

local projects making a difference —

Water Use Efficiency Achievements in *California*



If you would like this report in an alternate format, call DWR's Equal Opportunity and Management Investigations Office at TDD 1-800-653-6934, or Voice 1-800-653-6952.

For more information about DWR's water use efficiency programs, please visit this Website: www.owue.water.ca.gov.



Photo of residential high efficiency washing machine courtesy of Electric and Gas Industrial Association



Photo of weather based controller installation courtesy of Santa Barbara County Water Agency



Photo of agricultural canal lining project courtesy of Lost Hills Water District

local projects making a difference —

Water Use Efficiency Achievements in *California*

State of California
The Resources Agency
Department of Water Resources
Office of Water Use Efficiency



Arnold Schwarzenegger
Governor
State of California

Michael Chrisman
Secretary for Resources
The Resources Agency

Lester Snow
Director
Department of Water Resources

March 2004

contents

Introduction	1	Save Water—Save A Buck Commercial Rebate Program, Metropolitan Water District	12
Background	1	Rebates for High-Efficiency Clothes Washers, Metropolitan Water District	12
Project Selection	1	Water Softener Pilot Program, Municipal Water District of Orange County	13
Funding Highlights	2	Waste Not, Want Not: The Potential for Urban Water Conservation, Pacific Institute	14
Urban Water Use Efficiency Projects			
Schools and Water Conservation Program—Large Landscape, Alameda County Water District	5	Save Our Delta Survey Program, City of Pittsburg	15
Water Conservation in Urban Supermarkets, Aquacraft	5	Water Wise Demonstration Landscape, Regents of the University of California	15
WaterWise Resource Action Program, Blue Planet Foundation	6	Brookside Golf Course Water Management Project, Rose Bowl Operating Company	16
Public Information Program, California Water Awareness Campaign	7	High Efficiency Clothes Washer Voucher, San Diego County Water Authority	16
Efficient Landscape Water Program, Cal Poly San Luis Obispo	7	Sacramento Water Use Efficiency, San Juan Water District	17
A Straight Flush—Commercial ULFT Replacement Program, Contra Costa Water District	8	Santa Barbara ET Controller, Santa Barbara County Water Agency	18
ULFT Rebates for Low-Income Residents, El Dorado Irrigation District	8	Landscape and Agricultural Area Measurement and Water Use Budgets, Santa Clara Valley Water District	18
Regional High-Efficiency Washing Machine Rebate, Electric and Gas Industrial Association	9	Water Conservation and Recycling Awareness Initiative, Water Education Foundation	19
California Water Efficiency Survey, Environmental Policy Center	10		
Community Water Education and Training Program, Expert, Inc.	10		
Joint Agency X-Ray Processor Retrofit, Irvine Ranch Water District	11		
New Courses for Bilingual Landscape Education, Metropolitan Water District	11		

contents

Agricultural Water Use Efficiency Projects

Anderson-Cottonwood Main Canal Modernization Project, Anderson-Cottonwood Irrigation District	21	Real-Time Canal Flow Monitoring System and Canal Lining Project, Placer County Water Agency	29
Irrigation Districts' Technical Assistance, California Polytechnic State University, Irrigation Training and Research Center	21	Sub-Basin Level Water Measurement Program, Reclamation District 108	30
Assessing Spatial and Temporal Variability of Soil Salinity on Farms Implementing Integrated Drainage Management Practices, Center for Irrigation Technology, California State University Fresno	22	Southwest Stanislaus County Regional Drainage Water Management, San Joaquin Valley Drainage Authority	30
On-Farm Irrigation System Improvements, Columbia Canal Company	23	Irrigation Management, West and East Stanislaus Resource Conservation District	31
GCID System Optimization for Fisheries, etc., Glenn-Colusa Irrigation District	24	Evaluation of Salt-Tolerant Floral and Forage Crops as a Strategy for Conserving Fresh Water Resources, USDA/Agricultural Resource Services	31
Sub-Surface Drip Irrigation of Asparagus, Golden State Irrigation Services	25	Irrigation Scheduling, WaterTech Partners	32
Water Use Efficiency Project, Kern-Tulare Water District	25	Water Use Efficiency Project, Western Canal Water District	33
NPS Pollution Reduction in Vineyards, Lodi-Woodbridge Winegrape Commission	26	On-Farm Integrated Irrigation and Drainage Management, West Hills Community College District	33
Distribution System Improvement Project, Lost Hills Water District—Service Areas 3 and 5	27		
On-Farm Ditch and Cast-in-Place System Replacement, Modesto Irrigation District	27		
Regional Water Use Efficiency Project, Orland Unit Water Users' Association	28		
OWID Palermo Canal Lining Project, Oroville-Wyandotte Irrigation District	28		
On-Farm Mobile Lab, Pajaro Valley Water Management Agency	29		

Tables

Table 1	Summary of Projects by Region	2
Table 2	Summary of Urban Projects by Type	2
Table 3	Summary of Agricultural Projects by Type	2
Table 4	Summary of Urban Projects Funding	3
Table 5	Summary of Agricultural Projects Funding	3

organization

STATE OF CALIFORNIA

Arnold Schwarzenegger, Governor

THE RESOURCES AGENCY

Michael Chrisman, Secretary for Resources

DEPARTMENT OF WATER RESOURCES

Lester Snow, Director

L. Lucinda Chipponeri

Deputy Director

Stephen Verigin

Acting Chief Deputy Director

Peggy Bernardy

Chief Counsel

Jerry Johns

Acting Deputy Director

Peter Garris

Deputy Director

Vernon T. Glover

Deputy Director

OFFICE OF WATER USE EFFICIENCY

Marsha Prillwitz, Chief

This report was prepared by

Debra Gonzalez DWR Project Manager

Heidi West Environmental Scientist

Phillip Anderson Land and Water Use Analyst

Special acknowledgements and thanks for their contributions to this report go to

Keving Rumon, California Urban Water Conservation Council and Larry Farwell

Editorial review, graphic design, and report production were provided by

Division of Planning and Local Assistance Publications Unit

Brenda Main Supervisor of Technical Publications

Mike Durant Research Writer

Alice Dyer Research Writer

introduction, background & project selection

Introduction

After three years, recipients of water use efficiency grants have completed their work. This report summarizes their work, achievements, and challenges. Included are references to their full reports, Web sites, and lists of contact people who can give complete information about each project. We hope this will be a good source of information and inspire others interested in water conservation.

Background

The California Bay Delta Authority (CBDA, formerly CALFED) is a cooperative effort of state and federal agencies that manage or regulate water in the San Francisco Bay and Sacramento River-San Joaquin River Delta, known commonly as the Bay-Delta. The Water Use Efficiency (WUE) Program, which is part of CBDA, works to encourage water conservation and recycling.

A key WUE strategy is to award grants to promising agricultural and urban water conservation projects. In January 2001, the WUE Agency Team consisting of staff from the California Department of Water Resources (DWR), the U.S. Bureau of Reclamation (USBR), Natural Resources Conservation Service (NRCS) and CBDA issued a Proposal Solicitation Package (PSP). The team designed the package to select the most promising agricultural and urban water conservation projects that would save water, improve water quality, and benefit the environment.

Project Selection

DWR, the lead state agency for this project, issued the PSP on Jan. 2, 2001, and held workshops in Modesto, Oakland and Los Angeles. The PSP generated 116 proposals for grants: 43 agricultural, 73 urban, totaling \$85 million in funding requests. Twelve million dollars were available for the program.

Evaluators used five criteria to decide which projects received grants:

- Relevance and importance
- Technical/scientific merit
- Outreach, community involvement and information
- Applicant qualifications and partnerships
- Costs and benefits

The two-month project review and selection process had three stages:

1. Technical Review

An economics team, a science team and a Native American team reviewed all proposals. Their reviews generated detailed, project-by-project critiques on specific criteria outlined in the PSP. The teams commented on each proposed project and, if they believed projects did not merit funding, provided an explanation. The teams submitted their reports to the Review Panel and WUE Agency Team for their deliberations.

2. Panel Review

There were 40 people on the Review Panel. They were drawn from federal, state and local water agencies and environmental, urban, agricultural and environmental justice stakeholder groups involved in water use efficiency. Each panelist reviewed 10 to 20 proposals and at least four reviewers evaluated each proposal. The panel's final rankings and reviewers' comments were then submitted to the WUE Agency Team for their deliberations.

3. WUE Agency Team Review

The WUE Agency Team recommended funding based heavily but not solely on the Review Panel's input. The Agency Team also considered project mix by category, geographic distribution, and amount of funds requested.

CBDA/DWR Approval

On May 8, 2001, CBDA concurred with the WUE Agency Team's final funding recommendations; and subsequently DWR approved.

funding highlights

Funding Highlights

DWR awarded \$11.7 million in grants to 53 projects. This represented \$5.8 million to 30 urban projects, with an estimated \$5.5 million in local matching funds; and \$5.9 million to 23 agricultural projects, with an estimated \$3.6 million in local matching funds. Five urban projects under one agency and one agricultural project were discontinued due to the agencies' inability to fulfill contract requirements.

Table 1. Summary of Projects by Region

Agricultural Region	Number	(\$)	Urban Number	(\$)
Statewide	2	369,600	5	1,086,800
Colorado River	0	0	0	0
South Coast	0	0	14	1,868,051
Bay & Delta	1	99,500	5	2,481,875
San Joaquin Valley	11	3,426,436	0	0
Sacramento Valley	9	2,028,208	6	446,524
Total	23	5,923,744	30	5,883,250

Table 2. Summary of Urban Projects by Type

Project Type	Number of Projects	Funding
High Efficiency Washers	4	\$3,009,875
Commercial, Industrial, Institutional	2	\$163,698
ET controllers	6	\$206,258
Demonstrations	3	\$343,774
Public Information	7	\$1,337,675
Research & Feasibility Studies	2	\$172,500
Residential Surveys	3	\$93,470
Ultra Low Flow Toilets	1	\$60,000
Large landscapes	2	\$496,000

Table 3. Summary of Agricultural Projects by Type

Project Type	Number of Projects	Funding
On-Farm Irrigation Improvements	4	\$830,286
Line or Pipe Canals	5	\$2,446,344
Education, Outreach & Assistance	3	\$499,500
Research	3	\$380,880
Automate Canal Structures	1	\$310,000
Demonstrations	2	\$440,534
Drainage Management	1	\$616,200
Feasibility Studies	4	\$400,000

