EXPANDED COVERAGE: Center for Irrigation Technology's New Ag Water Use Study

FRIANT WATER AUTHORITY

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FRIANT Waterline

The Reality Of Ag Water 'Savings'

CSUF Study Shows Conservation Doesn't Create Significant New Supplies

Friant Water Authority leaders are applauding a new academic study that derails the myths of claims that agricultural water conservation can result in enough new water to solve the problems of water management or at least provide the volumes of water desired by all users.

A report on the study released November 16 by the Center for Irrigation Technology at California State University, Fresno validates landmark water efficiency findings in a study conducted three decades ago.

CIT is an internationally-respected research body in the field of water use, management and efficiency on the CSUF campus. Its recent research confirms and builds upon the earlier work and conclusions of Robert Hagan and David Davenport at the University of California, Davis in 1982. *(Please see related story, Page 3.)*

WHAT AGRICULTURE HAS BEEN SAYING

"We are very pleased to see that such an esteemed research group has validated much of what those of us involved in delivering and utilizing agricultural water supplies have been saying for decades," said Friant Water Authority Assistant General Manager Mario Santoyo. "Agriculture's water use efficiency has increased dramatically over the past 20 years and there is no evidence that conservation we've achieved is sufficient to create significant additional water supplies for others. We agree with what Dr. David Zoldoske, the CIT's Director, said in introducing the study."

'The study is an important addition to the ongoing discussions about California water and specifically what decisions must be made to assure adequate supplies for the future.'

—Dr. David Zoldoske

According to Dr. Zoldoske, "The study is an important addition to the ongoing discussions about California water and specifically what decisions must be made to assure adequate supplies for the future. The information presented in this paper should provide a valuable tool in moving the discussions forward."

Santoyo noted that previous reports authored and embraced by environmental organizations have claimed agriculture can conserve 10-15% of its water with those supplies then made available to be redirected to other uses. "That is a fallacy, as this report clearly states," he said.

CONSERVATION OF ONLY 1.3%

"CIT's report demonstrates and details that agricultural conservation would account for just 1.3% of existing farm water supplies and only 0.5% of the state's total water

Please see **Study**, back page

A Foggy Fall Dawn Along The Friant-Kern

Wisps of fog rise from unhurried waters in the Friant-Kern Canal east of Clovis in Fresno County on a chilly November morning. Water orders have decreased seasonally and by month's end stood at 442 cubic feet per second being released from Friant Dam.

Friant Water Authority / J. Randall McFarland

Ag Facing Regulatory Expansion

Irrigated Lands Program Growing In Its Scope

Recent Central Valley Regional Water Quality Control Board action to include discharges to groundwater ensures that virtually all irrigated agricultural operations will fall under the Regional Board's Irrigated Lands Regulatory Program (ILRP), a reality for which many Friant Division districts and their growers are preparing.

David Orth, Southern San Joaquin Water Quality Coalition Coordinator (SSJWQC) and Kings River Conservation District General Manager, told a Kings River Water Association meeting November 14, "It's time for folks to understand the scope of the new Irrigated Lands Regulatory Program."

That scope, at least within the Tulare Lake Basin, is going to be much broader than it has been over the past several years.

Please see **Irrigated Lands**, Page 2

Mid-Fall Storms Are Little Help To Watershed

Storms have been stingy over the central Sierra Nevada since early October and long-term predictions appear to be offering little hope for change.

November provided four storm events over the San Joaquin River watershed, with only one bringing more – and that just modestly – than very light rain or snow.

The National Weather Service's long-range forecast for Central California in December, the beginning of the region's three wettest months, is for "equal chances" of above or below average precipitation, but January-through-April predictions are for below-average rain and snow.

Storage in the San Joaquin River's Millerton Lake remains higher than normal for this time of year as a result of the above-average 2010-11 water year and on November 30 stood at 298,397 acre-feet, just under 57% of capacity. Upstream storage is also fairly high. The U.S. Bureau of Reclamation has indicated that a significant storm event could trigger a need to evacuate some water from Millerton Lake to comply with flood control parameters. Such an event could result in additional supplies to Friant contractors and/or flood releases.

