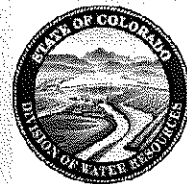


Irrigation Improvement Issues in the Arkansas River Basin

Water Resources Review
Committee

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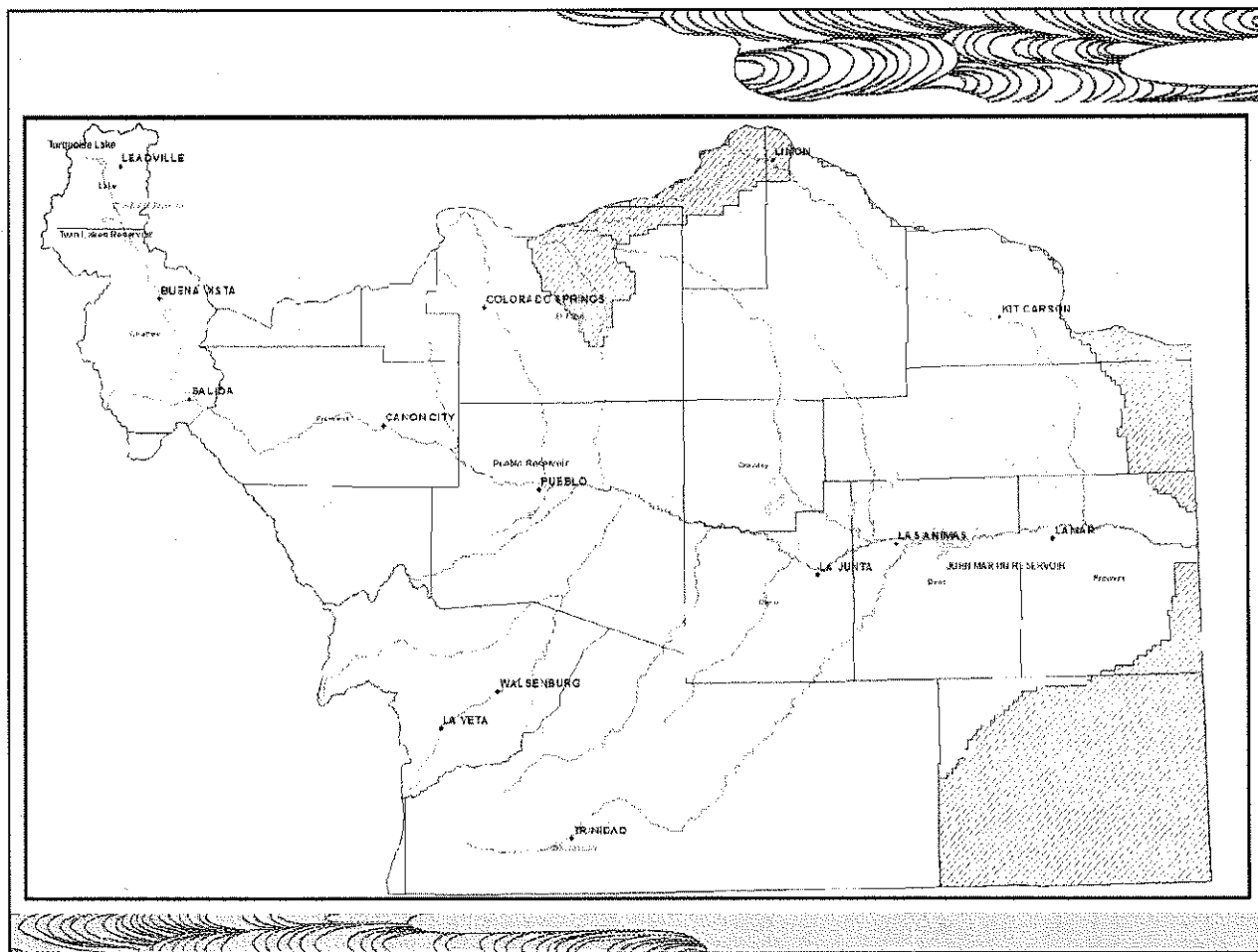




