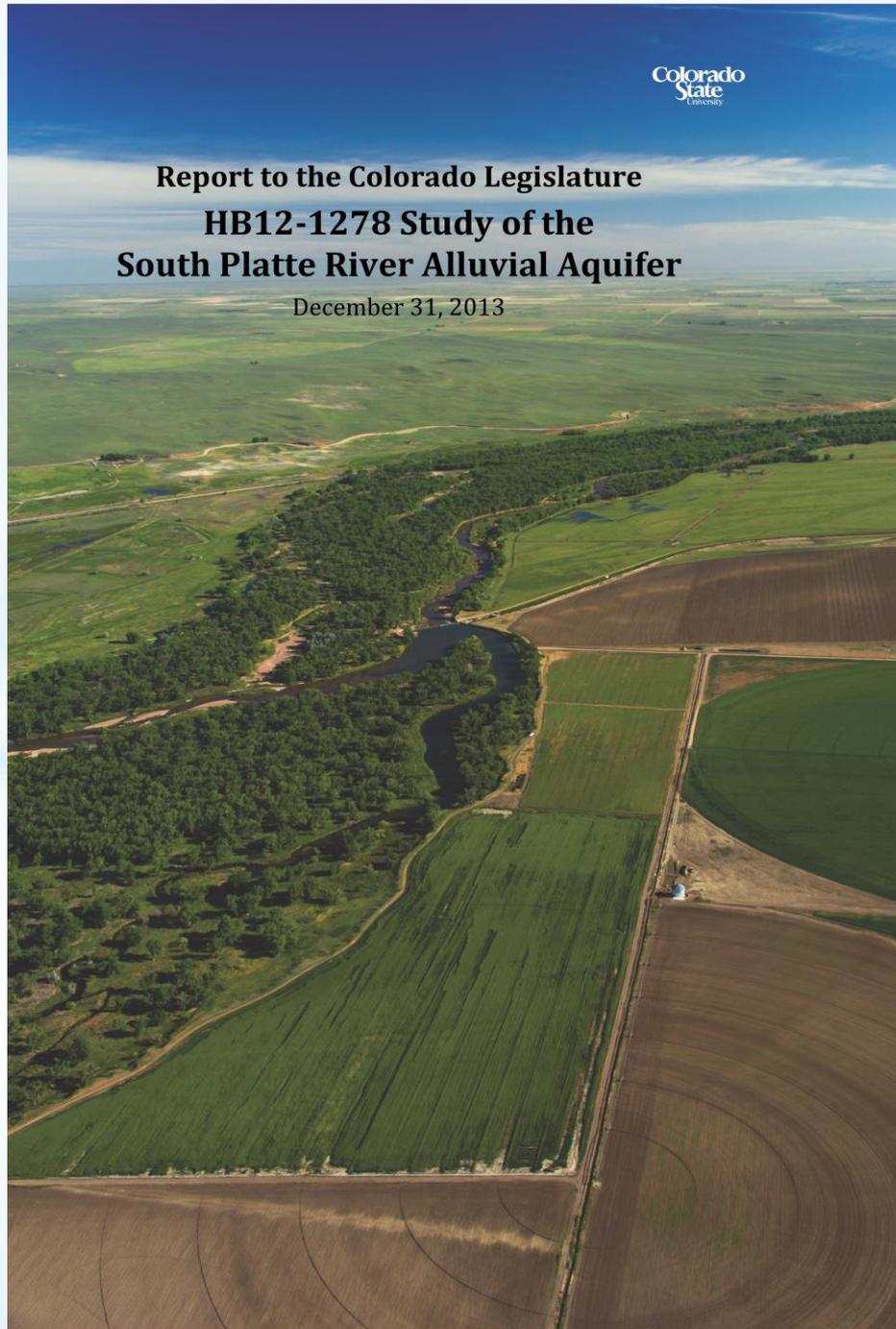


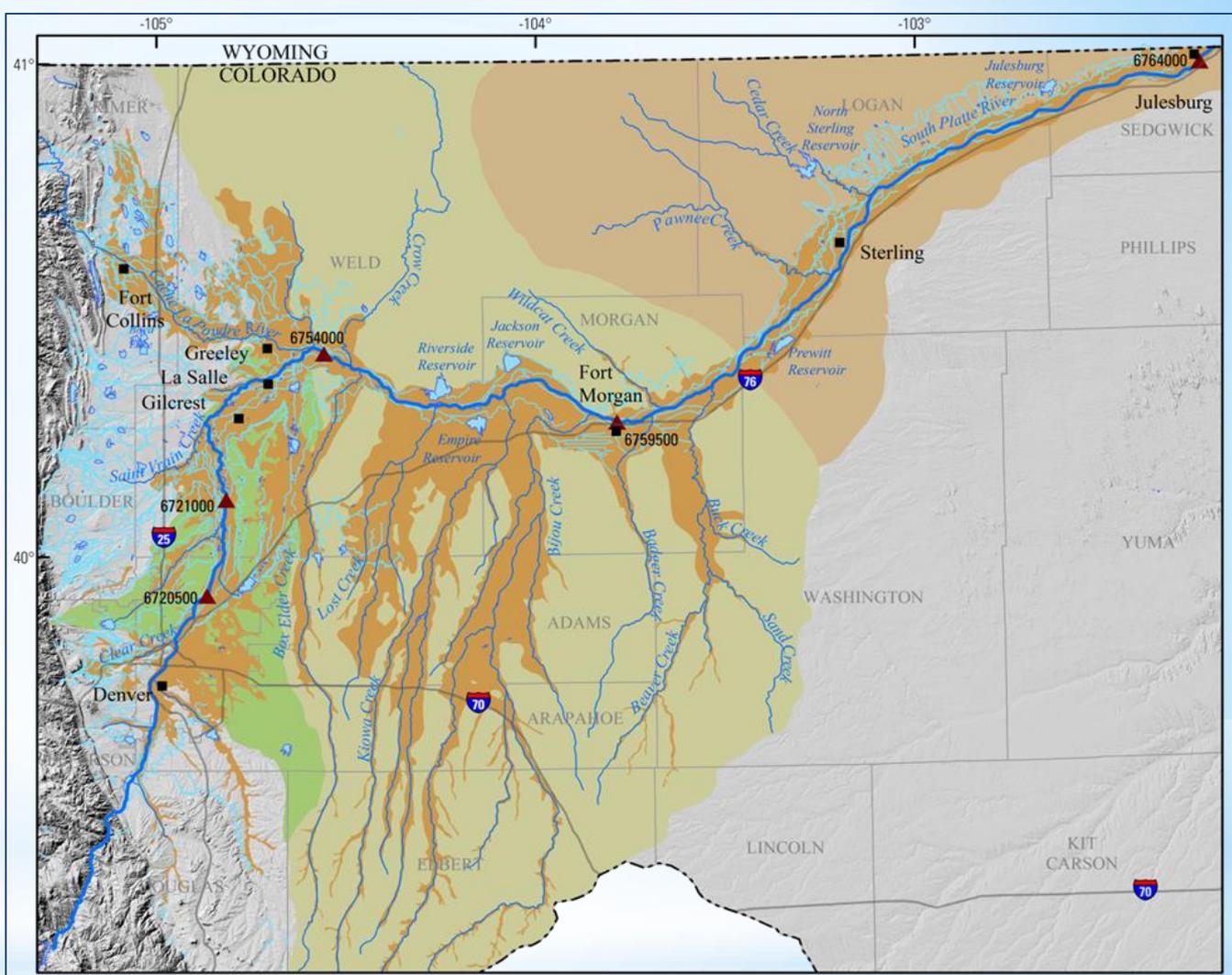
**Report to the Colorado Legislature
HB12-1278 Study of the
South Platte River Alluvial Aquifer**

December 31, 2013



S. Platte Alluvial Aquifer

Water Districts 2, 1 and 64



Base from U.S. Geological Survey digital data, 2009, 1:100,000
 Lambert Conformal Conic projection (Colorado State Plane Central)
 Standard parallels 38°27' N and 37°45' N, central meridian 105°00'W



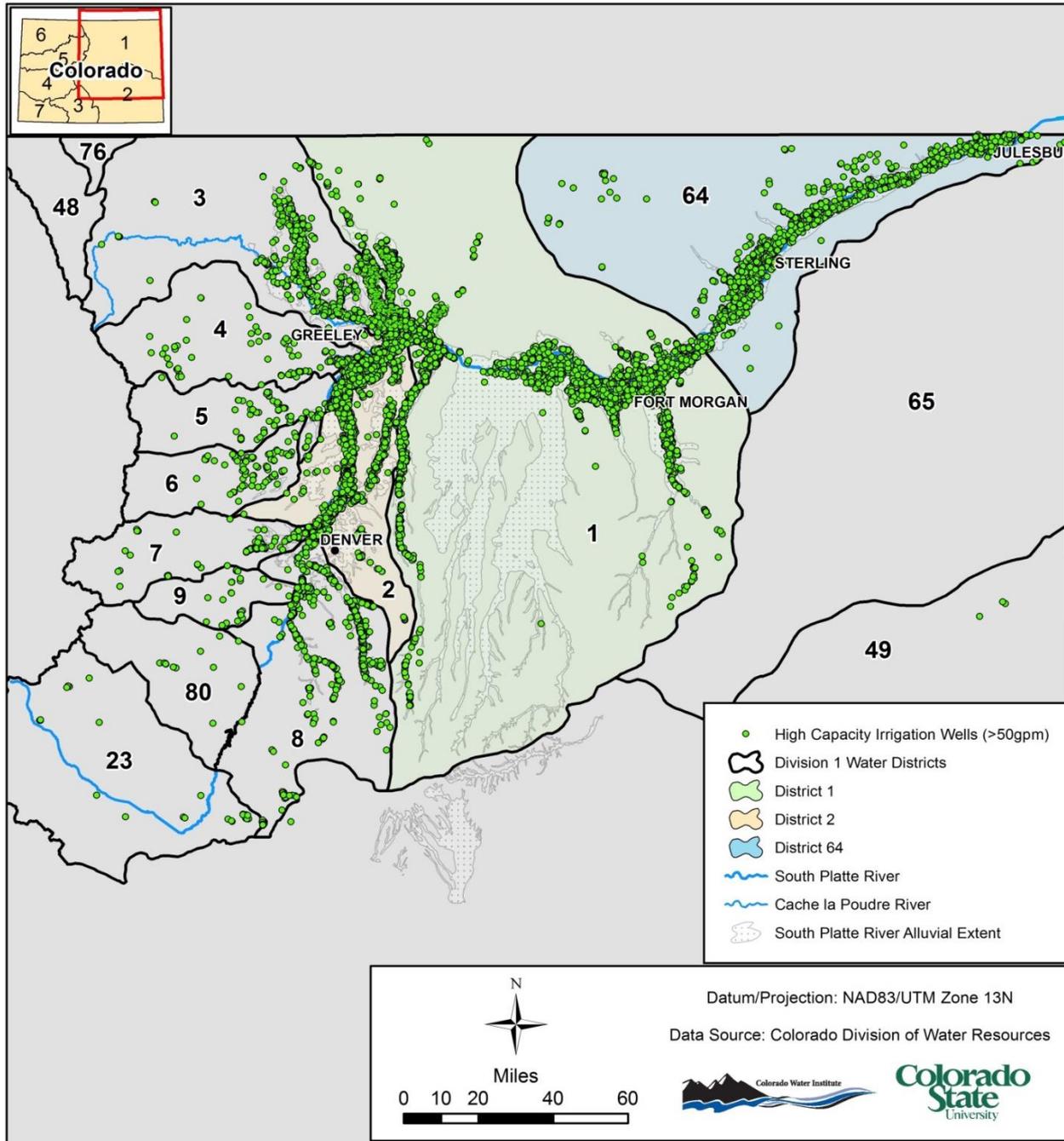
- EXPLANATION**
- Water division 1
 - Water district 1
 - Water district 2
 - Water district 64
 - S. Platte Aquifer
 - S. Platte River
 - S. Platte tributaries
 - Canals
 - Gauging stations