Table 4. Summary of Urban Projects Funding

GRANT RECIPIENT	PROJECT TITLE	STATE SHARE	LOCAL SHARE
Alameda County Water District	ACWD Schools & Water Conservation–Large Landscape	\$125,000	\$131,700
* Aquacraft, Inc.	Demonstration of Water Conservation in Urban Supermarkets	\$126,000	\$54,000
Blue Planet Foundation	Expansion of the Learning to be WaterWise Program	\$38,000	\$20,245
California Water Awareness Campaign	Public Information Program	\$250,000	\$118,575
Cal Poly State University–ITRC	Efficient Landscape Water Program	\$244,000	\$244,477
* Contra Costa Water District	A Straight Flush Commercial ULFT Direct Install	\$150,000	\$224,000
El Dorado Irrigation District	ULF Toilet Rebates for Low–Income Customers	\$60,000	\$44,300
Electric & Gas Industry Assoc., EGIA	Regional High–Efficiency Washing Machine Rebate	\$1,750,875	\$2,654,730
Environmental Policy Center	California Water Conservation Support Network	\$115,000	\$95,130
ExPERT, Inc.	Community Water Education and Training (WET)	\$360,000	\$25,000
* Irvine Ranch Water District, et al.	Joint Agency X–Ray Processor Retrofit Model	\$13,698	\$28,000
* Metropolitan Water District of So. California	New Courses for Bilingual Landscape Education	\$925,000	\$575,000
Metropolitan Water District of So. California	Commercial Rebate Program	\$100,000	\$50,000
* Metropolitan Water District of So. California	High–Efficiency Clothes Washer Rebates	\$34,000	\$239,500
* Municipal Water District of Orange County	Water Softener Pilot Program	\$100,000	\$257,005
* Pacific Institute	Waste Not, Want Not: The Potential for Urban Water Conservation	\$72,500	\$72,500
Pittsburg, City of	The Save Our Delta Surveys (SODS)	\$50,000	\$50,000
Regents of University of California	Fair Oaks Water–Wise Demonstration Landscape	\$92,774	\$19,355
Rose Bowl Operating Company	Brookside Golf Course Water Management Project	\$90,000	\$137,000
* San Diego County Water Authority	Voucher Incentive–Clothes Washers–Residential	\$300,000	\$582,353
San Juan Water District–Water Forum	Sacramento Water Use Efficiency Training	\$100,000	\$19,530
* Santa Barbara County Water Agency	Weather TRAK ET Controller	\$100,000	\$69,492
Santa Clara Valley Water District	Landscape & Agricultural Area Measurement & Water Budgets	\$406,000	\$229,712
Water Education	Water Conservation and Recycling Awareness	\$168,675	\$38,617
TOTAL \$		\$5,771,522	\$5,980,221

Table 5. Summary of Agricultural Projects Funding

GRANT RECIPIENT	PROJECT TITLE	STATE SHARE	LOCAL SHARE
Anderson–Cottonwood Irrigation District	Main Canal Modernization	\$100,000	\$0
Cal Poly State University–ITRC	Irrigation Districts' Technical Assistance	\$300,000	\$300,000
* Center for Irrigation Technology	Variability of Soil Salinity on Farms	\$175,010	\$106,400
Columbia Canal Company	On–Farm Irrigation System Improvements	\$152,823	\$152,823
* Glenn–Colusa Irrigation District	GCID System Optimization for Fisheries, etc.	\$100,000	\$19,000
Golden State Irrigation Services, Inc.	Sub–Surface Drip Irrigation of Asparagus	\$299,500	\$488,657
Kern–Tulare Water District	Water Use Efficiency Project	\$310,000	\$310,000
* Lodi–Woodbridge Winegrape Commission	NPS Pollution Reduction in Vineyards	\$217,440	\$147,860
* Lost Hills Water District	Service Area 5 Distribution System Improvement	\$754,500	\$140,400
Lost Hills Water District	Service Area 3 Distribution System Improvement	\$572,100	\$78,000
Modesto Irrigation District	On–Farm Ditch and Cast–in–Place Replacement	\$274,000	\$274,000
Orland Unit Water Users' Association	Regional Water Use Efficiency Project	\$100,000	\$13,636
Oroville–Wyandotte Irrigation District	OWID Palermo Canal Lining Project	\$183,000	\$67,685
Pajaro Valley Water Management Agency	On–Farm Mobile Lab	\$99,500	\$33,405
* Placer County Water Agency	Real–Time Canal Flow Monitoring and Canal Lining	\$662,744	\$662,744
Reclamation District 108	Sub–Basin Level Water Measurement Program	\$100,000	\$168,000
San Joaquin Valley Drainage Authority	SW Stanislaus County Regional Drainage Water Management	\$160,523	\$263,235
Stanislaus RCD, West	Irrigation Management	\$69,600	\$0
* USDA/Agricultural Research Services	Salt–Tolerant Crops Evaluation	\$100,000	\$531,340
West Hills Community College District	On–Farm Integrated Irrigation & Drainage Management	\$265,524	\$20,000
Western Canal Water District	WCWD Water Use Efficiency Project	\$616,200	\$231,938
WaterTech	Irrigation Scheduling	\$200,000	\$254,546
TOTAL \$		\$5,812,464	\$4,263,669

* *projects of particular importance*

urban water use efficiency projects

Schools and Water Conservation Program—Large Landscape

Contractor: Alameda County Water District

Contact: Vana Phibbs; vana.phibbs@acwd.com

Phone: 510-659-1970

Background

The goal of this project was to address the need for large landscape water use efficiency programs at schools within the Alameda County Water District (ACWD). Fifty percent of water used in the ACWD is used for landscape irrigation. Water used at schools was believed to be driven predominantly by landscape irrigation. The project was intended to reduce the amount of water applied to school yards by establishing and monitoring landscape water budgets. By measuring the irrigated areas and installing separate landscape meters, the districts could identify where irrigation system upgrades would be cost effective and could better schedule their irrigation.

Results

Three unified school districts, Fremont, New Haven, and Newark, participated in this program. The grant was initially expected to include the California School for the Deaf and Ohlone College, but staffing constraints prevented their participation. Eighteen schools within the three districts participated. Six schools installed centrally controlled irrigation timers, nine schools installed sub-meters to athletic fields, and three schools replaced manual irrigation systems with automated systems.

The ACWD believes that the initial goal of saving up to 125 acre-feet of water annually is achievable. Because this long-term project is still in its early stages, definitive data is not yet available. The long-term results of this project will help develop an understanding of the potential of large-landscape water efficiency programs in schools.

Water Conservation in Urban Supermarkets

Contractor: Aquacraft

Contact: William DeOreo; bill@aquacraft.com

Phone: 303-786-9691

Background

This study investigated the potential water savings of advanced water treatment on typical urban supermarket systems. Water use patterns of the stores were also investigated as a secondary subject. The goal was to quantify the water-saving potential and the economic feasibility of advanced water treatment in cooling systems, and to look for water savings in the other uses at the stores.

Results

Six full-service urban supermarkets with an average size of 50,000 square feet and having multiple departments were the subjects of this investigation. Some had full kitchens and food preparation areas and others had minimal food preparation. All had some form of meat, produce, bakery, and service deli. These stores, chosen at random, used an average of 3.5 million gallons of water per year, which was split evenly between cooling and other in-store uses. Daily cooling use and in-store uses were about 4,100 gallons per day. Energy use was also evaluated, as cooling systems are energy intensive. On average, the stores used 2.3 million kWh annually.

The report provides an insightful description of cooling technology and discusses the critical elements of water treatment in evaporative condensers, particularly the prevention of scale. Three water treatment technologies were investigated in this study. Two of the six study sites were used for each system. The static electricity and pulsing electromagnetic radiation methods were unable to combat scale build up rates in these large cooling systems. Alkalinity control, when properly maintained and monitored, proved to be the most successful approach for scale reduction.

urban water use efficiency projects

The water savings achieved at the six sites exceeded the amounts predicted by the theoretical calculations. On average, the shift from conventional to advanced treatment resulted in savings of 709,000 gallons per year. These savings were exclusively from the changes to the cooling operations, and were measured using water meters on the cooling systems.

The benefits identified were threefold:

- a reduction in water use and lowered wastewater charges;
- reductions in electrical use; and
- a reduction in the amount of acid washing required to keep the system scale free and a commensurate increase in equipment life.

A benefit/cost analysis showed that a well run alkalinity control program can pay for itself in one or two years, and that over the life of a new evaporative condenser, the benefits from using advanced water treatment will be between two and 10 times the incremental costs of using the system.

Recommendations for other in-store water savings included the use of high efficiency spray nozzles, aerators, and water flow restrictors on all hand sinks and spray tables, elimination of garbage grinders in favor of composting produce wastes, replacement of low pressure hoses with high-pressure sprayers, and encouraging leak reporting and water conserving ideas by employees.

The authors believe that an aggressive water saving campaign of cooling and in-store conservation can save more than 800,000 gallons per year on average per store, which is nearly 2.5 acre-feet per store.

This report demonstrates the enormous potential for water savings in urban supermarkets. The report is thorough, well organized, and mathematically defensible.

WaterWise Resource Action Program

Contractor: Blue Planet Foundation

Contact: Dave Muni; www.blueplanetfoundation.com

Phone: 714-378-3362

Background

The WaterWise Resource Action Program combines a turnkey set of classroom activities with hands-on home projects to introduce resource conscious behavior. Geared for fourth- to sixth-grade students, the program teaches students and their families the importance of wise water and energy use.

Program and teacher materials are provided. Surveys are taken before and after the students complete the program to assess the program's effectiveness and water and energy savings.

Results

Two phases of the WaterWise program are presented in the final report. In the first phase, 949 fifth-grade students in Orange County completed the program. Surveys conducted before and after the program showed that knowledge improved from 50 to 79 percent. The installation of 55 percent of the shower heads was confirmed. Sixty-one percent confirmed installing the bathroom faucet aerator. Teacher evaluation results and survey results are included in the final report. Over 10 years, 217 acre-feet of water, 4,802 MWh of electricity, and 740,000 therms of gas are expected to be saved. Detailed calculations are shown in the final report.

The second phase of the program covered 318 households in Newport Beach. This phase reported anticipated savings of 38 acre-feet of water, 248 MWh of electricity, 59,000 therms of gas over 10 years. Pre-survey to post-survey knowledge improved from 26 to 77 percent.

Public Information Program

Contractor: California Water Awareness Campaign

Contact: Lynne Wichmann; cwac@acwanet.com

Phone: 916-325-2596

Background

The goal of this project was to develop and implement a public information and education campaign in California. The campaign's primary objective was to create a better understanding of water's critical importance and demonstrate how behavior affects the future of water. The campaign was intended to encourage the public to participate in the restoration of the Bay-Delta by using less water and increasing understanding of the Bay-Delta system.

Many California water agencies do not have the resources to develop a public education plan. In addition to economies of scale, it made sense to have one statewide public information campaign. The campaign included television, radio, movie theater, print, and transit ads, all sharing a common visual theme. The campaign targeted the main urban areas of California (San Francisco Bay Area, Los Angeles, San Diego, Sacramento) and the major metropolitan areas of the Central Valley.

Results

The public information campaign was developed after conducting focus groups, focus interviews, and general public opinion surveys. Participants represented all regions of California and included members of the water industry.