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OBITUARY

Retired TBID Manager Boudreau Dies

John E. Boudreau, who managed the Terra Bella Irrigation District for three decades and became a leader in Friant Division water and power issues, died October 26 at his home in Cayucos. He was 78.

John Boudreau

Mr. Boudreau's career as Engineer-Manager with TBID began in 1968 and ended with his 1998 retirement. He was active in all issues involving the Central Valley Project and Friant water, including the former Friant Water Users Association.

In 1985, Mr. Boudreau helped organize the Friant Water Users Authority, which the next year became the Friant-Kern Canal's conveyance contractor for the U.S. Bureau of Reclamation. He was an active participant in the agency's Advisory Committee and served on many other Friant committees as well.

POWER AUTHORITY

From 1979-2000, Mr. Boudreau also managed the Friant Power Authority. He oversaw planning and construction of the FPA's three hydroelectric power plants on the face of Friant Dam.

"For those of us in the Friant Power Authority, our districts owe an enduring debt of gratitude to John and his foresight in the development of the FPA power project," said Delano-Earlimart Irrigation District General Manager Dale Brogan in a message to other Friant leaders in remembrance of Mr. Boudreau. "One of his more prophetic quotes about the FPA project, while in the middle of being financially devastated, was to hold on, knowing that one day the project would be profitable. That continues to ring in my ears."

COMPREHENSIVE PLAN UPROAR

Mr. Boudreau was a leader in what became a public uproar when the Bureau of Reclamation announced in 1994 that it was beginning the San Joaquin River Comprehensive Plan as called for in the Central Valley Project Improvement Act.

The first public meeting held by the Bureau to scope the plan was in Terra Bella and 400 attended. Even larger crowds objected to the process in meetings that followed in Delano, Tulare and Madera. Ultimately, Friant contractors lost no water as a result of the program.

Mr. Boudreau also was active in the Association of California Water Agencies, was an Executive Board member of the Thermal Electric Water Supply Committee, and chaired both the Tulare County Nuclear Power Plant Advisory Committee and Tulare County Flood Control Commission.

He was born in Los Angeles in March 1933, a week after Long Beach, where his parents lived, was heavily damaged in an earthquake.

SANTA CLARA GRADUATE

After spending his youth in Long Beach, where he was a body surfer and played basketball at St. Anthony's High School, John attended Santa Clara University on a basketball scholarship and earned a bachelor's degree in mechanical engineering.

He began his engineering career at Shell Chemical before joining Aerojet General in Sacramento in the 1960s as a test engineer on the Polaris missile program.

After a brief term of active duty in the U.S. Army as a second lieutenant, Mr. Boudreau served eight years in the Army Reserve, rising to the rank of Captain.

In 1956, he married Sue Josephson of San Jose, whom he met while he was at Santa Clara.

Irrigated Lands: All Irrigators Targeted By Program

Continued from front page

A SSJWQC newsletter states: "The current agricultural waiver applied only to surface water and allowed individuals to avoid regulation if it could be proven that the agricultural operation did not discharge storm water or irrigation water into surface waters of the state. The amended ILRP will begin with an assumption that *every irrigator* is a discharger because of the inclusion of groundwater."

"This is a regulatory program that all farmers will have to deal with," Orth said. "Except for extremely limited circumstances, irrigators will no longer be able to argue that they are not dischargers."

FEE INCREASE FROM STATE

They will also have to pay more. In September, the State Water Resources Control Board approved an ILRP fee increase for irrigators.

What had been an annual fee of 12 cents per acre has been raised to 56 cents for each acre due to the Legislature's decision during budget crisis deliberations to eliminate state general fund support for the program. Future state fee increases are possible.

The Regional Board has jurisdiction throughout the Central Valley and adjoining mountain and foothill areas in all or parts of 32 counties, including the Friant Division.

Although the Friant Water Authority is not a party to ILRP issues, the plan being framed for the Tulare Lake Basin affects all Friant districts that receive water from the Friant-Kern Canal.

