3,300 AF)
3 Left Hand Water District (4,900 AF)
4 Erie (6,500 AF)
5 Evans (1,600 AF)
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13 Firestone (1,300 AF)
14 Frederick (2,600 AF)
15 Dacono (1,000 AF)

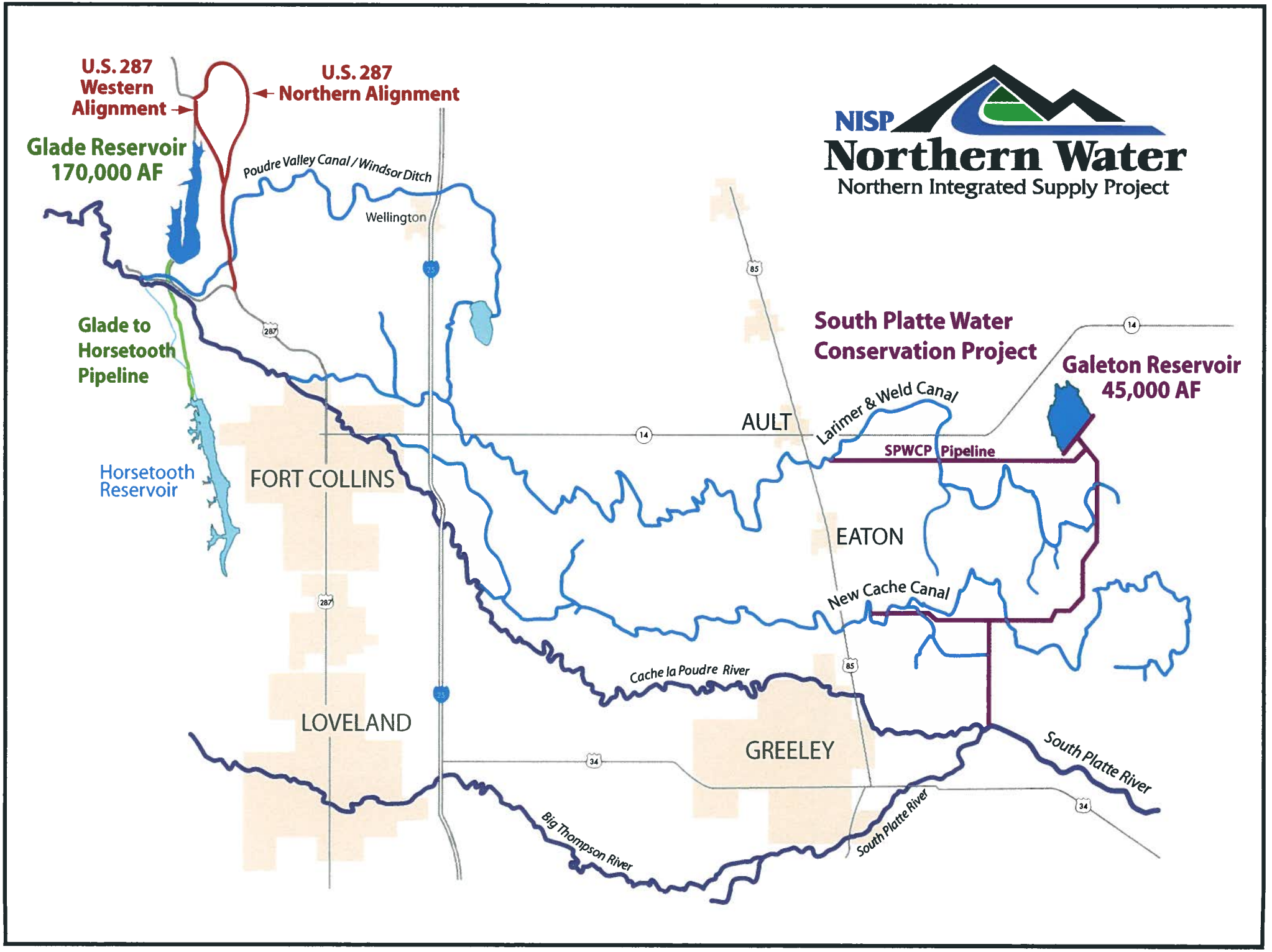
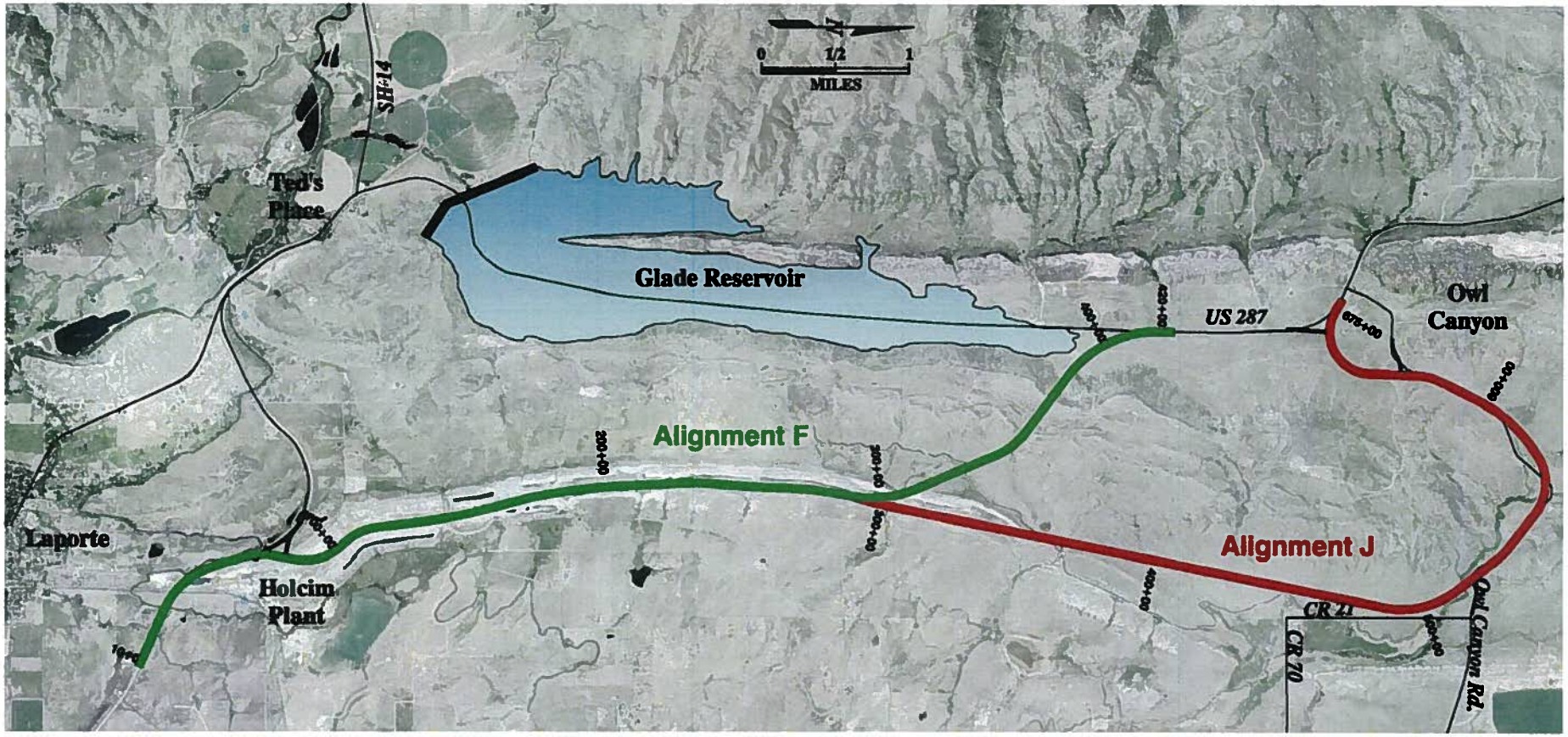

U.S. 287
Western
Alignment
U.S. 287
Northern Alignment
Glade Reservoir
170,000 AF
Poudre Valley Canal / Windsor Ditch
Wellington
Glade to
Horsetooth
Pipeline
Horsetooth
Reservoir
FORT COLLINS
LOVELAND
AULT
Larimer & Weld Canal
South Platte Water
Conservation Project
SPWCP Pipeline
Galeton Reservoir
45,000 AF
EATON
New Cache Canal
Cache la Poudre River
GREELEY
South Platte River
Big Thompson River
South Platte River
NISP
Northern Water
Northern Integrated Supply Project

Figure 2 - Short Listed Alternatives



NISP Support/Endorsements

NISP participant communities & water districts
Dacono, Eaton, Erie, Evans, Firestone, Fort Lupton, Fort Morgan, Frederick, Lafayette, Severance, Windsor, Central Weld County Water District, Fort Collins-Loveland Water District, Left Hand Water District, Morgan County Quality Water

Ditch & reservoir companies
District 6 Water Users Association
Lake Canal Ditch Company
Larimer and Weld Irrigation Company
New Cache la Poudre Irrigating Company
Windsor Reservoir and Canal Company

Agricultural-related organizations
Agland, Inc.
Colorado Cattlemen's Association
Colorado Corn Growers Association
Colorado Dairy Producers
Colorado Egg Producers Association
Colorado Farm Bureau
Colorado Livestock Association
Colorado Pork Producers Council
Colorado State Grange
Colorado Sugarbeet Growers Association
Eaton Local Sugarbeet Growers
GreenCO
Rocky Mountain Agribusiness Association
Rocky Mountain Farmers Union
Valley Irrigation of Greeley
Western Sugar Cooperative

Business-related organizations
Club 20
Colorado Association of Commerce & Industry
Fort Collins Board of REALTORS ®
Progressive 15
United Power
Upstate Colorado Economic Development
Weld Community Development Group
Weld County Builders Assoc, Inc.

Chambers of commerce
Berthoud Area Chamber
Carbon Valley Chamber
Evans Area Chamber
Fort Lupton Chamber
Fort Morgan Chamber
Greeley Chamber
Lafayette Chamber
Longmont Area Chamber
Mead Area Chamber
Windsor Chamber

Water conservancy districts
Central Colorado Water Conservancy District
Lower South Platte Water Conservancy District
Northern Colorado Water Conservancy District
St. Vrain & Left Hand Water Conservancy District

Conservation districts
Boulder Valley Conservation District
Longmont Conservation District
West Greeley Conservation District

Editorial support
Erie Review
Fort Morgan Times
Greeley Tribune
Lafayette News
Longmont Times-Call
Louisville Times
Loveland Reporter-Herald
Windsor Beacon

County commissioners
Larimer County Commissioners
Morgan County Commissioners
Weld County Commissioners

Public/elected officials
U.S. Rep. Cory Gardner

State Sen. Greg Brophy
State Sen. Mary Hodge
State Sen. Kevin Lundberg
State Sen. Scott Renfroe
State Sen. Lois Tochtrop

State Speaker Frank McNulty
State Rep. Jon Becker
State Rep. Don Beezley
State Rep. Brian DelGrosso
State Rep. B.J. Nikkel
State Rep. Kevin Priola
State Rep. Jim Riesberg
State Rep. Jerry Sonnenberg
State Rep. Glenn Vaad

Former U.S. Sen. Wayne Allard
Former U.S. Sen. Hank Brown
Former state Minority Leader Josh Penry
Don Marostica, former director, Colorado Office of Economic Development under Gov. Ritter
Don Ament, former state agriculture commissioner

*****For Immediate Release*****

Contact:
Shawn Martini
303-749-7505
smartini@colofb.com

Statement by Don Shawcroft, President, Colorado Farm Bureau, Regarding Save the Poudre: Poudre Waterkeepers 'Farm Facts' Report

Denver, CO, April 27, 2011 – Alamosa rancher and Colorado Farm Bureau President Don Shawcroft had strong words for Save the Poudre: Poudre Waterkeepers upon reading their 'report' on the impact of NISP on northern Colorado agriculture.