Six recommendations resulted:

- develop a message that links water quality and conservation,
- create communication tools that can easily be used by water agencies,
- emphasize individual behaviors and responsibility in a friendly, uncomplicated manner,

- identify people over the age of 18 as the primary and secondary targets,
- have the message be useful throughout the year, not just during Water Awareness Month, and
- develop a three-year implementation plan.

The report chronicles the development of the campaign theme, "Right at Home," starring Guy Waterman and the new campaign tagline, "Use Water Wisely and Keep it Clean—It's a Way of Life." The message was conveyed using television and radio public service announcements, signs, movie theater ads, print ads, utility bill inserts, and booklets. Additional details can be found at www.wateraware.org.

Efficient Landscape Water Program

Contractor: Cal Poly San Luis Obispo

Contact: Robert Walker; rewalker@calpoly.edu

Phone: 805-756-2434

Background

The project developed a framework for a Web-based application for computing irrigation schedules for urban landscapes. The project was an interim step to developing a fully functional Web-enabled Landscape Water Management (LWM) program.

The existing LWM program was not user-friendly. There was a need to convert this program so it could be used over the Internet. This would allow CIMIS evapotranspiration data to be incorporated in irrigation budget calculations.

Results

The final report presents the LWM framework and demonstrates its use in a mocked-up Web browser. Numerous browser screen images are included in the final report. The software that created these images draws from several Microsoft Access databases that are included on the CD ROM.

urban water use efficiency projects

A Straight Flush—Commercial ULFT Replacement Program

Contractor: Contra Costa Water District

Contact: Ray Cardwell; rcardwell@ccwater.com

Phone: 925-688-8234

Background

The goal of this program was to address past performance issues related to commercial ultra low-flush toilet (ULFT) rebate programs and replace 1,000 Commercial ULFT over three years. Contra Coasta Water District (CCWD) believed that a high rebate amount (\$300) and a marketing campaign targeting commercial, industrial and institutional (CII) sectors with the high potential water savings would yield the greatest water savings.

CCWD attempted to assuage customer concerns related to ULFT performance and cost by identifying the highest quality ULFTs and pre-negotiating with wholesale plumbers. The \$300 rebate amount covered 100 percent of the material cost.

Results

A comprehensive marketing plan identified CII market sectors that would yield the greatest water savings. The two top sectors were restaurants and wholesale/retail. Marketing and application materials were developed to elicit a high response.

Over two years, 1,081 commercial ULFTs were replaced at 133 commercial sites. Healthcare, office and hotel/motel accounted for most of the replacements. The primary targets in the restaurant and wholesale/retail sectors did not participate at the level hoped for by CCWD. Several reasons are provided in the final report, primarily associated with the malaise and retrenchment in these sectors due to the depressed economy. There were 319 responses to the marketing campaign.

The program rebated \$255,618 for the 1,081 installed ULFTs, translating into a \$300 per toilet rebate.

The program pre-inspected 3,020 sites, but many sites declined to participate for a variety of reasons. CCWD believes that the expenses associated with pre-inspection of sites that ultimately did not install ULFTs increased the overhead cost beyond what it had anticipated.

CCWD calculated 0.49 acre-feet of water savings per toilet assuming a 20-year life of the toilet. Divided by the \$300 cost yields a cost of \$612 per acre-foot saved.

The report identifies six key approaches to successful CII ULFT programs. The report also includes CCWD's marketing strategy and copies of the marketing materials used to achieve the high response rate. The report identifies a need for better ULFT savings estimates for certain CII sectors, such as beauty salons, health clubs, bowling alleys, theaters, and parks.

ULFT Rebates for Low-Income Residents

Contractor: El Dorado Irrigation District

Contact: Cari DeWolf; cdewolf@eid.org

Phone: 530-642-4126

Background

The El Dorado Irrigation District (EID) provides a standard \$75 rebate for customers replacing older, water-inefficient toilets with ultra low-flush toilet (ULFT) models. EID's standard rebate program resulted in the replacement of 2,000 toilets. EID believed that participation in the program by low-income households had been below average. The cause, they believed, was due to the average toilet cost of \$150 with an additional \$75 installation charge, thus a \$150 out-of-pocket expense. EID estimated that 5,000 households were at or below 20 percent of mean income and 6.3 percent are on public assistance.

This program expanded rebate opportunities to low income and tribal members by providing an additional \$150 rebate, for a total of \$225. EID relied on County Social Service agencies and other organizations for referrals. EID conducted community outreach to target those living in single family dwellings, apartments, and mobile homes. The EID Water Efficiency Coordinator processed applications and eliminated unqualified applicants and free riders (new construction, remodeling, etc.) Rebate checks were issued after customers submitted purchase and installation receipts. Direct payment to the plumbing supplier was made. EID used billing inserts and the plumbing supplier used ads in a local paper to publicize the program.

Results

EID processed 127 ULFT rebates. It had anticipated 400 rebates under this low-income program. The district found that vouchers would have been more effective than rebates for this group. For each rebate, EID contributed \$75 and the state, \$150. EID estimates that 6.43 acre-feet per year will be saved under this program.

Regional High-Efficiency Washing Machine Rebate

Contractor: Electric and Gas Industrial Association

Contact: Pat Matos; pmatos@egia.com

Phone: 916-609-5300

Background

High efficiency clothes washers use 60 percent less energy and 40 percent less water per load than conventional machines. PG&E conducted a clothes washer rebate program from 1996 to 2000 and issued more than 34,800 rebates. This grant was intended to continue and expand the PG&E rebate program at the same level for two years. The Electric & Gas Industry Association (EGIA), which had administered the PG&E program for four Bay Area water agencies, was selected to coordinate and administer the project for seven participating Bay Area water agencies: Alameda County Water

District, City of Davis, Contra Costa Water District, East Bay Municipal Utility District, Marin Municipal Water District, Santa Clara Valley Water District, and Zone 7 Water Agency. EGIA anticipated processing 23,345 rebates under this program.

Results

EGIA issued more than 27,000 high efficiency clothes-washer rebates. Water agency funds matched the \$1,785,000 grant on a dollar-for-dollar basis, plus contributed \$780,000 in program administration services. EGIA processed incoming rebate applications after verifying eligibility. Rebate checks were issued within eight weeks of receipt. EGIA sent correspondence to customers regarding rebate status and responded to all customer inquiries. EGIA provided monthly accounting summaries to each district and created rebate forms and other materials to promote the program.

The program provided retailers with lists of products that qualified for the rebate. Retailers said the program helped increase sales. Retailers were kept apprised of all program conditions and changes. The final report includes a spreadsheet that identifies the 107 washing machine models that were rebated. The spreadsheet also includes quantities rebated, water factor, and tier.

As agencies struggled to meet the demand the program was generating, several had to modify rebate incentives to keep funds available through the end of the program. These changes in rebate values contributed to additional printing costs for newly modified rebate applications.

urban water use efficiency projects

California Water Efficiency Survey

Contractor: Environmental Policy Center

Contact: Walter McGuire; wmcguire@mcguireco.com

Phone: 415-775-0791, extension 315

Background

Sharing information about water conservation programs is a good way to help new programs get started. It is much easier to start a water conservation program, or improve an existing one, when you learn from others who have run similar programs. The Environmental Policy Center (EPC) proposed to inventory all water conservation programs in the state. EPC planned to survey water wholesalers, retailers, and other relevant water industry organizations. EPC identified 86 water efficiency program types (Best Practices Guides). These BPGs include the 14 Best Management Practices identified by California Urban Water Conservation Council.

Results

Of the 166 organizations and governments surveyed, 147 (88.5 percent) submitted responses to EPC. The survey asked respondents whether they had implemented each of the BPGs. The final report contains brief descriptions of the BPGs and refers the reader to EPC's PolicyScan Web site for more information.

The survey found a strong correlation between water agency size and the number of BPGs implemented. There were 109 agencies in Southern California and 59 in Northern California that participated in the survey. On average, 48 percent of those in the south and 42 percent in the north implemented BPGs.

EPC also maintains a Products and Services Directory that includes Audit and Leak Detection, Efficient Toilets, General Conservation Devices, Landscape and Irrigation, Filters, Meters, Pumps, Quality Testing Devices, Storage Equipment, Treatment, Appliances, and Consulting. This directory is included in the final report.

Community Water Education and Training Program

Contractor: Expert, Inc.

Contact: Kourt Williams; expertinc@aol.com

Phone: 310-660-0280

Background

Expert's mission is to coordinate training and education in water, energy, natural resource management, and other environmental disciplines, and to help create jobs for culturally diverse groups of people. The Water Education and Training (WET) Program is intended to increase community awareness of selected urban water conservation practices at the grassroots level by providing incentives.

Results

Project participants completed a Residential Water and Energy Audit Training Workshop. One-hundred forty-six surveys were completed in households that responded to an announcement in the Park Water Company bills. There were 438 shower heads installed. Using two leak detectors on loan from the California Urban Water Conservation Council, program participants worked with the City of Compton on 45 miles of potentially leaking pipeline. Six leaks were confirmed. Participants also shadowed Compton Water Department personnel on 435 meter retrofits. There were 2,000 ULFT toilets installed and 1,975 old toilets were returned for recycling. Expert estimates that its efforts contributed to an annual savings of 1,082 acre-feet per year.

The program included some unique elements related to water industry employment.

Joint Agency X-Ray Processor Retrofit

Contractor: Irvine Ranch Water District

Contact: Fiona Sanchez; sanchezf@irwd.com

Phone: 949-453-5325

Background

Hospital X-ray processors operate constantly and consume from 0.2 to 2.5 gallons of water per minute (gpm). There are very few 0.2 gpm models (105,000 gallons per year) in service and most operate near 2.5 gpm (1,314,000 gallons per year). New water recirculation technology is available. It reduces consumption to about 35,000 gallons per year. A small retrofit project by the Los Angeles Department of Water and Power (LADWP) substantiated the water savings. The proposed project was intended to expand upon the LADWP sample to seven existing X-ray processors. This technology does not involve any significant operational changes and there is no additional chemical impact to the environment to operate the equipment.

This project was jointly conducted by the Irvine Ranch Water District (IRWD), Upper San Gabriel Valley Municipal Water District (USGVMWD), and East Bay Municipal Utility District (EBMUD).

Results

Seven hospital installations were completed: three in EBMUD's service area, one in IRWD's, and three in USGVMWD's. Hospital locations are provided in the final report. The program installed meters to gain accurate pre- and post-installation data.

There was an average savings of 98 percent over the seven installations, saving 24.24 acre-feet annually. Using a 10-year equipment-life expectancy yields a savings of 242 acre-feet (488 acre-feet for a 20-year life expectancy). The project cost per acre-foot saved was \$139 (\$69 for a 20-year life) and an equipment-only cost per acre-foot saved was \$103 (\$51 for a 20-year life).