DEER CREEK-TULE RIVER READINESS

Preparations and grower awareness efforts are under way. One example is the Deer Creek and Tule River Authority in Tulare County. It has sent applications for sub-watershed membership to all landowners of five acres or more. About 100,000 acres are enrolled and those who have not joined will have at least one more chance to sign up.

Sean Geivet, who manages the Terra Bella, Saucelito and Porterville irrigation districts (all members of the Deer Creek and Tule River Authority and Friant Water Authority), says landowners have been informed on water quality issues.

"I think growers are more up to speed than others may think," Geivet said. Especially in districts with federal water contracts from the Central Valley Project's Friant Division, increases in regulation and fees are nothing new, he said. Geivet said the Regional Board discussion is really over where to build a regulatory bureaucracy – either at a fairly local level or within the Regional Board. "Either way, we're going to be regulated," he said.

ARGUMENTS UNSUCCESSFUL

Regional Board action expanding its ILRP regulatory reach came despite extensive arguments submitted by the SSJWQC during hearings. The Coalition argued unsuccessfully that the Regional Board was over-reaching in regulating discharges to groundwater because not all irrigated agriculture degrades groundwater quality. Legal challenges to adequacy of the Regional Board's findings under the California Environmental Quality Act have been made.

Talks are continuing between SSJWQC and Regional Board staff representatives on development of a general order that would establish regulatory provisions for the Kings, Kaweah, Tule and Kern rivers sub-watersheds although that process is not likely to be completed and lead to implementation until 2014 or 2015.

The SSJWQC newsletter stated, "The Coalition will continue to meet with the Regional Board staff…in an effort to obtain a general order that best represents water quality issues and conditions for the Tulare Lake Basin." Coalition officials added, "The ability of the Coalition to continue representation of the landowners will depend ultimately on the additional requirements of the Regional Board."

About The CIT At Fresno State

Much of this month's Friant *Waterline* is dedicated to presenting an overview of an important study on farm irrigation efficiency and conservation.

Researching and authoring "Agricultural Water Use in California — a 2011 Perspective" were faculty and staff members at California State University, Fresno's Center for Irrigation Technology.

Created in 1980, CIT is recognized around the world as an independent testing laboratory, applied research facility and educational resource.

CIT points out that one of California's biggest challenges is managing ever-increasing demands on its most precious resource – water. A core mission of CIT is to help extend this limited supply of water through the use of technology, research and education.

SAN JOAQUIN RIVER AND RESERVOIR WATER CONDITIONS

WATERSHED PRECIPITATION

Inches	2011-12 *Including Nov. 30*	2010-2011 *Including Nov. 30*	Season Avg. *Through November*
Huntington Lake	5.75	17.40	8.14
Bass Lake	3.78	10.09	6.39
Friant	2.38	4.33	2.46

SEASONAL RUNOFF

Acre-Feet	In 2011-12	Predicted	Prev. Year
Nov. (30th)	27.957	45,000	52,918
April-July period…			2,243,065
Water Year……	75,549		112,532

2009-2010 Total *(October 1-September 30)* — 3,300,750

FLOWS

San Joaquin River

Cubic Feet Per Second	Nov. 30	Nov. 30, '10
Calculated Natural Flow (Friant)	460	1,007
Actual Millerton Lake Inflow	590	1,884
Actual Flow At Friant	103	303
Flow at Gravelly Ford	7	
Flow below Mendota Dam	M	
Flow at Vernalis *(San Joaquin County)*	2,381	
Total Delta inflow	17,577	
Delta outflow index	12,444	
Delta conditions	*Excess*	