Key Information

- Arkansas River Compact and Recent Compact Litigation
- Compliance for Post-Compact Wells
- Irrigation Improvement Rules in the Arkansas River Basin





Regulation of the Arkansas

- Typically subject to priority administration year round...only 5 “call free” instances since 1954.
- Avg. annual basin yield, 884,000 af
- Avg. annual imports, 126,933 af
- Avg. stateline flow, 142,200 af
- Avg. surface diversions, 2 M af (approx.)
- Reuse ratio = 2.0

Arkansas River Compact

- ❑ An outgrowth of previous interstate litigation—1907; Doctrine of Equitable Apportionment
- ❑ Negotiated in 1948, approved by Congress in 1949
- ❑ Benefits of John Martin Reservoir allocated to Colorado and Kansas, 60/40
- ❑ Not a specific performance contract...

Article IV D
Arkansas River Compact
CRS 37-69-101

- This compact is not intended to prevent development of the Arkansas river in Colorado, which may involve improved or prolonged functioning of existing works: Provided, the waters of the river shall not be depleted in usable quantity or availability to the water users in Colorado and Kansas...

Kansas v. Colorado 1985

- Kansas claimed Colorado violated Article IV-D of the Compact by:
 - Operating the Winter Water Storage Program
 - Building and Operating Trinidad Reservoir
 - Allowing high capacity wells to be drilled and operated

Outcome of the Litigation


- Claims related to the Winter Water Storage Program and Trinidad Reservoir were dismissed.
- Claim for post-Compact wells was upheld and Colorado was found in violation of the Compact and was at risk of ordering post-Compact irrigation wells to stop being used. Colorado ultimately paid Kansas \$34 million dollars for past damages.
- Special Master Arthur Littleworth ruled against the Kansas motion to shut down all post-Compact irrigation wells because he believed Colorado's Arkansas Basin Use Rules would prevent further injury to Kansas.
- The Special Master ruled that the proof of Colorado's Compact compliance would be measured by the use of the Hydrological-Institutional Model (H-I Model) on a Ten-Year basis.