New Courses for Bilingual Landscape Education

Contractor: Metropolitan Water District

Contact: Diane Harrelson; dharrelson@mwdh2o.com

Phone: 213-217-6167

Background

For the past 10 years, the Metropolitan Water District, with its member agencies, developed a community program known as Protector del Agua (PDA). PDA offers classes about irrigation systems, landscape designs, and low-water use plants to landscape professionals and homeowners. PDA has conducted more than 350 classes attended by more than 5,000 participants.

Metropolitan believed that developing three new classes and producing videotapes of key classes could increase the reach of PDA. The video materials would help more landscape professionals and homeowners, who otherwise could not attend the classes in person.

Results

Three new classes were developed: "Basic Hydraulics and Water Pressure Management," "Water Management for Landscapers," and "Water Management for Property Managers." Each class includes a PowerPoint presentation, a teacher's handbook, and a student handbook. Helpful teacher notes are included with each slide. All are professionally prepared and contain an engaging mixture of theory, photos of installations and equipment, reference charts, and test exercises.

The videotaped portion of the project focused on the original PDA series. The program teaches landscape professionals, in English or Spanish, water conservation techniques. One set is geared towards the landscape professional and covers six lessons: Basic Irrigation Principles, Irrigation System Adjustment and Repair, Irrigation System Troubleshooting, Basic Controller Programming, Advanced Controller Programming, and Irrigation Scheduling. The second set

urban water use efficiency projects

is geared toward the homeowner and covers four lessons: Irrigation Systems, Watering and Fertilizers, Landscape Design, and Plant Identification.

The three new classes and the video version of the PDA were professionally prepared and are valuable to anyone interested in homeowner or contractor irrigation education. While several references are made to Southern California, the class material is not limited by region and should have a statewide appeal.

Save Water—Save a Buck Commercial Rebate Program

Contractor: Metropolitan Water District

Contact: Bill McDonnell; bmcdonnell@mwdh2o.com

Phone: 213-217-7693

Background

In January 2001, the Metropolitan Water District started its region wide rebate project for commercial customers called “Save Water Save a Buck.” This new project was directed specifically at business customers of water agencies in Southern California, excluding San Diego County, which had an operational commercial rebate program. The project offers from \$15 to \$500 for replacing old water-wasting equipment with new water-efficient equipment. All commercial customers were eligible for the project, however it targeted those businesses identified by the California Urban Water Conservation Council as being in high water-use sectors: restaurants, grocery stores, supermarkets, and distribution centers.

This grant focused on high efficiency clothes washers in coin-operated laundries and apartment buildings and cooling-tower controllers in warehouses and office buildings. Grant funds increased participation by increasing rebate amounts and providing for contractor services.

Results

All grant funds were expended in less than two weeks during October 2001. There were 145 high-efficiency clothes washers installed in coin-operated laundries and apartment buildings, representing 17 acre-feet of annual water savings, or 135 acre-feet over the lifetime of the products. Contractor services were rebated for six cooling-tower controllers, representing 13 acre-feet of annual water savings, or 134 acre-feet over the life of the towers. The cooling towers were installed on large food processing warehouses and commercial office buildings. High efficiency washers were rebated at \$150 per unit with a \$79.50 processing fee. Cooling towers had a \$118.50 processing fee and no per-unit rebate.

Rebates for High-Efficiency Clothes Washers

Contractor: Metropolitan Water District

Contact: Carlos de Leon; jdeleon@mwdh20.com

Phone: 213-217-6594

Background

This program was intended to increase High Efficiency Clothes Washer Rebate participation rates among customers in the Metropolitan Water District (MWD) by increasing the rebate amount from \$35 to \$125. Before this program, only five MWD agencies were participating in the \$35 rebate program, producing about 500 rebates per month. MWD planned to have the participating agencies administer and promote their own programs. MWD would manage the grant funds. MWD intended to process 10,000 rebates under this program.

Results

The increased rebate program was initiated in January 2002 and 10,000 rebates were processed in 10 months. Fifteen of MWD’s member agencies participated. Rebates were offered to member agencies on a first-come, first-serve basis. Initially, member agencies

submitted monthly invoices and documentation of promotional and program administration costs. Late-stage buying resulted in 754 additional rebates being processed, for a total of 10,754.

The final report lists the most popular models processed for rebates. Installation verification was the responsibility of the member agencies and rebate recipients were required to permit in-house verification if asked. The final report also contains quarterly data by member agency and a consumer post-installation survey of 125 respondents.

MWD estimates that 3,222 acre-feet will be saved over 15 years for the 10,000 units processed under this grant. MWD believed that the first-come, first-serve basis made it difficult to control cost overruns. Future programs would be allocated on a per capita basis to each agency. MWD also believes that a greater ramp-up time would have been beneficial, as some agencies needed board approval for the modified program. Some agencies also had to find and hire consultants to administer the rebate program.

Water Softener Pilot Program

Contractor: Municipal Water District of Orange County

Contact: Joseph Berg, jberg@mwdoc.com

Phone: 714-593-5008

Background

This study assesses consumer opinions about different types of incentive programs that could help reduce salinity problems caused by the use of water softeners in homes. The scope of the salinity problem was evaluated as well as the impact of various alternatives. A pilot project that gathered consumer reaction to various incentives was developed.

Results

The study conducted two focus groups of 62 people each and a general survey of 876 households. Subsequent analysis provided

insight into the anticipated success of market-wide incentive programs.

Households' choice and use of chloride-based water softeners often were based on misinformation. That suggests that consumer education could be effective. Nonusers of water softeners believe that regulation could be an effective solution to the problem. Water softener users responded more favorably to incentives. Financial incentives (often near full-replacement cost) were found to be essential to encourage switching to less harmful equipment. In general, consumers were not willing voluntarily to do what was best for the community. Those who would participate in the incentive program did so primarily because it was time to change to a newer system or the benefits of a newer system were worth the incentive amount. Numerous charts and graphs, as well as statistical analysis, are provided to support the surveyors' conclusions.

Consumers trusted local water agencies as providers of information and initiators of efforts to help solve water problems. Most consumers had little knowledge of the water cycle and water quality issues.

An analysis of the marketing materials of two manufacturers showed that manufacturers were less than factual and complete in portraying their products to the marketplace.

The final report contains a thorough analysis of results from the focus groups and the general survey.

urban water use efficiency projects

Waste Not, Want Not: The Potential for Urban Water Conservation

Contractor: Pacific Institute

Contact: Katherine Cushing; k_cushing@pacinst.org

Phone: 510-251-1600

Background

The purpose of this study was to investigate potential water savings in the urban sector as well as the costs associated with those efforts.

Results

The Pacific Institute estimates that 2.3 million acre-feet of water, one-third of California's current urban water use, can be saved with existing technology. Two million acre-feet of that savings could be accomplished cost effectively. The report looks at indoor domestic water use; outdoor residential water use; and commercial, industrial and institutional water use.

Indoor Domestic Water Use

The report estimates that indoor residential water consumption can be reduced by 40 percent by applying a weighted average to each of the following device savings: toilets (57 percent), showers and baths (24 percent), clothes washers (33 percent), dishwashers (46 percent), leaks (80 percent), and faucets (0 percent).

Outdoor Residential Water Use

Savings estimates range from 983,000 to 1,450,000 acre-feet per year—a factor of nearly two—showing the high uncertainties about actual outdoor residential water use. Although there have been very successful commercial irrigation programs, residential outdoor use is generally a low priority and is often considered an investment risk because outdoor use varies widely with both weather conditions and individual behavior and preferences

Three categories of efficiency options were identified: management practices, hardware improvements, and landscape design. Potential savings from each option are estimated using several different estimates of water usage.

Commercial, Institutional, and Industrial Water Use

The study estimates that landscaping uses more water than any other end use in the CII sectors, 35 percent. Other significant end uses include rest rooms, cooling, and process, which, combined, comprise close to fifty percent of total water use. The smallest end uses, in terms of total use, are kitchens, laundries, and other, unclassified uses. Process water use comprised approximately 17 percent of all CII use in 2000. Nearly all of this water use took place in the industrial sector with the High Tech, Beverage, and Food and Vegetable industries using the most process water of the examined industries. In the commercial sector, only the Hospital industry used significant amounts of process water. Approximately 16 percent of total CII water use in 2000 was used in rest rooms. Rest room water use is ubiquitous across all industries, but it is most significant in the commercial sector, particularly hotels, where it was calculated to represent as much as 55 percent of total water use.

The researchers collected a wide array of data from many sources and applied thoughtful, uncomplicated economic analyses to reach their conclusions. This is a pivotal study for California's water community.

Save Our Delta Survey Program

Contractor: City of Pittsburg

Contact: Walter Pease; wpease@ci.pittsburg.ca.us

Phone: 925-252-6966

Background

The City of Pittsburg, in cooperation with the City of Antioch and the Contra Costa Water District (CCWD), developed a customer survey for single-family residences. The survey, Save Our Delta (SOD), went beyond the traditional data gathering to incorporate education and post-survey follow-up to find out if the program works. The SOD survey educated customers about the water cycle – where water comes from and where it goes. Participants reviewed allied topics such as storm water, pesticides, and integrated pest management. Surveyors focused on irrigation water and runoff.

Results

The agencies completed 141 surveys. The final report identifies the 15 steps used for each one- to two-hour survey. Pre- and post-survey water usage was compared against a control group of customers that had not been surveyed. Among SOD survey participants, water usage decreased 4.6 percent on an annual basis, with significantly greater reductions occurring during the summer. Survey participants reduced water consumption during July, August, and September by 13 percent, 13 percent, and 6 percent respectively. The control group experienced reductions of 2 percent, -1 percent, and 1 percent during that same period. The final report expressed concern regarding the statistical significance of some of the findings.

During post-survey telephone surveys, 97 percent of respondents indicated that they were able to follow the suggested irrigation water schedule. Other questions in the post-survey telephone survey were related to a handout explaining the “water cycle.” In follow up phone conversations, 28 percent of respondents knew where their water came from and 6 percent knew that storm water went untreated to bodies of water. Twenty-eight percent of post-survey respondents changed the amount of pesticides they used. Of those,

78 percent reduced pesticide use with 47 percent tried less toxic or natural alternatives.

The final report identified the need for better water cycle knowledge and a longer-term study of the results through continued follow-up with participants.

Water Wise Demonstration Landscape

Contractor: Regents of the University of California

Contact: Chuck Ingels; caingels@ucdavis.com

Phone: 916-875-6913

Background

The Horticultural Center in Fair Oaks Park, Fair Oaks, near Sacramento, was established in 1998 to showcase proper selection and care of backyard fruit trees and vine crops and to conduct trials on backyard vegetables. The project goal was to address the need for hands-on information about efficient landscape water use through the development of a “Water Wise Demonstration Landscape” at the Horticultural Center. The proposed facility included backyard landscapes and demonstration areas. The landscapes would represent different designs and themes. Tours, workshops, and lectures would be used to increase education.

