A Joint Study by:

U.S. Bureau of Reclamation
Mid-Pacific Region

California Department
of Water Resources

Upper San Joaquin River Basin Storage Investigation

Public Meeting

CALFED
BAY-DELTA
PROGRAM

April 13, 2005

AGENDA

- Introduction and Background
- Initial Alternatives Overview
  - Surface Storage Option Screening
  - Water Operations
  - Conjunctive Management
- Next Steps

Objectives for Upper San Joaquin Storage

Enlarge Millerton Lake by 250 to 700 TAF

OR

Develop a functionally equivalent program to store San Joaquin River flow

DEVELOP AND MANAGE WATER SUPPLY TO:

- Contribute to restoration of the San Joaquin River
- Improve water quality of the San Joaquin River
- Facilitate conjunctive water management and exchanges that improve urban water quality

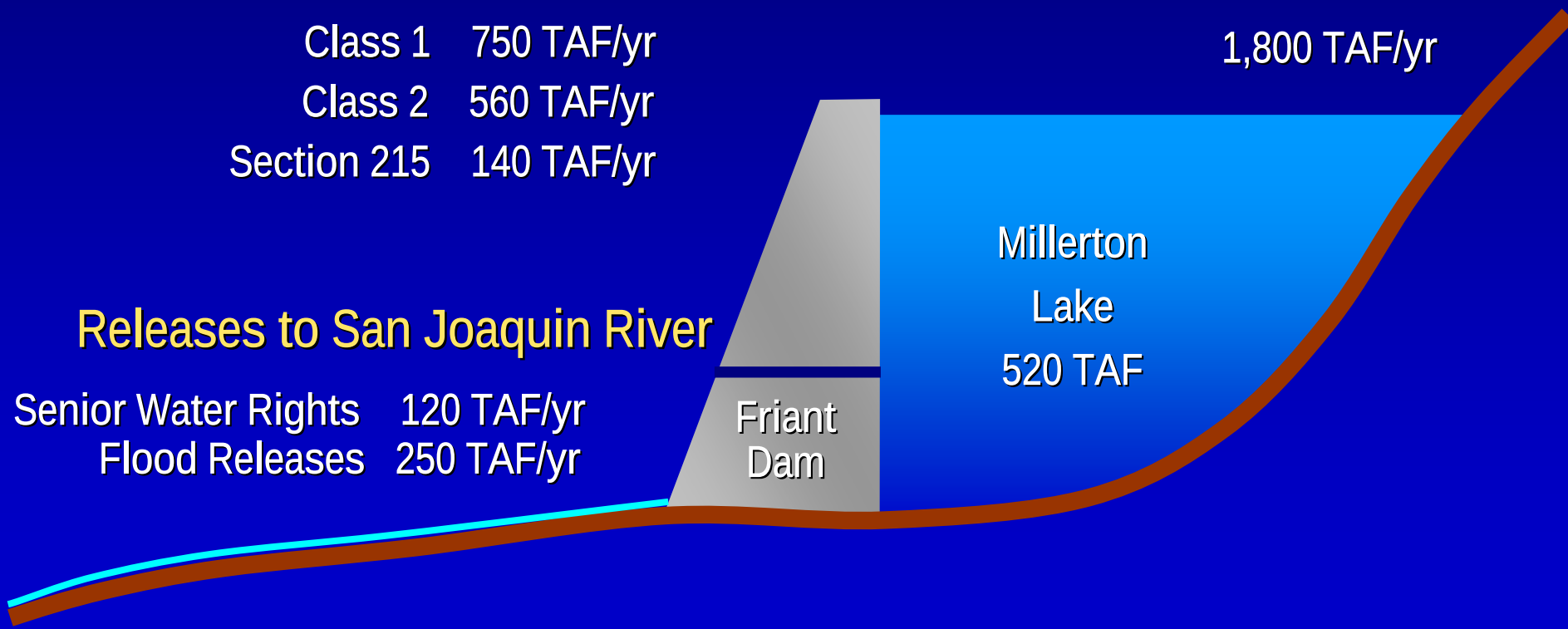
Average Annual Water Supply at Friant Dam