"The so-called report is nothing but propaganda, spread by Save the Poudre in a vain attempt to derail the Northern Integrated Supply Project (NISP). Save the Poudre does not speak for Colorado agriculture, an industry forthright and vocal in its support for NISP. Their attempts to divide the ag industry are tiresome. They speak only for themselves and their attempts to stall a project supported by large majorities of northern Colorado citizens.

The NISP project is a crucial step in reducing the pressure from development on irrigated agriculture in Northern Colorado. Opponents of NISP would have us do nothing in the face of increasing water needs along the northern Front Range. Whether the Save the Poudre crowd likes it or not, more people are moving into the region served by the NISP participants. The project is a proactive, environmentally sound step to manage the growth along the Front Range and it will insure that irrigated farmers along the South Platte Basin will have access to their water for years to come.

Colorado farmers and ranchers support the NISP project. Unlike the Poudre Waterkeepers, food producers in Colorado have been managing our states water resources for hundreds of years. If we support the development of a water project, you can bet it will help keep irrigated farmers on the land. The public knows this. Lawmakers know this. So does Gary Wockner and the rest of the Waterkeepers. They just won't tell you that."

###

Colorado Farm Bureau is a grassroots organization dedicated to preserving and improving the agriculture industry, rural communities, and the Colorado economy, through member involvement in education, policy activities, programs and services.

Executive Summary
Northern Integrated Supply Project
No Action Alternative Evaluation

Prepared for:

Northern Colorado Water Conservancy District

April 2010

Prepared By:

MWH

Denver and Fort Collins, CO

NISP
Northern Water
Northern Integrated Supply Project

Preface

MWH Americas, Inc. was contracted by the Northern Colorado Water Conservancy District and Participants in the Northern Integrated Supply Project (Consulting Services Agreement dated April 27, 2009, MWH Project No. 1006828) to develop and provide conceptual level information regarding the No Action Alternative for evaluation in the Supplemental Draft Environmental Impact Statement. This executive summary summarizes the main report, which is available under separate cover.

Executive Summary

The U.S. Army Corps of Engineers (Corps) prepared a Draft Environmental Impact Statement (DEIS) for the Northern Integrated Supply Project (NISP) proposed by the Northern Colorado Water Conservancy District (Northern Water) and the NISP Participants. The DEIS included a description of the No Action Alternative (NAA), or the alternative likely pursued by the Participants to meet their future needs if the Corps does not permit their Proposed Action or another Action Alternative.

Comments on the DEIS included a request for more detail on the specific features of the NAA including the general location of agricultural water transfers (ag transfers), confirmation of storage sites, details on conveyance and water treatment infrastructure and operations. The Corps is preparing a Supplemental Draft EIS (SDEIS) to address comments. MWH was contracted by Northern Water to provide the requested analysis and detail on the NAA. Discussions with Northern Water and the Participants revealed that the DEIS NAA was not feasible particularly due to its reliance on gravel pit storage, C-BT unit purchases, and groundwater use, and that substantial changes to the DEIS NAA were needed.

A process similar to that used in the DEIS to develop and evaluate project alternatives was used to develop the NAA. This process is summarized in Figure 1. Any NAA option would be composed of water supplies, storage, conveyance and water treatment configured to meet the requirements of the Participants in a manner that is consistent with providing 40,000 acre-feet (AF) of firm yield. MWH gathered concepts from the NISP DEIS Alternatives Evaluation Report, the Windy Gap Firming Project (WGFP) Alternatives Report, and discussions with staff of Northern Water and Participants. Some concepts were screened from future consideration because they were not feasible for the NAA. MWH assembled the remaining concepts into six preliminary NAA options. Based on feedback from the Participants, three final NAA options were further developed. A recommended NAA was chosen based on the performance of the three final NAA options in several categories such as water quality, effect on irrigated agriculture, and implementation uncertainty.

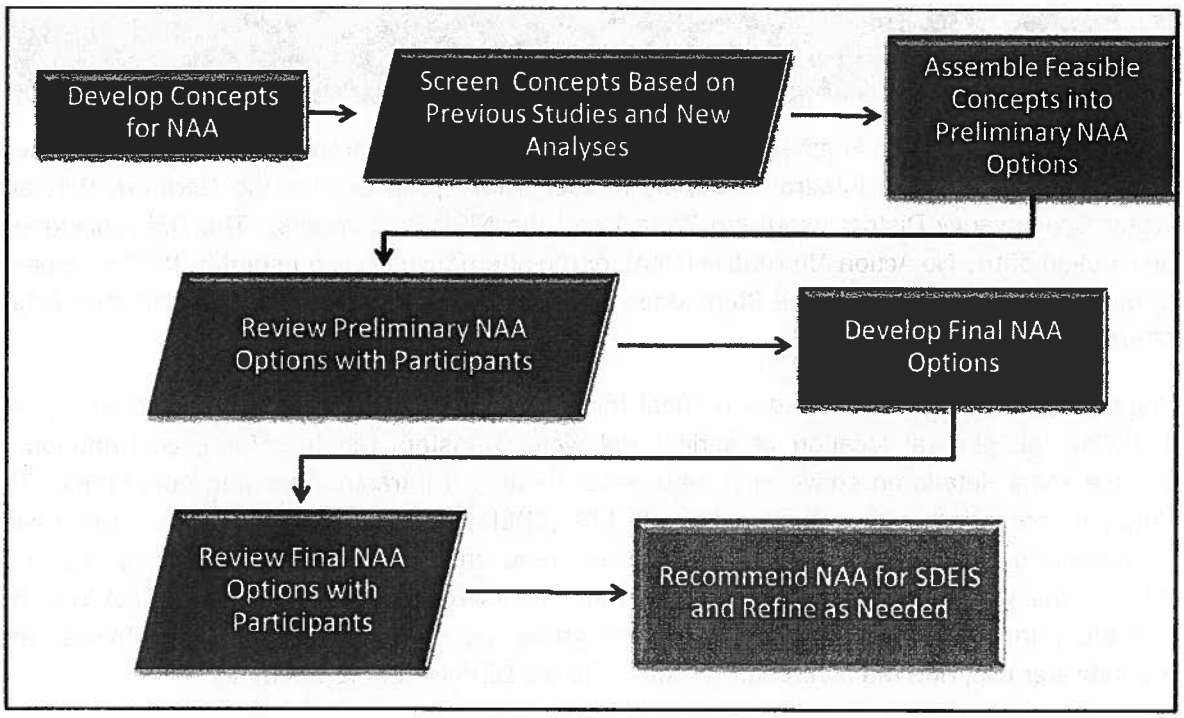


Figure 1. Process for Developing the NAA

No Action Alternative Requirements

Based on MWH's experience with previous National Environmental Policy Act (NEPA) projects and discussions with Northern Water, technical and operational requirements for development of the NAA were established at the outset of the project. These requirements are summarized below.

- No Corps Action - The NAA cannot include structural or non-structural components that would result in any type of individual Corps permit, including individual 404 permits, or other Corps action resulting in NEPA activities.
- Firm Yield Delivery - The NAA would need to provide the requested 40,000 AF of new reliable water supply (annual firm yield).
- Water Quality - The Participants must deliver to their customers treated water that meets drinking water standards and customer expectations; an upper limit of 400 milligrams per liter (mg/L) total dissolved solids (TDS) concentration was adopted for planning purposes.

No Action Alternative Concepts

The NAA will be comprised of four basic components: water supply, storage, conveyance, and water treatment. There are several potential concepts for each component. Concepts were analyzed and screened based on the analyses conducted in the DEIS and alternative evaluation studies, and based on experience with Northern Colorado water planning issues. A summary of the screening results is presented in Table 1.

Table 1. Summary of NAA Concept Screening

Component	Concepts Retained	Concepts Eliminated
Water Supply	• Native Water Rights • Ag transfers	• C-BT Unit Transfers • Rotational Fallowing • Dry-Year Leases • Groundwater
Storage	• Existing Facilities • New Reservoirs	• Gravel Pits • Aquifer Storage and Recovery
Conveyance	• Poudre Valley Canal • Southern Water Supply Pipeline • Dual Use Systems	• C-BT Facilities • Southern Water Supply Pipeline (west of Weld County) • Pleasant Valley Pipeline • Exchanges
Water Treatment	• Advanced Finished Water Treatment	• Pretreatment (and delivery to existing water treatment facilities)

C-BT = Colorado-Big Thompson

For the water supply component, native water rights and ag transfers were retained for further analysis. The following concepts were eliminated:

- Transfer of Colorado-Big Thompson (C-BT) Project units was eliminated because it is unlikely that an adequate supply of units will be available in the future to meet a significant portion of the NISP Participants' yield requirements. This is based on the number of units currently available, anticipated use of these units to serve a portion of un-met demand by NISP participants, competition from non-NISP participants, and current rules that prohibit "stock-piling" of C-BT units for future growth,
- Dry-year leases were eliminated because they only provide water in dry years, and would not meet the NISP requirement of providing 40,000 AF of water every year.
- Rotational fallowing was eliminated because it would require contracts with large numbers of irrigators and would involve large areas of land, likely more than 300,000 acres. It would be logistically difficult to implement permanent rotational fallowing on the large scale required for NISP. The rotational fallowing contracts that would be required by the municipalities would prohibit farmers from selling their water resulting in a cost that would be similar to the municipalities purchasing the water directly.
- Alluvial groundwater was eliminated because any alluvial groundwater development would also require surface water supplies to replace depletions, and bedrock groundwater was eliminated because it is a non-renewable and unreliable resource.

For the storage component, concepts consisting of the use of existing facilities and the development of new reservoirs were retained. The following concepts were eliminated:

- C-BT storage facilities were eliminated as storage options because there is very little excess storage capacity available (as witnessed by the need of Windy Gap Firming Project participants to develop additional storage to firm Windy Gap supplies) and because water quality would be degraded for non-NISP Participants.

- Gravel pits were eliminated because individually they would meet only a very small portion of the storage requirements, the availability of a large quantity of gravel pits for purchase and use is questionable, they are generally located too low in the basin to efficiently store water used for supplies, and the combination of multiple smaller storage facilities results in up to twice as much evaporative loss as fewer larger facilities.
- Aquifer storage and recovery (ASR) was eliminated because the alluvial geology in the study area does not support large-scale ASR development.

Conveyance concepts retained include the existing Poudre Valley Canal, the eastern spur of the Southern Water Supply Pipeline, and dual use systems, which would deliver non-potable water for irrigation of landscaped areas in new development. The following concepts were eliminated:

- C-BT conveyance facilities were eliminated as conveyance options because the introduction of water transferred from agriculture into the C-BT system would degrade water quality for non-NISP Participants.
- The southern portions of the Southern Water Supply Pipeline and the Pleasant Valley Pipeline were also eliminated due to contractual water quality requirements for delivery to non-NISP Participants.
- Exchanges were not included in the original development of NAA alternatives due to unreliability of exchange potential given future conditional water rights in basins that could supply NAA water. However, exchange rights would likely be filed for any of the options and exercised as exchange potential permits in order to maximize water quality and reduce pumping costs.

Conventional water treatment is not explicitly part of any of the Action Alternatives or the NAA and is expected to be the responsibility of the Participants. Advanced water treatment was retained as an NAA concept. Pretreatment was eliminated due to the inability to remove total dissolved solids (TDS) and other constituents of concern in the source water at a basic pre-treatment facility.

No Action Alternative Preliminary Options

MWH developed six NAA preliminary options prior to meeting with each of the Participants. Fact sheets illustrating the preliminary options, available in Appendix A, were discussed with the Participants at individual meetings.

Three categories of preliminary options were developed.

- **Preliminary Option A: Local Supplies/Local Storage** – Similar to the DEIS NAA, with smaller more localized projects.
- **Preliminary Option B: Northern/Balanced Supplies** – Larger regional project based mostly upon ag transfers from the Poudre and Big Thompson basins.
- **Preliminary Option C: South Platte Natural Pretreatment** – Poudre Basin water supplies for Participants located near the Poudre River, South Platte water supplies for the remaining Participants, and the use of shallow wells to divert, store and pre-treat South Platte supplies.