Results

The Water Wise Demonstration Landscape was completed with matching funds from the County of Sacramento, the Elvenia J. Slosson Endowment Fund (UCD Environmental Horticulture Department), and the City of Folsom. The final report provides a financial breakdown for all construction activities ranging from grading to planting.

The project participants installed a water meter for each valve and monthly water use is recorded for each of the five planted areas.

urban water use efficiency projects

They also installed a Moisture Control System on one of the two valves that serve a similar number of perennial plants on each system. Participants also applied more than 200 highly visible plant labels.

The project has led to collaboration with the Regional Water Authority on a project providing information and instruction to area residents on water-efficient landscaping. The program includes distribution of the 20-page “Rules of Thumb for Water Wise Gardening” booklet and hydrozone cards to all customers purchasing plants at several local nurseries and at the Fair Oaks Horticulture Center (FOHC). More than 500 of the brochures have been distributed at the FOHC at recent events. The program also includes displays at several nurseries. The displays teach about water efficient landscaping and hydrozoning. The program conducted a survey at five local nurseries asking customers about their understanding of hydrozoning and water-efficient landscaping. The same survey will be done again in 2004 at the same nurseries.

Brookside Golf Course Water Management Project

Contractor: Rose Bowl Operating Company

Contact: Darryl Dunn; dduunn@ci.pasadena.ca.us

Phone: 626-397-4185

Background

The Brookside Golf Club consists of two 18-hole golf courses, each of which is approximately 140 acres. Combined, the two courses are the single largest user of water in the city of Pasadena. About 650 acre-feet of water was used annually to irrigate the golf courses.

Most elements of the irrigation system were well beyond their useful life, with some elements dating back to 1916. Serious water-wasting breaks were common, caused by the age of the mainline piping system. Also, the growth of some trees negatively affected sprinkler

patterns. Fairways for the Brookside Golf Club are also used for Rose Bowl parking, contributing to sprinkler-head damage.

The goal of this project was to install new mainline piping and new irrigation control with satellite-based ET controllers. Total cost was expected to be \$457,000 and was to be the first step to reducing water usage by 40 percent. Accompanying this water use reduction would be a reduction of fertilizer and pesticide runoff.

Results

The 20-year old irrigation system was replaced with a modern Toro irrigation system, including satellite delivered weather data. Fifteen acres of turf were transformed into fifteen acres of non-irrigated native plants. More than 2,500 new sprinkler heads were installed on the new mainline piping.

The project spent \$1.4 million on the new irrigation system, including \$235,000 for the irrigation control system. The Rose Bowl Operating Committee estimates that \$65,000 will be saved in watering costs, 65 acre-feet will be saved in irrigation water, and revenues will increase by \$250,000 due to the improved quality of the course.

High Efficiency Clothes Washer Voucher Program

Contractor: San Diego County Water Authority

Contact: Cindy Hansen; chansen@sdewa.org

Phone: 858-522-6747

Background

The San Diego County Water Authority (SDCWA) had provided rebates for nearly 7,000 high efficiency washers (HEW) before this project. In 2001, San Diego Gas and Electric discontinued its contribution to the rebate program. The reduced rebate was less compelling to those considering HEW instead of less expensive and

less efficient top loading clothes washers, resulting in diminished participation. This program increased the rebate amount by an additional \$50 for an additional 5,000 HEW rebates.

Results

Five thousand high efficiency clothes washers were rebated under this project, resulting in a potential 1,231 acre-feet of water savings over the 14-year life of the high-efficiency washers. The total cost of this project was \$826,042. Excluding salaries and wages, the total cost per acre-foot of savings was \$634. The acre-foot cost for this \$300,000 grant was \$244.

SDCWA used a Voucher Processing Center. Customers could call the Center, ask for a voucher and they would receive one, valid for 30 days, by mail. Consumer could redeem the voucher when they bought the appliance. This eliminated a concern about mail-in rebates.

Another approach used by SDCWA was the “instant” voucher that enabled a customer to call directly from the appliance store while shopping and receive a voucher at the store within 30 minutes during regular business hours. Stores welcomed this approach. It increased immediate sales because customers did not have to wait a couple of days for a voucher to arrive in the mail. Consumers redeemed more than 50 percent of the vouchers using this method.

SDCWA refined their rebate program to better accommodate both the customer and retailer’s needs, resulting in greater program yields. The final report contains descriptions of the rebate voucher model and mass marketing.

Sacramento Water Use Efficiency

Contractor: San Juan Water District

Contact: Charles Pike; cpike@rwah2o.org

Phone: 916-791-2663

Background

This grant included two water efficiency training activities. Activity 1 researched and developed promotional media to foster better understanding of water efficiency objectives on a statewide basis. Included was the promotion of a Water Conservation Coordinator Level 1 Certification class held in the Sacramento area in 2002. Activity 2 developed materials for landscape management use on a community level and conducted a series of workshops for homeowners and professional landscapers.

Results

A public relations firm researched the promotion of the interest in water conservation training. The firm concluded that a printed brochure or flier was preferable to a CD. A brochure was sent via e-mail. It promoted a June 2002 Conservation Coordinator Training Workshop, hosted by the Carmichael Water District. Thirty-two students participated in the workshop. After the class, 16 students took a Cal-Nevada AWWA Conservation exam.

The program held three workshops, for a total of 14 hours, in April and May 2002. The objective of the workshops was to improve the knowledge and skills of homeowners and gardeners so that they will practice efficient water use, minimize solid waste, create healthy, attractive landscapes, minimize use of fertilizers and pesticides, and eliminate runoff from the properties being cultivated.

urban water use efficiency projects

Santa Barbara ET Controller

Contractor: Santa Barbara County Water Agency

Contact: Rory Lang; rlang@co.santa-barbara.ca.us

Phone: 805-568-3545

Background

Coordinated by the Santa Barbara County Water Agency (SBCWA), this project included the cities of Santa Barbara, Lompoc and Santa Maria; the Goleta Water District; and the Vandenberg Village Community Services District. The goal of the project was to distribute 300 ET controllers with rain sensors and soil probes at no cost, other than the monthly \$4 data link charge that provides CIMIS weather data. The WeatherTRAK ET controller was chosen because of its success at an earlier project by the Irvine Ranch Water District.

SBCWA calculated that the average amount of landscaping in the region was one acre and that approximately half the water is used in irrigation. SBCWA and the partner agencies identified and targeted high irrigation water users. The program trained local landscape contractors and reimbursed them for equipment installation at \$100 per unit.

Results

Participating agencies and an outside consulting group developed materials describing the ET controller program. These included sales, survey, training, and post-installation materials. All are included in the final report. The program conducted two installer-training workshops where 20 licensed contractors were qualified. It established two public demonstration sites with ET controller technology.

Team members reached several early conclusions. Installations would take longer than the anticipated two to three hours. Site visits and pre-qualification surveys were best conducted by agency team members and would require two to four hours of time. Controller programming and adjustment could take up to six hours. The team

members concluded that the size and complexity of the landscapes of the biggest water users were the causal factors.

Early installations showed that some water bills increased after installation of the ET controllers. An investigation showed that turf was being over-watered and drip lines were being under-watered. The team concluded that the factory-set default precipitation rates of some irrigation systems were far too high. These were adjusted. The 12-station limit of the controllers also limited their effectiveness in some larger landscapes. Post-installation adjustments by the consumer were unreliable.

Ultimately, 62 installations were completed with a 10-deep waiting list. The original proposal of 300 installations extended into 2004. The team expects to complete these installations per the original proposal. Although the data are early and not statistically significant, there was an average of 26 percent water savings, ranging from 8 percent to 59 percent savings.

Landscape and Agricultural Area Measurement and Water Use Budgets

Contractor: Santa Clara Valley Water District

Contact: Jerry De La Piedra

Phone: 408-265-2600

Background

The Santa Clara Valley Water District (SCVWD) developed a database-backed Web site. It is called Web ITAP, with ITAP standing for irrigation technical assistance program. It is designed to deliver real-time landscape water budget information to property and landscape managers. Web ITAP uses area measurements to calculate water budgets for specific sites. Each budget uses ET data from CIMIS. In order to achieve specific water budgets, the district needed to know the acreage of irrigated landscape for each site.

The goal of this project was to accurately measure the large landscape areas of urban parcels and agricultural farmland in Santa Clara County. The project analyzed multispectral images of the region to identify the square footage of 18 different classifications for each parcel. The results were put in a database, which will be used for developing landscape water budgets and to support the ITAP Landscape Survey and Agricultural Mobile Lab Programs.

Results

Using digital airborne sensor in flyovers, 3-band multispectral images were gathered. A 900-square-mile area with 50,000 irrigation-only and mixed-use commercial accounts was surveyed. The sensor produced a 3-foot-per pixel resolution. The data was then filtered using ortho-rectification.

Five Santa Clara County cities provided parcel data that showed property ownership. These boundaries were overlaid on the filtered spectral data. For the most part, the parcel layers reasonably matched the imagery, however significant editing would have been required to achieve a perfect overlay. It was too expensive and time consuming.

It was decided that hand-editing should be performed for areas with at least one acre of irrigated landscape and an editing impact of at least 10 percent. In the case of sites with multiple parcels (such as homeowners associations), the edit also aggregated parcels as appropriate to producing useful water budgets.

Using the overlaid and edited parcel map, 18 landscape classifications were applied as appropriate. Forty randomly selected sites that met four criteria were targeted for a physical site survey. Additional editing followed as necessary. The results of the field evaluation were applied to the entire project area via modeling rules. SCVWD estimates that 10-15 percent misclassifications remain after the edits.

SCVWD estimates that the landscape water budgets will reduce water use by at least 10 percent (or 5,000 acre-feet per year for the entire

county). The final report contains photographs and a description that easily guide the reader through the imaging, data conversion, and data merging processes. A live demonstration of water budgeting is given in the final report.

Water Conservation and Recycling Awareness Initiative

Contractor: Water Education Foundation

Contact: Rita Schmidt Sudman; rsudman@watereducation.org

Phone: 916-444-6240

Background

The Water Conservation and Recycling Awareness Initiative is a comprehensive, multimedia public education campaign intended to raise the public's awareness and understanding of two water supply-stretching strategies: water conservation and recycling. This multidisciplinary program uses a three-pronged approach to provide education and outreach to the public. The Water Minute Radio Program, a revised *Layperson's Guide to Water Conservation*, and the *Conserve Water Educator's Guide*, were used to show the importance of water use efficiency all the time, not just during droughts.

The project assumes that if people understand the need to be good stewards of California's water resources and have the tools, they will. This assumption was based on research, including the National Environmental Education and Training Foundation's 1999 study that found that the likelihood that people will perform conservation activities "increases proportionately with their environmental knowledge."

