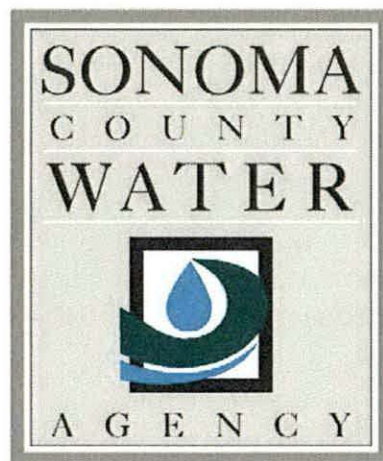


State Water Resources Control Board
Order 8/25/2014

Term 16 - Water Loss, Water Use Efficiency
and Water Reliability



April 1, 2015

Prepared by

**Sonoma County Water Agency
404 Aviation Blvd
Santa Rosa, CA 95403**

1 Introduction

This report has been prepared by the Sonoma County Water Agency (Water Agency) to fulfill the requirements of Term 16 of the State Water Resources Control Board (State Board) Order dated August 25, 2014 (Order).

Term 16 of the Order directs the Water Agency to take the following actions:

SCWA shall provide a written update to the Deputy Director by April 1, 2015, regarding activities and programs being implemented by SCWA and its water contractors to assess and reduce water loss, promote increasing water use efficiency and conservation, and improve regional water supply reliability.

2 Water Use Efficiency

In response to ongoing drought conditions, the Water Agency launched a conservation campaign, "There's a Drought On, Turn the Water Off." This first ever winter advertising campaign used humor to remind customers to conserve. Inspired by the Water Agency campaign, SaveOurWater.org launched a similar campaign using the same slogan.

The Water Agency also hosted a "Drought Drive-Up" event. This event, with 10 locations throughout Sonoma County, gave away free water saving kits of a free showerhead, bathroom and kitchen faucet aerators, dye tabs, a shower timer and a bucket for saving water while waiting for hot water. Over 5,100 kits were given away in one day.

In addition to the Drought Drive-Up event, the Water Agency was one of the hosts of the DIY Outdoor Drought Solutions event, an interactive water conservation focused event that attracted approximately 1,000 people. There, customers learned about how to sheet mulch, convert their sprinklers to drip irrigation, harvest rainwater and more.

Also in response to the severe drought conditions, the Water Agency applied for and was awarded a grant through the Department of Water Resources- North Coast Integrated Regional Water Management Plan. This grant provided \$1.05m for a direct installation toilet and urinal program, as well as a turf removal rebate program for residents within the Russian River watershed, an area that has never had water conservation programs available previously.

The Water Agency also won the U.S. Environmental Protection Agency WaterSense Partner of the Year award for the Sonoma-Marin Saving Water Partnership work with the Qualified Water Efficient Landscaper (QWEL) program. QWEL is a national certification program, created in part by the Water Agency, developed to educate landscape professionals to the benefits of sound landscape design, management and irrigation practices.

2.1 Sonoma-Marin Saving Water Partnership Annual Report

The Cities of Santa Rosa, Rohnert Park, Sonoma, Cotati, Petaluma, Town of Windsor and North Marin, Marin Municipal and Valley of the Moon Water Districts and the Water Agency formed the Sonoma-Marin Saving Water Partnership in 2010. The purpose of the Sonoma-Marin Saving Water Partnership is to establish the financial obligation for the eight local water utilities, Marin Municipal Water District and Sonoma County Water Agency, identify and recommend implementation of water conservation projects and to maximize the cost-effective projects for the Partnership.

The Partners are committed to remain as members in good standing of the California Urban Water Conservation Council (CUWCC) and implement the Best Management Practices (BMPs) for water conservation. The Partners will implement or use best efforts to secure the implementation of any water conservation requirements and will publish an Annual Report to track progress. The Annual Report will track program implementation, highlight program milestones, and reinforce the importance of protecting and preserving water resources for future generations. The 2013/2014 Annual Report for the Partnership is attached in Appendix A.

3 Water Loss

Under the Water Agency's Condition Assessment Program, Pure Technologies (Pure) was contracted to conduct two pipeline inspections in 2014 using two different approaches. In January 2014, Pure provided detailed inspection of 1.2 miles of the Agency's 24-inch Oakmont Pipeline. The pipeline was taken off-line, dewatered, and inspected with a robotic crawler (PureRobotics platform) outfitted with a high-definition CCTV camera to assess mortar lining, LiDAR assembly for 3-dimensional pipe scans, and enhanced electromagnetics equipment to assess the condition of the steel cylinder and bar-wrapping of the bar-wrapped concrete cylinder pipe (AWWA 303). The results of the inspection identified small isolated areas that experienced mortar loss, but overall the inspected pipeline was found to be in very good condition with no signs of the pipe integrity being compromised. The enhanced electromagnetics analysis found no indications of corrosion of the pipe's steel cylinder or bar-wrapping.

