# FIRO AT SEVEN OAKS DAM

Will assess alternative operations of the dam to optimize for water supply availability and downstream habitat enhancement while maintaining or potentially improving flood risk management.

## SEVEN OAKS DAM FIRO STEERING COMMITTEE

FIRO at Seven Oaks Dam is a collaborative research and operations partnership consisting of an interdisciplinary team of scientists, water managers, dam operators, and environmental experts. Water management needs inform the research required to optimize operations of the dam and results of this research are used for improving water conservation, managing flood risk, and improving downstream habitat. The Steering Committee represents these interests in an integrated way and members work together to produce the studies needed to assess FIRO operations.

### STEERING COMMITTEE CO-CHAIRS

**Dr. Cary Talbot, FIRO Program National Lead**
Engineer Research and Development Center, USACE

**Dr. F. Martin Ralph, Director**
Center for Western Weather and Water Extremes
Scripps Institution of Oceanography, UC San Diego

**Heather Dyer, CEO/ General Manager**
San Bernardino Valley Municipal Water District

### STEERING COMMITTEE MEMBERS

Scripps Institution of Oceanography

Center for Western Weather and Water Extremes
Scripps Institution of Oceanography at UC San Diego

San Bernardino Valley | A Regional Water Agency Since 1954

US Army Corps of Engineers®

OC Public Works

San Bernardino County

Department of Water Resources · State of California

U.S. Fish & Wildlife Service · Department of the Interior

National Oceanic and Atmospheric Administration · NOAA · U.S. Department of Commerce

Western Water · Powered by water. Driven by service.

San Bernardino Valley Water Conservation District
Helping Nature Store Our Water

Orange County Water District · Since 1933

MORE INFORMATION:

**Visit Website:** https://cw3e.ucsd.edu | **Contact:** Greg Woodside at gregw@sbvmwd.com

# FIRO
## FORECAST INFORMED RESERVOIR OPERATIONS
### AT SEVEN OAKS DAM

Forecast Informed Reservoir Operations (FIRO) is an innovative approach that uses modern weather forecasting technology and enhanced monitoring to selectively retain or release water from reservoirs in anticipation of future conditions. FIRO leverages improved forecasts of atmospheric rivers, which are responsible for nearly half of all water supply and over 95% of all flood damages in California. FIRO is being explored at Seven Oaks Dam to maximize groundwater recharge and downstream habitat while ensuring flood risk management objectives are met or exceeded. The FIRO study will evaluate strategically managing releases from the dam in concert with downstream channel modifications to restore alluvial fan habitat for endangered species.

## CONNECTING INFRASTRUCTURE & THE ENVIRONMENT

### WEATHER WHIPLASH

Climate change is increasing the intensity of the largest precipitation events and causing larger swings between wet and dry cycles.

### WATER RESOURCES

Selectively retaining and releasing water from Seven Oaks Dam using improved weather forecasting can maximize groundwater recharge for people and restore endangered species habitat.

### ECOSYSTEM

This area is home to a diverse range of endangered plants, mammals, reptiles and fish, including the San Bernardino Kangaroo Rat, Santa Ana River Woolly Star, Slender-Horned Spineflower, and Santa Ana Sucker.

### CLIMATE RESILIENCE

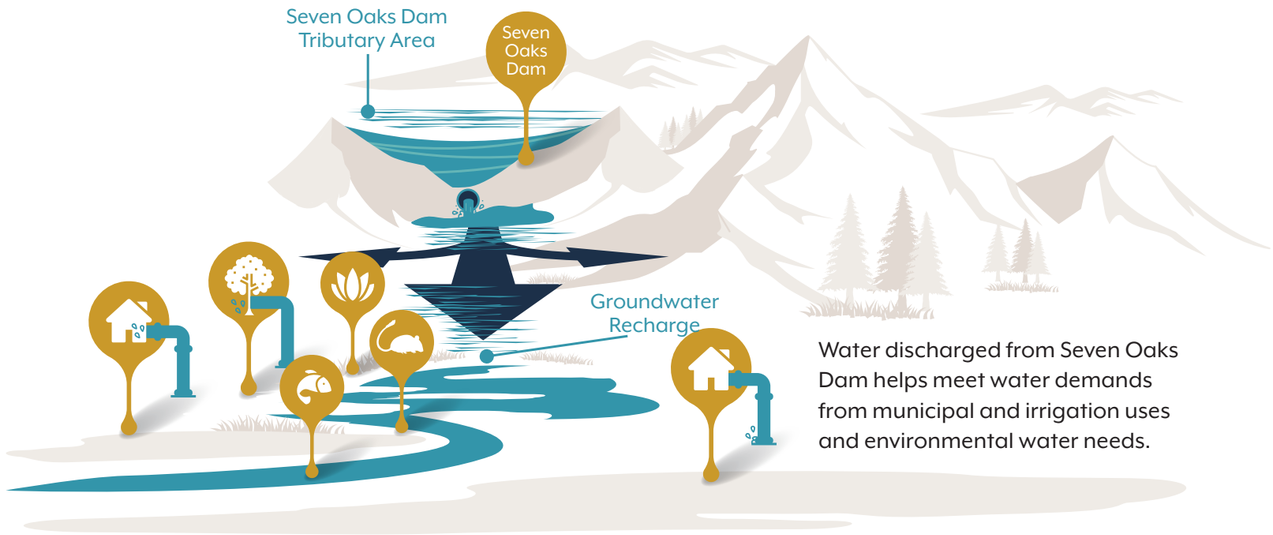
Utilizing existing infrastructure such as Seven Oaks Dam to increase water supply availability helps people and the environment be resilient in a changed climate.