Preliminary Option B was further sub-divided to provide more definition on how the preliminary option could be developed.

- **Preliminary Option B.1: Balance Ag Transfer, Existing Storage** – Implementing enough ag transfer to meet yield requirements without constructing new storage.
- **Preliminary Option B.2: Northern Ag Transfer, Existing Storage, New Plains Reservoir** – Ag transfers in the Poudre and Big Thompson basins with a new reservoir on the plains (east of I-25).
- **Preliminary Option B.3: Northern Ag Transfer, New Foothills Reservoir** – Ag transfers from the Poudre Basin and development of new reservoir in the foothills, likely resulting in the best water quality of the Preliminary Option B sub-options.
- **Preliminary Option B.4: Balanced Ag Transfer, New Plains Reservoir** – A higher percentage of ag transfers in the Big Thompson Basin with a new reservoir on the plains (east of I-25).

All of the preliminary options involve a substantial amount of ag transfers, including the agricultural water storage rights associated with the transferred ditch company shares.

Final No Action Alternative Options

Based on feedback received from Participants and Northern Water, and subsequent technical analysis, three final NAA options were refined. Although preliminary NAA options included smaller, more individualized projects, the NAA development process led to final NAA options that are regional projects. Regional projects are more efficient in terms of infrastructure, total cost, and minimizing effects on irrigated agriculture. For the final NAA options, information was developed to document the source ditch system and quantity of irrigation dry-up; the potential diversion of native water supplies; specific storage sites and required volume; general alignments and required capacities of conveyance segments; general locations, capacities and description of the type of water treatment required; and the infrastructure required for delivery of treated or untreated water to the Participants. Table 2 summarizes the components of the final NAA options.

Table 2. Final NAA Options Component Summary

Component	Option 1 North and South Systems	Option 2 No New Storage	Option 3 Large Plains Reservoir
Associated Preliminary NAA Option	A	B.1	B.2
Water Supply [1]	• Ag transfer 44,100 acres • Average yield 41,300 AF • Sources: Poudre, Big Thompson & S. Platte • Junior rights with 4,957 AF average yield	• Ag transfer 91,000 acres • Average yield 64,000 AF • Sources: Poudre & Big Thompson	• Ag transfer 62,000 acres • Average yield 43,900 AF • Sources: Poudre & Big Thompson • Junior rights with 877 AF average yield
Storage	• Shares in existing ag reservoirs • Acquire Cobb Lake 22,300 AF • New Berthoud Hill Reservoir 25,000 AF	Shares in existing ag reservoirs	• Shares in existing ag reservoirs • New Cactus Hill Reservoir 120,000 AF
Conveyance	• Existing canals, existing and new pipelines • North and south systems not connected • Dual use system	• Existing canals, existing and new pipelines • Connected raw water system	• Existing canals, existing and new pipelines • Connected raw water system
Water Treatment	• Advanced water treatment and high recovery RO for 16 percent of supply with ZLD and evaporation ponds for brine disposal • 30 percent of supply untreated for delivery in dual use systems	Advanced water treatment	Advanced water treatment

MGD = million gallons per day, RO = reverse osmosis, ZLD = zero liquid discharge

Notes:

[1] Average yield of water supplies is diverted water at headgate. Water supplies required are greater than firm yield (40,000 AF) to account for reservoir evaporation and undiverted flow during times when water cannot be delivered or stored.

The following paragraphs generally describe each option.

- **Option 1: North and South Systems** - The Participants generally located near the Poudre River (Evans, Windsor, Fort Collins-Loveland Water District, Severance, and Eaton) would develop northern water supplies and an associated storage facility. The remaining Participants, all located further south, would develop water supplies from the Lower South Platte Basin and store them in a separate storage reservoir located near the water sources.

The North System would use ag transfers from the Poudre Basin, existing reservoir storage in agricultural systems, and purchase of the existing Cobb Lake to serve the northern Participants. Use of multiple smaller reservoir facilities such as gravel pits was originally considered, but ultimately not included.

The South System would use ag transfers from the Big Thompson and South Platte basins, existing reservoir storage in the Big Thompson Basin, and a new reservoir east of I-25 near Berthoud to serve the southern Participants. Because the South System would rely on South Platte supplies that generally have high levels of TDS, about 4 million gallons per day (MGD) of the flow would be treated via high-recovery reverse osmosis (RO). Brine disposal would be accomplished through a combination of evaporation ponds and zero liquid discharge (ZLD). To reduce the amount of advanced water treatment required, Option 1 also includes a non-potable system that would deliver untreated water to selected Participants for use in dual-use distribution systems to be constructed in new development.

- **Option 2: No New Storage** – The premise of this option is to minimize the need for new storage. Because existing agricultural reservoirs typically do not have a significant carryover storage component (i.e., they are filled and drained annually to meet consumptive use (CU) requirements), enough agricultural CU would be purchased to meet firm yield requirements in the driest year of the planning period.

  Option 2 involves the transfer of water from irrigated land in Larimer & Weld and New Cache systems in the Poudre Basin, and the Home Supply system in the Big Thompson Basin. Transferred water would continue to be diverted from the Poudre and Big Thompson Rivers at the existing diversion locations. Larimer & Weld and New Cache water would be delivered directly to Big Windsor Reservoir. Home Supply water would continue to be delivered to Lonetree Reservoir southwest of Loveland. From these existing reservoirs, water would be delivered to two regional advanced water treatment plants that would serve the northern and southern Participants.

- **Option 3: Large Plains Reservoir** - This option was based on using a large new reservoir and identifying ag transfer supplies based on their ability to be delivered to the reservoir.

  Option 3 involves the transfer of water from irrigated land in Larimer & Weld and New Cache systems in the Poudre Basin, and the Home Supply system in the Big Thompson Basin. As with Option 2, transferred water would continue to be diverted at the existing diversion locations and delivered to Big Windsor Reservoir and Lonetree Reservoir. Cactus Hill Reservoir would be constructed and used for carryover storage, and would be filled from both Big Windsor Reservoir and through the existing Poudre Valley Canal. Water would be delivered to two regional advanced water treatment plants that would serve the northern and southern Participants.

Comparison of NAA Options

A qualitative screening process was used to evaluate the three final options and assist Northern Water and the Participants in selection of a recommended NAA for the SDEIS. In order to perform this screening, a list of decision criteria was developed using the NAA requirements

described earlier. All of the alternatives meet the requirements for permitting and delivering 40,000 AF of firm yield. A total of 6 criteria were developed from the remaining three categories of requirements (reliability, water quality and reasonableness), based on comments received from project Participants and Northern Water. A summary of the criteria and qualitative evaluation is presented in Table 3.

Table 3. Relative Comparison of NAA Options

Criteria	Option 1 North and South Systems	Option 2 No New Storage	Option 3 Large Plains Reservoir
System Reliability & Flexibility	• Low operational flexibility due to unconnected systems	• Lack of carryover storage • Low operational flexibility due to lack of storage	
Water Quality	• South system raw water TDS greater than water quality standard • Lack of maturity of ZLD process	• Raw water quality poorer than Carter Lake	• Raw water quality poorer than Carter Lake
Effect on Irrigated Agriculture	44,100 acres retired	91,000 acres retired	62,000 acres retired
Construction & Water Cost	Estimated to be within comparable range for all options.		
O&M Cost	• Operation of dual-use systems • Extra cost and energy requirements for RO & brine disposal		
Implementation Uncertainty	• Uncertainty in future regulations and environmental concerns for brine disposal	• High percentage of ag transfers from individual ditch companies may be unattainable • Cost estimate uncertainty due to high reliance on ag water purchases	

Note: Shading indicates, where information clearly differentiates, a preference of one option over another. Green = higher preference, Pink = lower preference.

The evaluation and screening of NAA options was reviewed with the Participants, Northern Water and the consulting team that prepared this report. The following is brief discussion of each option.

- **Option 1 – North and South Systems:** This option evolved from Option A in the preliminary options analysis, which was a more "localized" option somewhat similar to the No Action Alternative in the DEIS. Because of limited water supplies near many of the Participants, and challenges with numerous smaller storage facilities such as gravel pits and small new reservoirs, the option became a "North System" and "South System" option involving two smaller reservoirs and water supplies from the Poudre Basin to the South Platte Basin.

  Due to water quality issues in the South Platte Basin, RO facilities would be required for the South System. The certainty to which an RO system could be developed at the treatments rates required in Colorado is questionable, primarily due to brine disposal issues and high energy costs. Implementation of dual-use systems in certain Participant communities without existing dual use systems was included to reduce the amount of RO treatment required. Additionally, due to lack of interconnection between the two systems, the combined system provides less water supply and operational flexibility for the NISP Participants as a whole. This option would have the least amount of impacts to irrigated agriculture due to the use of South Platte water supplies. However, the tradeoff is reduced water quality requiring RO treatment.

- **Option 2 – No New Storage:** This option, which originally was termed Option B.1 in the preliminary options analysis, was developed as an option that would not require construction of new storage facilities, and utilize storage in existing agricultural storage facilities to the maximum extent possible. Because agricultural storage systems along the Front Range have typically been developed as seasonal storage facilities without a significant carryover storage component, storage in these facilities does not provide the level of drought protection required for municipal water supplies. Similarly, because less storage is available, this option would have the greatest impact on irrigated agriculture because municipal entities would have to continue to rely primarily on transferred direct flow yield during dry years (which is typically much lower than average or wet year yield) rather than relying on carryover storage during dry years. Due to a lack of storage, this option would not be able to take advantage of new junior water rights that could divert currently unappropriated water.

  Staged construction and implementation of this option would likely be easier than other options due to fewer required infrastructure requirements at the outset. However, there could also be issues in conversion of existing storage facilities from an agricultural water supply, which primarily has a defined release to augment late season irrigation requirements, to a municipal water supply that requires releases throughout the year and a desired carryover storage component.

- **Option 3 – Large Plains Reservoir** – This option, which originally was termed Option B.2 in the preliminary options analysis, was developed as a regional solution, and involves the construction of a single larger plains reservoir that could be developed without an individual Corps permit, and a mid-level amount of ag transfers. The option would provide the maximum amount of flexibility to the Participants due to a reasonable

amount of carryover storage, interconnection amongst all Participants, and proven technologies (i.e. it would not require large-scale RO treatment).

Implementation of the final NAA options requires a continued regional partnership between the NISP Participants. More independent NAA options could be possible, but they would result in greater impact to irrigated agriculture. During Participant meetings, all Participants expressed continued interest in a regional project. As part of the NISP process, the Participants have developed the organizational structure and planned implementation strategies that could be adapted directly to this regional solution.

In general, the Participants were concerned about the quantity of agricultural dry-up for all options, the uncertainties surrounding the development of Options 1 and 2 regarding the availability of water supplies and implementation of RO, and the overall cost of implementing any of the options. Ultimately, using the information presented in Table 3, it was determined that Option 3 represents the most likely future action by the Participants if the NISP Proposed Action could not be permitted.