Arkansas Well Use Rules

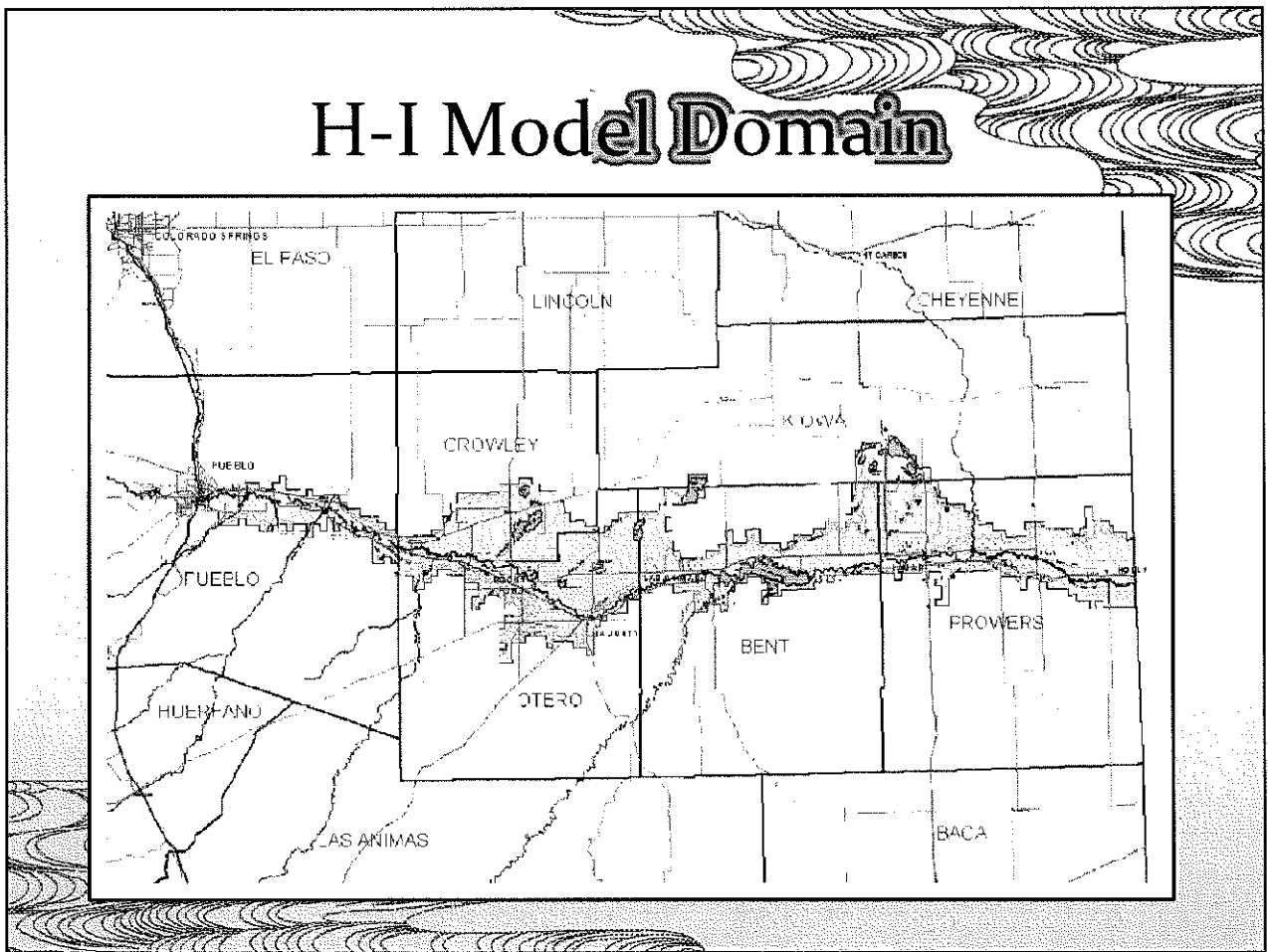
- Went into effect in June 1996
- Irrigation wells primarily continue to pump under three large well associations plans that are annually approved by the State Engineer
- Farmers have been able to continue to use wells as an important hedge against a single year of bad drought
- The large well associations have invested in securing replacement resources by purchasing some senior ditch rights and strategically drying up lands to maintain well pumping on substantial portions of the historic lands
- Colorado has not been out of compliance with the Compact due to well depletions during the 17 years of plan operations