Results

This project had three parts: Water radio minutes, *Layperson's Guide to Water Conservation*, and *Conserve Water Educator's Guide*. Six radio spots were aired a total of 274 times, with an

estimated 250,000 listeners. Six thousand *Layperson's Guides* were printed and 1,100 have been distributed. The *Conserve Water Educator's Guide* was distributed to 1,226 facilitators and 85 percent (1,042) said they would use it.

agricultural water use efficiency projects

Anderson-Cottonwood Main Canal Modernization Project

Contractor: Anderson-Cottonwood Irrigation District

Contact: Dee Swearingen, General Manager; acid@shasta.com

Phone: 530-365-7623

Background

The Anderson-Cottonwood Irrigation District (ACID) diverts water from the Sacramento River and also operates a pump station on the river. ACID's distribution system includes about 35 miles of Main Canal, about 98 percent of which is unlined.

The ACID Main Canal Modernization Project is a three-phase project intended to improve water management. The district has 89 unmetered turnouts and has flow measurement capabilities at only one Main Canal location. Control has historically been limited to managing the head gate near the river, with surpluses spilling at wasteways (which return water to the Sacramento River and local streams when flow exceeds the canal capacity). Canal seepage is significant in sections near natural drainages.

This proposal was funded as a feasibility study to identify the necessary site selection, design, construction, construction management, and post-construction monitoring level of effort and related costs to implement elements of the ACID Main Canal Modernization Project. The project would reduce Sacramento River diversions and decrease nonproductive evapotranspiration (ET) resulting from operational spills and seepage. Reliability and flexibility of irrigation deliveries would be improved, benefiting district customers.

Results

Most of the effort was collecting and mapping data with GIS and building a hydraulic evaluation model. The model will be used in the next phase of the project to evaluate proposed modifications. Databases and other existing documentation were reviewed and very general comments listed. Field surveys were not conducted.

Locations of proposed structures are mainly from ACID recommendations; types of proposed control structures are listed.

General locations and design flows that have been identified for the three new control structures:

- north of Anderson near Clear Creek, 300 cubic feet per second (cfs)
- south of Anderson near Anderson High School, 250 cfs
- north of Cottonwood, near Gas Point Road and Interstate 5, 100 cfs.

New work completed as part of the grant involved preliminary work on configuring a hydraulic model, photographing existing canal and control structures, and preparing rough cost estimates.

Irrigation Districts' Technical Assistance

Contractor: California Polytechnic State University, Irrigation Training and Research Center (ITRC)

Contact: Stuart Styles, Director; sstyles@calpoly.edu

Phone: 805-756-2429

Background

The goal of this project was to provide technical assistance to water users and to identify new opportunities for water conservation and improved water management for irrigation districts. The technical assistance program was aimed at water district personnel, farmers, individuals and organizations such as irrigation supply dealerships.

Results

—Training, Special Studies, and Technology Transfer Programs

The first component was a variety of programs aimed at all agricultural water users.

- Training classes were held at ITRC and at irrigation districts. These classes included subjects such as:
 - water delivery modernization
 - basic principles for ditch riders and water masters

agricultural water use efficiency projects

- flow measurement
- on-farm irrigation system design
- on-farm irrigation system management
- Special studies were conducted for purposes such as identifying water conservation potentials, or understanding cause, effect and solutions for technical problems.
- Participation in seminars and workshops.
- In-house specialty training for U. S. Bureau of Reclamation, Department of Water Resources, the Agricultural Water Management Council and other agency personnel.
- Development of newsletter articles and reports on study results, demonstrations and new technologies directed at informing and educating irrigation professionals.

—Direct Technical Assistance to Individual Irrigation Districts

The second component was aimed at individual irrigation districts. The ITRC provided technical expertise for specific water conservation programs for individual districts, at their request. This included the following services to five districts:

- Reviews of modernization and water management plans.
- Use of RAP (Rapid Appraisal Process) for identification of modernization needs.
- Development of guidelines and assistance with quality control for districts, which may be interested in setting up on-farm irrigation evaluation and scheduling programs.
- Review of plans or guidelines prepared by consulting engineers for irrigation district modernization or water management programs.
- Assistance with the implementation of SCADA (Supervisory Control and Data Acquisition).
- Assistance with implementation of flow measurement programs including 20 flume designs.
- Assistance with other modernization efforts, such as improving pumping plant operations, water ordering and pressure control for improved water and energy management.

Assessing Spatial and Temporal Variability of Soil Salinity on Farms Implementing Integrated Drainage Management Practices

Contractor: Center for Irrigation Technology (CIT), CSU Fresno

Contact: Florence Cassel Sharmasarkar, Ph.D.;

david_zoldoske@csufresno.edu

Phone: 559-287-2066

Background

Many farmlands on the west side of the San Joaquin Valley are threatened by too much salinity and not enough drainage. The threats affect crop yields and soil quality. The need to reduce salt buildup in soils and improve efficiency of irrigation has led to a collaborative effort between the Department of Water Resources (DWR), Westside Resource Conservation District (RCD), and Westlands Water District (WWD), which called for integrated on-farm drainage management (IFDM) practices. Such practices are expected to conserve irrigation water by reducing drainage water outflow on farms. Knowledge of soil salinity distribution on a farm is critical to evaluating the effects of the new practice and maintaining crops. This research proposed to use electromagnetic induction (EM) surveys and geo-statistical analyses as reconnaissance tools to assess spatial and temporal variability of soil salinity following implementation of IFDM practices at several farms. The project was conducted over three years, evaluating the effectiveness of IFDM on reducing soil salinity and improving efficiency of water use. The study intended to provide vital data for the success of the IFDM approach program both as a baseline for the initial implementation phase and then as a tool for managing drainage systems and selecting crop rotations.

Results

Four farms participated in the IFDM program. Soil salinity surveys, geo-referencing, and geo-statistical analyses were conducted over three years. Initial EM measurements were performed from October

2001 on all farms enrolled in the IFDM program. Two other EM measurements were taken during ongoing IFDM in fall 2002 and 2003 to monitor salinity response to the new practice. Following each EM survey, the project produced salinity maps, and conducted geo-referencing and geo-statistical analyses.

Before and after IFDM salinity levels (variability, distribution) were compared, analyzed, and used for crop rotation and drainage management recommendations to growers.

On-Farm Irrigation System Improvements

Contractor: Columbia Canal Company

Contact: Randy Houk, Manager; Columbia@thegrid.net

Phone: 559-659-2426

Background

The purpose of this project was to conduct on-farm irrigation system improvements to increase irrigation efficiency. The project involved the installation of drip or micro irrigation systems on 339 acres of existing flood irrigated almonds and 116 acres used for flood irrigated alfalfa production that was planted to almonds during spring 2001. The irrigation improvements were proposed for lands owned by five farmer cooperators.

The Columbia Canal Company (CC) has 1,444 acres planted to permanent crops, primarily almonds. In the spring of 2001, another 115 acres were converted from flood-irrigated alfalfa or row cropland to almonds. Including the 115 acres to be planted in 2001, 672 acres of almonds are still flood-irrigated. Presently, 857 acres of almonds are drip- or micro-irrigated in Columbia CC. A major objective of the Columbia CC was to continue the conversion of flood-irrigated almonds to drip or micro irrigation to conserve limited irrigation water.

Based on records of water use and Columbia CC experience, the estimated annual water savings from improved irrigation efficiency

would be about 1.5 acre-feet per acre for a mature almond orchard. This equals an annual water conservation savings of about 884 acre-feet for the project. This estimate does not consider the water savings that would be realized from the conversion of 115 acres of flood-irrigated alfalfa to drip- or micro-irrigated almonds. Those annual water conservation savings would be about 3 acre-feet per acre, which equates to about 345 acre-feet per year.

The objectives of the proposed project was to: 1) provide financial assistance to the five farmer cooperators to establish the proposed irrigation systems; 2) demonstrate the efficiency of the proposed system improvements to other farmers in the area to further encourage the adoption of these irrigation systems; and 3) to conserve irrigation water supplies.

Results

The project installed drip or micro irrigation systems on these orchards in accordance with engineering designs and price quotations from three local irrigation companies, which constructed the proposed irrigation systems. The proposed facilities included water-metering equipment to measure monthly and annual irrigation water applications.

The project installed drip or micro irrigation on 77 percent of the proposed acreage.

agricultural water use efficiency projects

GCID System Optimization for Fisheries, etc.

Contractor: Glenn-Colusa Irrigation District

Contact: Van Tenny, Manager; vtenney@gcid.net

Phone: 530-934-8881

Background

The scope included:

- Comprehensive collection and analysis of existing drain water use data.
- Development of a system wide simulation model that captures the primary characteristics of water supply, irrigation demand, drain water availability, and overall system hydrology.
- The model's use to develop a range of drain water management improvements including new local reservoirs for storage and management of drain water, improved facilities for direct diversion and reuse such as larger drain pump stations and conveyance facilities to return drain flows to the distribution system, and a combination of these two alternatives.
- The model as a basic water quality module that uses the existing water quality data and "mass balance" information to determine the potential water quality impacts from improved control of drain water return flows and blending with canal water for reuse on fields.
- Information about the alternatives developed includes a layout plan (size, location, primary facility features), operational descriptions, and operation and maintenance (O&M) and capital costs.
- The study methods, findings, recommendations, and supporting analytical tools are documented in a drain water optimization alternatives report.

Results

—Data Collection and Review

The data includes 10 years of monthly information on all major drain reuse diversion points, inflows to drains, outflows from the district service area, and monthly water quality sampling. The project

mapped the district's primary distribution system, drains, drain recapture points, outflow locations, and other relevant information to provide a detailed picture of both the location and timing of drain water production, reuse, and outflow.

—Drain water Operations Mode

The data collected in this task was used to create a detailed "mass balance" tool to simulate the district's operations in terms of major canal reach flows, irrigation demands, drain water production, drain water reuse, and outflows. The model includes both quantity and quality components, and simulate operations on a monthly average time-step. The model was compiled in EXCEL and includes a user-friendly interface in Visual Basic, allowing efficient use of the model by district staff and others.

—Alternatives Development and Evaluation

The drain water operations model was used to develop and evaluate a range of "bookend" alternative components for improved drain water management. These components include three surface water reservoirs for the temporary storage of drain water, and three major direct diversion improvements—new pump stations combined with pipelines/canal to convey drain water directly back to the main canal and local laterals. Combinations of these components were used to develop up to three major alternatives for improved future drain water management.

—Project Report

A project report (Alternatives for Improved Drain water Management in the GCID Service Area) was produced to document the study methods, data sources, findings, and recommendations.