Recommended No Action Alternative

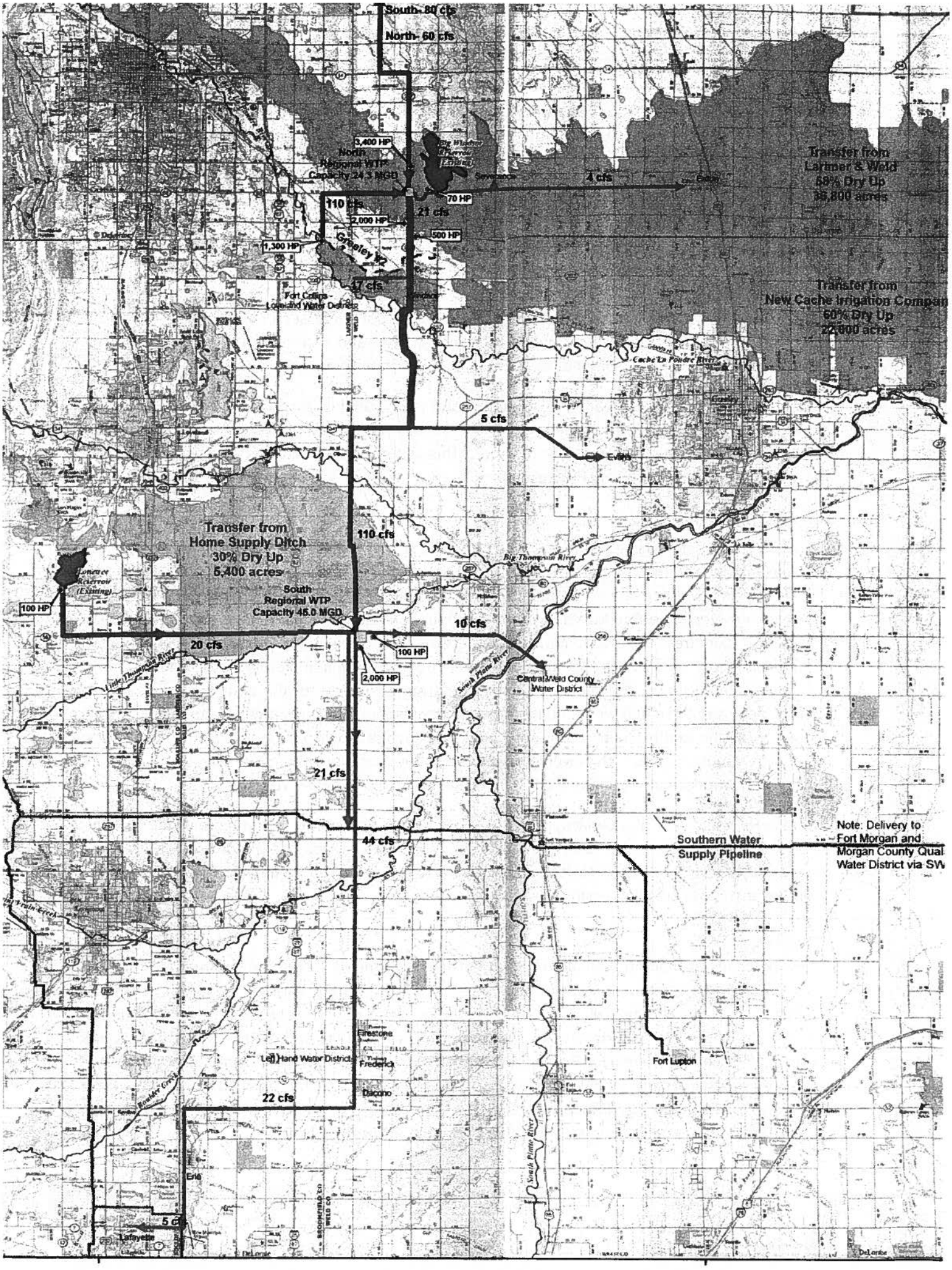
The recommended NAA is based on Option 3, and is shown on Map 1. Based on supplemental analysis and review, some refinements were made to Option 3, primarily to the amount of water supply assumed to be available from certain ditches. Details regarding the recommended NAA were developed to a level of detail that would provide adequate information for evaluation of environmental and socioeconomic effects by the Corps in the SDEIS.

Water Supply

Table 4 summarizes the water right transfers and associated existing storage within each system required to meet NISP firm yield delivery requirements to the North and South system Participants. All transferred water supplies are located in the Poudre and Big Thompson basins for ease of conveyance to storage and water treatment facilities.

Table 4. Recommended NAA - Water Rights Transfer Summary

Ditch System	Transferable Ditch CU (AF/ac)	Irrigated Land Affected (acres)	Average Annual Yield (AF)	Percent of Total Ditch Shares	In-Ditch Storage Transferred (AF)
Larimer & Weld	0.54	36,800	19,900	58%	13,569
New Cache	0.97	22,000	21,300	60%	6,145
Home Supply	0.74	5,400	4,000	30%	5,998
Total	0.70	64,200	45,200	55%	25,712


South- 80 cfs
North- 60 cfs
3,400 HP
North
Regional WTP
Capacity 24.3 MGD
Transfer from
Larimer & Weld
58% Dry Up
36,800 acres
4 cfs
110 cfs
21 cfs
2,000 HP
70 HP
500 HP
1,300 HP
17 cfs
Fort Collins -
Loveland Water District
Transfer from
New Cache Irrigation Compan
60% Dry Up
22,800 acres
5 cfs
Transfer from
Home Supply Ditch
30% Dry Up
5,400 acres
110 cfs
South
Regional WTP
Capacity 45.0 MGD
100 HP
10 cfs
20 cfs
100 HP
2,000 HP
Central Weld County
Water District
21 cfs
44 cfs
Southern Water
Supply Pipeline
Note: Delivery to
Fort Morgan and
Morgan County Qual
Water District via SW
Lower Latham Reservoir
(Existing)
Big Thompson River
Little Thompson River
South Platte River
North Platte River
Boulder Creek
Left Hand Water District
Firestone
Frederick
Dacono
Erie
Lafayette
Fort Lupton
22 cfs
5 cfs

Total water supplies for the recommended NAA are approximately 45,200 AF, while the total annual firm yield of the NAA is 40,000 AF. The 5,200 AF of water supplies that are in excess of the 40,000 AF required for annual delivery to the Participants would be consumed as evaporation in the reservoirs or spilled when the transferred agricultural water is available during times when carryover storage is full. Yield estimates are approximate and based upon the hydrologic modeling techniques described in the main report.

Alternate point of diversion (APOD) or exchange water rights would be filed for the NAA. Water transferred from the Larimer & Weld and New Cache systems would be diverted through the Poudre Valley Canal when the APOD or exchange would not injure senior water rights to provide the higher quality source water for delivery and storage and to reduce pumping costs. The APOD/exchange operation should be included in the hydrologic analysis of the NAA in the SDEIS.

In addition to water rights transfers, a junior water right would be filed in the Poudre Basin. On average, this water right would yield about 900 AF per year. Even in wet years the junior water right would not yield a large amount of water. This water would be diverted through the existing Poudre Valley Canal to Cactus Hill Reservoir.

Storage

Water would be stored in existing reservoirs that are part of the Larimer & Weld, New Cache, and Home Supply systems. Regulating, carryover, and terminal storage would be held in pro-rata ownership in several reservoirs connected to these systems, including the Larimer and Weld high mountain system, the Poudre Valley Canal system, Terry Lake, Timnath Reservoir, Big Windsor Reservoir, Lonetree Reservoir, Mariano Reservoir, and Lon Hagler Reservoir. Big Windsor Reservoir would be a key facility in the NAA, serving as a terminal storage facility for the north water treatment plant, and partially serving as terminal storage for the south water treatment plant. Lonetree Reservoir would be the other key existing reservoir, as it would serve as terminal storage for the south water treatment plant. Reservoirs would be operated in a manner to optimize water quality. This would require rotating releases among reservoirs to prevent excessive evapoconcentration of salts from occurring in any one reservoir.

Cactus Hill Reservoir, at a capacity of 120,000 AF, would be constructed to store water from the Poudre River system. The reservoir size was selected to reduce the amount of ag transfers required. Cactus Hill Reservoir is included as part of Alternatives 3 and 4 in the DEIS and has already received extensive environmental review.

Conveyance

New pipelines and pump stations required for the recommended NAA are summarized in Table 5. Cactus Hill Reservoir would be filled via a pipeline from Big Windsor Reservoir and short pipeline from the Poudre Valley Canal. The pipeline from Big Windsor Reservoir to Cactus Hill Reservoir would be a bi-directional pipeline, which would allow releases from Cactus Hill Reservoir back to Big Windsor Reservoir and the North Water Treatment Plant. Raw water from the New Cache system would be diverted from the Greeley No. 2 Ditch to the North Water Treatment Plant and Big Windsor Reservoir. Raw water would be delivered from Lonetree Reservoir to the South Water Treatment Plant through a pipeline.

Water Treatment

In a worst case scenario where supplies cannot be exchanged to a higher diversion point, the average raw water TDS would be about 350 mg/L, less than the secondary maximum contaminant level (MCL) of 500 mg/L and the assumed water quality goal for the NAA of 400 mg/L. Therefore, the two new water treatment plants would not require RO. However, if supplies are diverted at the ditch headgates, the NAA would be obtaining 43 percent of supplies downstream of municipal wastewater discharges and developed areas. There is potential to improve NAA raw water quality by exchanging New Cache water to diversion points further upstream. The amount of water that can be exchanged is not known at this time because the NISP hydrologic model continues to be modified. Due to the potential for lower raw water quality, the Participants would likely construct advanced water treatment facilities.

Table 6 summarizes the water treatment plant average and maximum month design flow rates.

Table 5. Recommended NAA – Conveyance Summary

Segment	Capacity (cfs)	Diameter (inches)	Length (miles)	Pump Station Horsepower
Raw Water - Cactus Hill Reservoir Inlet	200	48	6	1 @ 7,700 HP
Raw Water - Cactus Hill Reservoir to North Water Treatment Plant (bidirectional)	80 (south) 60 (north)	42	9	1 @ 3,400 HP
Raw Water - New Cache to North Water Treatment Plant	110	66	4	1 @ 1,300 HP
Finished Water - North Water Treatment Plant to FCLWD / Evans	5 - 21	16-30	17	1 @ 500 HP
Finished Water - North Water Treatment Plant to Eaton	4	14	9	1 @ 70 HP
Raw Water - North Water Treatment Plant to South Water Treatment Plant	110	66	21	1 @ 2,000 HP
Raw Water - Lonetree Reservoir to South Water Treatment Plant	20	36	15	1 @ 100 HP
Finished Water - South Water Treatment Plant to CWCWD	10	20	11	1 @ 100 HP
Finished Water - South Water Treatment Plant to Lafayette	5 - 44	20-48	24	1 @ 2,000 HP
Finished Water - South Water Treatment Plant to SWSP	21	36	5	--

Table 6. Recommended NAA - Water Treatment Plant Summary

Segment	Average Month Flow (MGD)	Max Month Flow (MGD)
North Water Treatment Plant (Advanced)	12.5	24.3
South Water Treatment Plant (Advanced)	23.2	45.0
Total	35.7	69.3

There are a variety of potential water treatment designs that could be selected by the Participants to meet their water quality goals. One potential design would be similar to the Peter Binney Water Purification Facility in Aurora. A similar plant for the recommended NAA would use the following treatment steps:

- Precipitative softening
- UV advanced oxidation
- Granular media filtration, and
- Carbon adsorption

Treated water would be delivered to the Southern Water Supply Pipeline for delivery to Morgan County Quality Water District and Fort Morgan. Although this pipeline currently carries raw water, it is of higher quality than the NAA water, and the raw NAA water may be acceptable to the receiving municipalities.

Recommended NAA Opinion of Probable Construction Cost

An opinion of probable construction cost for the recommended NAA is summarized in Table 7. All estimates are at a conceptual level.

Table 7. Recommended NAA Conceptual Level Opinion of Probable Construction Cost

Component	Cost
Storage – Cactus Hill Reservoir	$120M
Water Treatment (beyond conventional)	$40M
Conveyance	$160M
Unlisted Items at 10%	$30M
Subtotal	$340M
Contingency at 25%	$90M
Base Construction Cost	$440M
Engineering, construction management, legal, administrative at 13%	$60M
Water Rights Acquisition, Revegetation, Legal and Engineering	$300M - 400M
Total	**$800M – 900M**

MWH developed cost estimates for water rights acquisition and revegetation. The cost of water is presented as a range due to the uncertainty in the future cost of large ag transfers. Several different sources of information were consulted to develop costs for water transfers, including reported transactions for the last 10 years, a review of current cash-in-lieu rates for municipalities, and discussions with sources knowledgeable with particular irrigation systems. Estimated share prices for each basin were increased by 25 percent to account for the market's reaction to large scale water transfers. Revegetation, legal and engineering fees were also included. This resulted in a range of $5,900 to $8,600 per AF of municipal yield for the Poudre Basin, $11,200 to $13,800 per AF for the Big Thompson Basin, and $13,800 to $16,400 per AF for water obtained in the Denver Metro Area. Costs for Denver Metro Area shares were not used for the Recommended NAA.