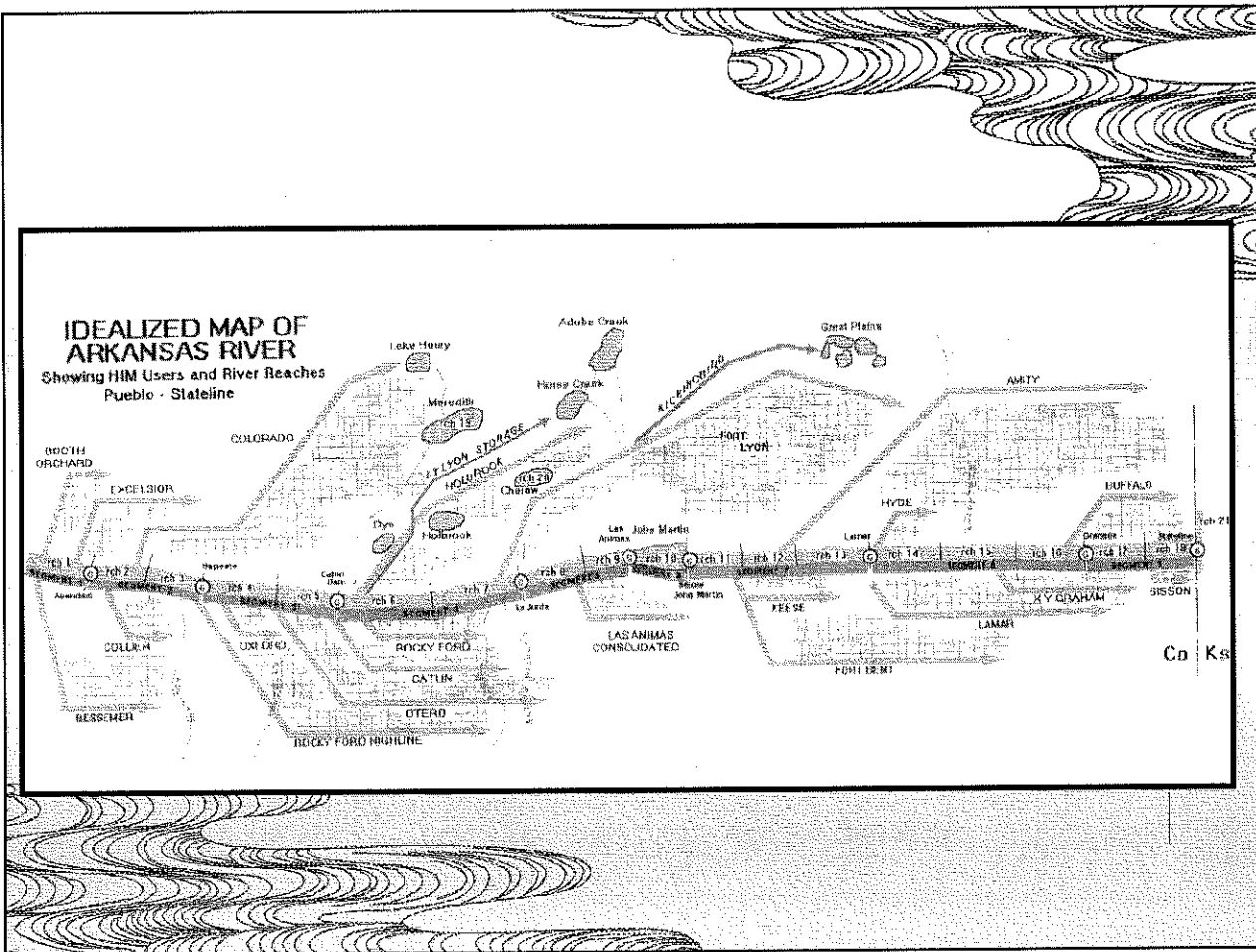


Compact Compliance Measured with the H-T Model

- Used to determine depletions and accretions to Stateline flow due to Groundwater Pumping and Replacement for Irrigation Wells within the model domain area
 - Simulates hydrologic and institutional systems along the Arkansas River from Pueblo to the Stateline
 - Predicts diversions, stream flows and storage of water in and releases from John Martin Reservoir and off-channel reservoirs
 - Calibrated over the period 1950-1994 to historical diversions and stream flows
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H-I Model Domain