Diversions at Friant Dam

Friant-Kern Canal	442	0
Madera Canal	0	0

RESERVOIR STORAGE

Acre-Feet	Nov. 30	Last Year	Capacity
U.S. Bureau of Reclamation			
Millerton Lake	298,397	291,593	*520,500*
Southern California Edison Company			
Edison Lake	99,716	86,406	*125,000*
Florence Lake	45,727	39,119	*64,400*
Huntington Lake	63,903	75,493	*89,000*
Shaver Lake	4,364	25,903	*135,300*
Mammoth Pool	70,553	34,751	*122,000*
Redinger Lake	18,150	15,771	*26,120*
Pacific Gas and Electric Company			
Bass Lake	17,613	18,169	*35,000**
Kerckhoff Lake	3,976	4,119	*4,200*
**—Temporary capacity pending Crane Valley Dam seismic retrofit*			
Upstream Total	**324,037**	**299,731**	***611,400***
OVERALL	**622,434**	**591,324**	***1,131,900***

OTHER SOUTH VALLEY DAMS AND RESERVOIRS

Acre-Feet	Nov. 30	Capacity
Chowchilla River / *Buchanan*	107,688	*150,000*
Fresno River / *Hidden*	28,416	*90,000*
Merced River / *New Exchequer*	672,625	*1,024,600*
Kings River / *Pine Flat*	552,163	*1,000,000*
Wishon, Courtright total	144,963	*251,900*
Kaweah River / *Terminus*	20,375	*185,600*
Tule River / *Success*	10,550	*40,000**
**—Capacity for emergency flood control, 82,314 acre-feet.*		
Kern River / *Isabella*	168,329	*360,000**
**—Capacity for emergency flood control, 570,000 acre-feet.*		
San Luis Reservoir / *CVP*	844,114	*980,000*
State Water Project portion	917.606	*1,060,000*
San Luis Reservoir total	1,761,606	*2,040,000*

CENTER FOR IRRIGATION TECHNOLOGY'S NEW AG WATER USE STUDY

The Hagan-Davenport Report of 1982

UC Davis Study Set Efficiency Benchmark That Agriculture Still Uses

Other studies have come and gone but a 1982 report by two University of California, Davis, researchers remains as true today as when it was released. That work by Robert Hagan and David Davenport created a research foundation that much of production agriculture has embraced and used over the past three decades to improve irrigation efficiency, management and conservation.

Its findings have also been largely validated in the recently released Center for Irrigation Technology study and report upon which California State University, Fresno, researchers worked for the past few years.

STILL STAND

"Regarding the potential for agricultural water conservation to fix the water management problems in California, it is strongly evident that the major findings of the [Hagan-Davenport] Report still stand," the CIT report's conclusion states.

CIT adds, "Claims of excessive irrigation inefficiencies, with resulting large volumes of new water available, are wrong" due to common practices by farmers to recover and re-utilize water.

"We're encouraged that CIT finds it is strongly evident that major findings of the Hagan-Davenport Report that resulted from an extensive water efficiency study nearly 30 years ago stand," Friant Water Authority Assistant General Manager Mario Santoyo said. "We all know that what CIT says is true – that today's water issues go well beyond what Robert Hagan and David Davenport studied, but the basis of their work has been found to be just as relevant now as it was in 1982. Much of what critics of agricultural water use claim is being wasted is actually used again by other farmers and communities."

HAGAN-DAVENPORT CONCLUSIONS

Here are the Hagan-Davenport Report's principal conclusions:

- "**California's net water deficit can be reduced** only by agricultural water conservation actions that curtail soil surface evaporation ... and flows to highly saline sinks. Therefore, the realistic potential for agricultural water conservation, without loss in crop production, is not likely to be in the range of 10-50%, but is more likely to be approximately 2-3% of the water applied in California's irrigated agriculture.
- **"It is erroneous to conclude** that a particular irrigation system such as sprinkler or drip requires only a fraction of the water applied by systems such as furrow or border-strip. (With good design and management, most irrigation systems have a similar potential for efficient water application.) Because of the recoverability and reusability of field runoff and deep percolation, it is even more erroneous to conclude that decreasing runoff and deep percolation will proportionately reduce the state's net water deficit. Therefore, statements suggesting a 10-50% potential savings in agricultural water conservation by improving irrigation application systems are a disservice to the people of California because water policy and action programs based on such statements will substantially underestimate the state's needs for future water supplies."
- **"On-farm water savings** can best be achieved by proper management of existing and new irrigation systems and through good irrigation programs which determine the correct timing and quantity of water application. These savings will mainly occur as a reduction in recoverable water and as reuse of recovered water. On-farm reduction of irrecoverable water loss can be achieved without curtailing economic crop production, mainly by reducing soil surface evaporation but the magnitude of the state-wide savings that can be practically achieved through reduced [evaporation] is not expected to be substantial.
- **Water used in irrigation** is either recoverable or is irrecoverably lost. It is important that recoverable water be recovered and reused as efficiently as possible. However, it should not be permitted to accumulate under conditions where it is subject to evaporation or to transpiration losses by nonproductive vegetation. Seepage, surface runoff, and deep percolation contributing to soil moisture available to crops, groundwater, or wildlife habitat and recreation cannot be regarded as lost. Water flow to salt water bodies is irrecoverable and should be avoided. "Conservation decisions must take into account environmental and in-stream needs as well as the appropriate balance of potential water savings against net farm income, possible reductions in food and fiber production, infrastructural viability, and the ability of farmers to retain flexibility in their operations and remain competitive in the market."
- **Agencies distributing California's** irrigation water are individually distinctive in historic, geologic, geographic, water-source, political, and other characteristics, so water pricing, management and distribution policies vary considerably. "Because of these unique characteristics, universal recommendations on agricultural water conservation actions cannot be made."
- "**There is a large array of conservation** actions, but while these are workable in theory many are not always justified in practice because of technical, economic, and environmental reasons. These conservation actions might be taken during water storage, conveyance, and application; by use of cultural and crop management practices; by reusing and reclaiming water; and through institutional mechanisms."
- **"In much of the San Joaquin Valley**, water conservation has been practiced by water agencies and growers for many decades. This has been done out of necessity because of poor natural distribution of water and scarcity of water supplies relative to irrigation demands. Irrigation is essential because available water is the major resource lacking in an otherwise bountiful valley blessed with fertile soil and plentiful solar radiation."
- **"If water saving is looked at solely** from an on-farm viewpoint (without regard to associated effects), the decision to use water conservation measures depends on whether the motive is 1) just to reduce on-farm water demand, or 2) to reduce the state's net water deficit. Reducing field runoff (RO) and deep percolation (DP) by improving irrigation application efficiency, will reduce on-farm water demand but will not affect the state's water deficit because RO and DP are recoverable for reuse. The state's water deficit can only be reduced by curtailing irrecoverable losses to the air and to saline sinks, mainly to the ocean. This will not create new water, but it will make more of the existing water supplies available for agricultural, [municipal and industrial], and in-stream uses."
- **"The largest true loss of water** from agricultural areas occurs as crop transpiration which can theoretically be curtailed only by reducing the area, the rate and/or the time duration of the transpiring surface." Because crop growth and transpiration are related strongly, transpiration reductions by restricting irrigation, if considerable, "would clearly reduce crop production, and if small, may cause only a small reduction in crop yield but would increase the risk of substantial reductions in yield. Neither prospect is likely to be acceptable to growers. They are more likely to take water conservation actions, however, if their net farm profits increase through savings in production costs associated with water management."
- **There are many other effects** associated with agricultural water conservation actions. A positive result can be energy savings while negatives result if groundwater recharge or wildlife habitat water supplies are reduced as a result of conservation. Other benefits can include on-farm reductions in leaching of fertilizers or off-farm lessening of pollution.
- **San Joaquin Valley groundwater overdraft** can be reduced by reducing net water demand by cutting evapotranspiration to the air but since ET reduction tends to curtail agricultural production, this generally is not a practical solution. Another option is to bring more water into the valley through development or transfers.
- **"To be practical, these solutions** should result in little loss in farm profit, and water transfers should be of mutual benefit to the water sellers and the water buyers. The storage and transfer of surplus flood water (over and above that needed to maintain instream needs) that would otherwise be irrecoverably lost to the ocean would contribute considerably toward reducing California's total projected net water deficit. Also, increased storage, both as surface and groundwater, would reduce the state's vulnerability to future droughts."
- **No precise numerical conservation is reported** because "a distinction must be made between water savings that occur only on-farm and those that help alleviate the state's water deficit; and that deficit can only be met by reducing irrecoverable water outflow, but there is insufficient information on the economic and environmental impacts of reducing those irrecoverable water losses from the state."