All other costs were based on cost information developed by Integra Engineering and GEI for the SDEIS action alternatives using engineering information provided by MWH.

No Action Alternative Implementation

Implementation of the NAA would differ from that of the NISP Proposed Action due to the additional time required to procure and change agricultural water rights. Transfer of ditch shares from agricultural to municipal use would be a lengthy process for the Participants, and include initial studies and purchase offerings to individuals within the ditch companies involved, procurement of shares, a change case in water court, performing actual dry-up and revegetation, and finally, construction of facilities and delivery of water. Because of the uncertainty involved in water rights procurement and change cases, it is likely that the Participants would chose not to construct facilities until an adequate quantity of shares were purchased to justify construction and the entire change case was complete. Construction of facilities would likely commence with pipelines from the Greeley No. 2 Ditch and Lonetree Reservoir to the water treatment plants and associated facilities. Cactus Hill Reservoir and associated facilities would be the last portion of the project to be constructed.

Impact of Utilizing Water Supplies from the South Platte Water Conservation Project on Crop Production

Report made to the
Northern Colorado Water Conservancy District

By
Dr. Glenn J. Hoffman

May 2004

INTRODUCTION

At the request of the Northern Colorado Water Conservancy District and in connection with the water court applications filed in Consolidated Case No. 92CW130 for the South Platte Water Conservation Project (Project or SPWCP), I have assembled crop and water data, analyzed the data with respect to the impact of the salinity of the applied water in the proposed Project area on crop production, and drawn conclusions and made several management recommendations. I wish to thank Mr. Andrew Pineda and others at the District office for providing data and acquainting me with the proposed Project. This analysis draws heavily upon the information provided in the Reference Section and information provided by the District.

This report presents the salt tolerance of the major crops in the project area, summarizes the potential sources of applied water and their approximate level of salinity for this project, and describes how these water sources can be weighted by the amount applied from each source to estimate an average salinity of the applied water. These results are then applied to a crop salt tolerance equation to predict the crop yield with various scenarios of applying the several sources of water. The report concludes with an analysis of which crops will not be and which may be at risk of suffering a yield loss from utilizing the various water sources. Several recommendations are presented for managing waters and crops to avoid yield losses from excess salinity.

CROP SALT TOLERANCE

Crops differ in their response to salinity. The most distinct signs of injury from excess salts are reduced plant growth and loss of yield. Crops can tolerate salinity up to certain levels without a measurable loss in yield. This is called the salinity threshold. As the salt tolerance of crops increases, the threshold also increases. At salinity levels greater than the threshold, crop yield is typically reduced linearly as salinity increases. The relationship between soil salinity and crop yield in equation form is:

$$Yr = 100 - S\ (ECe - T), \qquad (1)$$

where Yr is crop yield relative to the same conditions without salinity, S is the linear rate of yield decline with increasing salinity beyond the threshold (slope of the line), T is the threshold salinity, and ECe represents the average root zone salinity measured as the electrical conductivity of a saturated soil extract (Maas and Hoffman, 1977). The threshold and slope values for the major crops in the project area are presented in Table 1. The crops in Table 1 are also rated as sensitive (S), moderately sensitive (MS), moderately tolerant (MT), or tolerant (T) of soil salinity.

Table 1. Threshold (T) and slope (S) values to calculate crop yields as a function of soil salinity and the crop's qualitative salt tolerance rating. (Adapted from Maas and Hoffman, 1977)

Crop	Threshold (T) dS/m	Slope (S) %/dS/m	Qualitative Salt Tolerance Rating
Alfalfa	2.0	7.3	MS
Barley for grain	8.0	5.0	T
Bean	1.0	19	S
Carrot	1.0	14	S
Corn for grain	1.7	12	MS
Corn for silage	1.8	7.4	MS
Grass hay/pasture			
Brome, smooth	---*	-----	MS
Orchard grass	1.5	6.2	MS
Rye	---*	-----	MS
Onion	1.2	16	S
Sorghum for grain	6.8	16	MT
Sugar Beet	7.0	5.9	T
Wheat for grain	6.0	7.1	MT

*These values are not published.

The salt tolerance data presented in Table 1 are based upon the average soil salinity of the root zone reported as the electrical conductivity of saturated soil extracts (ECe). This can be seen in the relationship given in equation (1). For this proposed project the only estimate of salinity is that of the applied water (see section on Applied Water Salinity). When the actual relationship between average soil salinity and the salt content of the applied water is not known, ECe is assumed to be 1.5 times larger than the salinity of the applied water (Ca). This relationship has been shown to be a reasonable estimate for many situations and the basic assumption is that 15% of the applied water leaches (drains) through the root zone to control soil salinity (G. Hoffman, 1997). If more water is applied than is needed to satisfy the crop's evapotranspiration and provide a leaching fraction of 0.15, the leaching fraction will increase and the ratio of ECe to Ca of 1.5 will become smaller. Conversely, applying less water results in a leaching fraction less than 0.15 and the ratio between ECe and Ca will become larger. If the leaching fraction is known to be different than 0.15 then a more accurate relationship can be applied to the analysis presented in this report.

APPLIED WATER SALINITY

There are four potential sources of water that could be available for crop production. These four sources are: rainfall, surface water currently provided by the irrigation and reservoir companies, well water, and proposed water supplies from diversion of Cache la Poudre River and South Platte River water. The amount of precipitation that may be effectively used by crops is discussed in the next section, followed by sections on probable salinity levels of ditch company surface waters after the project is initiated, and projected salt levels in the supplies from the South Platte Water Conservation Project (SPWCP). There is limited information on well water supplies in the Project area. If more information on the salt content of well water is

available, the accuracy of analysis considering well water as an irrigation source can be improved.

Effective Rainfall

Even in regions of low to moderate rainfall, precipitation can be an effective source of water for crops. Any precipitation used by the crop will obviously reduce the irrigation requirement. How much of the recorded rainfall can be utilized by crops is not well understood. As a result, many estimate that 75% of the recorded rainfall can satisfy a portion of the crop's ET requirement. The 75% figure is to take into account small, low intensity rainfalls that may not penetrate into the crop root zone and high intensity and/or long duration rains that result in surface runoff. Thus, to be conservative, 75% of the recorded rainfall will be assumed to offset irrigation requirements. With respect to water quality, rainwater, which is salt free, permits the use of more saline irrigation water than would otherwise be permissible in the absence of rain. For the purposes of this study, recorded rainfall records were used from station number 53553 at Greeley, Colorado, for 1967 through 2003.

For an overall analysis of rainfall in the project area, the 26-year rainfall record was utilized. Later in this report, the effective rainfall for each major crop was considered. For overall comparisons, the typical growing period was considered to be from March 1 through September 30 of each year. This time period is a compromise considering that planting dates vary from March to late May for many crops and some crops are planted in the fall (alfalfa) or winter (seed onions). Likewise, harvest dates among crops range from July to October. After this initial analysis, if certain crops appear to be in jeopardy of yield loss because of excess salinity, a detailed analysis for any crops threatened by salinity will be conducted. Taking recorded rainfall at Greeley from March 1 until September 30 and multiplying by 0.75 yields the values in Table 2 for effective rain from 1967 to 2003.

Also of interest are drought years. Data for the driest year and an average of the five driest years are presented in Table 2.

Table 2. Rainfall at Greeley, Colorado, from 1967 to 2003

	Inches
Average Values	
Annual rainfall	14.1
Effective seasonal rainfall (Mar. 1 to Sept. 30)	8.3
Drought Values	
Lowest value on record (1968)	
Annual rainfall	8.4
Effective seasonal rainfall	4.4
Average of 5 driest years (1968, 1986, 1994, 2000, & 2002)	
Annual rainfall	9.6
Effective seasonal rainfall	5.0

As a check on the effective rainfall data, a comparison was made with the values reported by Broner and Schneekloth (2003) from Colorado State University. The time period for their rainfall records was not specified but they reported an average seasonal precipitation for Greeley

of 12.2 inches and an average effective seasonal precipitation of 7.3 inches. The ratio of effective to total was 0.60 for Broner and Schneekloth and 0.59 for the data in Table 2.

Existing and Projected Ditch and Reservoir Company Irrigation Water

The NCWCD Water Quality Sampling Report (2003) on the presents the salinity of water delivered in the Larimer and Weld irrigation canal (LW) and to the New Cache la Poudre Irrigation Company (NC) from 1999 through 2002 during the irrigation season along with a number of other areas. For the purposes of this study, measurements from the sampling sites designated, as LW8, NC5, and NC7 will be used because they are in the proposed project area and four years of data were collected throughout the irrigation season at each site. The four years of sampling include data for two years of above average rainfall (1999 and 2001) and two drought years (2000 and 2002). Salinities of LW and NC irrigation waters will be considered separately because the values from the 2003 report are different for the two supplies and it is projected that the project will have different impacts on the water quality to these two suppliers.

Larimer and Weld Irrigation Canal (LW). The average electrical conductivity (EC) for the LW8 sampling site for the two high annual rainfall years (1999 and 2001) and the two dry years are both 0.52 dS/m. Thus, this value was used for predicting the current impact of water quality on crop yield. NCWCD personnel have estimated that the EC of the water at the LW8 location may increase because of withdrawals of water at upstream locations for exchange purposes. Thus, the EC value of 0.52 dS/m was increased by 15 %. This resulted in a projected EC of 0.60 dS/m. This value will be used when calculating crop yields after the project begins.

New Cache la Poudre Irrigation Company (NC). For NC, the average values for sampling sites NC5 and NC7 were utilized. For the above average rainfall years (1999 and 2001), the average EC was 0.83 dS/m and for the two dry years the average was 0.88 dS/m. Although the EC value is higher for the dry years, the difference is not considered to be significant. Thus, an average of 0.86 dS/m was taken as the current average condition. With the initiation of the project, NCWCD personnel have projected that the EC of water supplied to this company will increase 7 %. Thus, an EC value of 0.92 dS/m was assumed for after the project is started.

South Platte Water Conservation Project Water Supplies

Two sets of data were made available to estimate the salinity of the water pumped to Galeton Reservoir from the South Platte River to be used in the proposed project. The NCWCD provided data on the relationship between water salinity and flow rate at the Kersey gauging station on the South Platte River near where water will be diverted for the SPWCP. The maximum EC was about 1.3 dS/m when flow rate was at its lowest. The second set of data is from a USGS report (1995) where salinity was measured in five off-stream reservoirs along the South Platte River. Measurements from the Riverside Reservoir during the irrigation season of 1995 indicated an average of about 1.3 dS/m. The 1.3 dS/m value will be used here for the SPWCP. The actual value will depend on flow in the river, which is controlled by snowmelt, diversions, return flows, evaporation rates, and runoff from rainfall.

Well Water

Well water is another potential source of applied water and many farmers use wells to supplement their other sources of water. Data on the salt concentration of well water in the

Project area are lacking. District personnel have measured only a few irrigation wells in the Project area to date. The salinity of these measurements ranges from an EC of 1.2 to 2.7 dS/m.

In the Project area the use of well water is more predominant under the New Cache la Poudre system than for the Larimer and Weld system. The salinity of the well water used for this analysis was assumed to be 2.0 dS/m.

Projected Salinity of Applied Water

The average salinity of the applied water (irrigation and seasonal rainfall), Ca, can be calculated based upon the equation from Hoffman (1997) as:

$$Ca = [(Cr \times Dr) + (Cdi \times Ddi) + (Csp \times Dsp) + (Cw \times Dw)] / (Dr + Ddi + Dsp + Dw) \quad (2)$$

The variable C can be expressed as concentration (mg/L or ppm) or electrical conductivity (dS/m or mmhos/cm). D is depth of water (inches). The symbols a, r, di, sp, and w indicate weighted average, rainfall, ditch company irrigation water, SPWCP water, and well water, respectively.