In June 2014, Pure conducted an acoustic pipeline inspection of 6.8 miles in the southern portion of the Sonoma Aqueduct. The inspected section of pipeline was welded steel pipe of mainly 20-inch and 16-inch diameter. Pure inspected the pipeline with their SmartBall technology, an acoustic sensing device capable of detecting leaks and air pockets. The SmartBall was inserted in the pipeline while it remained in service traveling with the flow. The results of the acoustic data analysis identified two leaks over the 6.8 miles. The first leak was categorized as medium-sized (2-10 gpm) and was found during a follow-up site visit to be a delivery turnout valve that was not properly sealing. This 'leak' was not a water loss leak since water was flowing out to an Agency customer's (Valley of the Moon Water District) distribution system. The second identified leak was categorized as small (<2 gpm). Subsequent site visits were not able to detect a leak with a ground mic in the vicinity identified by the SmartBall. The final determination for this leak was that the elevated pipeline pressures during the inspection created a small joint leak that under normal pressures disappeared. While the analysis of the acoustic data did not pick up an additional leak because noise from a nearby throttling valve masked the signal, a leaking

check valve was discovered during the inspection planning process. A swing check valve located on the east end of the Verano Avenue bridge in Sonoma was discovered to have a bad seal and leaking at approximately 5 gpm. There was no recollection by Agency staff of any inspection of the check valve prior and therefore the leak may have been occurring for many years without detection. Temporary repairs have reduced the leak and the check valve has been scheduled for replacement.

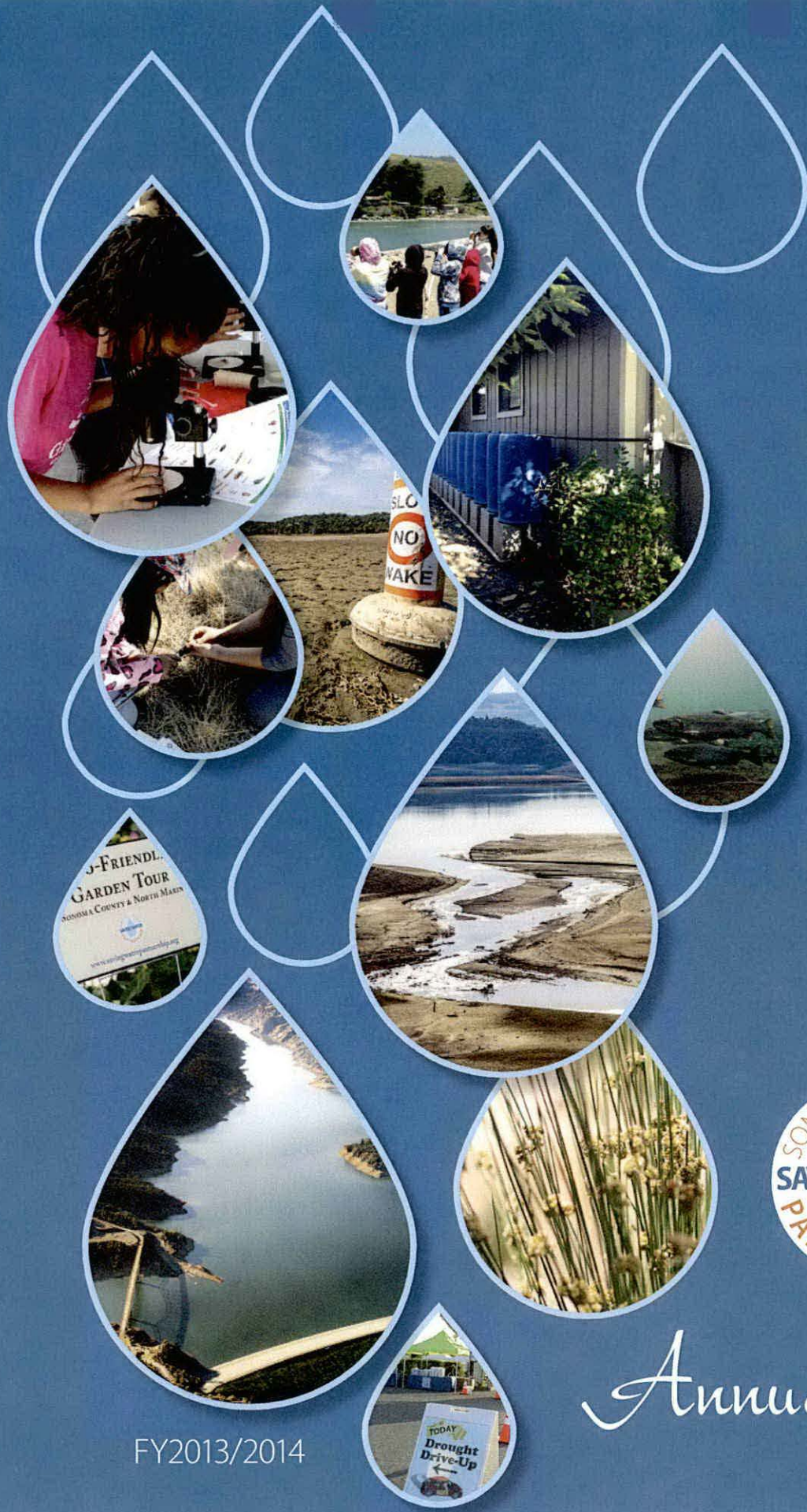
4 Water Supply Reliability- Forecast-Informed Reservoir Operations

Forecast-Informed Reservoir Operations is a management strategy that uses data from watershed monitoring and modern weather and water forecasting to help water managers selectively retain or release water from reservoirs in a manner that reflects current and forecasted conditions. A workshop was held in August 2014, at University of California San Diego/Scripps Institution of Oceanography. Thirty-two representatives from multiple agencies met for three days to scope out an appraisal level FIRO study for Lake Mendocino. A work plan is now being drafted for release in 2015. The FIRO study is expected to occur over the next five years (depending on funding). Tangible outcomes from the full Lake Mendocino FIRO study will include identification, assessment and enhancement of the best science available to improve operations to maximize flood control, water supply and ecosystem benefits. The evaluation will identify realistic, short-term steps to provide more accurate and timely information about weather and watershed conditions. In addition to benefitting Lake Mendocino, the project has transferability potential throughout the western United States. Additional information on Improving Reliability for Droughts & Floods: Forecast-Informed Reservoir Operations is attached in Appendix B.