## SEVEN OAKS DAM AT A GLANCE

| 1999 | 2,980 | 550 | 177 | $450 | 145,600 |
|---|---|---|---|---|---|
| **Completion Date** | **Feet Crest Length** | **Feet High** | **Square Mile Drainage Area** | **Million Construction (1990's Cost)** | **Acre-Feet Capacity for Flood Risk Management** |

Seven Oaks Dam was constructed for flood risk management but is not authorized to capture water for groundwater recharge. Although the existing operation of the dam provides some incidental water conservation benefits, it may be possible to increase the opportunity to conserve more water with improved forecast skills. FIRO will assess options for adjusting the timing of releases to optimize recharge while maintaining if not enhancing flood risk management.

## MULTI-BENEFICIAL OPPORTUNITIES IN THE WATERSHED



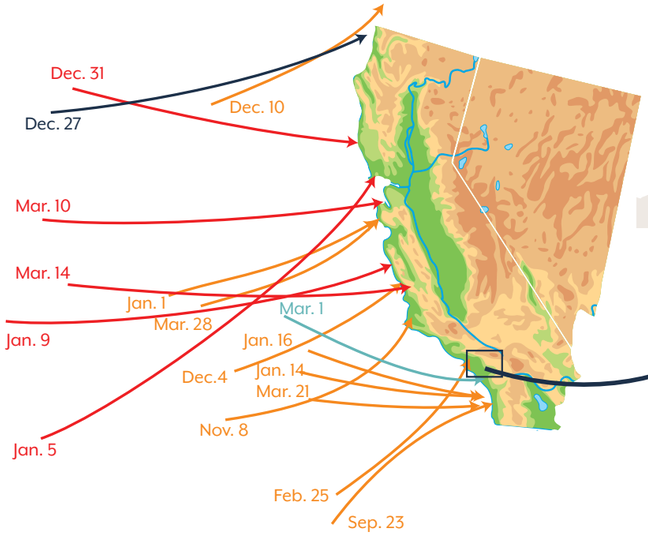

Water discharged from Seven Oaks Dam helps meet water demands from municipal and irrigation uses and environmental water needs.

Santa Ana River Watershed

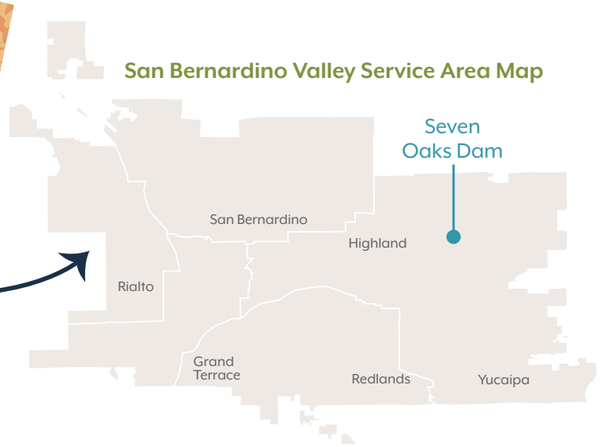
## ATMOSPHERIC RIVERS

Atmospheric rivers are long, narrow bands of concentrated water that, when they make landfall, can produce massive amounts of rain or snow. In the winter of 2022-2023, 17 atmospheric rivers affected California and produced the majority of snow at Big Bear (up to 240 inches) and over 14 inches of rain in the Santa Ana Basin. Accurately predicting the location, duration and runoff volume anticipated due to occurrence of atmospheric river storms is foundational to FIRO.

### Atmospheric Rivers that Impacted California In Water Year 2023




### San Bernardino Valley Service Area Map




**Ralph/CW3E AR Strength Scale**

- Weak: IVT=250-500 kg $m^{-1}$ $s^{-1}$
- Moderate: IVT=500-750 kg $m^{-1}$ $s^{-1}$
- Strong: IVT=750-1000 kg $m^{-1}$ $s^{-1}$
- Extreme: IVT=1000-1250 kg $m^{-1}$ $s^{-1}$
- Exceptional: IVT>1250 kg $m^{-1}$ $s^{-1}$

## CHALLENGES AND OPPORTUNITIES

Floods and droughts are becoming more extreme - we need to manage our water resources to be more resilient to these impacts.

**Seven Oaks Dam is ideally situated to provide significant water supply benefits to people in the region, located upstream of substantial groundwater recharge facilities in the San Bernardino Basin.**

The San Bernardino Basin area needs approximately 50,000 acre-feet per year more water.

**Seven Oaks Dam has over 100,000 acre-feet of storage space; the FIRO study will evaluate if some of the storage space can be temporarily used to capture stormwater for additional water supply by providing discharge from the dam to local water agencies for groundwater recharge, while not compromising the project's primary mission for flood risk management.**

The Santa Ana River Watershed is home to multiple threatened and/or endangered species.

**Reconnecting nature with the water resources on which they depend is central to the region's ecosystem-based conservation strategy.**

Seven Oaks Dam FIRO needs to evaluate, analyze, and assess a dynamic project area with overlapping regulatory jurisdictions.

**A team of professionals and volunteers are dedicated to maximizing the benefits of our public infrastructure investments while protecting the ecology and unique heritage that defines this landscape and reflects our values.**

## FLOWING THROUGH THE FIRO TIMELINE

The Seven Oaks FIRO Steering Committee has begun a FIRO study to assess if forecasts of atmospheric rivers can be used to inform flexible reservoir operations at Seven Oaks Dam to optimize multiple benefits.

**2023** Creation of Steering Committee

**2024**
Publication of Workplan
Technical Studies Final Report

**2026**
Preliminary Viability Assessment
Request FIRO Operations Deviation from Water Control Manual

**2028** Final Viability Assessment

Water Control Manual Update