Sub-Surface Drip Irrigation of Asparagus

Contractor: Golden State Irrigation Services

Contact: Mike Conrad, Executive Vice President;
mconrad@goldenstateirr.com

Phone: 209-943-7774

Background

This project replaced inefficient, aging irrigation pumping plants, earthen irrigation ditches and century old methods with smaller more efficient pumping plants, buried PVC pipelines, subsurface drip emission devices, which allowed the grower to reduce the total amounts of water and fertilizer applied to the crop with a potentially higher yield. This project replaced 304 acres of surface irrigation on row crops with subsurface drip irrigation with an objective of using the least amount of inputs to reach a maximum yield.

This project reduced irrigation water losses from evaporation by reducing flows and increasing the water supply. Additional benefits included the substantial reduction of pesticide, fertilizer and other organic contamination of the San Joaquin River and Delta by eliminating tailwater pumping.

Results

Two farms of 120 and 155 acres, received irrigation systems. An on-site agronomist scheduled the irrigation timing and fertilizer timing. System design included CIMIS information, and leaf and petiole analysis. Growers picked a field attendant to work with an agronomist to learn the system.

Because the asparagus had not reached maturity, there is little real data on actual water use, yields, fertilizer and chemical inputs.

Water Use Efficiency Project

Contractor: Kern-Tulare Water District

Contact: Steven C. Dalke, General Manager;
ktrgwd@lightspeed.net

Phone: 661-327-3132

Background

The primary purpose of this project was to increase irrigation efficiency through increased flexibility in water ordering and expansion of the Kern-Tulare Water District's conjunctive use program. Other incidental benefits of the project were reduced energy use and improved groundwater conditions.

The above objectives would be obtained by expanding the district's distribution system delivery capability and flexibility. These improvements would enable water users to reduce reliance on groundwater in years of adequate water supply, which will result in improved groundwater levels for use during years of reduced surface water supplies.

District staff manually operates the distribution system. As a result, water users must place water orders a minimum of 24 hours in advance and changes are made only once per day. This causes water users to continue to take delivery of water for the entire 24 hours, even if the irrigation has been completed sooner. In addition, the distribution system is undersized and water deliveries are prorated during the peak summer months. Enforcing prorates to water users requires that the districts' turnouts remain locked and are operated only by district personnel. In order to allow for the water users to operate their own turnouts and avoid the 24-hour notice requirement, the districts' distribution system capacity and flexibility needed to be increased.

Results

A SCADA system and controls on 29 pumps and one reservoir were installed. VFD electrical controls were added to the Rag Gulch, 6th Booster and Twin Pipes pumping plants.

agricultural water use efficiency projects

NPS Pollution Reduction in Vineyards

Contractor: Lodi-Woodbridge Winegrape Commission

Contact: Dr. Clifford P. Ohmart, Research/IPM Director;
cliff@lodiwine.com

Phone: 209-367-4727

Background

Conventional farming of wine grapes can adversely impact the environment, water supply and quality. It can affect environmental quality and surface and ground water quality by providing several sources of nonpoint source (NPS) pollution, such as offsite movement of pesticides, nutrients, and sediment. Winegrape growing affects water supply because vineyards are irrigated during the growing season. To address these problems the Lodi-Woodbridge Winegrape Commission has, over the past eight years, developed a sustainable farming program (SFP) for wine grapes that focuses on NPS pollution reduction and water use efficiency. In 2000, LWWC completed the Lodi Winegrower's Workbook: A Self-Assessment of Integrated Farming Practices (Ohmart and Matthiasson 2000) to use in implementing the next stage of their SFP. The workbook helps a grower:

- identify areas of environmental concern on their farm, particularly NPS pollution problems;
- evaluate their vineyard irrigation practices;
- develop plans to address these concerns (the workbook provides educational information for implementing these plans);
- develop a timetable for carrying out these plans; and
- measure the level of adoption of sustainable farming practices on their farm and track improvements over time.

Results

There were four project objectives:

- Engage all LWWC growers (650) in implementing sustainable farming practices in their vineyards, focusing on reducing NPS pollution and increasing water use efficiency, by using the already established farmer-to-farmer infrastructure in place in LWWC to

hold innovative workshops to implement the *Lodi Winegrower's Workbook* self-assessment program. *Thirty workshops reached 200 growers, farming 55 percent of vineyard acres and 49 plans entered in the database.*

- Document and track the level of adoption of sustainable farming practices in LWWC using LWWC's database system and survey tools and measure the impact of the program on reduction of NPS pollutants and increased water use efficiency. This tracking system could serve as a model for other watershed programs and is easily modified for other cropping systems. *Two hundred self-assessment vineyard evaluations were entered into the database. Inputs for 60 vineyards were tracked and entered into the database.*
- Present the self-assessment workbook program as a model pollution prevention and increased water use efficiency program to other commodities in the Central Valley. *Twenty presentations on the project were made to vineyard grower groups.*
- Report on project results. Revise the text of the *Lodi Winegrower's Workbook* based on project experience and share lessons learned from the project with all participating or funding groups.

This is a well managed and thorough project. The vast majority of the proposed project is documented in the final report.

Distribution System Improvement Project

Contractor: Lost Hills Water District—Service Areas 3 and 5

Contact: Philip D. Nixon, Manager; lhwdphil@aol.com

Phone: 661-633-9022

Background

The projects lined with concrete about 1.4 miles of canals in Lost Hills Water District's Service Area 3 and 1.9 miles in Area 5. LHWD is in northwestern Kern County. The purpose of the proposed project was to prevent seepage losses to a saline shallow groundwater table.

Results

During construction, the work was reviewed to ensure compliance with plans and specifications. Water savings began as soon as the project was complete, but direct measurement of the water savings was not possible. However, water savings were estimated on an annual basis by comparing the metered delivery records from the aqueduct to the metered field delivery turnout records. After accounting for any meter inaccuracy, this will help give an indication of the efficiency of the delivery system and a comparison to historical data might yield an estimate of the annual water savings.

Water savings were estimated at 110 acre-feet per year in Area 3 and 170 acre-feet per year in Area 5.

On-Farm Ditch and Cast-in-Place System Replacement

Contractor: Modesto Irrigation District

Contact: Joseph Lima; joel@mid.org

Phone: 209-526-7562

Background

This project replaced on-farm irrigation ditches and deteriorating concrete cast-in-place pipelines with plastic pipe to improve water delivery flexibility and reliability within the Modesto Irrigation District (MID) service area. With the greater reliability and flexibility of the plastic pipelines, growers have the ability to convert the on-farm irrigation system from the less efficient flood irrigation to more efficient pressurized drip and micro sprinkler systems. The on-farm water delivery reliability and flexibility required for micro irrigation systems does not exist with ditches and cast-in-place concrete pipelines.

This funding augmented the MID 2001-2002 budget of \$274,000 for the 50 percent cost share with the growers. With the state funding, MID increased the contribution to up to 67 percent of the eligible project costs to upgrade the on-farm water supply system. With the larger contribution, grower participation increased.

Results

The measure of project success was based on grower participation. The summary list shows 33 program participants but does not provide information about the number of potential participants or number of participants during previous years. A two-page final report with summary table of costs and some information on actual construction indicates that 'several thousand feet of new pipelines' were installed but there is no information on cost per foot.

agricultural water use efficiency projects

Regional Water Use Efficiency Project

Contractor: Orland Unit Water Users' Association

Contact: Rick Massa, Project Manager; ouwua@glencounty.net

Phone: 530-865-4126

Background

The Orland Unit Water Users' Association (OUWUA), in cooperation with the Tehama-Colusa Canal Authority (TCCA), conducted a conceptual design study to support implementation of key infrastructure elements of a regional water management strategy. The strategy is intended to provide greatly improved conveyance and water use efficiency within the OUWUA service area, reduce seasonal surface-water diversions on the Sacramento River, and expand the conjunctive use of groundwater resources. This would make available a significant quantity of surface water at critical times of the year to meet other beneficial needs in the Sacramento River Basin.

Results

Information was collected that is required to support the conceptual design and provide the models needed to evaluate and screen project alternatives.

Historical Stony Creek hydrology, existing reservoir operations, and Red Bluff Diversion Dam operations were reviewed, drawing primarily from previously published sources. The basic purpose of the review was to determine the amount of storage available to manage the conserved water expected to result from the project.

OWID Palermo Canal Lining Project

Contractor: Oroville-Wyandotte Irrigation District

Contact: George M. Barber, Water Division Manager; gbarber@owid.com

Phone: 530-533-4578

Background

The Oroville-Wyandotte Irrigation District (OWID) proposed a project of lining sections of the district's Palermo Canal. It chose locations based on accessibility and historical knowledge of high leak areas.

The project is the application of a three-inch nylon-fiber reinforced concrete lining to approximately 13,500 feet of the 65,000 feet of main canal. It accomplished it over three-years, lining three or four separate locations each year. It projected it would line about 4,500 feet of canal each year.

The objective of the project was to reduce the amount of water lost to seepage and leakage in the canal and make it available for storage in Lake Oroville and for flow in the Feather River. The project estimated it would provide water savings of 695 acre-feet annually—providing water for hydroelectricity generation, transfers to downstream communities, and flow to improve aquatic ecosystems on the Feather River.

Results

The district lined 9,335 feet of canal (69 percent of the 13,500 feet planned).

On-Farm Mobile Lab

Contractor: Pajaro Valley Water Management Agency

Contact: Charles McNiesh, General Manager;
mcniesh@pvwma.dst.ca.us

Phone: 831-722-9292

Background

The project provided mobile irrigation laboratory services to growers. The mobile lab offers irrigation system evaluations and recommendations for improvements. The protocol of the mobile lab used the field proven Cal Poly and Department of Water Resources methodology. It would perform up to 50 evaluations, at a cost of \$650 per evaluation, during each year for local growers. Pajaro Valley Water Management Agency (PVWMA) staff would be responsible for management and oversight of the project. The goal of the project was to improve overall irrigation efficiencies in the Pajaro Valley by providing growers in the Pajaro Valley the means to make irrigation equipment and management improvements based on the evaluations of their irrigation system.

An Environmental Protection Agency grant administered by the San Luis arid Delta Mendota Water Authority funded the mobile lab program. There is a PVWMA cost share of 50 percent of the mobile lab services in the district. This grant was scheduled for completion in 2000. Although irrigation efficiency in the Pajaro Valley is considered high when compared to some other areas of the state due to the prevalence of drip irrigation technology and sprinkler irrigation in the major crops, the water conservation plan anticipates increases in irrigation efficiencies to offset possible future increases in groundwater or surface water consumption due to changes in crop types or cropping patterns. Reducing agricultural water demand, through increasing irrigation efficiencies is a major element and goal of the PVWMA's long-range water supply planning.

Results

Reduced water use of 200-300 acre-feet per year, under the following circumstances: 50 mobile lab evaluations performed at an average of

100 acres affected; with a potential water savings of an average of 2 percent per site; and applied crop water usage on that acreage ranging from 2-3 acre-feet per acre of cultivated land. The report indicated that 16 evaluations were performed, 12 reports filed with 434 acres evaluated.