Appendix A

**2013/2014 Annual Report for the
Sonoma-Marín Saving Water Partnership**

(begins on the following page)



J-FRIENDL
GARDEN TOUR
SONOMA COUNTY & NORTH MARIN
www.savingwaterpartnership.org



FY2013/2014

Annual Report

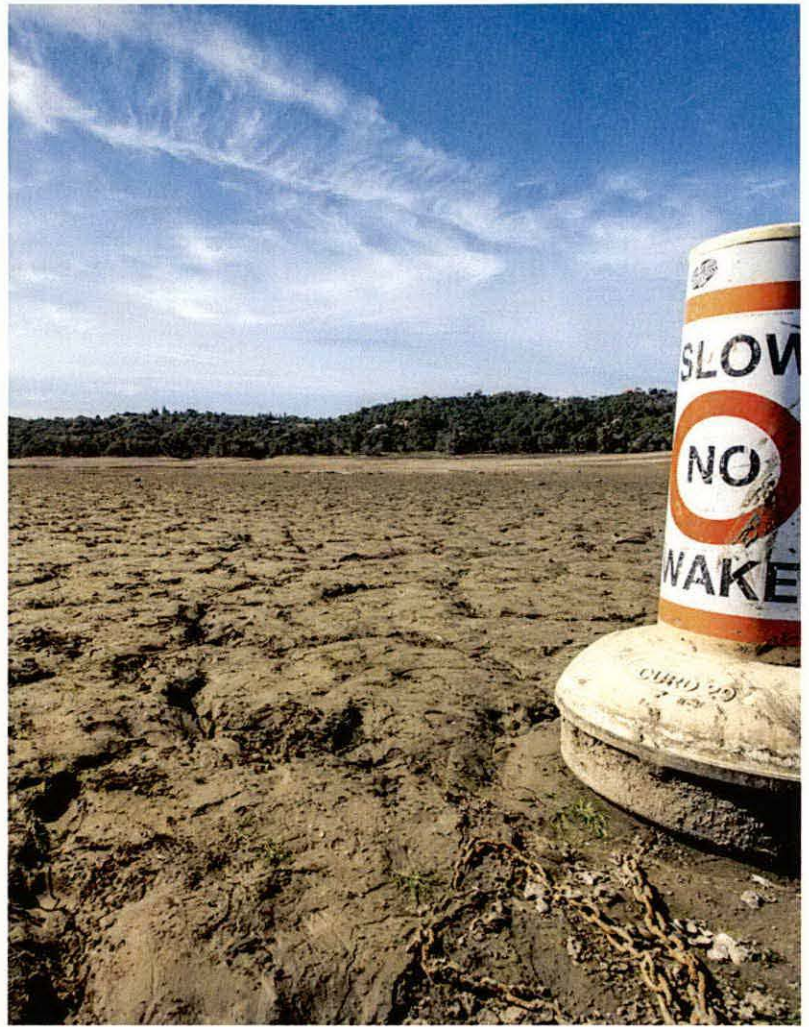
About the Partnership

The Sonoma-Marín Saving Water Partnership (Partnership) represents 10 water utilities in Sonoma and Marin counties that have joined together to provide regional solutions for water use efficiency.

The utilities include the Cities of Santa Rosa, Rohnert Park, Petaluma, Sonoma, Cotati; North Marin, Valley of the Moon and Marin Municipal Water Districts; Town of Windsor and Sonoma County Water Agency (Partners). Each of the Partners have water conservation programs that can assist customers in reducing their water use.

The Partnership was formed to identify and recommend implementation of water use efficiency projects, and maximize the cost-effectiveness of water use efficiency programs in our region.

The Partners are committed to remain members in good standing of the California Urban Water Conservation Council (CUWCC) and implement the Best Management Practices (BMPs) for water conservation.



Our Service Area

More than 600,000 residents in Sonoma and Marin counties rely on the water delivered from the Russian River by the Sonoma County Water Agency (Water Agency) to the nine cities and districts in the Partnership. Supplementing the water provided by the Water Agency are local supplies including recycled water, groundwater from underground aquifers and surface water reservoirs.

Recreation, agriculture and wildlife, including threatened and endangered steelhead and coho and Chinook salmon also rely on these same natural resources in order to thrive.

Realizing the importance of protecting and preserving water resources for future generations, the members of the Partnership have taken a proactive role in helping fund, maintain and implement an array of water supply, water use efficiency and fishery recovery programs.



There's a Drought On! Turn the Water Off!