South Platte River Basin Irrigation

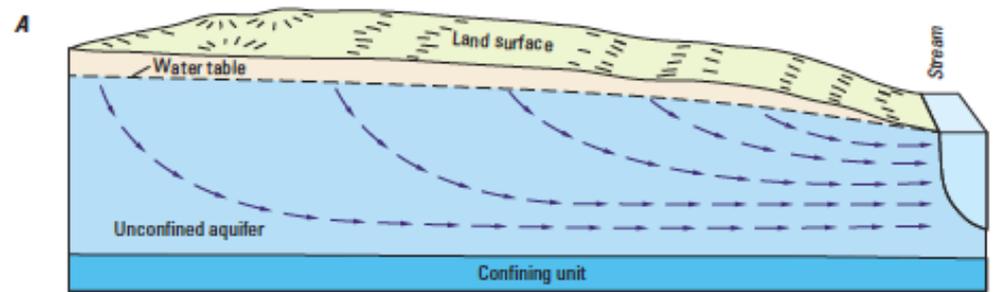
- 830,000 irrigated acres
- 18% is served by groundwater only
- 27% is served by a combination of surface and ground water
- 55% is served by surface water only
- Return flows are critical for downstream water rights



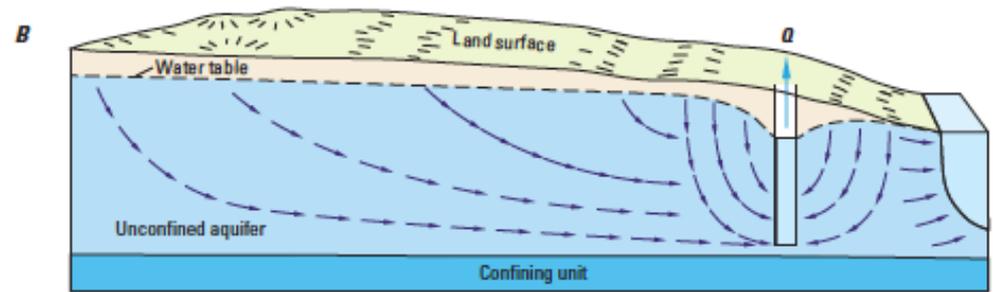


High Capacity Wells in the S. Platte Alluvial Aquifer

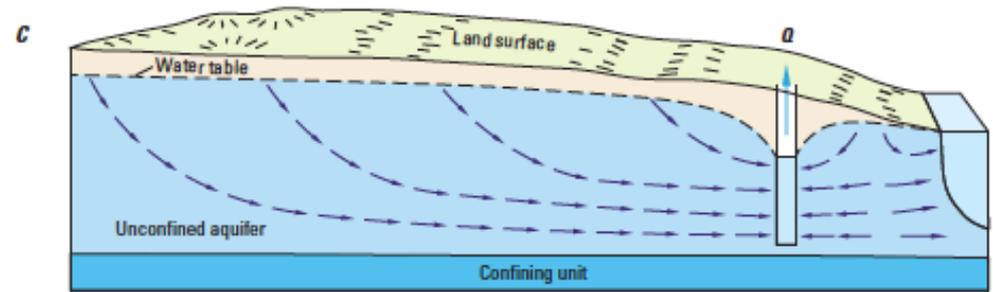
- Pre- well development groundwater flow



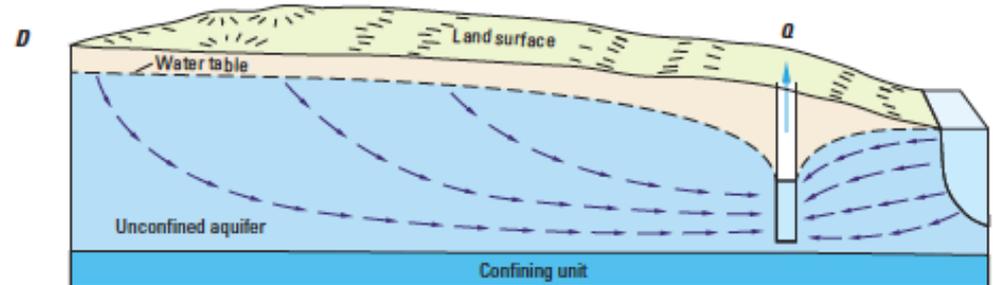
- Initial pumping impact



- Expanding cone of depression

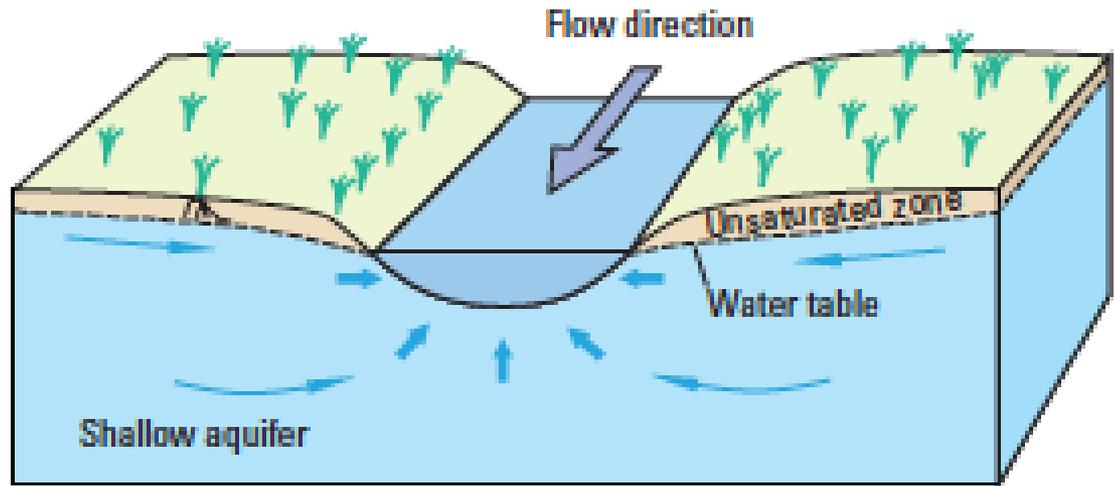


- Changed gradient to stream. Impact can last years.

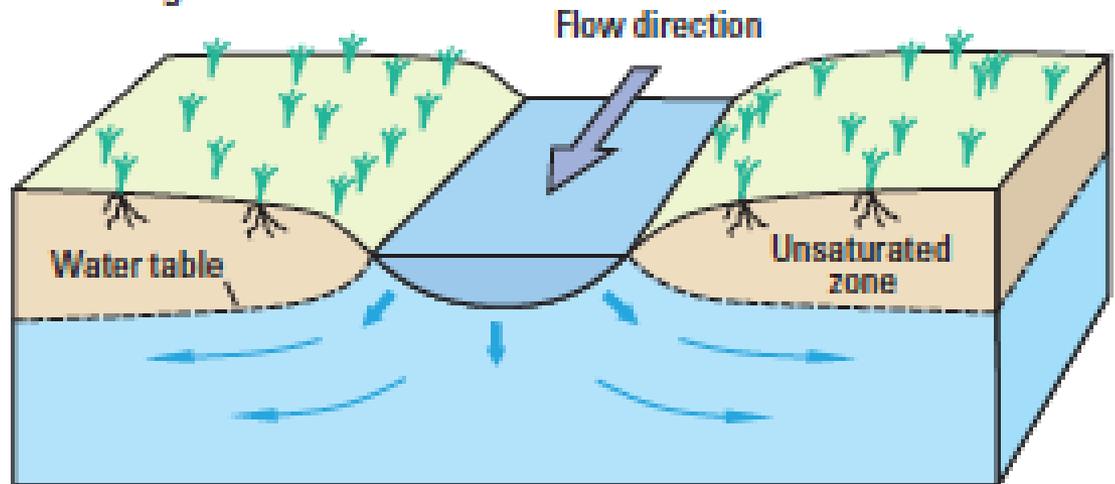


Stream Gain or Loss

A. Gaining stream



B. Losing stream



Integration of Groundwater into the Prior Appropriation System

1969 Water Right Determination and Administration Act:

Required the State Engineer to administer the wells in priority in relation to surface rights and introduced the concept of a “plan for augmentation,” by which a well or other junior water right could divert or operate out-of-priority so long as replacement water was supplied in time, location, and amount sufficient to prevent injury to senior water rights.

Plan for Augmentation

A plan to replace out of priority depletions caused by a junior water right to senior water rights. Depletions must be replaced in time, place and amount in order protect senior water rights. The application for approval of a plan for augmentation in water court allows others the opportunity to express their concerns regarding its ability to protect their water rights.