Real-Time Canal Flow Monitoring System and Canal Lining Project

Contractor: Placer County Water Agency

Contact: Mike Nichol; mnichol@pcwa.net

Phone: 530-823-4864

Background

The project automated canal structures by installing 12 canal flow monitoring stations on Placer County Water Agency (PCWA) canals. The monitor stations allow flows to be continually monitored remotely, which would reduce canal spills. About 75 percent (87,850 acre-feet per year) of PCWA water supply deliveries are raw water deliveries, distributed by canal. About 40 percent (35,000 acre-feet per year) of the water in the canals would pass through the 12 monitoring stations. The project estimated it would save about 4,867 acre-feet per year.

Results

The project installed flow monitoring devices, a remote monitoring station, and a central computer station, and lined a canal.

PCWA monitored and assessed water use before and after it installed the devices and lined the canal. A report documented the results. This project is well documented and implemented.

agricultural water use efficiency projects

Sub-Basin Level Water Measurement Program

Contractor: Reclamation District 108

Contact: Luther Hintz, General Manager; luhintz@colusanet.com

Phone: 530-437-2221

Background

The program was intended to provide flow measuring devices in the Colusa, Butte, Sutter, and American sub-basins. Currently, water management and measurement occur primarily at the district level throughout the Sacramento Valley. Measuring at the sub-basin level would help make the best use of surface-water and groundwater and achieve the right level of drain- and return-flow water between water users in a sub-basin.

The proposal sought to identify the necessary study, design, environmental documentation, selection of measurement locations, and construction requirements necessary to implement a water measurement program for the sub-basins.

Results

Efforts focused on identifying the appropriate hydrologic locations to install measurement tools in each of the sub-basins.

Southwest Stanislaus County Regional Drainage Water Management

Contractor: San Joaquin Valley Drainage Authority

Contact: Frances Mizuno, Assistant Executive Director;
frances.mizuno@sldmwa.org

Phone: 209-833-1040

Background

Project goals:

- Reduce the silt load to the San Joaquin River
- Reduce pesticide levels in the drainage water discharged to the San Joaquin River
- Reduce constituents adversely affecting the dissolved oxygen level in the San Joaquin River
- Improve the management of water supplies by building spill and tailwater recovery systems

The project was intended to reduce nutrients, pesticides, salinity, and native constituents in the San Joaquin River. For example, preliminary estimates for the Marshall Road Drain indicate there is the potential in this 6,800-acre watershed to reduce agricultural surface drainage by approximately 1,600 to 2,500 acre-feet per year. If the total dissolved solids in the drainage water is approximately 900 parts per million, this would equate to a reduction of approximately 2,000 to 3,000 tons of salt per year to the San Joaquin River. For the 85,000 acre study area, preliminary estimates indicate there is the potential to reduce agricultural surface drainage to the San Joaquin River by 21,000 to 31,000 acre-feet per year.

Results

Following completion of Phase 1, the information developed from the Marshall Road Drain project will be utilized in Phase 2 to recommend similar on farm tailwater return systems throughout the 85,000 acre drainage study area. The construction of regional desalting and tailwater return reservoirs will be recommended to

manage the existing discharges from the different drainage areas. Opportunities to recirculate and reuse the captured drainage water, blending it back into existing irrigation supplies will be recommended when it will optimize improvements in water supply flexibility.

The Authority estimates savings from Phase I to be 1651 acre-feet per year, and up to 20,632 acre-feet per year for Phase II.

Irrigation Management

Contractor: West and East Stanislaus Resource Conservation District

Contact: Norman Crow, Chairman; crows5@inreach.com

Phone: 209-892-3026

Background

Currently 100 miles of the San Joaquin River are included in the list of impaired water bodies in the 1990 California State Water Resources Control Board Quality Assessment. Previous studies pinpointed the West Stanislaus area as one of the highest contributors of soluble pesticide residue and sediment-borne contaminants of the San Joaquin River.

West Stanislaus has been recognized as a consistent non-point source pollution area due to the combined effects of:

- the area is adjacent to the river;
- the surface and subsurface hydrology has been extensively altered;
- the soils, which comes from the coastal range, are erosive, and
- land use adjacent to the river is diversified relative to other areas in the basin.

Results

A program in “Total Irrigation Management” (TIM) was given to 17 growers that looked at the system, soil, weather, and current management. This included selected growers with a variety of crops and irrigation types from different areas of Stanislaus County.

Irrigation scheduling was provided at sites in the selected fields. Irrigation system evaluations were completed by the Mobile Irrigation Lab to determine the distribution uniformity of the systems. It recommended changes to improve uniform distribution, increase infiltration and reduce runoff.

The goal of the program was to save the county 15 percent, 5,000 acre-feet or \$125,000 per year. This goal would be accomplished by tracking total water applied to each field in the study and comparing total water applied to previous years using the records that the grower and the irrigation districts provide. A database would be maintained of all fields with current information.

The second part of this program included training workshops in English and Spanish that outlined the principles of efficient irrigation. The goal was to help local growers learn about efficient irrigation and train their irrigators. One field day was held with 130 attendees.

The RCD estimated savings at 546 acre-feet per year.

Evaluation of Salt-Tolerant Floral and Forage Crops as a Strategy for Conserving Fresh Water Resources

Contractor: USDA Agricultural Research Service

Contact: James Poss, Soil Scientist; jposs@ussl.ars.usda.gov

Phone: 909-369-4863

Background

Saline irrigation water resources, primarily drainage effluents, but also including some groundwater, are important components to the conservation and recycling of water throughout the state. Increasing water supplies through reductions in nonproductive evapotranspiration (ET) could benefit from a study that evaluates the response of a number of promising salt-tolerant forage and floral

agricultural water use efficiency projects

crops to salinity levels typical of those present in the San Joaquin Valley. Experiments were conducted at the U.S. Department of Agriculture, Agricultural Research Service, George E. Brown Jr. Salinity Laboratory in Riverside using greenhouse and outdoor sand tank lysimeter systems.

Results

Dry matter production rates of the forages and the water balance of the sand tanks were measured periodically. Electrical conductivities (EC) was monitored, as was pH to document actual salinity and pH of the irrigation solutions. The forage tissue was dried, ground, and analyzed for major inorganic salts (Na, Ca, Mg, K, Cl, P, S,) and forage quality.

Water use efficiency was calculated based on accumulated biomass or economic product for each salinity treatment. Additional salinity-stress and stress relief experiments were conducted for flower crops in a greenhouse sand-tank facility to quantify the number of suitable flowers that could be saleable. Floral crops were assessed based on commercially acceptable criteria for flowers and biomass production was also measured as an indicator of plant performance under the range of saline treatments.

Investigators will publish results in a number of outlets including newsletters, popular articles and trade magazines such as *Irrigation Journal* and the *California Nurseryman*. Additional reports will be provided through publication in pertinent popular circulars and scientific peer-reviewed journals.

Results support the use of saline water for irrigation of certain crops.

Irrigation Scheduling

Contractor: WaterTech Partners

Contact: Ronald Enzweiler, Owner; ron@h2o-tech.com

Phone: 925-283-4918

Background

Task 1—Prior to the start of the irrigation season in the first project year (2002), the contractor would create a Graphic Information System (GIS) database for all 28,215 acres of cropland included in the project. This program would be a multi-layered, multi-year database capable of generating “bottoms ups” reports at the field, farm, water district and subregion level. Data cells would be created and baseline values entered for water sources, uses and costs; fertilizer usage and costs; pesticide usage and costs; crop type, quality ratings, yields, and market values; and, as applicable, groundwater conditions and site runoff. The baseline data would be collected by field visits and observations; interviews with growers and water district personnel; and satellite imagery. The software programs and hardware items would be acquired during the start-up period.

Task 2—During the irrigation seasons in project years 1, 2 and 3, the contractor would perform “basic” irrigation scheduling services on the 19 farms and the 28,215 acres of cropland included in the project. Basic services included weekly visits to each farm by an irrigation professional, taking soil and water samples, determining nutrient availability in the soil, monitoring weather data, generating irrigation schedules, and documenting water use.

In addition to these basic services, the contractor would collect data on other variables being studied (water costs, fertilizer and pesticide use, salinity, etc.) and would input these data into the GIS database. Supplemental laboratory analyses would be performed as needed to obtain data on these additional variables.

Results

Because the irrigation schedules were not used, it was impossible to calculate any savings or changes. The report provided little information about the other tasks included in the proposal.

Water Use Efficiency Project

Contractor: Western Canal Water District

Contact: Ted Trimble, General Manager; westerncan@aol.com

Phone: 530-342-5083

Background

Western Canal Water District's Water Use Efficiency Project consisted of two components: water management software and a water meter calibration station. These components would enable the district to create a relational database to track water use efficiency within the district and ensure accurate on-farm delivery to users.

This project would fill a critical local need for more reliable, accurate, and flexible water management. The resulting increase in water management will increase the efficiency of water users and the district, thus reducing costs for both. This project will also fill a critical Bay-Delta need of increasing flow to improve aquatic ecosystem conditions in the Feather River.

Results

The purchase, installation and operation of water management software, H2O Pro, along with hand held data recorders is allowing district personnel to better track water use among its growers.

A new water meter calibration station was completed to increase the accuracy of the district's water meters to within 2-3 percent.

On-Farm Integrated Irrigation and Drainage Management

Contractor: West Hills Community College District

Contact: Larry P. Rathbun, Ph.D., Farm of the Future Project Director; rathbunl@whccd.cc.ca.us

Phone: 559-284-8188

Background

This project created an instructional resource demonstrating effective and efficient on-farm integrated irrigation and drainage practices. With the guidance of an Industry Advisory Committee, this project identified and demonstrated current irrigation and drainage practices and technologies, and incorporated new practices as they became available for commercial use.

Results

This project was conducted on 210 acres of land. The following activities were completed as part of the project objectives:

- Design, install and operate an on-farm integrated irrigation and drainage system with the primary objective to demonstrate irrigation flexibility, efficiency, and minimize drainage.
- Demonstrate alternative irrigation systems and practices including efficient furrow, sprinkler, and surface and subsurface drip and micro low-volume applications.
- Select and install meters for the groundwater well.
- Select and install soil moisture determination devices for calculations of field capacity, permanent wilting point, soil moisture deficit, and soil moisture tension using data logging devices and software systems.
- Demonstrate irrigation practices that optimize water available in the plant root zone while minimizing drainage.
- Demonstrate evapotranspiration monitoring and calculation systems.
- Incorporate system data into a local Irrigation Management Information System (IMIS).
- Incorporate the IMIS data into the West Hills College Precision Farming Program using the latest GPS and GIS technologies.

State of California
The Resources Agency
Department of Water Resources
Office of Water Use Efficiency
P.O. Box 942836
Sacramento, CA 94236-0001

Phone: 916-651-7026