This year the California drought took center stage and Governor Jerry Brown declared a State of Emergency on January 17, 2014. Our region experienced historically dry weather and low reservoir water storage levels. The Sonoma-Marin Water Saving Partnership implemented an unusual winter water conservation public outreach effort with a simple message: *"There's a Drought On. Turn the Water Off."* In addition, the Partnership joined together to create a one day "Drought Drive-Up" event at 10 different locations throughout the region and handed out over 5,000 drought tool kits to community members. The area retail water providers stepped up their water conservation efforts and the Partnership website was enhanced by adding a Water Savings Calculator tool, an online form for reporting water waste, and providing online access to water conservation tips.

The Partnership received a 2014 WaterSense "Partner of the Year" award from the U.S. Environmental Protection Agency as a professional certifying organization for promoting water efficient irrigation practices through implementation of the Qualified Water Efficient Landscaper Program (QWEL). QWEL educates landscape professionals and their customers on the benefits of sound landscape design, management and irrigation practices. The award was one of only nine issued by the EPA nationally.

The Partnership was formed in late 2010 and recognizes that establishing common regional water conservation projects may cost effectively conserve more water than would otherwise be conserved by individual agencies. This regional approach is based on meeting water conservation regulatory requirements by offering financial incentives to conserve and by educating water users about where drinking water comes from and how to use it most efficiently. The Partnership, through its many water efficiency programs, educational seminars and outreach campaigns, is working every day of the year to educate our communities about the importance of conserving water resources and curbing water-wasting behaviors.

Regional water use during Fiscal Year 2013/2014 remains down significantly from prior years as mandatory outdoor water use restriction were in effect. The Partnership continues to offer educational resources, programs and incentives to aid our communities in meeting water use efficiency requirements in the future as we work together in response to variable water year conditions and maintain supplies for beneficial use and instream needs.

Sincerely,



Dennis J. Rodoni, Chair
Water Advisory Committee
President
North Marin Water District



Susan Gorin, Chair
Sonoma County Water Agency
Supervisor, County of Sonoma

Partnership Achievements by the Numbers

5,355,996 gallons of water per year are being saved by local businesses through **sustained reduction** programs where rebates are provided for implementing process changes and equipment upgrades resulting in measurable water use efficiencies.

507,222 square feet of lawn were removed through **turf conversion** programs — enough to cover nearly nine professional football fields.

23,061 students in 823 different classrooms received curriculum materials provided by the **Water Education Program**.

10,496 students experienced "The Musical Watershed" performed by the **ZunZun** performing arts group in 37 shows at 25 different elementary schools.

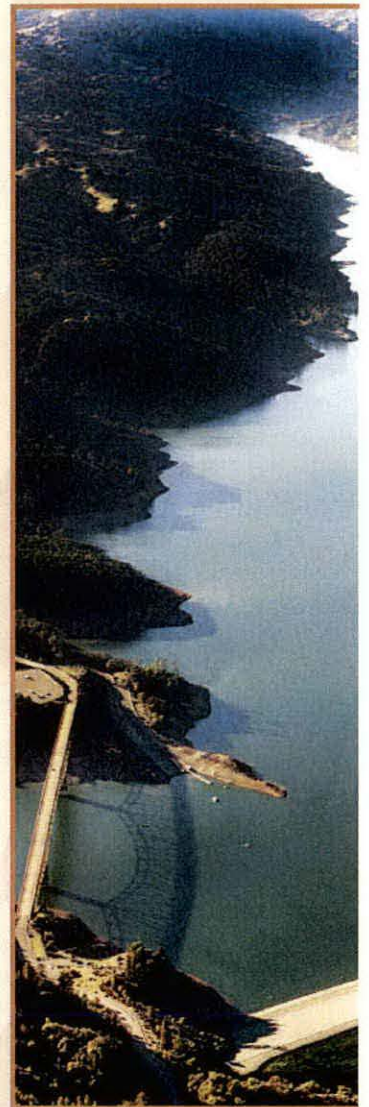
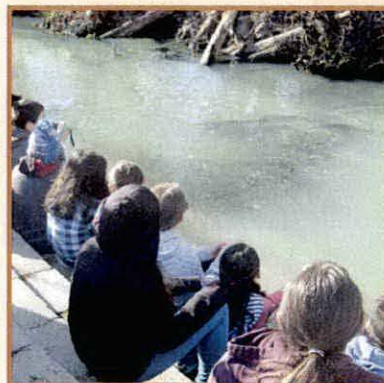
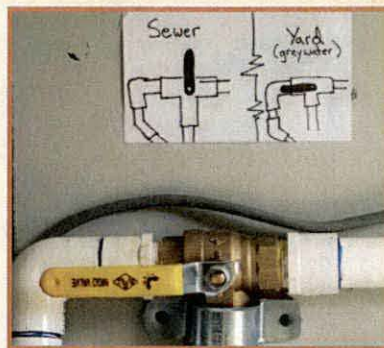
7,058 actions were inspired by the **Community Resilience Challenge**.