Recharge Site

Situation

- Following 2000 Empire Lodge Case and the 2002 drought, strict administration of wells was implemented in S. Platte basin.
- Total groundwater pumping declined by about 10% since the peak in 2002. The number of active high capacity wells have decreased by about 20%.
- Over 500 groundwater recharge facilities have been built recently in the S. Platte as part of augmentation plans. 230,000 AF recharge capacity.
- Groundwater levels are rising in some areas in the S. Platte.

Sterling, CO 2010



An Act

HOUSE BILL 12-1278

BY REPRESENTATIVE(S) Fischer, Becker, Brown, Casso, Coram, Duran, Fields, Kefalas, Labuda, Miklosi, Pabon, Pace, Priola, Ryden, Schafer S., Solano, Todd, Tyler, Vigil, Williams A., Wilson, Young, Nikkel, Sonnenberg, Summers;
also SENATOR(S) Renfroe, Brophy, Cadman, Grantham, Jahn, King K., Lambert, Lundberg, Neville, Scheffel, Shaffer B.

CONCERNING THE AUTHORIZATION OF A STUDY OF THE SOUTH PLATTE RIVER ALLUVIAL AQUIFER, AND, IN CONNECTION THEREWITH, MAKING AN APPROPRIATION.

Be it enacted by the General Assembly of the State of Colorado:

SECTION 1. Legislative declaration. (1) The general assembly hereby declares that:

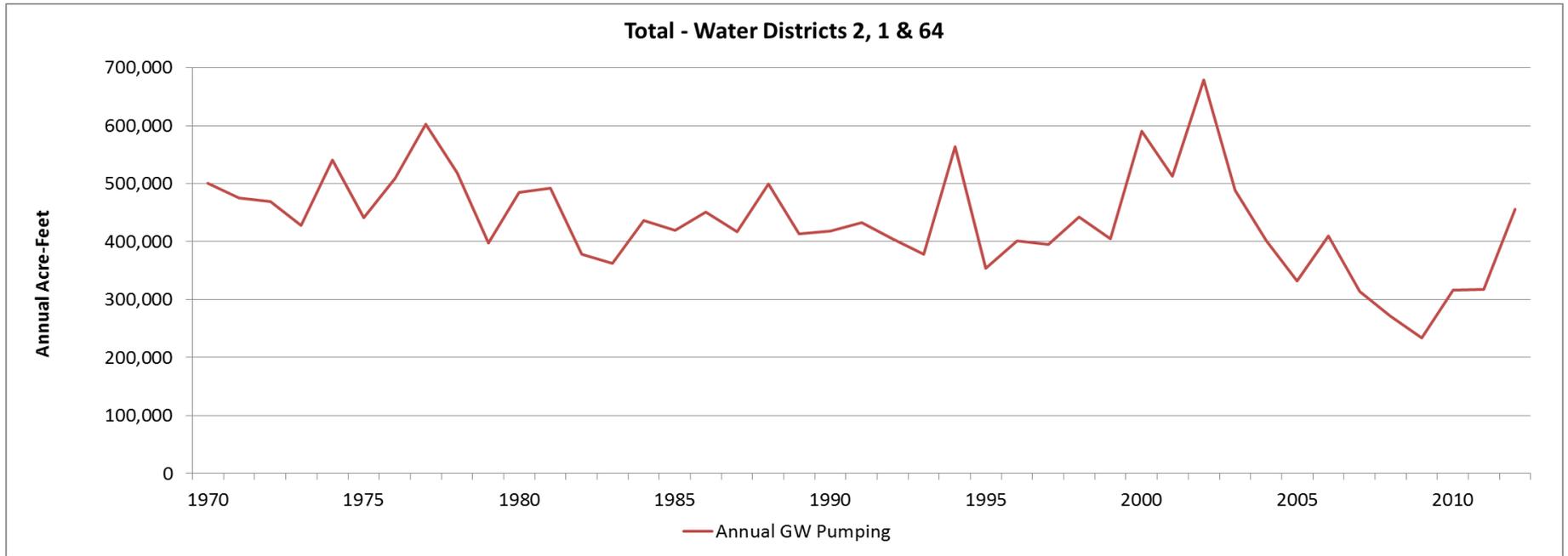
(a) In 1966, the general assembly commissioned a study of the interaction between the South Platte alluvial aquifer and the surface flows in the South Platte river. The general assembly considered this study in passing the "Water Right Determination and Administration Act of 1969", article 92 of title 37, Colorado Revised Statutes, and augmentation plans authorized by the 1969 act are operating on a large scale in the South Platte river basin. Many scientific and technological advances have occurred since

Capital letters indicate new material added to existing statutes; dashes through words indicate deletions from existing statutes and such material not part of act.

HB12-1278

- Evaluate whether current laws and rules that guide water administration in the South Platte River basin achieve the dual goals of protecting senior water rights and maximizing the beneficial use of both surface water and groundwater within the basin.
- Identify and delineate areas within the basin adversely impacted by high groundwater levels and to conduct a feasibility-level evaluation of the causes of high groundwater levels in the affected area.
- Provide information to use as a base for implementation of measures to mitigate adverse impacts in areas experiencing high groundwater levels.
- Provide information to the General Assembly to facilitate the long-term sustainable use of South Platte water supplies.
- To what extent augmentation plans are preventing injury to other water rights holders or potentially causing over-augmentation of well depletions.
- Whether additional usage of the alluvial aquifer could be permitted in a manner consistent with protecting senior surface water rights.
- To what extent the use of water in the basin could be improved by affording the state engineer additional authority to administer water rights.

Annual Groundwater Pumping in Water Districts 2, 1 and 64 (AF/yr)



Groundwater Pumping

- Prior to early 2000s, annual variability of pumping can be attributed to varying climate conditions, and changes in irrigated acreage to a lesser degree
- Reduced pumping after 2003 reflects administrative changes and abandonment of wells
- Pumping increased in late 2000s as augmentation sources were secured

Augmentation

- Groundwater recharge
- Surface water supplies
- Reservoir water
- Augmentation wells



Augmentation Requirements

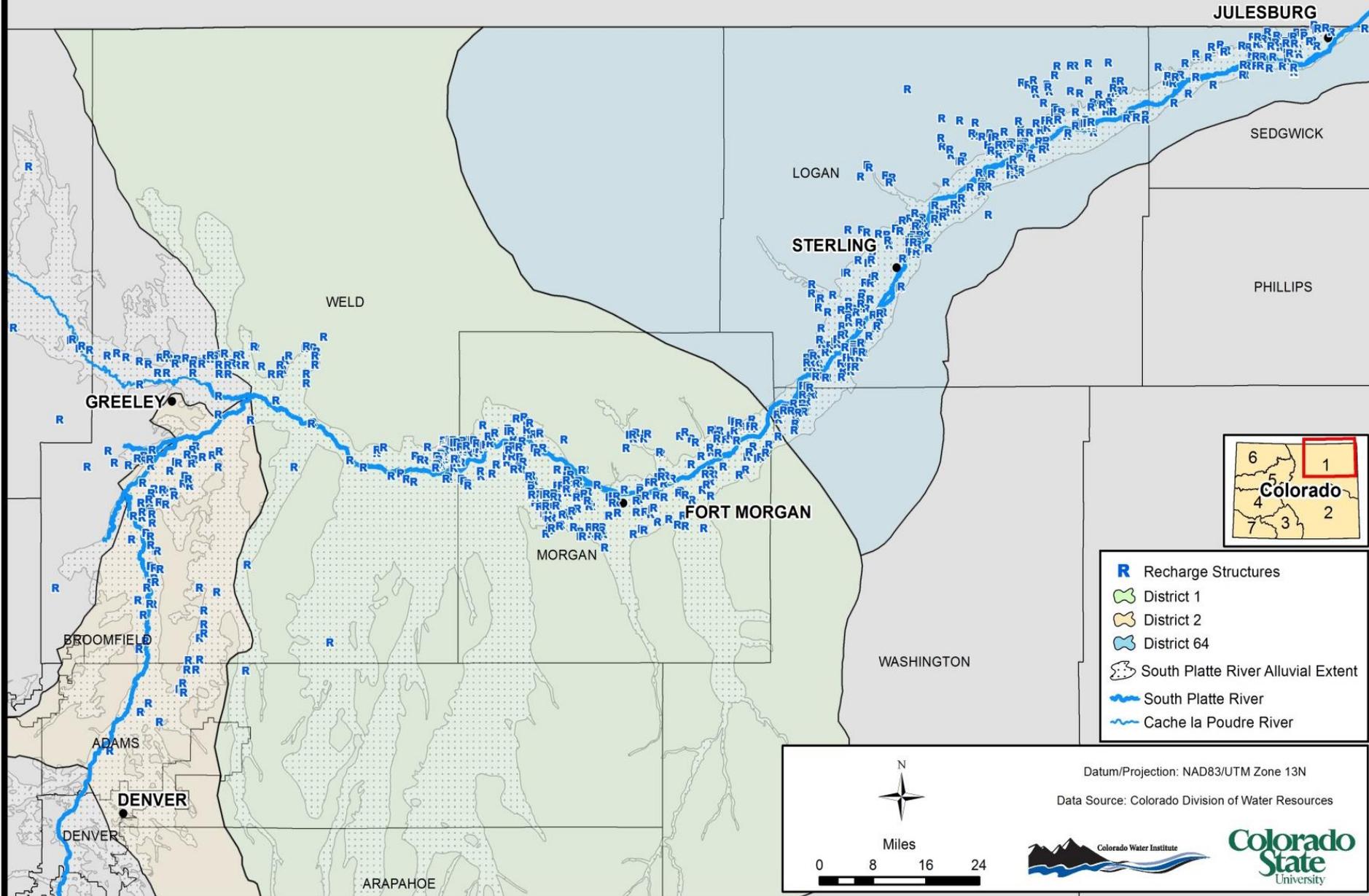
- Not all groundwater pumping causes depletions to the river
- Augmentation requirements are based upon consumptive use of pumped groundwater
- Depletions do not require augmentation if there is not a senior call on the river