'Recoverable Fractions' Principle Is Key In Ag Water Conservation

It's a term that may not sound familiar but a recent study and report has reaffirmed the critical importance of *recoverable fractions* in understanding the amount of water supply actually realized through agricultural water conservation.

"Some claim California agriculture is wasteful or inefficient with water used to irrigate crops and fields," says the Center for Irrigation Technology about the report prepared by California State University, Fresno researchers. "However, based on the principle of recoverable fractions…, new volumes of water gained through conservation practices are insignificant."

In fact, conclusions in CIT's report state, "The estimated potential new water from agricultural water use efficiency is 1.3% of the current amount used by the state's farmers – about 330,000 acre-feet per year… . That represents about 0.5% of California's total water use of 62.66 million acre-feet." Costs to achieve such a small total amount could be very high.

DEFINITION

CIT defines *recoverable fractions* as "surface runoff or deep percolation from an irrigated field that is reclaimed and re-used. The new use can be another field, farm, city water supply, or the environment."

"It is imperative to understand when discussing efficiency of volumetric consumption by agriculture the focus must be on the farm, district, and basin, not the individual field or irrigation event," CIT says.

The concept became recognized in a 1982 water efficiency report by Robert Hagan and David Davenport (*please see related story, this page*), although "fractions" were then referred to as water "losses."

GOOD OR BAD DESTINATIONS

"When irrigation water is applied to a field to satisfy the needs of a crop, that water can end up in several different places," the CIT report says. "…These fractions … can be beneficial or non-beneficial." There are also consumptive or non-consumptive fractions.

According to CIT, understanding of the recoverable fraction concept and how it could affect water diversion changes requires acknowledgement of the complexities existing among different water users.

CIT says, "Impacts can be seen from flow reductions (and the timing of these reductions) in streams and rivers, as well as impacts to water quality from irrigation return flows, recoverable or irrecoverable. Everything downstream of any changes to the established water distribution patterns can be affected, including plants and animals, recreation, as well as human and industrial consumptive uses."

NON-BENEFICIAL

Non-beneficial fractions in fields result from irrigation inefficiencies and need to be minimized.

"Recoverable fractions aren't true depletions," the report says. "Rather they are water that can be used at a different place and different time than the original diversion. In fact, recoverable fractions may be recovered and reused several times and possibly for different purposes."

The report states, "The only true depletions (losses) in terms of water volumes are irrecoverable fractions. All water users should continually strive to minimize irrecoverable fractions. However, recoverable fractions are just that, recoverable. There may be other undesirable impacts … and the range of uses (e.g., irrigation, recreation, human consumption, stock watering) may be diminished with each reuse and recovery, but nonetheless, they are available."

NEED FOR CAUTION

"Caution should be used when evaluating estimates of new water available through conservation," the report says. "Decisions affecting agricultural water use are dependent on many variables including crop and irrigation system selection, soil management, available water delivery systems, and water quality. Agricultural water conservation estimates are, by necessity, based on generalizations involving these variables."

CENTER FOR IRRIGATION TECHNOLOGY'S NEW AG WATER USE STUDY

Friant-Kern Service Area Illustrates Study Findings

Two key findings in the Center for Irrigation Technology's "Agricultural Water Use in California" report are illustrated by recounting how things work in the Central Valley Project's Friant Division within districts served from the Friant-Kern Canal.

Friant's CVP supply is not only isolated from the rest of the Central Valley Project, the Friant-Kern Canal flows into the southern San Joaquin Valley, a closed basin (that is part of the Tulare Lake Basin). Water does not move back to the San Joaquin River or out to the Pacific Ocean except in the wettest of years, thus creating a closed-end system.

NONE OUT OF AREA?