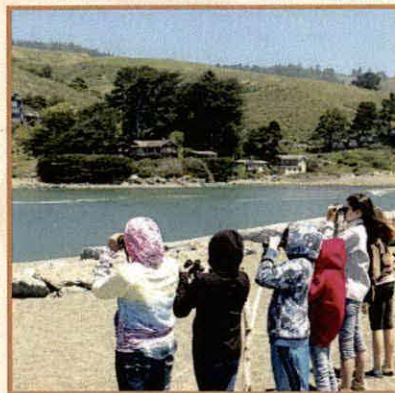
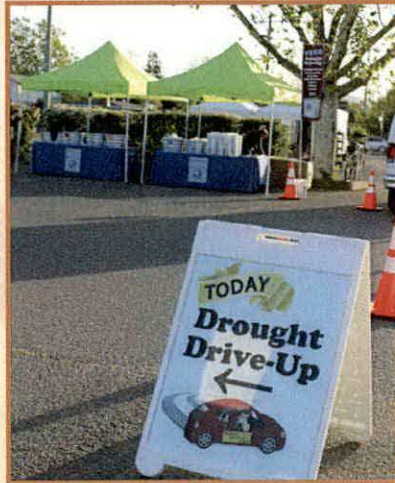
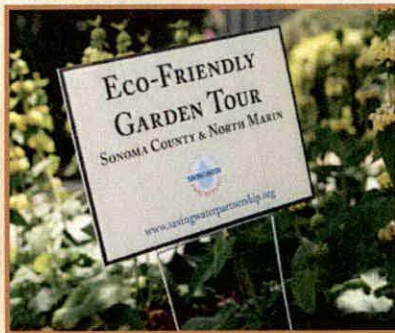
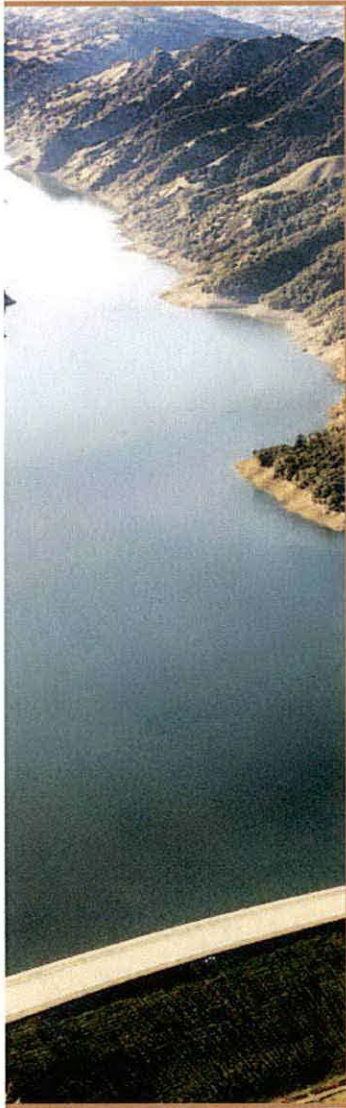
8,037 students received **direct instruction** by Water Education Program staff in the classroom, on technical tours and during field study sessions.

5,148 drought kits were distributed during the **Drought Drive-Up Event** held at 10 locations throughout Sonoma and Marin counties on April 23, 2014. The kits included showerheads, bath and kitchen faucet aerators, dye tabs, shower timer, and bucket for saving water while waiting for hot water.

4,410 **Water Smart Home evaluations** were performed. These in-home water efficiency assessments are performed by trained technicians to find opportunities for improvements, identify leaks, and inform homeowners about their indoor and outdoor water use.

3,540 rebates were issued to **residents** for replacing their old, inefficient toilets with new, EPA WaterSense labeled **high-efficiency toilets** that flush at 1.28 gallons per flush or less.





2,379 high-efficiency clothes washer rebates were issued. These EPA EnergyStar rated clothes washers use 40 to 60% less water than older, top loading models and they save energy from heating less water and wringing out more water before the clothes go into the dryer.

2,284 students participated in the Field Study Program where the 5th grade students performed water related experiments along the banks of the Russian River and learned about the riparian ecosystem.

2,210 high school students learned about the water system and explored career opportunities in the field of water.

941 rebates were issued to **businesses** for installing **high-efficiency toilets and urinals**.

720 guests visited the nine gardens that participated in the Third Annual **Eco Friendly Garden Tour**.

356 parents volunteered to chaperone their child's class during their field study visit to the Water Agency's Russian River Field Study Site near Forestville. The parents participated along with the students allowing the **Field Study Program** to reach adults as well as children.

215 landscapes were upgraded through our rebate programs.

185 students graduated from the **Qualified Water Efficient Landscaper (QWEL)** and Spanish QWEL programs.

166 in-garden visits were conducted by the Master Gardeners through the **Garden Sense** program to educate customers on low water use landscapes.

151 businesses participated in our **water use survey** programs.

87 people attended **Rainwater Harvesting classes**.

47 videos were submitted for the high school video contest themed "There's a Drought On! Turn the Water Off!"

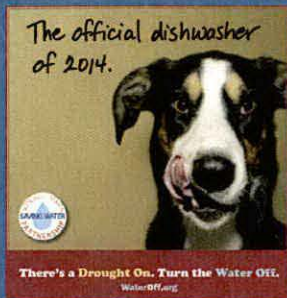
22 businesses were certified through the Sonoma County Green Business Program sponsored by the Water Agency.

11 permitted **graywater systems** were installed in homes to reuse water from bathroom sinks, showers, tubs and laundry for irrigating landscapes.

