Flood-MAR
Using Floodwater for Managed Aquifer Recharge

Groundwater Tour
Water Education Foundation
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California’s Water Management
A Tale of Extremes

Historic Flood Events
- 1969-1970
- 1972
- 1974-1976
- 1978
- 1980
- 1983-1986
- 1993
- 1995
- 1997
- 1998
- 2002
- 2004
- 2006
- 2008
- 2011
- 2016-2017

Historic Drought Periods
- 1976-1977
- 1987-1992
- 2007-2009
- 2012-2015

Too Little
Folsom Reservoir, 1976

Too Much
Effects of Climate Change Necessitate Wholesale System Changes
Systemic & Institutional Challenges
Overcoming them Increases Return on Investment

- Fragmented and uncoordinated decisions, initiatives & actions
- Inconsistent, inflexible, & conflicting regulations
- Insufficient capacity for data-driven decision-making
- Insufficient & unstable funding
- Inadequate performance tracking
For Sustainability -- Need to Align & Integrate Water Management Sectors

- Multi-Sector Collaboration
- Multi-Discipline Planning
- Multi-Benefit Projects
- Multi-Fund Investments
What is Flood-MAR?

Using high flows from, or in anticipation of, rainfall or snowmelt, for managed aquifer recharge on agricultural lands, working landscapes, and natural managed lands.
Flood-MAR is also...

- ... an integrated & voluntary management strategy to improve water resources sustainability & climate resiliency
- ... multi-sector (flood, surface & groundwater, ecosystem, quality)
- ... scalable (farm, GSA, basin, region, watershed)
- ... multi-faceted (reoperation, conveyance, storage, recharge, banking, transfers, cultivation, restoration, etc.)
- ... an untapped part of California’s water portfolio
State Recommends Flood-MAR

• State Board of Food & Agriculture letter (May 2018)
• CA Water Plan Update 2018 Public Draft (Dec. 2018)
Example Components of Flood-MAR Projects

- Forecast-Informed Reservoir Operations
- Reservoir Recharge Pool
- New/Expanded Reservoir Outlet Works
- New/Expanded Conveyance to Recharge Areas
- New/Expanded Flood Bypasses/Floodplains
- Suitable Recharge Areas, such as some agricultural lands or other working landscapes
- Landowner Compensation/Recharge Credits
- Suitable Recharge Methods
- Suitable Aquifers
- Ecosystem Enhancement Features
Public Benefits of Flood-MAR

- Flood risk reduction
- Drought preparedness
- Aquifer replenishment
- Ecosystem enhancement
- Groundwater remediation/water quality
- Working landscape preservation and stewardship
- Climate change adaptation
- Recreation and aesthetics

Public benefits defined in Proposition 1

Green Infrastructure
Flood-MAR Implementation Factors

Governance and Coordination: How will project needs be coordinated?
- Landowner willingness
- Local or system needs and opportunities
- Partnerships and agreements
- Coordination and operations decisions
- Legal/regulatory framework

Funding and Incentives: How will project be funded and landowners compensated?
- Available funding sources
- Landowner incentive or compensation programs
- Recharge quantification

Source Water: Where will the surface water come from?
- High flows
- Reservoir reoperation
- Timing and quantity of flows
- How are flows expected to change in the future?

Conveyance: How will surface water get to the site?
- Existing infrastructure
- New infrastructure

Site Suitability: Where are good candidate sites for recharge?
- Soil suitability
- Crop suitability
- Aquifer suitability
- Aquifer capacity
- Aquifer water quality
- Vadose zone water quality

Recharge Method: How will the water get into the ground?
- On-farm
- Fallowed land
- Dedicated basin
- In-lieu
- Direct injection

Groundwater Use: How will groundwater be recovered or otherwise used?
- Groundwater extraction wells
- Beneficial Uses
- Augmentation of groundwater for replenishment/restoration

Feasibility Analysis: Is the project feasible?
- Benefits and beneficiaries
- Costs and impacts
- Agreements and assurances
Potential Barriers to Flood-MAR Implementation

• Cooperation and Governance – trust, sector coordination, operations agreements

• Legal – water rights, regulations, permitting

• Policy – public benefit, beneficial use, landowner compensation/incentives

• Implementation – land use, recharge/recovery suitability, conveyance, reservoir operations, economics, funding
Current Plans and Activities

• Fact Sheet
• White Paper
• Draft Research & Data Development Framework
• Merced River Basin Conceptual Study
• Tuolumne River Climate Vulnerability Study
• Convened Research Advisory Committee
What Can I Do?

- **Landowners** -- Look for project opportunities and expand partnerships
- **Academia and Private Researchers** -- Continue to fill data gaps and conduct pilot projects
- **NGOs and Other Stakeholders** -- Encourage broad public benefits and look for partnership opportunities
- **Gov’t Agencies** -- Provide technical and facilitation assistance (financial assistance, when available)
- **Regulators** -- Streamline processes and provide compliance assistance
- **Policy- and Decision-Makers** -- Authorize & fund agencies to remove barriers, conduct research, and support projects
Questions?

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www.water.ca.gov/Programs/All-Programs/Flood-MAR