CIT researchers found that "improved on-farm efficiency may not result in new water outside the use area." They said that bettering on-farm efficiency could actually permit more irrigated acreage or more water-intensive crops to be grown.

"An important point of this example is that the additional water within the system resulting from improved efficiencies is used to irrigate more crops," the study said. "The recovered fractions (water supplies) are not left in the reservoir or sent outside the district. … This water could be sold and transferred to another user."

Another finding related directly to Friant is that "improved on-farm efficiency can create third-party impacts." In Friant's case, better on-farm efficiency is part of a change from a balanced aquifer to aquifer overdraft.

"The improved on-farm efficiency did not create new water, it just changed the use of the affected water," CIT said.

DEEP PERCOLATION

"The overall impact on groundwater quality from reduced deep percolation is not clear. Less deep percolation could reduce the movement of nitrates and other soluble chemicals to the aquifer. If a salt balance is to be maintained in the soil to ensure crop production and quality, it may result in a higher salt concentration in the deep percolation that remains. This could eventually contribute to the overall salt concentration in the aquifer."

The report also summarizes how the conjunctive use of groundwater and surface water – so vital to the overall Friant Division water supply – operated.

"When there are sufficient surface water supplies available from the Friant-Kern Canal, groundwater sources may not be used. However, in times of scarcity, groundwater is used to augment, or even completely supplant, the canal supply.

"This is the concept behind conjunctive water management and water banks. In times of plenty, water is transferred to dedicated recharge areas … so that the excess water is percolated and stored in the aquifer. This stored water is then used in times of drought. Intentional percolation using dedicated sites provides for high-quality water reaching the aquifer."

To Read The Entire CIT Report And Its Findings

- There are many other issues and factors discussed in the report. It is available on line. Go to *www.californiawater.org*

Flowing Into A Closed Basin

The Friant-Kern Canal passes through the Delano area where its water deliveries have been a major factor in combating groundwater overdraft for 60 years. The Central Valley Project's Friant Division is a closed-end system with no outlet to the ocean.

Friant Water Authority / J. Randall McFarland

Study: 'Tiny Amounts Statewide' Can Be Conserved

Continued from front page

use," Santoyo said. "These are tiny amounts statewide, adding up to what CIT estimates as being 330,000 acre-feet each year." The report also shows that previous reallocations of agricultural water supplies for environmental purposes now add up to at least 5% of farm water diversions depending on the water year.

Experience since Central Valley Project water deliveries began in the Friant Division along the San Joaquin Valley's East Side in the mid to late 1940s agrees with what the CIT shows and is demonstrated in some detail by the study, Santoyo said. "Changes in irrigation practices create opportunities to use the saved water within the region, such as through transfers, but have not resulted in new supplies beyond the Friant Division," he said.

CIT's researchers state, "An important goal of this report is to affirm that the issue is not what total percentage of water agriculture diverts or consumes, it is whether or not agriculture is providing good stewardship over its allocation. As noted earlier, the [Hagan-Davenport] Report was published in part as a response to 'misunderstandings' that were leading to claims of water wastage within agriculture. These types of claims continue along with reference to solutions that could be quickly or easily implemented.

WATER WASTE CLAIMS REJECTED

"The authors of this paper, as did Davenport and Hagan, reject these claims and explain why based on the principle of recoverable versus irrecoverable fractions." *(Please see related story, Page 3.)*

Friant Water Authority General Manager Ronald D. Jacobsma pointed out CIT's study "demonstrates a clear and well-defined trend toward dramatic improvements in water management and efficiency. The study shows that between 1994-2008, drip irrigation use on California's 8 million irrigated acres increased by 150%, from 933,696 acres to 2,336,130 acres. The increase in drip irrigation and water use efficiency through the farmland irrigated from the Friant-Kern and Madera canals is even greater."

The report also points out the trade-offs that result in large-scale farm production within the San Joaquin Valley. "If society wants/needs this mix of food and fiber production, or if the normal flow of business decides in favor of this level of production, then the result is a large volume of consumptive plant water use – evapotranspiration. This is simply a result of the physics of irrigated crop production."