In addition to the salinity of the various water sources, the amount of each source applied must be estimated. In Table 3 the amount of irrigation water required to satisfy the crop water requirements in the District is presented. The water requirement for each major crop was taken from Broner and Schneekloth (2003) for Greeley. The average effective seasonal rain was then subtracted to arrive at the net irrigation requirement. The gross irrigation requirements for center pivot irrigation systems and for gravity irrigation systems (furrow or flood) are presented in the last two columns of Table 3 assuming the irrigation efficiency is 85% for center pivots and 55% for gravity irrigation.

Table 3. Estimated water requirement and the net and gross irrigation requirements for crops near Greeley, Colorado, with center pivot and gravity irrigation systems.

Crop	Water Required* Inches	Average Effective Rainfall Inches	Net Irrigation Required Inches	Gross Irrigation Requirement Center Pivot Inches	Gravity Inches
Alfalfa	32	11	21	25	38
Barley	16**	6	10	12	18
Bean	18	4	14	16	25
Carrot	18	5	13	15	24
Corn, grain	22	7	15	18	27
Corn, silage	22***	6	16	19	29
Grass, hay/pasture	27	11	16	19	29
Onion	18	7	11	13	20
Sorghum	20	5	15	18	27
Sugar Beet	29	8	21	25	38
Wheat	16	9	7	8	13

* Data taken from Broner and Schneekloth (2003).
** Value assumed equal to wheat.
*** Value assumed equal to corn for grain.

To calculate Ca from equation (2), the depth of water to be applied from ditch water and SPWCP water must be known. Until better values are available, the gross irrigation will be assumed to be provided equally from these two sources. If quantities and qualities are known from well water the proportions of water from each of the three sources could be entered into equation (2) for the determination of Ca. For example, Ca for alfalfa can be calculated for the Larimer and Weld irrigation canal once the project is initiated assuming no well water is applied from equation (2) for center pivots as follows:

$$Ca = [(0 \times 11) + (0.60 \times 12.5) + (1.3 \times 12.5)] / (11 + 12.5 + 12.5)$$
$$Ca = (7.5 + 16.2) / 36$$
$$Ca = 0.66 \text{ dS/m}$$

For gravity irrigation systems:

$$Ca = [(0 \times 11) + (0.60 \times 19) + (1.3 \times 19) / (11 + 19 + 19)$$
$$Ca = (11.4 + 24.7) / 49$$
$$Ca = 0.74 \text{ dS/m}$$

The average values for the salt concentration of the applied water (Ca) for each ditch system are summarized in Tables 4 through 9 using average rainfall conditions and by type of delivery application (gravity or sprinkler). For the Larimer and Weld system it was assumed that no well water was applied to crops in the Project area. For the New Cache system two scenarios were analyzed: 1) no well water applied and 2) combined surface and well water supplies. Under the combined water supply scenario it is assumed that well water makes up 30% of the total water supply.

Results of the calculations are shown with varying concentrations of SPWCP in the total water supply deliverable to the ditch systems. For this report, the ratio of SPWCP water to existing surface water analyzed are assumed to be 25%, 50% and 75%. These ratios represent varying levels of SPWCP development. The Project will most likely be developed in phases, as water is needed for upstream exchange purposes. The 50% ratio approximately represents a full-scale project as described in the Project Completion Study Report and operated under firm yield conditions (NCWCD, 2002). The 75% ratio represents a full-scale project operated under maximum potential yield conditions.

Table 4. Larimer and Weld System – Surface Supplies Only – Gravity Systems
Salinity of the applied water [Ca, (dS/m)] after the SPWCP project is started.

Crop	Existing Conditions	75% Ditch 25% SPWCP	50% Ditch 50% SPWCP	25% Ditch 75% SPWCP
Alfalfa	0.40	0.60	0.74	0.87
Barley	0.39	0.58	0.71	0.85
Bean	0.45	0.67	0.82	0.97
Carrot	0.43	0.64	0.78	0.93
Corn, grain	0.41	0.62	0.76	0.90
Corn, silage	0.43	0.64	0.79	0.93
Grass, hay/pasture	0.38	0.56	0.69	0.82
Onion	0.39	0.57	0.70	0.83
Sorghum	0.44	0.65	0.80	0.95
Sugar Beet	0.43	0.64	0.79	0.93
Wheat	0.30	0.45	0.56	0.66

Table 5. Larimer and Weld System – Surface Supplies Only – Sprinkler Systems
Salinity of the applied water [Ca, (dS/m)] after the SPWCP project is started.

Crop	Existing Conditions	75% Ditch 25% SPWCP	50% Ditch 50% SPWCP	25% Ditch 75% SPWCP
Alfalfa	0.36	0.54	0.66	0.78
Barley	0.34	0.51	0.63	0.75
Bean	0.42	0.62	0.76	0.91
Carrot	0.39	0.58	0.72	0.85
Corn, grain	0.37	0.55	0.68	0.81
Corn, silage	0.39	0.59	0.72	0.85
Grass, hay/pasture	0.33	0.49	0.60	0.71
Onion	0.34	0.50	0.62	0.73
Sorghum	0.41	0.60	0.74	0.88
Sugar Beet	0.39	0.59	0.72	0.85
Wheat	0.25	0.37	0.45	0.54

Table 6. New Cache System – Surface Supplies Only – Gravity Systems
Salinity of the applied water [Ca, (dS/m)] after the SPWCP project is started.

Crop	Existing Conditions	75% Ditch 25% SPWCP	50% Ditch 50% SPWCP	25% Ditch 75% SPWCP
Alfalfa	0.67	0.79	0.86	0.94
Barley	0.65	0.76	0.83	0.91
Bean	0.74	0.88	0.96	1.04
Carrot	0.71	0.84	0.92	0.99
Corn, grain	0.68	0.81	0.88	0.96
Corn, silage	0.71	0.84	0.92	1.00
Grass, hay/pasture	0.62	0.74	0.81	0.87
Onion	0.64	0.75	0.82	0.89
Sorghum	0.73	0.86	0.94	1.02
Sugar Beet	0.71	0.84	0.92	1.00
Wheat	0.50	0.59	0.65	0.71

Table 7. New Cache System – Surface Supplies Only – Sprinkler Systems
Salinity of the applied water [Ca, (dS/m)] after the SPWCP project is started.

Crop	Existing Conditions	75% Ditch 25% SPWCP	50% Ditch 50% SPWCP	25% Ditch 75% SPWCP
Alfalfa	0.60	0.70	0.77	0.83
Barley	0.57	0.67	0.74	0.80
Bean	0.69	0.82	0.89	0.97
Carrot	0.65	0.76	0.84	0.91
Corn, grain	0.62	0.73	0.79	0.86
Corn, silage	0.65	0.77	0.84	0.91
Grass, hay/pasture	0.54	0.64	0.70	0.76
Onion	0.56	0.66	0.72	0.78
Sorghum	0.67	0.79	0.86	0.94
Sugar Beet	0.65	0.77	0.84	0.91
Wheat	0.41	0.48	0.53	0.58

Table 8. New Cache System – Surface and Well Water Supplies – Gravity Systems
Salinity of the applied water [Ca, (dS/m)] after the SPWCP project is started.

Crop	Existing Conditions 70% Ditch 30% Wells	53% Ditch 17% SPWCP 30% Wells	35% Ditch 35% SPWCP 30% Wells	17% Ditch 53% SPWCP 30% Wells
Alfalfa	0.93	1.02	1.07	1.12
Barley	0.90	0.98	1.04	1.09
Bean	1.04	1.13	1.19	1.25
Carrot	0.99	1.08	1.14	1.19
Corn, grain	0.96	1.04	1.10	1.15
Corn, silage	1.00	1.08	1.14	1.20
Grass, hay/pasture	0.87	0.95	1.00	1.05
Onion	0.89	0.97	1.02	1.07
Sorghum	1.02	1.11	1.16	1.22
Sugar Beet	0.99	1.08	1.14	1.20
Wheat	0.70	0.77	0.81	0.85

Table 9. New Cache System – Surface Supplies and Well Water Supplies – Sprinkler Systems
Salinity of the applied water [Ca, (dS/m)] after the SPWCP project is started.

Crop	Existing Conditions 70% Ditch 30% Wells	53% Ditch 17% SPWCP 30% Wells	34% Ditch 34% SPWCP 30% Wells	17% Ditch 53% SPWCP 30% Wells
Alfalfa	0.83	0.91	0.95	1.00
Barley	0.80	0.87	0.91	0.96
Bean	0.97	1.05	1.11	1.16
Carrot	0.91	0.99	1.04	1.09
Corn, grain	0.86	0.94	0.99	1.03
Corn, silage	0.91	0.99	1.04	1.10
Grass, hay/pasture	0.76	0.83	0.87	0.91
Onion	0.78	0.85	0.89	0.94
Sorghum	0.94	1.02	1.07	1.13
Sugar Beet	0.91	0.99	1.04	1.09
Wheat	0.57	0.63	0.66	0.69

PREDICTED CROP YIELD

After multiplying Ca times 1.5 to convert from the average salinity of the applied water to the average value of soil salinity in the crop root zone (ECe), equation (1) can be used to predict the yield of the major crops in the proposed project area. Relative crop yields can be estimated based on the salt tolerance of each crop from Table 1 and the salinity values for the two ditch company irrigation waters with the two major irrigation systems envisioned in the

project area from Tables 4 through 9. Relative crop yields under average rainfall conditions are presented in Tables 10 through 15. A value of 100% indicates that no yield loss is expected under these conditions.

Table 10. Larimer and Weld System – Surface Supplies Only – Gravity Systems
Relative crop yields based upon projected water qualities from ditch company waters and SPWCP waters being applied and average rainfall conditions.

Crop	Existing Conditions	75% Ditch 25% SPWCP	50% Ditch 50% SPWCP	25% Ditch 75% SPWCP
Alfalfa	100%	100%	100%	100%
Barley	100%	100%	100%	100%
Bean	100%	100%	96%	91%
Carrot	100%	100%	98%	95%
Corn, grain	100%	100%	100%	100%
Corn, silage	100%	100%	100%	100%
Grass, hay/pasture	100%	100%	100%	100%
Onion	100%	100%	100%	99%
Sorghum	100%	100%	100%	100%
Sugar Beet	100%	100%	100%	100%
Wheat	100%	100%	100%	100%

Table 11. Larimer and Weld System – Surface Supplies Only – Sprinkler Systems
Relative crop yields based upon projected water qualities from ditch company waters and SPWCP waters being applied and average rainfall conditions.

Crop	Existing Conditions	75% Ditch 25% SPWCP	50% Ditch 50% SPWCP	25% Ditch 75% SPWCP
Alfalfa	100%	100%	100%	100%
Barley	100%	100%	100%	100%
Bean	100%	100%	97%	93%
Carrot	100%	100%	99%	96%
Corn, grain	100%	100%	100%	100%
Corn, silage	100%	100%	100%	100%
Grass, hay/pasture	100%	100%	100%	100%
Onion	100%	100%	100%	100%
Sorghum	100%	100%	100%	100%
Sugar Beet	100%	100%	100%	100%
Wheat	100%	100%	100%	100%

Table 12. New Cache System – Surface Supplies Only – Gravity Systems
Relative crop yields based upon projected water qualities from ditch company waters and SPWCP waters being applied and average rainfall conditions.