Days of Call per irrigation year in Water Districts 2, 1 and 64

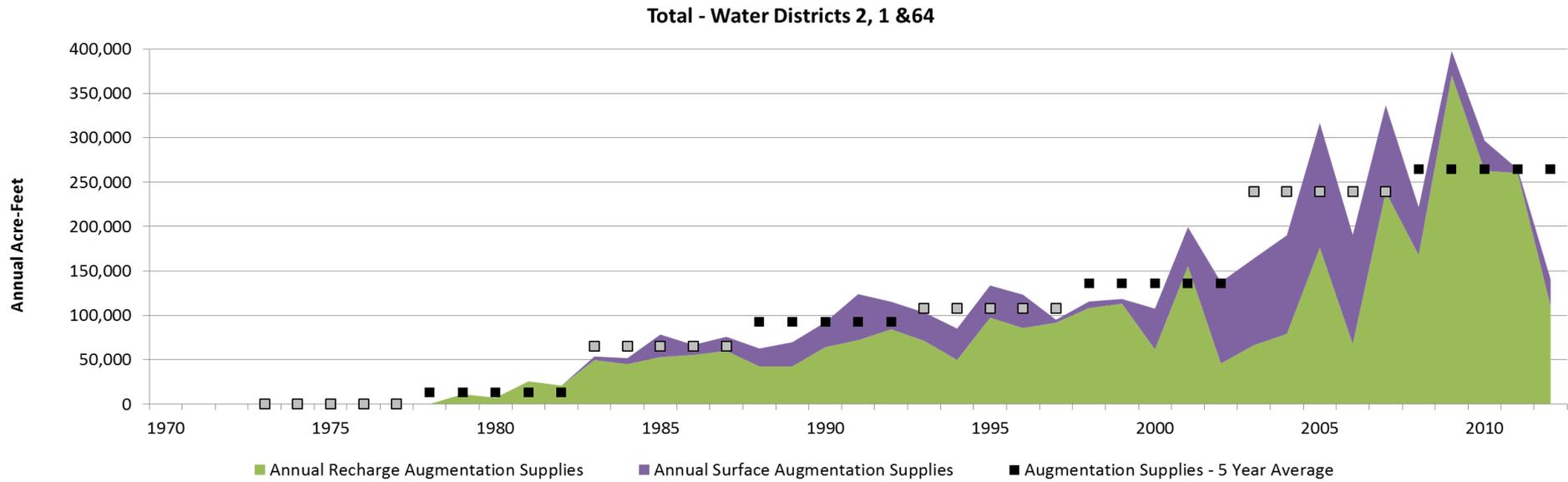
Irrigation Year	District 2	District 1	District 64	South Platte River Compact
Average 1982-2001	102	55	72	70
Average 2002 - 2012	305	271	177	116

* Some of these are junior bypass calls that do not affect wells

Location of Existing Recharge Structures in the S. Platte Basin.



Augmentation Plan Supplies



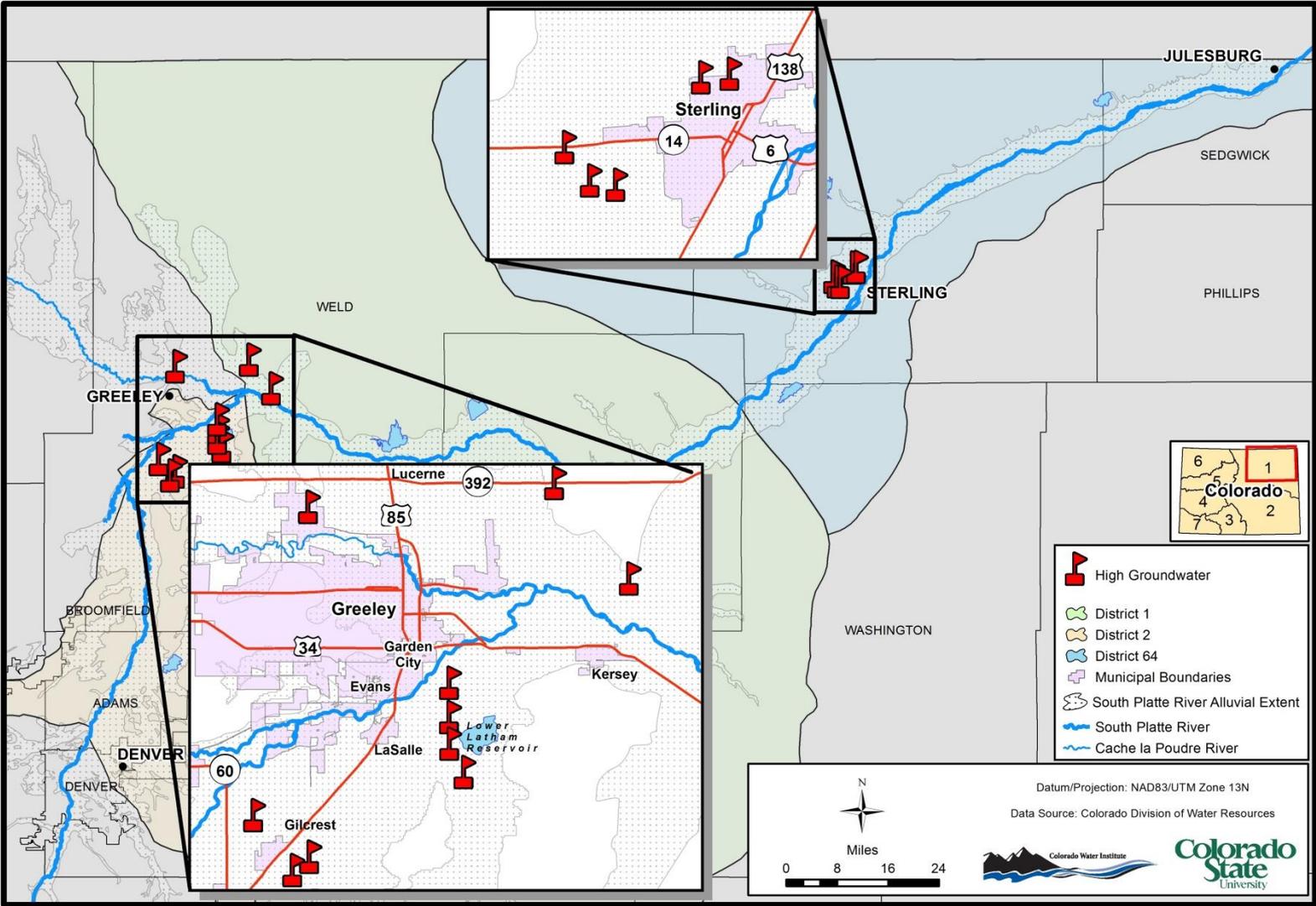
Augmentation Supplies vs. Requirements

- Surface augmentation is more widely used as a supply in Water District 2 due to difficulty in developing recharge supplies
- Augmentation supply exceeds potential requirements in Water District 1 and 64 during average and wet years.
- This reflects both the increase in recharge site construction, and some higher runoff flows available to divert for recharge

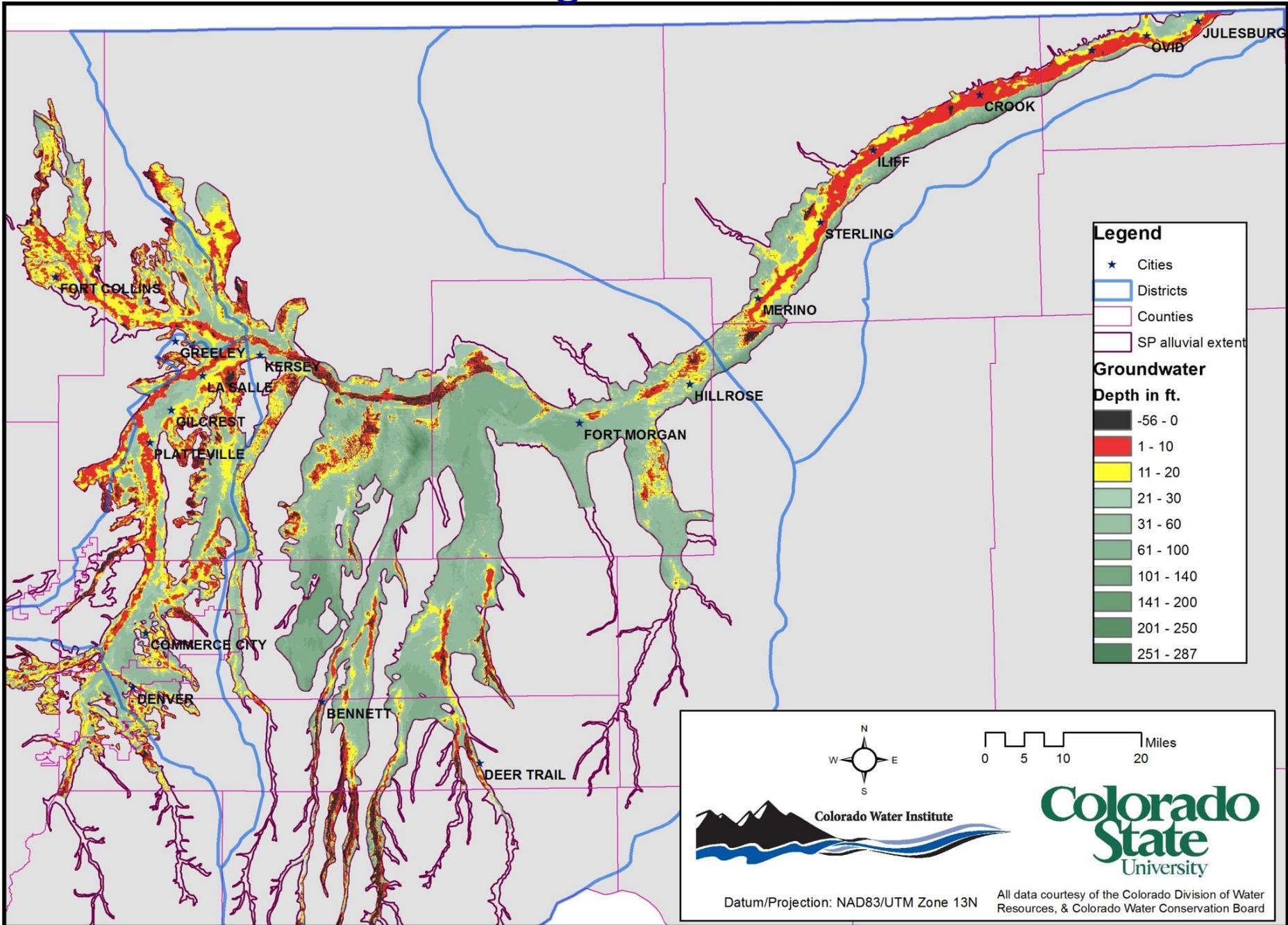
Observations

- Well users in Morgan, Logan and Sedgwick Counties have been able to develop and acquire recharge supplies.
- Due to the timing of recharge pond accretions, recharge augmentation supplies must be taken in advance of requirements (i.e. users must “hedge” their bets).