Irrigation Improvement Rules of Surface Water Systems

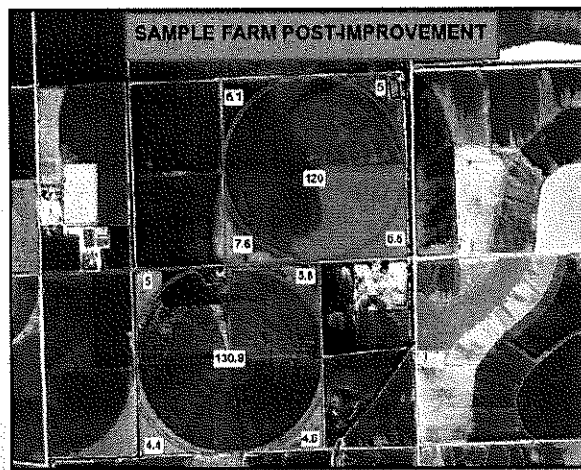
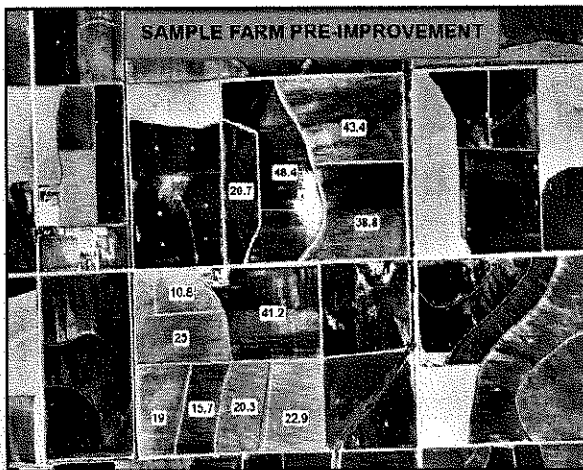
- Reason for these Rules was the increased conversion of flood irrigation systems to sprinkler and drip systems after 1999 posing a potential violation of the Compact
- Developed from 2008 through 2010 via an Advisory Committee approach and approved by the Division 2 Water Court in January 2011

Irrigation Improvement Rules

What types of irrigation improvements are subject?

- Lining of canals and off-farm laterals
- Pipelines or chemicals to reduce losses from canals and off-farm laterals
- Head stabilization ponds and tailwater recovery pits
- Sprinklers & drip systems that replace flood and furrow methods
- Replacing a side-roll sprinkler with a center-pivot system, replacing impact sprinklers with spray nozzles, or adding surface water as a source for a sprinkler

Most Common Improvement *Conversion of Irrigation Method*



How do you **determine if an**
improvement **reduces return flows?**

- ▣ Rules approved the use of the Irrigation System Analysis Model (ISAM) for evaluation of changes to irrigation systems
- ▣ Rules allowed sprinkler owners to hire engineers to perform an independent analysis in lieu of using ISAM

What is ISAM and why was it developed?

- ISAM is a water budget model that estimates the amount of water available to grow crops and build up moisture in the root zone and estimates how much water returns to the river from the farm as surface flow and ground water flow
- A primary complaint raised by water users impacted by these Rules was cost and availability of engineering consultants and ISAM was provided at no cost to the users
- Division of Water Resources needed a workable tool to evaluate on-farm irrigation system changes

How many farms are impacted by the Improvement Rules?

- There are currently two return flow maintenance plans approved under the Rules
- Plans include 81 farms with 107 improvements (currently all sprinklers/drip systems)
- Return flow maintenance estimates for the two plans are approximately 1100 acre-feet during the 2013-14 Plan Year (May-April)

Study of Delivery Pond Seepage

- ❑ Small ponds are used to temporarily hold water delivered to the farms from canals and lateral ditches prior to the water being pumped into sprinklers or drip systems
- ❑ There was very limited data on how much water leaked or seeped from these ponds in the Arkansas Basin
- ❑ Since this seepage helps maintain return flows a study is being conducted of 25 ponds where inflows and outflows are metered and evaporation accounting allows seepage rates to be computed
- ❑ Study results after 2013 and 2014 should help reduce the return flow maintenance requirement for farmers and is already doing so for these 25 systems



Summary

- Colorado's efforts to comply with the Arkansas River Compact have been successful from 1996 forward under the Arkansas Well Use Rules
- Colorado has avoided a violation of the Arkansas River Compact via the Irrigation Improvement Rules while not deterring the installation of sprinkler and drip irrigation systems during 2011 thru 2013
- Operations under both sets of Rules are continually improving due to innovative thinking by farmers and cooperation by the Southeastern Colorado Water Conservancy District and the Lower Arkansas Valley Water Conservancy District
- Colorado Water Conservation Board has also been a key partner through low cost loans and grants