Crop	Existing Conditions	75% Ditch 25% SPWCP	50% Ditch 50% SPWCP	25% Ditch 75% SPWCP
Alfalfa	100%	100%	100%	100%
Barley	100%	100%	100%	100%
Bean	98%	94%	92%	89%
Carrot	99%	96%	95%	93%
Corn, grain	100%	100%	100%	100%
Corn, silage	100%	100%	100%	100%
Grass, hay/pasture	100%	100%	100%	100%
Onion	100%	100%	99%	98%
Sorghum	100%	100%	100%	100%
Sugar Beet	100%	100%	100%	100%
Wheat	100%	100%	100%	100%

Table 13. New Cache System – Surface Supplies Only – Sprinkler Systems
Relative crop yields based upon projected water qualities from ditch company waters and SPWCP waters being applied and average rainfall conditions.

Crop	Existing Conditions	75% Ditch 25% SPWCP	50% Ditch 50% SPWCP	25% Ditch 75% SPWCP
Alfalfa	100%	100%	100%	100%
Barley	100%	100%	100%	100%
Bean	99%	96%	94%	91%
Carrot	100%	98%	96%	95%
Corn, grain	100%	100%	100%	100%
Corn, silage	100%	100%	100%	100%
Grass, hay/pasture	100%	100%	100%	100%
Onion	100%	100%	100%	100%
Sorghum	100%	100%	100%	100%
Sugar Beet	100%	100%	100%	100%
Wheat	100%	100%	100%	100%

Table 14. New Cache System – Surface and Well Water Supplies – Gravity Systems
Relative crop yields based upon projected water qualities from ditch company waters, well waters, and SPWCP waters being applied and average rainfall conditions.

Crop	Existing Conditions 70% Ditch 30% Wells	53% Ditch 17% SPWCP 30% Wells	35% Ditch 35% SPWCP 30% Wells	17% Ditch 53% SPWCP 30% Wells
Alfalfa	100%	100%	100%	100%
Barley	100%	100%	100%	100%
Bean	89%	87%	85%	83%
Carrot	93%	91%	90%	89%
Corn, grain	100%	100%	100%	100%
Corn, silage	100%	100%	100%	100%
Grass, hay/pasture	100%	100%	100%	100%
Onion	98%	96%	95%	94%
Sorghum	100%	100%	100%	100%
Sugar Beet	100%	100%	100%	100%
Wheat	100%	100%	100%	100%

Table 15. New Cache System – Surface Supplies and Well Water Supplies – Sprinkler
Relative crop yields based upon projected water qualities from ditch company waters, well waters, and SPWCP waters being applied and average rainfall conditions.

Crop	Existing Conditions 70% Ditch 30% Wells	53% Ditch 17% SPWCP 30% Wells	34% Ditch 34% SPWCP 30% Wells	17% Ditch 53% SPWCP 30% Wells
Alfalfa	100%	100%	100%	100%
Barley	100%	100%	100%	100%
Bean	91%	89%	87%	86%
Carrot	95%	93%	92%	91%
Corn, grain	100%	100%	100%	100%
Corn, silage	100%	100%	100%	100%
Grass, hay/pasture	100%	100%	100%	100%
Onion	100%	99%	98%	97%
Sorghum	100%	100%	100%	100%
Sugar Beet	100%	100%	100%	100%
Wheat	100%	100%	100%	100%

From the results in Tables 10 through 15, slight yield losses can be expected for salt sensitive crops like bean, carrot, and onion under the conditions considered in the preceding sections. The yield loss for salt sensitive crops is directly proportional to the concentration of SPWCP water introduced to the Project area. All of the other crops studied should give full potential yields. It should be noted that a slight yield loss for salt sensitive crops probably already exists under present operations for the New Cache system.

As shown in Tables 10 and 11 the relative yield loss for salt sensitive crops such as beans grown under Project delivery area of the Larimer and Weld system would range from 7 to 9% if the Project was providing 75% of the irrigation water.

For the New Cache system greater yield loss may be expected depending on the management of existing water supplies (Tables 12 through 15). Some farms have well water available at varying EC concentrations. For the scenarios with the SPWCP providing 75% of the water supply and where well water is also applied, the yield loss for beans ranges about 6% less than existing conditions. For the scenarios where only existing surface supplies with SPWCP water is used shows a yield loss for beans ranging from 3 to 9% more than existing conditions.

Based on the rainfall data presented in Table 2, however, about 20% of the time a drought can be expected. In drought years, on average, only about 60% of the average rainfall can be expected. When making calculations like those for the expected yields reported in Tables 10 through 15greater yield losses may be experienced during a drought. Table 16 shows the predicted relative yields during a drought for those crops likely to be impacted. In Table 16 the total water requirement not provided by rain is assumed to be available in equal amounts from ditch company water and SPWCP water. In some drought situations water from other sources may not be available to satisfy crop water conditions. Under these conditions, even larger yield reductions can be expected.

Table 16. Relative yields of crops relatively sensitive to salinity under drought conditions (60% of average effective rainfall) in the project area. These calculations assume any lack of rainfall is supplied from other sources.

	Relative Yield, %			
	Sprinkler systems		Gravity systems	
Crop	Larimer & Weld	New Cache	Larimer & Weld	New Cache
Bean	95	91	94	90
Carrot	97	95	96	93
Corn, grain	100	100	100	100
Onion	100	99	100	97

Comparing results in Tables 10 through 13 for the 50% ditch supply and 50% SPWCP supply with Table 16 shows that yields for sensitive crops are reduced only slightly more than in typical drought years than in years of average rainfall (1 to 3 % more). However, these calculations are based on the salt content of the water sources not increasing and sufficient quantities of irrigation water being available.

CONCLUSIONS AND RECOMMENDATIONS

From the data presented and the assumptions and calculations made in this report, the following conclusions can be made:

- Crops that are moderately sensitive, moderately tolerant, or tolerant of salinity will not suffer yield losses from the water qualities considered.

- Under maximum operation of the Project crops that are salt sensitive may suffer losses in yield (up to 9%) under the average conditions considered in this report. In typical drought years, yield losses for salt sensitive crops may be as high as 11 %.

- If the appropriate amount of water is applied to compensate for differences in irrigation efficiency, the response of crops to the salinity of the applied water is not significantly impacted by the irrigation method.

- Effective rainfall is a significant source of water for crops in the project area and should be considered in irrigation requirement and water quality considerations.

With these findings, the following are recommendations to minimize or prevent yield losses of salt sensitive crops:

- The proportion of irrigation water from the ditch company's supply should be increased and the water from the SPWCP reduced when growing salt sensitive crops where ever possible.

- Crops are more sensitive to salinity in their early growth stages. Thus, ditch company water should be applied early in the irrigation season in preference to SPWCP water where feasible.

- If high quality well water is available it should be used in place of SPWCP water for salt sensitive crops.

- If the proportion or timeliness of applying ditch company water are not options then additional water should be applied to increase leaching, thereby reducing soil salinity.

The following are general recommendations to assist where salinity is a concern:

- Monitor selected fields at least annually to ensure soil salinity is not becoming excessive.

- Continue to measure the salt content of water sources to be sure the qualities used in this report are reasonable.

- Measure the salt content of well waters to assess their suitability as irrigation water sources.

- If needed to reduce soil salinity, apply excess irrigation water in the off-season to leach the crop root zone.

- Management practices can be implemented to alleviate the potential for crop yield losses due to salinity increases.

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NISP
Northern Water
Northern Integrated Supply Project

Fact Sheet



Water, Jobs and the Economy

Economic Impacts of the Northern Integrated Supply Project

Water and Economic Health

The availability of water and the economic health of a community are intrinsically, inextricably linked. Having an adequate water supply is critical to attracting and retaining jobs.

The Northern Integrated Supply Project (NISP) will provide 40,000 acre feet of reliable, high quality water to 15 municipalities and water districts in Northern Colorado (one acre foot of water serves about 2 ½ families of four for one year).

Because each water district serves multiple communities, NISP will actually serve businesses and residents water in close to 30 towns and cities located within four Northern Colorado counties, including:

Larimer County	Weld County	Morgan County	Boulder County
• Loveland	• Erie	• Wiggins	• Lafayette
• Fort Collins	• Fort Lupton	• Weldona	• Erie
• Windsor	• Windsor	• Orchard	• Niwot
• Timnath	• Frederick	• Goodrich	
	• Firestone	• Fort Morgan	
	• Eaton	• Brush	
	• Severance	• Hillrose	
	• Kersey	• Snyder	
	• Evans	• Log Lane Village	
	• Gilcrest		
	• Platteville		
	• Milliken		
	• Dacono		

The Northern Colorado economy is interconnected through housing, jobs, shopping and education. The strength of the communities that will receive their water through NISP will impact the entire region. Availability of water will directly affect their ability to serve existing and future populations as well as to attract businesses to the area and retain jobs. Many large employers in Northern Colorado are located in the communities that will use NISP water to serve their local residents and businesses.

A number of these communities offer affordable housing for people who work in higher cost-of-living communities such as Fort Collins, Boulder and Greeley. Many residents commute to work in a business located in a NISP community. Currently 18 percent of Fort Collins residents get their water from the Fort Collins-Loveland Water District, (FCLWD) a NISP participant, and in the future about one-quarter of Fort Collins residents would receive NISP water from FCLWD. By providing water to Fort Collins residents, NISP will help serve the needs of this regional economic hub.

The North Front Range Metropolitan Planning Organization reports that employment in the North Front Range area is expected to grow by 71.4 percent from 2005 to 2030, faster than either Denver or Colorado Springs, which would make the area the fastest growing region by employment and population along Colorado's Front Range.

Water for Business

The water NISP will provide agricultural businesses in the region, along with the "dry-up" it will slow down, will have a direct economic impact. NISP will support irrigated agriculture businesses in Weld, Larimer and Morgan counties. Weld County, for example, is Colorado's leading producer of beef cattle, grain, sugar beets, and dairy products. Weld is among the top 10 agricultural producing counties in the country and the only one not located in California. The county's agricultural products annually create over $1 billion of market value.

Leprino Foods is building its second largest U.S. plant in Greeley, slated to add 500 jobs. Many of the ranchers who raise the some 80,000 additional cows required for the milk production to make cheese will benefit from NISP water to grow crops, feed cows and produce milk.

Without NISP, more than 60,000 acres of farmland could dry up because cities may have to buy agricultural water rights instead of using the water that will be available through NISP. The value of NISP to agricultural business has generated endorsements from every major farm organization in the region and their statewide affiliates, including: Colorado Farm Bureau, Colorado Corn Growers Association, Colorado Cattlemen's Association, Colorado State Grange, Rocky Mountain Farmers Union, Colorado Livestock Association, Colorado Dairy Producers, Colorado Pork Producers Council, Colorado Egg Producers, Colorado Sugarbeet Growers Association, Rocky Mountain Agribusiness Association and Western Sugar Cooperative.

While the water rights secured by early visionaries support agricultural business, the availability of water today and tomorrow makes Northern Colorado a favorable competitive environment for non-ag business development. Over time, a diverse variety of employers has recognized the benefits of Northern Colorado, including several companies with national and international credentials: Halliburton, IBM, Anheuser-Busch, Exempla Good Samaritan Medical Center, JBS Swift & Company, Eastman Kodak, Owens-Illinois, Medical Center of the Rockies, and State Farm Insurance.

As a growing energy hub in the state, Northern Colorado is attracting both traditional and renewable energy firms. NISP participant community Windsor houses Vestas Blades A/S, which will employ close to 850 people at its Windsor plant and Louisville R&D facility.

Local economic development organizations recognize the importance of water and the economy. When companies are looking at potential sites, the availability of water is one of the key issues they research.

A number of local economic groups have endorsed NISP as well, including the chambers of commerce of Berthoud, Carbon Valley, Evans, Fort Lupton, Greeley, Lafayette, Longmont, Mead and Windsor and regional and statewide organizations, including Colorado Association of Commerce & Industry, Club 20, Progressive 15 and Upstate Colorado Economic Development.

The Larimer and Weld economic development plan, which has been submitted as a part of the State of Colorado's plan, strongly supports water storage projects, including NISP, as important for jobs and the economy. Water storage was one of the top priorities for both counties.