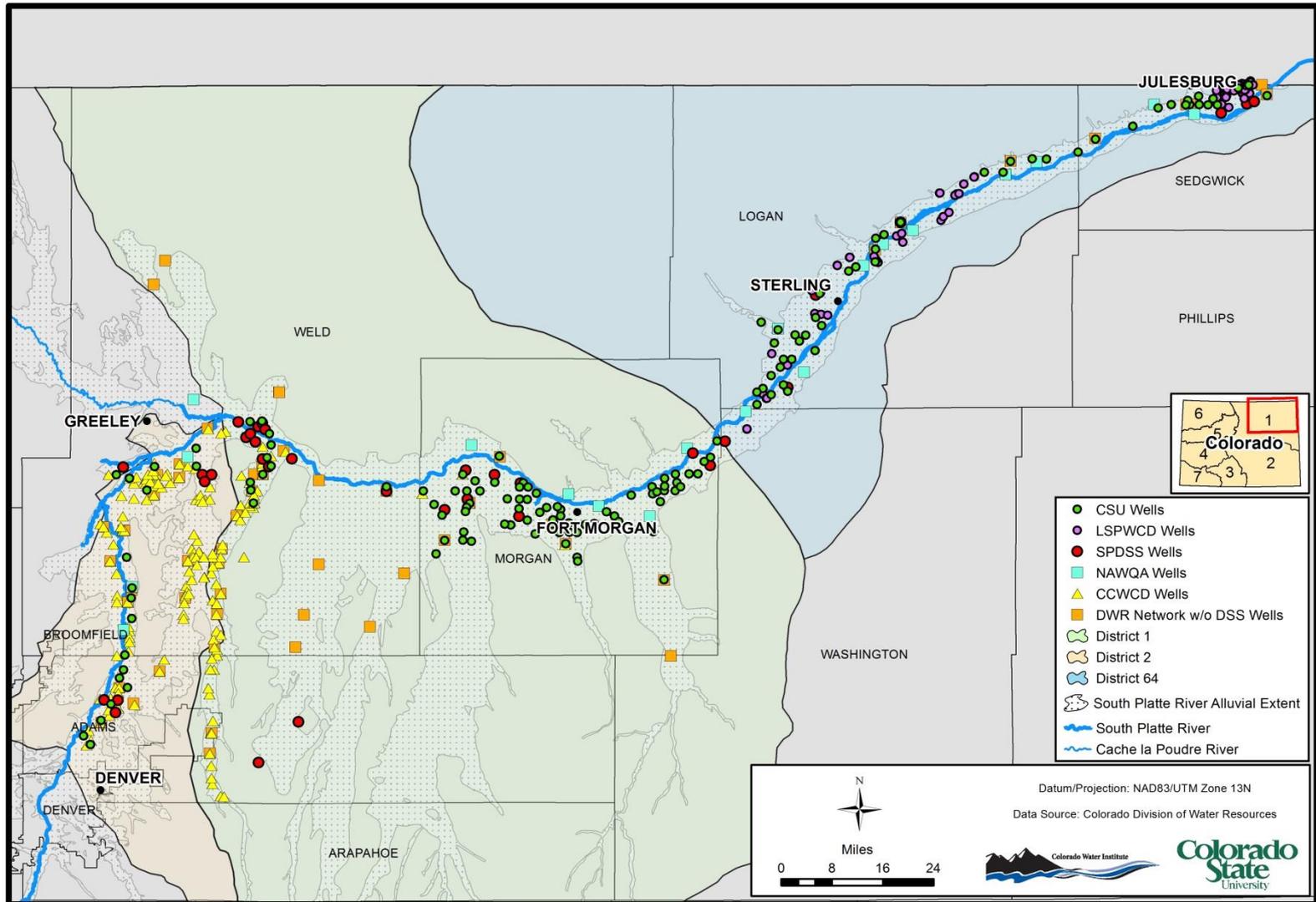
Groundwater Levels



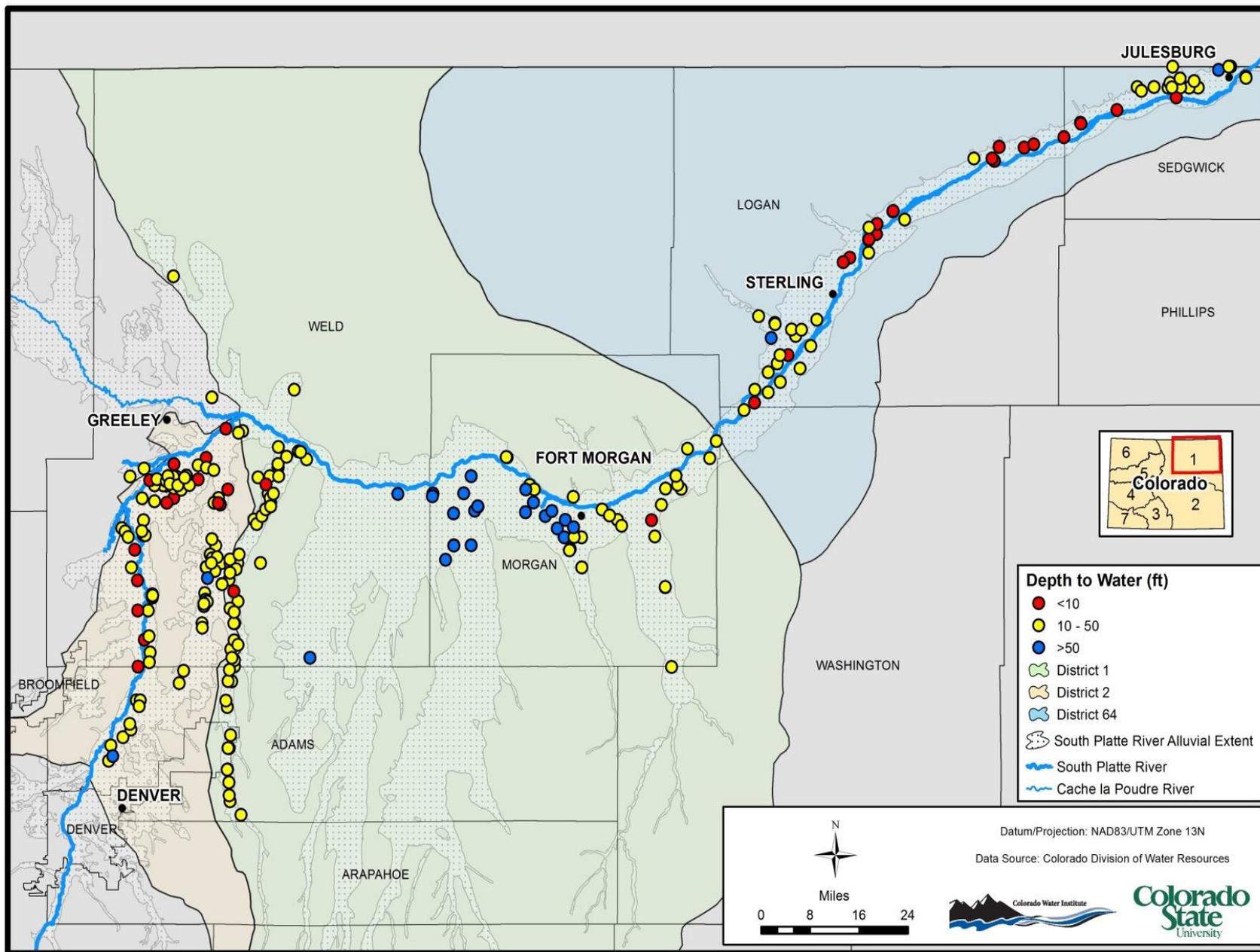
Historical High-Water Conditions



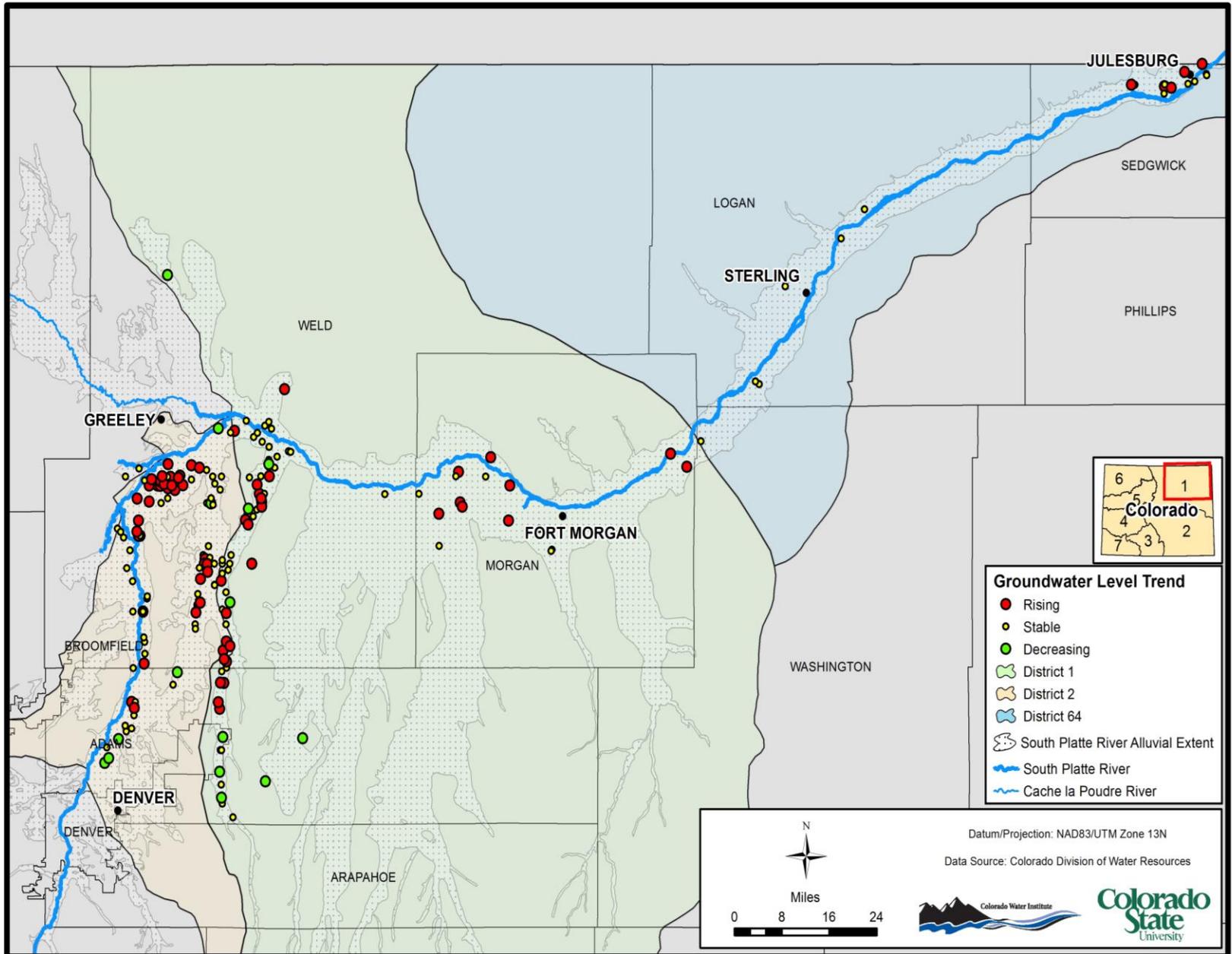
Observation and Monitoring Wells of the South Platte River Alluvial Aquifer