PERCOLATION AND GROUNDWATER

"Something else we have long known that has been validated by the report is that water applied to a crop but not actually used by the plant is not lost but typically percolates into the ground and helps boost groundwater supplies," Jacobsma said. "Groundwater is relied upon not only by thousands of farmers but many scores of communities and tens of thousands of rural residents with no other water source for domestic needs. CIT warns repeatedly of the potential for third party impacts if agricultural water use is reduced."

"As for switching to a crop that takes less water, it isn't that easy," said Santoyo. He said the CIT study is correct in pointing out that farm markets and economics, increased expenditures for field preparation and equipment, soil types and many other crucial factors must all be considered.

Santoyo also said the new study also "corroborates Friant's experiences in conjunctively using groundwater and surface water, noting that preservation of groundwater supplies is impossible if surface water supplies are inadequate or disrupted." The report notes that a serious overdraft problem, now amounting to some 2 million acre-feet annually across the state, will continue if surface water supply and reliability do not improve.

AG WATER USE ISN'T 'ISOLATED'

He said that it "is important to note the report's conclusion that farm water use isn't some isolated activity that takes place but that it's an integral part of what the report calls 'local and regional environments that are often co-dependent and impacted by decisions and activities of the local agricultural water users'."

The study says, "Water use patterns in the California have developed over decades, especially those involving large storage/delivery projects, resulting in co-dependent partnerships. Careful analysis must be done to evaluate all impacts before simply calling for increased on-farm water use efficiency. Changes to these environments that result in perceived benefits to some users can also result in negative impacts to other third-party users. It is essential to identify and understand these consequences."

"Friant's farmers know and understand what this report states," Jacobsma added, "that to be viable, any big changes have to be founded on assessments and analysis by the people who know the local conditions best – the farmers themselves."

Many Factors Are A Part Of Efficiency Study

Analysis of irrigation efficiency can be very complex. "While the irrigation efficiency on an individual field may be poor, the irrigation efficiency of a farm, irrigation district, or the basin may be very high because the inefficiencies of one field (recoverable fractions) are picked up for use by others in a larger area," the Center for Irrigation Technology says.

"However, diversions in themselves can lead to negative impacts on other beneficial uses and users. Thus, in most situations it should be an imperative to improve field irrigation efficiencies by reducing the required diversion to any individual field and in so doing, reducing surface and subsurface drainage flows.

TO REDUCE DIVERSIONS

An equation is included in the report to estimate required field water diversions in order to identify variables and their relationships. CIT says the equation shows that to reduce the acre-feet per year diverted to a field, one or more of these factors must occur:

- A reduction in irrigated acreage.
- A reduction in crop evapotranspiration (ETc).
- An increase in effectiveness of rainfall.
- A reduction in the leaching ratio.
- An increase in irrigation efficiency.

"Reducing irrigated acreage should not be considered a water conservation measure, but a transfer of water out of agriculture," says the report. "The question is: how will this impact regional and state economies and food supplies?"

Crop ETc is the combination of soil surface evaporation that occurs because of irrigation water that is present (not the immediate evaporation from free water surfaces during and just after the irrigation event) and transpiration from the crop surfaces.

Reducing ETc might be accomplished by reducing the soil wetted area, changing the crop to one using less water or changing crop management but, CIT says, "Such changes in practices have to be balanced with other factors such as the economics or disease and pest management impacts of such decisions."

IMPROVING EFFICIENCY

Improving irrigation efficiency is most important of all field application reductions to improve efficiency.

"This can involve improving management of the existing system or changing to an irrigation system that makes it easier to achieve the inherent potential efficiency of the system," says CIT's report.

Options for improved on-farm irrigation system management include understanding system characteristics and operating parameters, using some form of irrigation scheduling and maintaining the system to achieve the intended irrigation efficiency.

"The potential water savings from any of these options depends largely on how well or poorly the current irrigation system performs," CIT observes. "Many areas and growers in California already achieve high efficiencies." The Friant Division for many years has had some of the nation's highest irrigation efficiencies.