Meeting the Water Shortage Gap

Two counties in which NISP communities reside – Larimer and Weld – increased in population by 119,000 residents (19 percent Larimer; 40 percent Weld) during the last decade and are slated to double in size by 2040. Much of the growth will occur from residents' children and grandchildren who will choose to stay in the area to raise their own families.

The recently published Statewide Water Supply Initiative study conducted for the state's leading water policy board estimates that there will be a water supply gap of between 190,000 and 630,000 acre feet statewide by 2050. The lower estimate requires a host of local projects, including NISP, to be built. Without NISP, the gap will be much higher. In the South Platte Basin alone, the demand "gap" is estimated to be between 36,000 and 170,000 acre feet by 2050.

In order to meet the needs of future residents and area employers, the availability of water and well planned water storage projects are essential for the region and the state's economic well being.

Even with strong conservation programs, water storage projects such as NISP are necessary. All NISP participants have active conservation programs in place, but conservation alone is not enough to meet the future water supply gap.

Local Construction Jobs and Goods and Services Procurement

NISP is expected to cost $490 million to construct and could take about four to eight years to complete. As one of the largest capital projects in the region, construction of NISP reservoirs and related infrastructure will create hundreds of construction jobs for local contractors and suppliers and pump millions of dollars into Northern Colorado's economy. Procurement of local goods and services will be needed to support NISP construction.

The project will employ trades and skills ranging from designers and engineers, excavation companies, pipe fitters, electricians, concrete providers, fabricators, landscape companies, equipment rental, etc. Given the state's high unemployment rates, the project could not come at a better time for many Northern Colorado businesses and residents.

The timing of project construction may allow NISP communities to take advantage of competitively priced goods and services due to the down economy.

Recreation

NISP will create two new reservoirs to store excess water. The Glade Reservoir site, located northwest of Fort Collins, would be slightly larger than nearby Horsetooth Reservoir. The new reservoir will provide a variety of recreational opportunities that may include boating, sailing, fishing, wildlife viewing, camping and hiking trails, etc. Galeton Reservoir would be northeast of Greeley and would be about one-quarter the size of Glade.

The Environmental Impact Statement for NISP indicated that there could be $17 million annually in recreation impacts from NISP reservoirs. In a recent survey, 40 percent of Larimer and Weld counties' residents indicated they would use Glade Reservoir for recreation. The recreational amenities from the two new reservoirs will be a boost to local businesses that support boating, fishing and other water sports.

Planning Ahead

Business and industry need water to operate and provide jobs. We need adequate water to support current businesses and attract new jobs in the future. Communities that fail to plan ahead of water shortages experience serious economic and environmental consequences. NISP will provide water that is critical for the quality of life and economic health of a number of Northern Colorado communities.

For More Information:

Northern Integrated Supply Project (NISP)
Northern Water
220 Water Avenue
Berthoud, Colorado 80513

Phone: 1-800-369-RAIN (7246)
E-mail: bwerner@ncwcd.org
Website: www.gladereservoir.org

Attachment D

Notes regarding AAB Opinion on Save the Poudre's Facts About Farming Paper

1. Growth inducing impacts
    - People aren't really going to move to where the water is just because there is water
    - Global food prices will encourage people to stay in ag – less likely to sell their water rights, particularly if they can do interrupted supply agreements
    - Easements, public awareness of need for ag, etc. will combine to reduce likelihood farmers will sell water rights
    - Water is too cheap compared to other utilities. Water suppliers don't want to invest in water storage facilities because water is too cheap
    - No evidence is presented that supports an acceleration of growth rates based on NISP – growth will come with or without NISP
    - Growth in population projections are inflated.
    - Jobs drive growth, not availability of water.
    - The amount of land lost to growth is related to land planning footprint not water storage.
    - Once the farm land is gone; it's gone.
    - The NISP project is going to suck up a lot of water from farms – will happen with or without NISP. What is the lesser of the two evils?

2. Salinity of soils caused by NISP may be overstated as a diversionary issue
    - Graph shows we are already flushing salt out of the soil
    - Salinity in river at point shown is from waste water treatment return flows at that point
    - Salinity just isn't a big deal
    - Soils in area of irrigation application are sandy and won't hold the salt

3. What is the solution for water leaving the state
    - Water leaving Colorado for cranes in Nebraska isn't my biggest concern
    - Free water diversions downsteam that provide augmentation water for wells don't work very well without storage/infiltration facilities. Related to timing of use of the water too. That isn't accounted for in the Poudre paper.
    - Augmentation plans may be approved for some small farmer
    - The junior rights mapped may not account for impact of reservoir at Sterling
    - The maps of rights used for augmentation plans will only be accurate (or relevant) in years when there is water in the river but none at the state line.
    - Sterling reservoir can only capture water when their inlet is appropriate for the water level in the river

4. NISP submerges productive ag land
    - Where Glade reservoir will be isn't very productive land, some under pivot, most is grazing
    - Permitted/producing oil wells in Weld County will make that ground very expensive

- Fracking impacts could include the ability of the reservoir to hold water
- Proposal appears to be addressing impacts to Weaver ranch if 287 is rerouted
- A more significant impact from moving 287 could be the growth inducing impacts of the new roads connecting 287 to Laramie and I-25

5. Initial fill and ongoing diversions will come from west slope water
    - So what.
    - Statement is misleading. Again the water will be from willing sellers or in wet years when there is excess available.
    - Infill to Glade is too high – they can only get water into reservoir when the river is high enough for the inlet to operate. Water from other places can't get to the Glade (without a pump station)
    - Monroe only serves North Poudre
    - Water Supply Company could give up some water because they have Chambers Lake. That's high enough to give up the water at a point that could put water into Glade
    - Galeton has more exchange options. They are low in the system, so many more districts/users have a way to provide water that could actually get into Galeton.
    - There could be a slight increase in rental water but it's quite speculative
    - Can't use ag water without adjudicating the water for municipal use.
    - 1/8th of the Grey Mountain decree might be available for ag because it's owned by a group of irrigation suppliers currently
    - "Operational flexibility" is a scary term to me. Could use that for any purpose. "Sideboards" are defined well. What about long term? Could they take ag water based on the municipal need? Answer: not without court actions to enable. Statement regarding "could refill Glade with ag water at any time" is misleading, but it's not clear if Northern has those rights or not. Public sentiment/law will control the issue long term.

4. Other thoughts
    - Financial stability of participants is a concern. They should know if the participating towns and districts are bondable. Not well conceived plan at this point
    - National Geographic had an article recently showing water rates around the world. Our water is way cheap compared to world prices.
    - Willing sellers will be easier to find if the cost of water drives the price offered up.
    - Bring up the issue of 1041 – pros and cons
        - Is it another layer of bureaucracy?
        - Does it provide a useful tool to make our comments stick?
        - Details like the siphon versus the pumping station at the inlet is a big deal
    - Fort Collins water policy is another related issue that is important. Fort Collins has been successful in dropping the per capita use of water. Very open to sharing water supply for ag but will take a year or more to reconsider their policy. Fort Collins utility does not serve all for the City of Fort Collins. Some portions in north and south extremities are serviced by Districts. The % of water Fort Collins will need within their planning horizon is known (but not to us today.)

- Conservation trends were not well documented and considered. It cannot solve the water supply problem.
- Food supply is going to have to be considered to be as important as water. Have to have ag water to have local food
- Landscaping standards are still pushing water use high than it needs to be.

Inconsistency in numbers presented
Haligan and Seaman are both downstream of Glade

Attachment E

LARIMER COUNTY
COMMITTED TO EXCELLENCE

AGRICULTURAL ADVISORY BOARD

Date: 6/27/2011

To: Larimer County Board of County Commissioners
Larimer County Planning Department

From: Larimer County Agricultural Advisory Board, V. Manning, Chair

Subject: Code Compliance Complaint: Mountain View Feeders

It has come to our attention that the Eagle Lake Homeowners Association has filed a Code Compliance Complaint with Larimer County Planning against Mountain View Feeders located at 5200 N CR 19. The complaint first addresses odor or negative air quality and alleged increases in the number of cattle being fed. The complaint acknowledges that the operation is a legal non-conforming use since it was in existence prior to the 1973 date when new feeding operations would have to go through "special review in the O Open zoning district. Mountain View therefore is grandfathered until such a point as they might expand the operation and then be required to come into compliance (undergo special review) with the County Land Use Code.

The HOA admits that the number being fed was never established and so have focused on the expansion of the operations infrastructure as a way of showing that a review is now necessary. They attached information from the assessor showing the construction of two farm utility buildings as proof of expansion. They go on to list stockpiled feed, number of employees and cars in the parking lot as examples of expansion. Even though, expansion refers to increases in animal numbers, they provide no baseline levels for employee numbers or accumulated feed stocks to substantiate this claim. We view this as unsubstantiated and in error.

Many of us in the area, including current members of the Agricultural Advisory Board (AAB), have observed the current Mountain View operation and the operators that came before the current owners. A number of us on the AAB have sold grain, silage and forage to the lot over the years and have used manure from the operation to fertilize our cropland. These transactions have allowed us to observe the operation over many years. Several of us remember the feed yard at its current size and scale meeting the definition of feed yard as early as 1971. We do not feel that the addition of 2 small utility sheds with no wiring or plumbing and less square footage than the average house constitutes an expansion of the feeding operation. The footprint of the area where cattle are confined and the average number of cattle fed have remained consistent over the years. The partitioning of the approximately 4.8 acre southern lot that appears in the year 2000 aerial photo, represents an improvement in management, but not in lot size. In discussions with Mountain View operators, they have assured us that they are taking steps to bring the farm utility buildings they constructed in 2005 into compliance with County requirements.

It is our view that Mountain View runs a very well managed operation and they do so with few employees. They are a certified natural beef facility providing a type of beef that is being demanded by more consumers, perhaps even residents of Eagle Lake Subdivision. They are an economic engine that purchases local grain, silage, forage and cattle. They utilize the brewers mash produced as a byproduct of our local breweries. They supply many farms with fertilizer. This makes them an important part of the regions "food system" and economy. Larimer County and some of our AAB members recently participated in a Regional Food Assessment with Weld and Boulder Counties. Results from such studies remind us all that the system is an integrated one with concentrated operations like dairies and feeding facilities serving as key nodes in that system.

Moreover, we wish to point out (especially to residents of Eagle Lake) that we are a "Right to Farm County", and we have a "Code of the West " which was authored in part by a former County Commissioner and adopted by citizens and elected officials to show their support for local agriculture. These serve to remind those that choose to move to agricultural areas that they should expect to find the sights, sounds, smells and customs that go with the productive agricultural operations established there. The Right to Farm description is even included as a note on the final plat for land subdivisions that occur in the rural portions of our County. Additionally, Eagle Lake Homeowner materials describe the presence of the Mountain View Feeders yard for association members and prospective buyers. Larimer County residents take great pride in their Open Space program but sometimes overlook the fact that most of our open space is provided free by farms and ranches. We ask residents of Eagle Lake who live on high ground overlooking farms and ranches to think about all the ranch and farm acres that are kept in corn, alfalfa, and forage because of the inputs required by Mountain View and other surrounding farms. We ask them to consider the local agricultural system that enhances their food security, lowers carbon footprint and diversifies the economy using mostly renewable resources.

The AAB feels that the complaint against Mountain View Feeders, while it does point out a small code non-compliance that is now being addressed, is largely unfounded. The size of the operation (corrals, silage pits, feed stocks, employees, vehicles) has not changed since prior to 1973 and lot management is very good. Any air quality impacts are those produced by normal feeding operations. This is an operation that was in existence long before the Eagle Lake subdivision was built and residents have freely chosen to live in a rural area in a Right to Farm county. The expectation by some that they can have rural amenities without rural realities is unreasonable. The solution, in our view would be to support but establish and record the current level of operation as the baseline for this legal non-conforming use which is an important part of the regional food system. The current owners are approachable and willing to work on problems that may arise or practices that could improve an already well – run business. We do not believe that the time and expense of a special review (seemingly suggested by the complaint) is warranted or required.