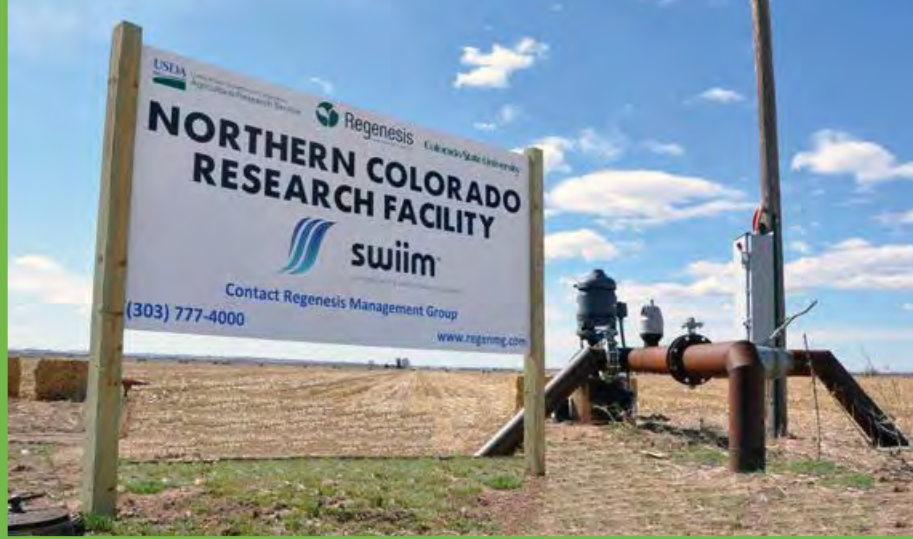


Regenesis: A New Approach for Irrigated Agriculture



By Tom Cech

Irrigated agriculture along the Front Range of Colorado is currently in the pathway of municipal growth. Colorado's population is expected to double, from 5 million today to 10 million by 2050. Other examples of this scenario exist throughout the prior appropriation states of the West. Cities need more water as they grow, and the least expensive option (beyond urban water conservation measures) is to buy senior water rights and then dry up the irrigated fields. The rural economies then suffer the consequences.

Now, as an alternative, researchers from Colorado State University (CSU) and the Agricultural Research Service (ARS) of the U.S. Department of Agriculture (USDA) in Fort Collins are working with Denver-based Regenesis Management Group, led by Ed Warner, Robert Stoller, Kevin France, and Dr. Stephen Smith. This public-private team is developing tools to help irrigators (1) use less water and document the reduction of crop water use (consumptive use or evapotranspiration), and (2) maintain historic return flows. Then, the unused consumptive use water could be sold or leased to cities—increasing an irrigator's net returns.

The key to success is to reduce and scientifically document the long-term reduction of crop historic consumptive use of water on a field, farm, or irrigation ditch/reservoir system. Reduced crop consumptive use can be achieved through permanent rotational fallowing, deficit irrigation, and possibly changed cropping patterns, or combinations of the above.

Dr. Tom Trout, Agricultural Engineer/Research Leader with ARS (the main research arm of USDA and one of the world's premier scientific organizations) is leading the field research efforts. "We [ARS] were already doing deficit irrigation research at the Research Farm out at Greeley. The people from Regenesis came out and liked what they saw. That led to our Cooperative Research and Development Agreement [CRADA] with Regenesis."

The scientific research is in place, but how will the concept of selling unused consumptive use water fit within Colorado's rigid water rights system? In 1876, Colorado adopted the "Doctrine of Prior Appropriation," and continues to follow that strict water allocation system today. As such, the sale of water rights is often a complex, highly technical, and often intensely litigated process. An irrigator cannot simply say that he is using less water and then sell that unused water to a municipality. Colorado water law requires that a buyer or seller must provide evidence regarding the historic consumptive use of water being transferred to a new location and/or use. In addition, historic return flows must be maintained.

When water rights are sold and converted from agricultural to municipal (or other) use, the Water Court (there are seven in Colorado, based on river basins) requires the new owner (in this case, a municipality) to maintain historic return flow patterns (in quantity, time, and location) back to the adjacent stream. This historic return flow is irrigation water that was applied to a field, but was not consumed by the crop.





Historic consumptive use and return flow analysis are prepared by a water engineer for Water Court, and often involves the analysis of information such as decades of ditch delivery records, years of cropping pattern data (including aerial photos), and documentation of irrigation water application methods. Ultimately, Water Court participants (the applicant and objectors) will either stipulate to an agreement on the engineering analysis, or will ask for a trial to present other evidence to the Water Court judge.

Alternative and permanent farming practices will be a key part of the Water Court consideration. The Regensis team is currently researching a variety of farming practice options, including:

- Deficit irrigation of selected crops
- Crop rotations
- Introduction of new crops, including perennial crops
- Permanent fallowing or rotational fallowing
- Introduction of dryland crops
- Continued full irrigation of selected crops
- Combinations of the above

At this point, there are two key questions: First, how will irrigators determine whether this program is right for them? To answer this critical question, the Regensis team is developing a patent-pending tool called the SWIIM™ (Sustainable Water and Innovation Irrigation Management™) Planner. SWIIM™ Planner allows irrigators to input potential farm cropping patterns to determine optimal cropping plans for highest net financial return (while allowing for the sale or long-term lease of a portion of their irrigation water). Irrigators can select farm inputs such as field size, water delivery quantities, crop type, full or deficit irrigation practices, crop rotations, and alternative irrigated and dryland cropping patterns within a variety of computer-assisted scenarios.

The second question will be asked by the city water manager: How can we ensure that the historic consumptive use water purchased from the irrigator will be approved in the Water Court process? This is where

Regensis's second patent-pending tool comes into play. SWIIM™ Manager is a technology package that uses real-time monitoring methods to determine crop consumptive use during an entire growing season. SWIIM™ Manager includes irrigation water application rates, crop evapotranspiration, surface water runoff from the end of fields, crop root zone, and deeper soil (vadose) zone percolation rates through real-time, remote, wireless instrumentation. Aerial and satellite information also helps verify crop consumptive use.

Jon Altenhofen, South Platte Special Projects Manager at the Northern Colorado Water Conservancy District in Berthoud, Colorado, is a strong supporter of the SWIIM™ concept because of the financial benefit it would provide to irrigators. "The benefit to the farmer has to be that he or she will make more net profit, and the city will pay less than if it [the land] was fallowed because we're also going to be increasing the water productivity on the farm—more crop per drop."

"To me," stated Dr. Stephen Smith, a partner with Regensis, "it's all about the detail of water balance. How do we effectively quantify the historic consumptive use (of a changed cropping or irrigation practice) and then, more importantly, monitor the parting off of a portion of the consumptive use water right under a new Water Court decree? And how do we monitor changed cropping or irrigation practices to the satisfaction of the water court objectors?"

For further information, contact Dr. Stephen Smith, Regensis Management Group, at swsmith@regenmg.com or visit www.regenmg.com.