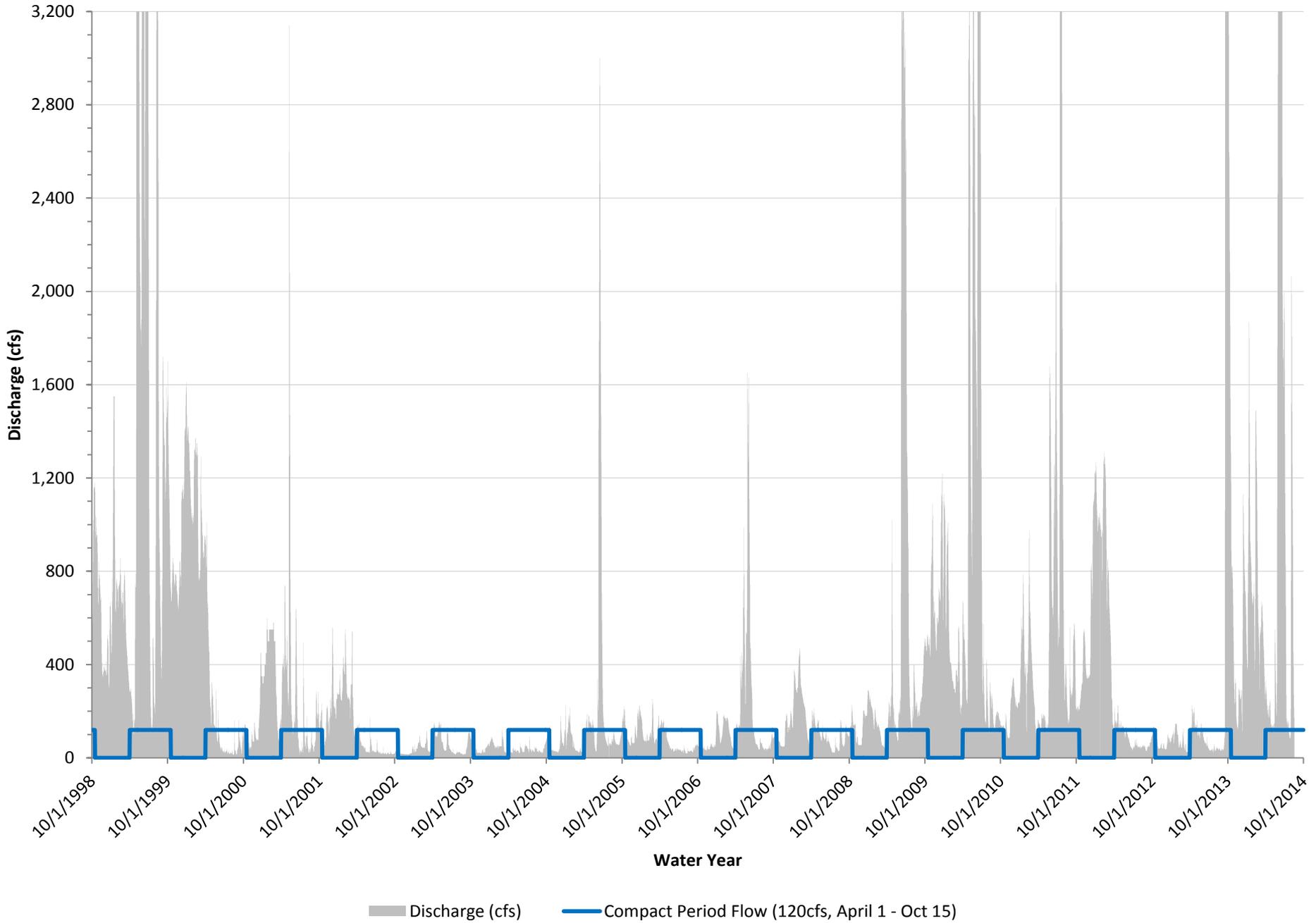
Depth to Groundwater using latest Measurements from the Six Observation Well Networks



Groundwater Depth Trends Over 2000-2012 for Observation Wells

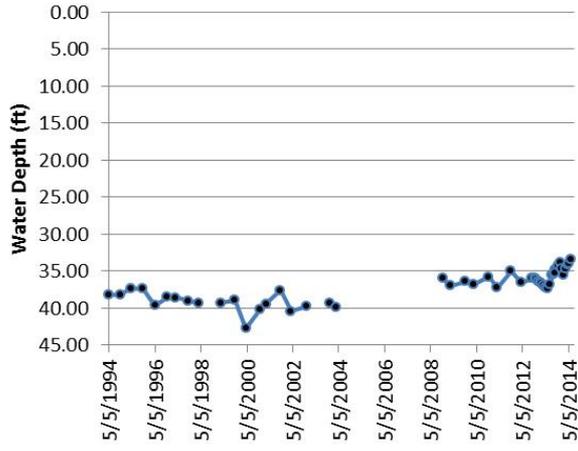


SOUTH PLATTE RIVER DAILY FLOWS AT JULESBURG, CO

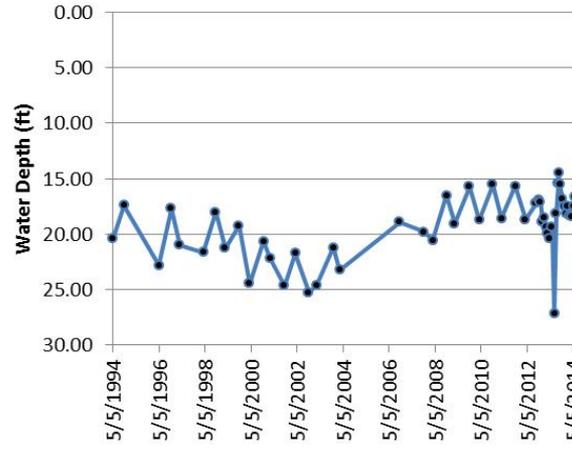


Groundwater Level Hydrographs

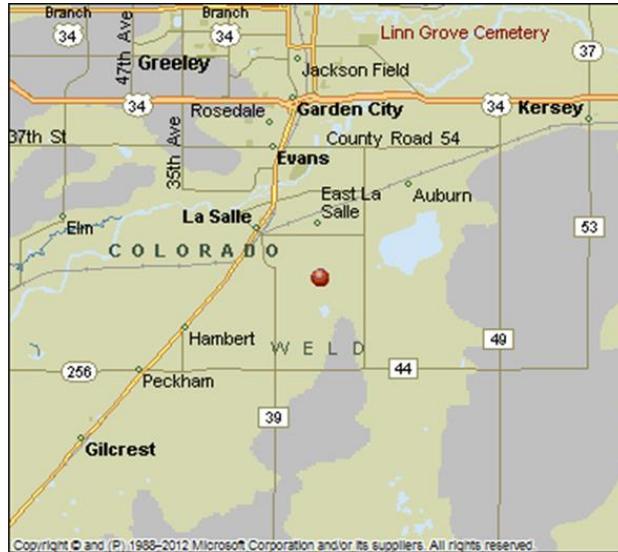
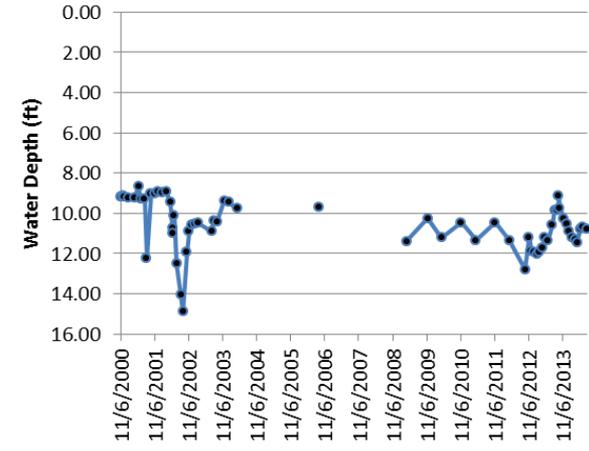
28-3 (C25)



39-1 (C52)

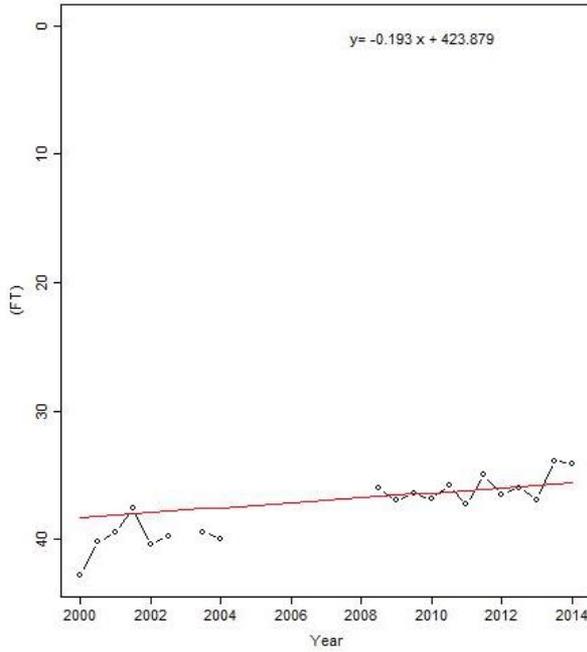


301-1 (V. Moser)