ANNUAL MULTI-MEDIA PUBLIC EDUCATION CAMPAIGN

Following the 20-Gallon Challenge Campaign, the Partnership launched a new campaign to continue to increase awareness of the dry weather and serious drought conditions. The Partnership implemented a new regional multi-media effort throughout the North Bay region with a simple message: **There's a drought. Turn the water off.** The campaign's goal is to educate the public about outdoor and indoor water conservation by promoting creative and humorous tips for saving water.

The Partnership also joined forces to hand out over 5,000 drought tool kits during a one day, 10 location event called the "Drought Drive-Up." Partnership staff and elected officials handed out tool kits that included toilet dye-tests, water efficient shower



heads, spray nozzles, shower buckets and more. The community's response was overwhelming as many drive-up locations ran out of supplies before the end of the day.

Partnership Highlights

PROGRAM EXPENDITURES

Partners have pledged to fund water use efficiency programs. The baseline funding is established in the Memorandum of Understanding (MOU) and is based on historic water deliveries through the Water Agency's water transmission system, ensuring that programs will always be available to help residents use our water resources efficiently.

Minimum funding levels are presented in the orange bar in the table below along with Fiscal Year 13/14 expenditures.

For the Town of Windsor, additional required funding paid through a direct diversion water conservation sub-charge is not included with their MOU minimum. These additional funds are designated for the Town's water use efficiency programs and are included in their annual program expenditures.

The Water Agency's Water Use Efficiency Program is funded by the water contractors through the Water Conservation Sub-Charge as part of the Water Agency wholesale water rates. The amount of money deposited into the fund is calculated based on an estimate of the total costs for all regional Water Conservation Projects for each fiscal year.

The Sonoma-Marin Saving Water Partnership does not specify a minimum amount that should be utilized for regional programs.

Program Expenditures (in thousands of dollars)

	City of Cotati	Marin Municipal Water District	North Marin Water District	City of Petaluma	City of Rohnert Park	City of Santa Rosa	City of Sonoma	Valley of the Moon Water District	Town of Windsor	Sonoma County Water Agency	Regional Total
FY 13-14	\$ 84	\$1,947	\$429	\$660	\$14	\$1,127	\$129	\$245	\$259	\$1,630	\$6,526
Minimum	\$25	\$177	\$241	\$242	\$120	\$557	\$55	\$72	\$10	NA	\$1,500

2014 TEMPORARY URGENCY CHANGE PETITION

As a result of the driest calendar year on record in Ukiah, the California State Water Resources Control Board (SWRCB) issued an order on December 31, 2013 that allowed the Sonoma County Water Agency to preserve Lake Mendocino's dwindling water storage in response to a Temporary Urgency Change Petition that was filed on December 20, 2013 by the Water Agency.

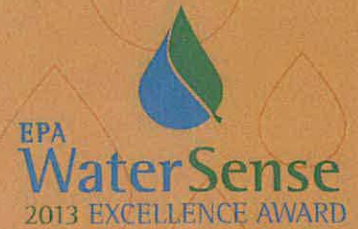
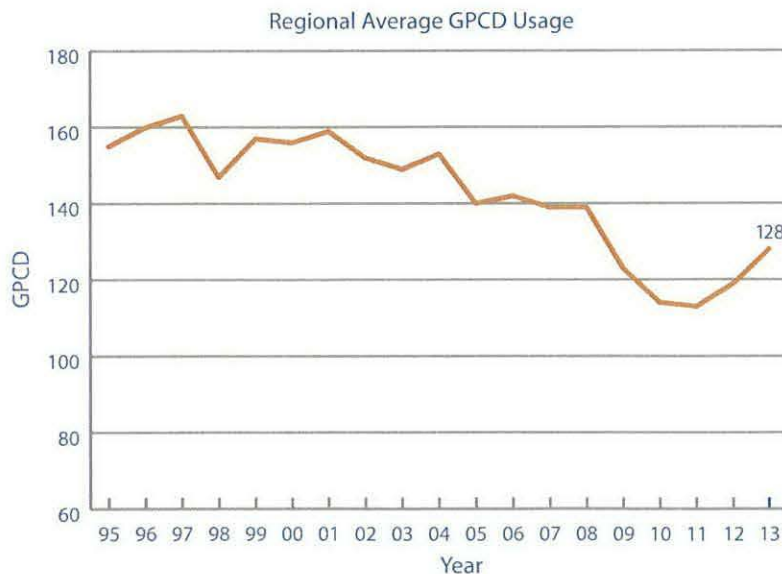
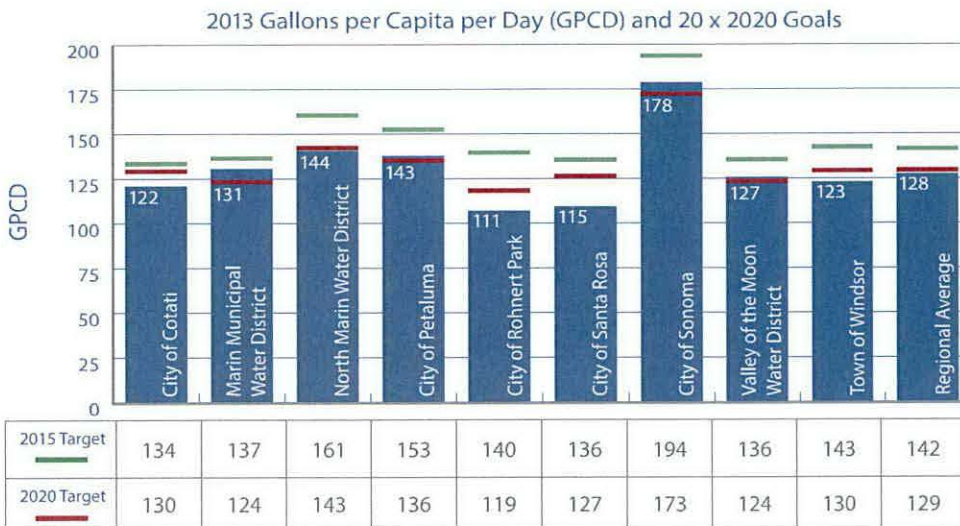
Beginning January 1, 2014 the order allowed lower minimum flows in the upper Russian River and more operational flexibility for water managers working to preserve every drop of water in Lake Mendocino. Due to the lack of rainfall in early 2014, the order was amended on March 7, 2014 adding terms to reduce water demand throughout the Russian River watershed. The reduced water releases saved over 15,000 acre- feet in Lake Mendocino; the equivalent of the reservoir's total storage in Fall 2014. The Water Agency worked closely with natural resource agencies to maintain river flows at levels supporting migrating endangered coho salmon and threatened Chinook salmon and steelhead.