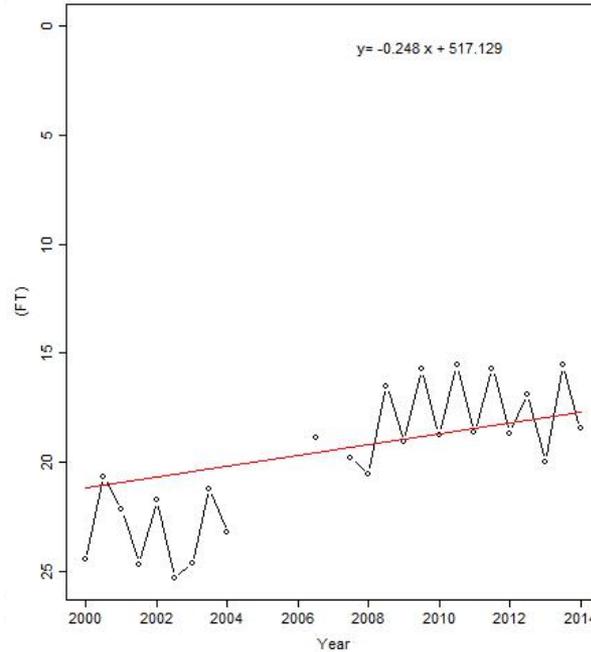


Groundwater Level Hydrographs

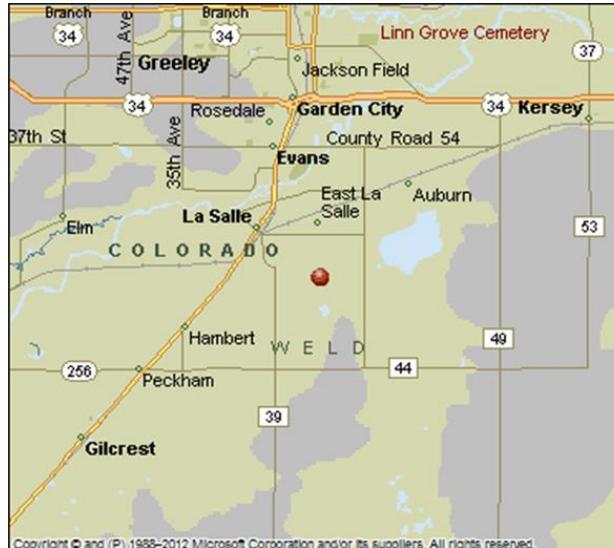
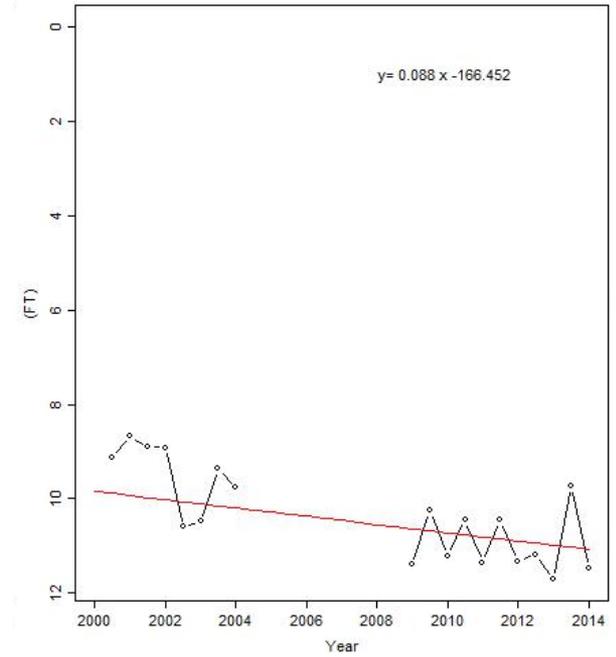
Well ID: 28.3



Well ID: 39.1



Well ID: 301.1

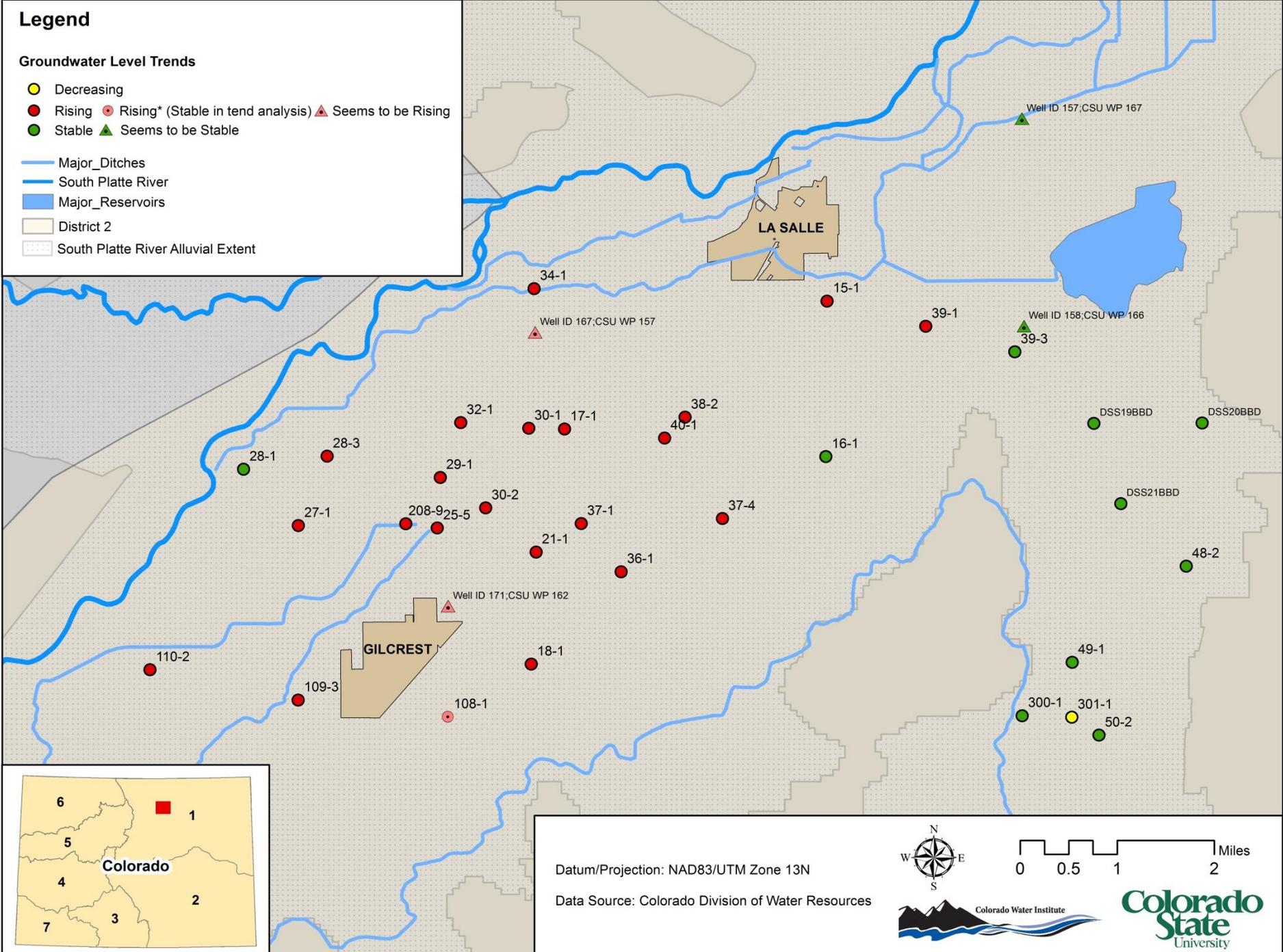


Legend

Groundwater Level Trends

- Decreasing
- Rising
- Rising* (Stable in tend analysis)
- Seems to be Rising
- Stable
- Seems to be Stable

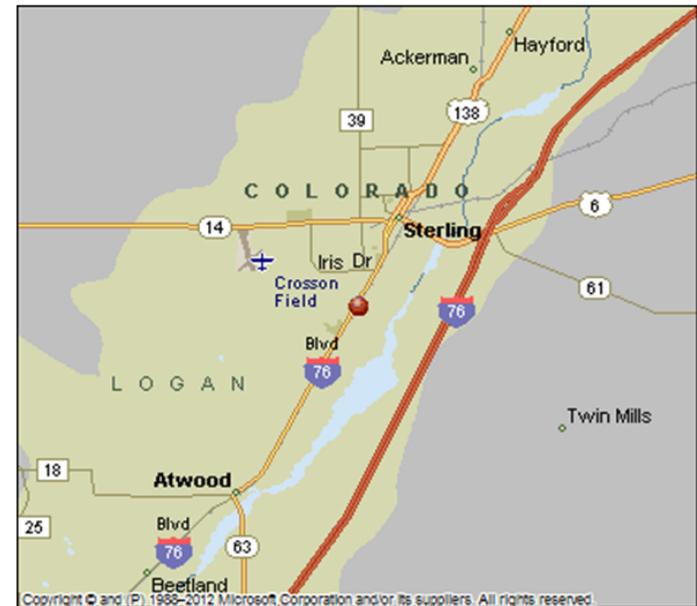
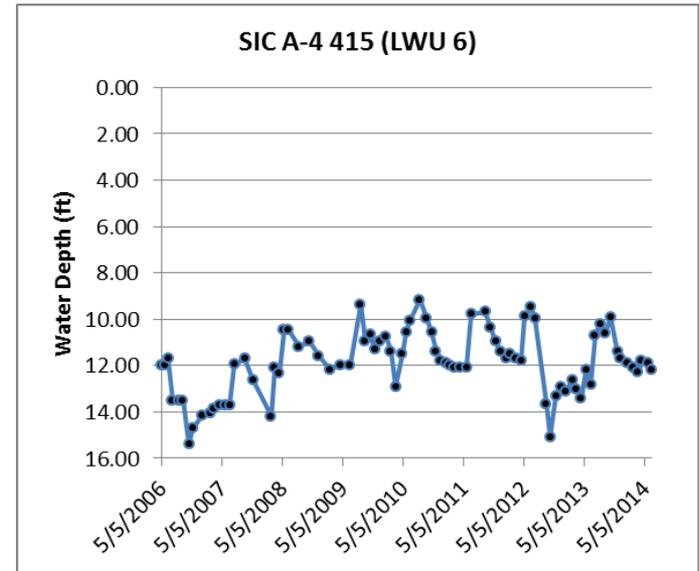
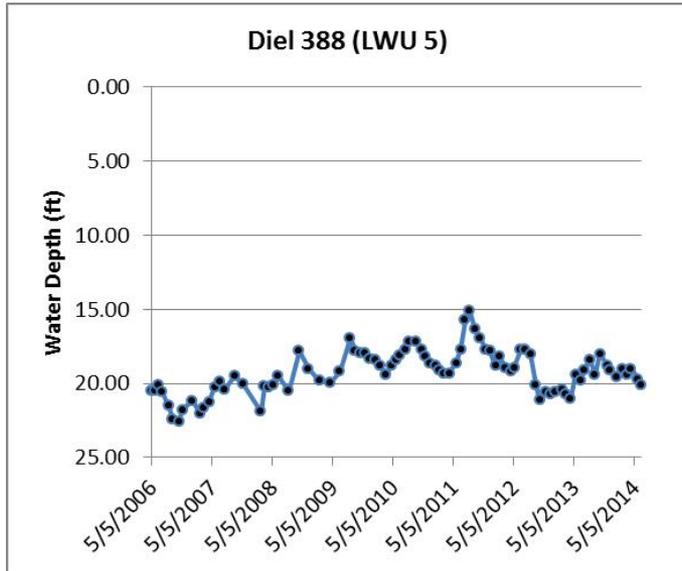
- Major_Ditches
- South Platte River
- Major_Reservoirs
- District 2
- South Platte River Alluvial Extent



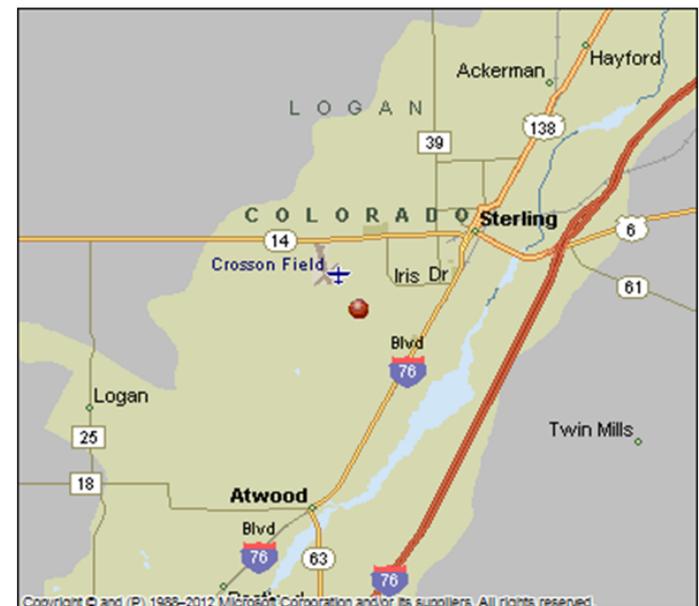
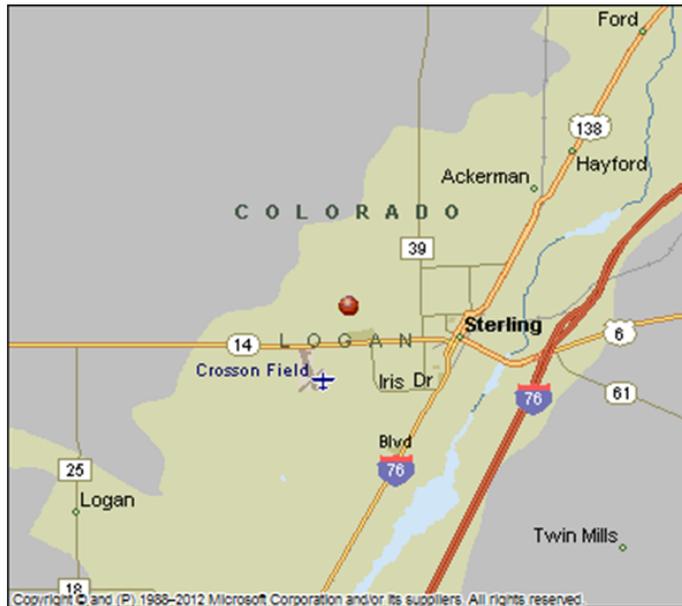
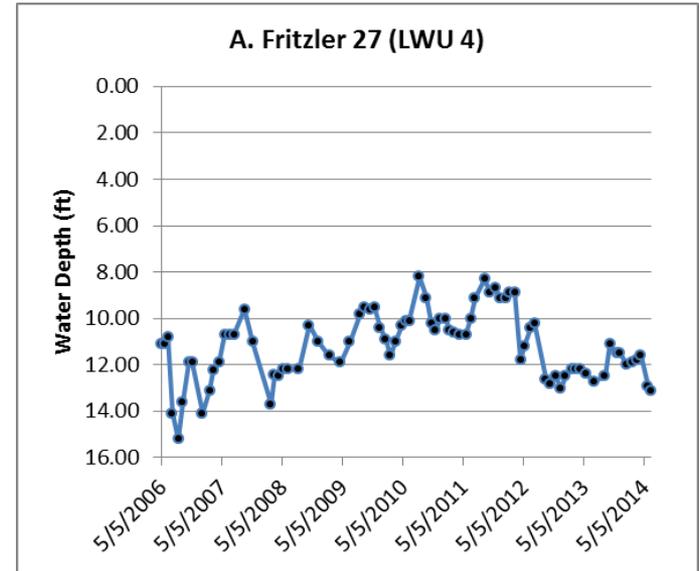
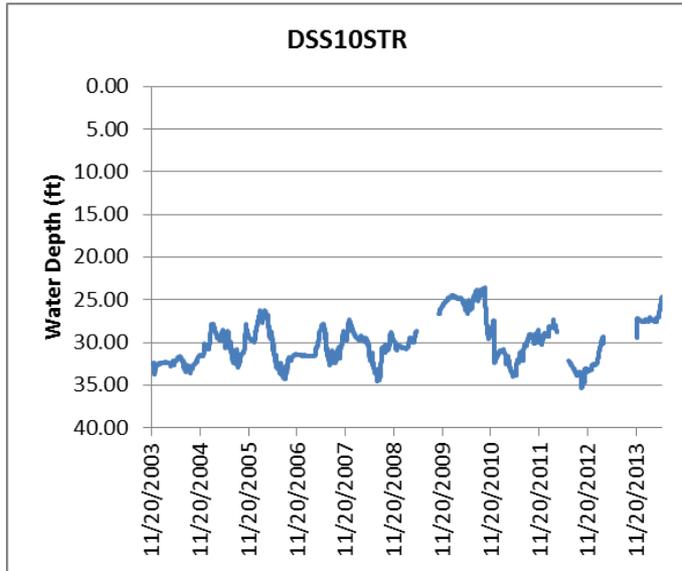
Datum/Projection: NAD83/UTM Zone 13N
Data Source: Colorado Division of Water Resources

North arrow, scale bar (0 to 2 miles), and logos for Colorado Water Institute and Colorado State University.

Groundwater Level Hydrographs at Sterling



Groundwater Level Hydrographs at Sterling



Summary

- Total groundwater pumping has declined by about 10% in WDs 2, 1 and 64 since the peak in 2002. The number of active high capacity wells have decreased by about 20%.
- The number of days of river call has increased significantly since 2000.
- Over 500 recharge facilities have been built recently in the S. Platte as part of augmentation plans.
- On a basin scale, augmentation supply has caught up with potential augmentation requirements, but many localized issues remain, particularly in Water District 2
- Groundwater levels are rising in some areas in the S. Platte.

HB1278 Recommendations

1. Mitigation of Localized High Water Table Conditions
2. Improving Augmentation Plan Administration and Efficiency
3. Implementation of Basinwide Management and Planning
4. Specific Recommendations for Colorado Division of Water Resources and the Colorado Water Conservation Board for Improved Data Collection, Data Collection, and Data Access

HB1278 Recommendations

1. Mitigation of localized high water table conditions

- A. The SEO (or the Colorado Geological Survey) should be delegated explicit responsibility by the General Assembly to **provide a consultation to the water court regarding new recharge structures before construction and be given the authority to require changes in design or operation when a recharge plan is deemed likely to cause or is causing harm.**
- B. Two pilot projects should be authorized and funded by the Legislature to allow the State Engineer to track and administer high groundwater zones differentially for a specified period of time to lower the water table levels at Sterling and Gilcrest/LaSalle while testing alternative management approaches.

HB1278 Recommendations

2. Increasing augmentation plan efficiency

A. The SEO should be directed by the Legislature to promulgate new rules for the S. Platte to:

- Establish a framework for the voluntary movement of excess water supplies between augmentation plans, facilitated by the office of the Division Engineer, including a water bank or pool available for use by augmentation plan users.
- Efficiently manage and distribute available water supplies to storage and recharge water rights in accordance with priority and historic practice by a) storing water out of priority at higher elevation, and managing deliveries to downstream reservoirs as necessary; b) minimizing frequency and duration of administrative calls.
- Develop uniform and transparent reporting standards for augmentation plan accounting designed to integrate with basin data collection, modeling and management.

B. Funding should be authorized to provide the Division 1 Engineer with two additional FTEs and greater annual investment in technology upgrades. Additionally, Colorado DWR needs at least one FTE to focus on information technologies and services.

HB1278 Recommendations

3. Implementation of basin wide management

- A. The General Assembly should authorize the establishment of a pilot basin-wide management entity with a defined sunset date.
- B. The General Assembly should direct the CWCB, CDA and DWR to work with USGS to implement the basin wide groundwater monitoring network outlined in this report.
- C. The State should cooperate with the S. Platte Roundtable and water organizations in the basin to fund and conduct a helicopter electromagnetic and magnetic survey to produce detailed hydrogeological maps of the S. Platte Alluvial Aquifer.
- D. The State should continue strong support for the development and implementation of the SPDSS but strive to improve accessibility, scope, and robust stakeholder processes.
- E. The State should aggressively begin working with water users and other stakeholders in the S. Platte basin to develop multiple-benefit water storage options.