20 x 2020 GOALS

In 2009, SBx7-7 established a statewide goal, known as 20 x 2020, to reduce per capita water use 20% by the year 2020 with an interim goal of a 10% reduction by 2015. The chart below displays 2013 per capita water use in each Partner service area and the region as a whole. The 2015 and 2020 goals are indicated by the green and red lines, respectively.

While the chart shows that many Partners are currently meeting the 2020 targets, we recognize that water use efficiency must continue. Many factors can affect water use patterns as seen in recent years. The rebound in the economy is one key factor that has caused an increase in water use. The overall longterm trend shows water demands have dropped as a result of many factors including the California drought, economy, changes in weather conditions, and active water conservation programs.

It is important to continue the work on water use efficiency to maintain the savings already achieved and make sure the region captures all the benefits of future water savings.



PARTNERSHIP RECEIVES NATIONAL AWARD

The Partnership was recognized with a 2013 WaterSense Excellence Award from the U.S. Environmental Protection Agency (EPA) for promoting water efficient irrigation practices through implementation of the Qualified Water Efficient Landscaper (QWEL) program. The Partnership was honored for its groundbreaking regional approach towards cost-effective incentive and educational based water use efficiency programs.

From its early development through a collaborative effort between Partnership agencies (before the Partnership was formed) and the landscape industry, QWEL's mission has been to educate landscape professionals and their customers on the benefits of sound landscape design, management, and irrigation practices. Since the QWEL program became WaterSense labeled in 2007, QWEL has issued over 700 certifications and is offered by 10 organizations throughout the US.



www.savingwaterpartnership.org



City of Cotati
(707) 665-3631
www.ci.cotati.ca.us



MARIN MUNICIPAL
WATER DISTRICT
Marin Municipal Water District
(415) 945-1520
www.marinwater.org



City of Petaluma
(707) 778-4507
cityofpetaluma.net/wrcd



NORTH MARIN
WATER DISTRICT
North Marin Water District
(415) 761-8933
www.nmwd.com



City of Rohnert Park
(707) 588-3300
www.rpcity.org



Sonoma County Water Agency
(707) 547-1933
www.sonomacountywater.org



City of Santa Rosa
(707) 543-3985
www.srcity.org/wue



Town of Windsor
(707) 838-1004
townofwindsor.com



City of Sonoma
(707) 933-2237
www.sonomacity.org



Valley of the Moon Water District
(707) 996-1037
www.vomwd.com



Printed on paper made with 100% certified renewable energy and 30% post-consumer recycled fiber content.

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Printed in Sonoma County, California

Appendix B

**Improving Reliability for Droughts & Floods:
Forecast-Informed Reservoir Operations (FIRO)**

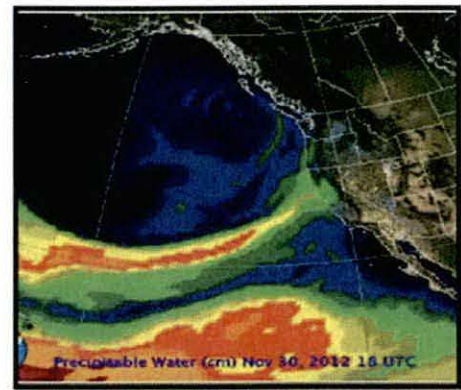
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IMPROVING RELIABILITY FOR DROUGHTS & FLOODS: FORECAST-INFORMED RESERVOIR OPERATIONS (FIRO)

PROJECT PARTNERS



US Army Corps
of Engineers
San Francisco District



BACKGROUND Lake Mendocino is located on the East Fork of the Russian River in Mendocino County, California. Created in 1958 by the Coyote Valley Dam, it provides flood control, water supply, recreation and stream flow regulation. The U.S. Army Corps of Engineers (Corps) owns and operates the dam in accordance with the Lake Mendocino Water Control Manual (1959, revised in 1986). Sonoma County Water Agency is the local partner that manages water stored in Lake Mendocino for water supply.

The Manual specifies elevations for an upper volume of reservoir storage that must be kept available for capturing storm runoff and reducing flood risk and a lower volume of storage that may be used for water supply. During a flood event, runoff is captured by the reservoir and released soon after to create storage space for another potential storm. The Manual is based on typical historical weather patterns— wet during the winter, dry otherwise.

THE PROBLEM

The Manual utilizes gross estimates of flood potential to establish reservoir storage and release requirements. It does not account for changing conditions in the watershed—for example, increased variation in dry and wet weather patterns and reductions to imported flows into the Lake that have occurred since 1986. Also, the Manual's reservoir operations procedures were developed decades ago, without the benefit of current science that more accurately predicts weather and streamflow.

Given reduced supplies, changed hydrologic conditions, and technological advances, some adjustments to the current reservoir operating procedures may be possible to optimize the goals of maintaining flood control while bolstering water supply reliability for downstream users and the environment (e.g., to support recovery of endangered and threatened fish). Modern observation and prediction technology could be used to reduce flood risk by supporting decisions of greater reservoir level drawdown in advance of storms. Or, such technology might be used to improve supply reliability by permitting more storm runoff to be retained for water supply while still preserving flood risk reduction objectives.

(over)

STEERING COMMITTEE MEMBERS

FIRO CO-CHAIRS

Jay Jasperse
Sonoma County Water Agency

F. Martin Ralph
Center for Western Weather and
Water Extremes

Michael Anderson
California State Climate Office,
Department of Water Resources

Levi Brekke
Bureau of Reclamation

Mike Dillabough
US Army Corps of Engineers

Michael Dettinger
United States Geological Survey

David Ford
Ford Consulting

Rob Hartman
NOAA's National Weather Service

Patrick Rutten
NOAA Restoration Center

Cary Talbot
US Army Corps of Engineers

Robert Webb
NOAA's Earth System
Research Laboratory

For example, following an atmospheric river-type storm in December 2012, water was released to create flood space according to the Manual, dropping reservoir levels by more than 35%. 2013 was the driest year on record, resulting in little inflow to refill the reservoir. By December 2013 lake levels were extremely low and remained low through 2014. Ideally, water from the December 2012 event could have been retained based on a longer-term precipitation forecasts, lessening the impact of drought.

THE POTENTIAL SOLUTION An interagency Steering Committee was formed to explore methods for better balancing flood control and water supply needs. The committee, consisting of state and federal agencies, the Center for Western Water and Weather Extremes (CW3E) at UC San Diego and Sonoma County Water Agency are working together on a viability study to determine if Forecast-Informed Reservoir Operations (FIRO) at Lake Mendocino can improve water supply, maintain flood risk reduction, and achieve additional ecosystem benefits. Recent studies show the potential for improved predictability of atmospheric rivers, which provide 50% of the region's precipitation and cause most of the Russian River's floods.

FIRO is a management strategy that uses data from watershed monitoring and modern weather and water forecasting to help water managers selectively retain or release water from reservoirs in a manner that reflects current and forecasted conditions. FIRO's utilization of modern technology can optimize the use of limited resources and represents a viable climate change adaptation strategy.

The goal of FIRO is to update standard flood control guidelines in order to improve water supply and environmental outcomes without diminishing flood risk reduction or dam safety. Examples of tangible benefits include:

Improve Supply Reliability for Downstream Uses - When storms cause moderate-to-high reservoir levels, normal operation is to release water to re-establish flood control space. With FIRO, some of that water could be retained for future supply as long as no major precipitation is predicted for several days and it can be demonstrated that the retained water can be released past downstream flood prone areas before the arrival of the next storm. This strategy will permit earlier supply capture in some years, improving summer season supply reliability for downstream water users and improving the timing and volume of releases to protect water quality and provide flows needed for recovery of fish populations.

Enhance Flood Risk Reduction - When a storm is predicted to cause flooding, normal operations call for release of reservoir water and drawdown of water levels. With FIRO, release decisions would consider weather observations and predictions, which, in some cases, would indicate greater drawdown for flood risk reduction so long as there is confidence that the amount of precipitation and runoff will restore reservoir levels for water supply after the storm.

PROJECT STATUS A workshop was held in August 2014, at University of California San Diego/Scripps Institution of Oceanography. Thirty-two representatives from multiple agencies met for three days to scope out an appraisal-level FIRO study. A work plan is now being drafted for release in early 2015. The FIRO study is expected to occur over the next five years (depending on funding).

Tangible outcomes from the full Lake Mendocino FIRO study will include identification, assessment and enhancement of the best science available to improve operations to maximize flood control, water supply and ecosystem benefits. The evaluation will identify realistic, short-term steps to provide more accurate and timely information about weather and watershed conditions. In addition to benefitting Lake Mendocino, the project has transferability potential throughout the western U.S.

CONTACTS/STEERING COMMITTEE CO-CHAIRS:

Jay Jasperse (FIRO Co-Chair), Chief Engineer, Sonoma County Water Agency
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F. Martin Ralph (FIRO Co-Chair), Director, Center for Western Weather and Water Extremes at UC San Diego's Scripps Institution of Oceanography 858.822.1809 • mralph@ucsd.edu