Releases to Friant-Kern and Madera Canals

Class 1	750 TAF/yr
Class 2	560 TAF/yr
Section 215	140 TAF/yr

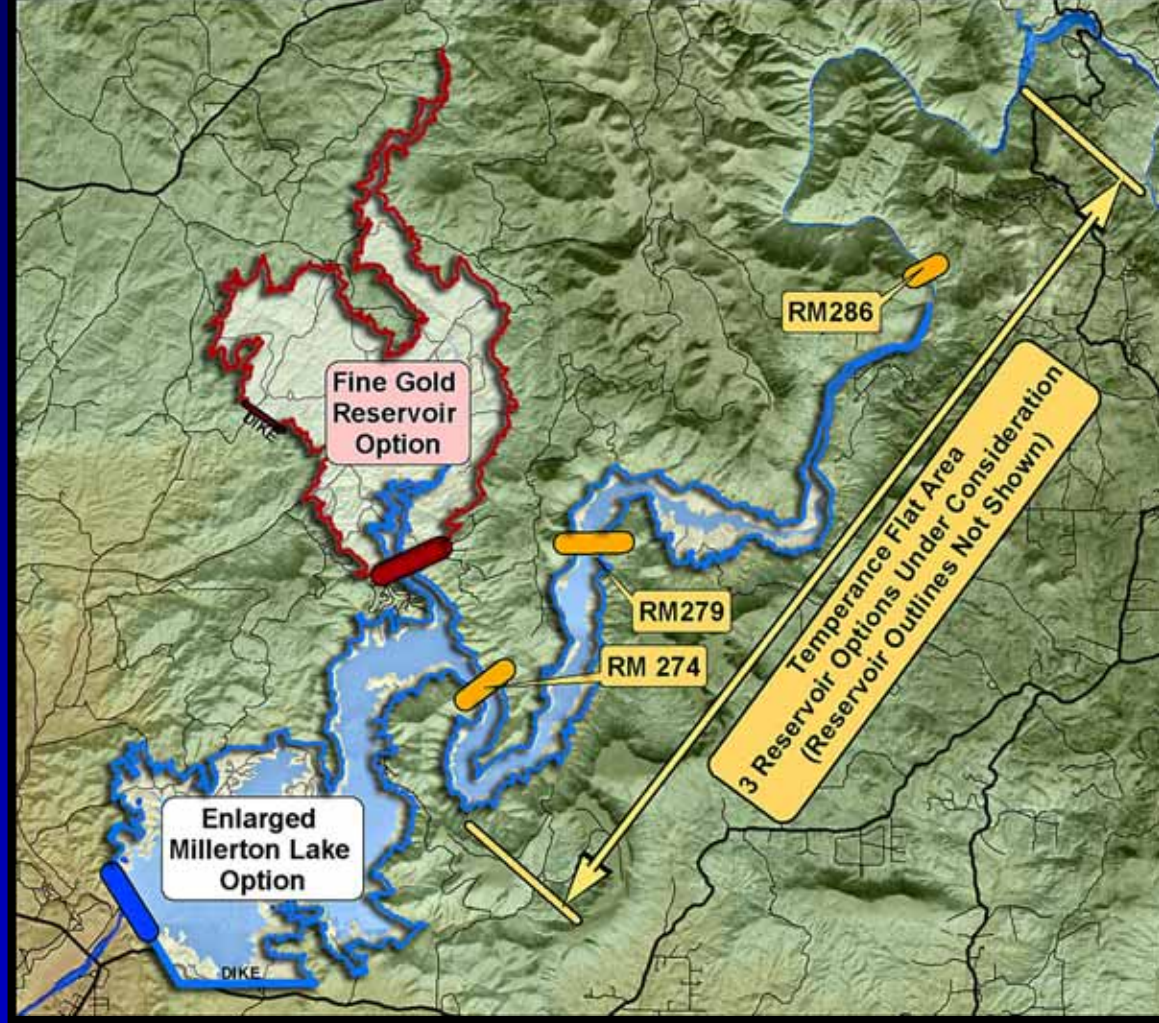
Releases to San Joaquin River

Senior Water Rights	120 TAF/yr
Flood Releases	250 TAF/yr

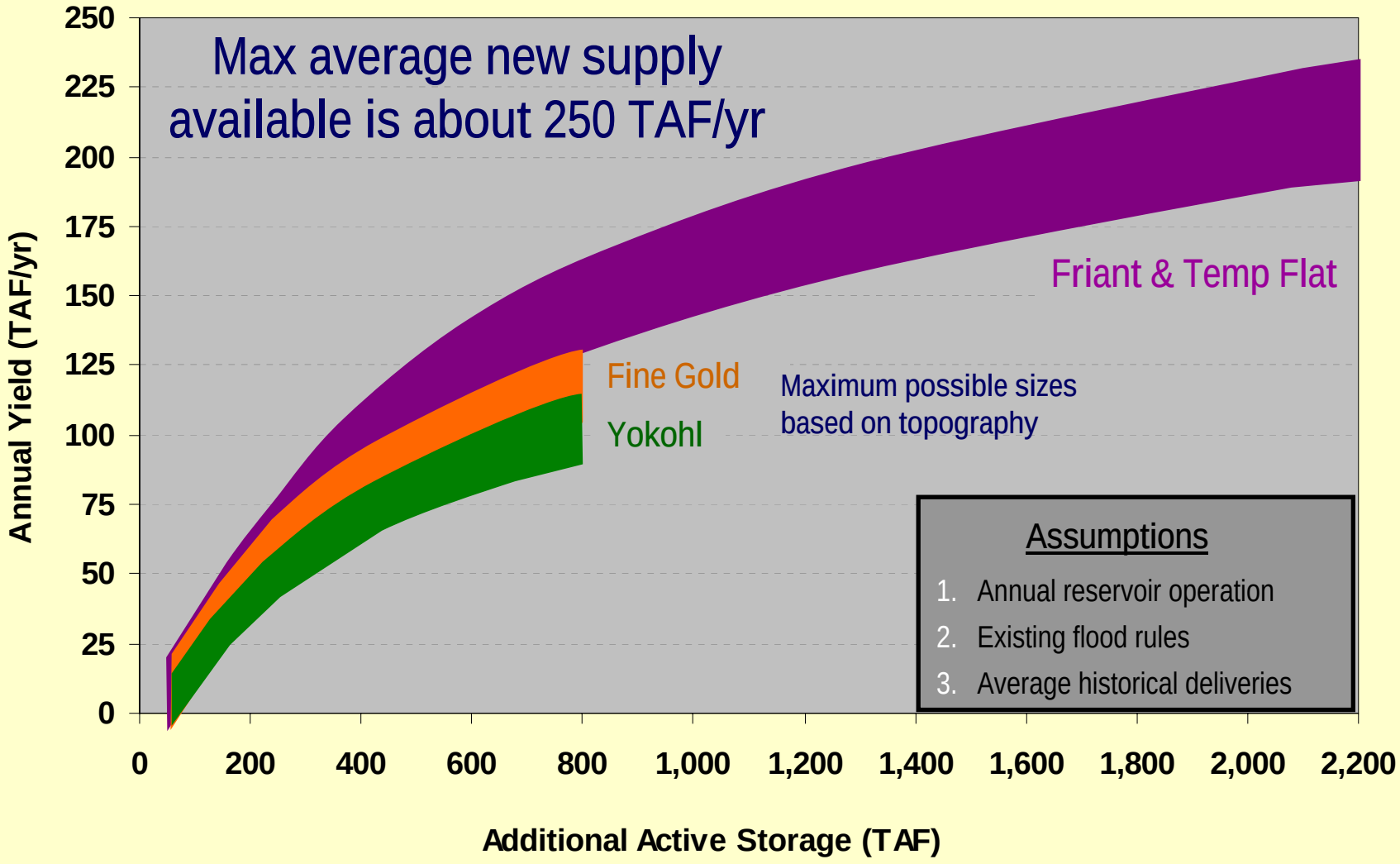


Surface Storage Options Retained from Phase 1

- San Joaquin River
  - Raise Friant Dam
  - Temperance Flat
    - RM 274
    - RM 279
    - RM 286
- Off-Stream
  - Fine Gold Creek
  - Yokohl Valley



New Water Supply From Additional Surface Storage



Key Findings from Phase 1

- Six surface storage options were retained
  - Costs are within range of other projects elsewhere in California
  - All options affect power generation or use
- Additional storage could allow management of new and existing water supplies to support multiple purposes
  - River restoration, River water quality, Water supply reliability
- Public support for continued study of storage is strong
- Regional interest in conjunctive management is high

Additional Potential Benefits of New Storage

- Flood protection below Friant Dam
- Hydropower generation
- Recreation

Alternatives Formulation Approach and Schedule

- Screen Storage Options
- Develop Operational Scenarios
- Define Initial Alternatives
- Evaluate Initial Alternatives
- Determine Benefits and Costs
- Define Final Alternatives
- Conduct Impact Analysis
- Evaluate Final Alternatives
- Complete Cost Allocation
- Recommend Preferred Alternative

Initial Alternatives Information Report

Spring 2005

Plan Formulation Report

Summer 2007

Draft FR/ EIS/EIR

Summer 2008

Final FR/ EIS/EIR

Summer 2009

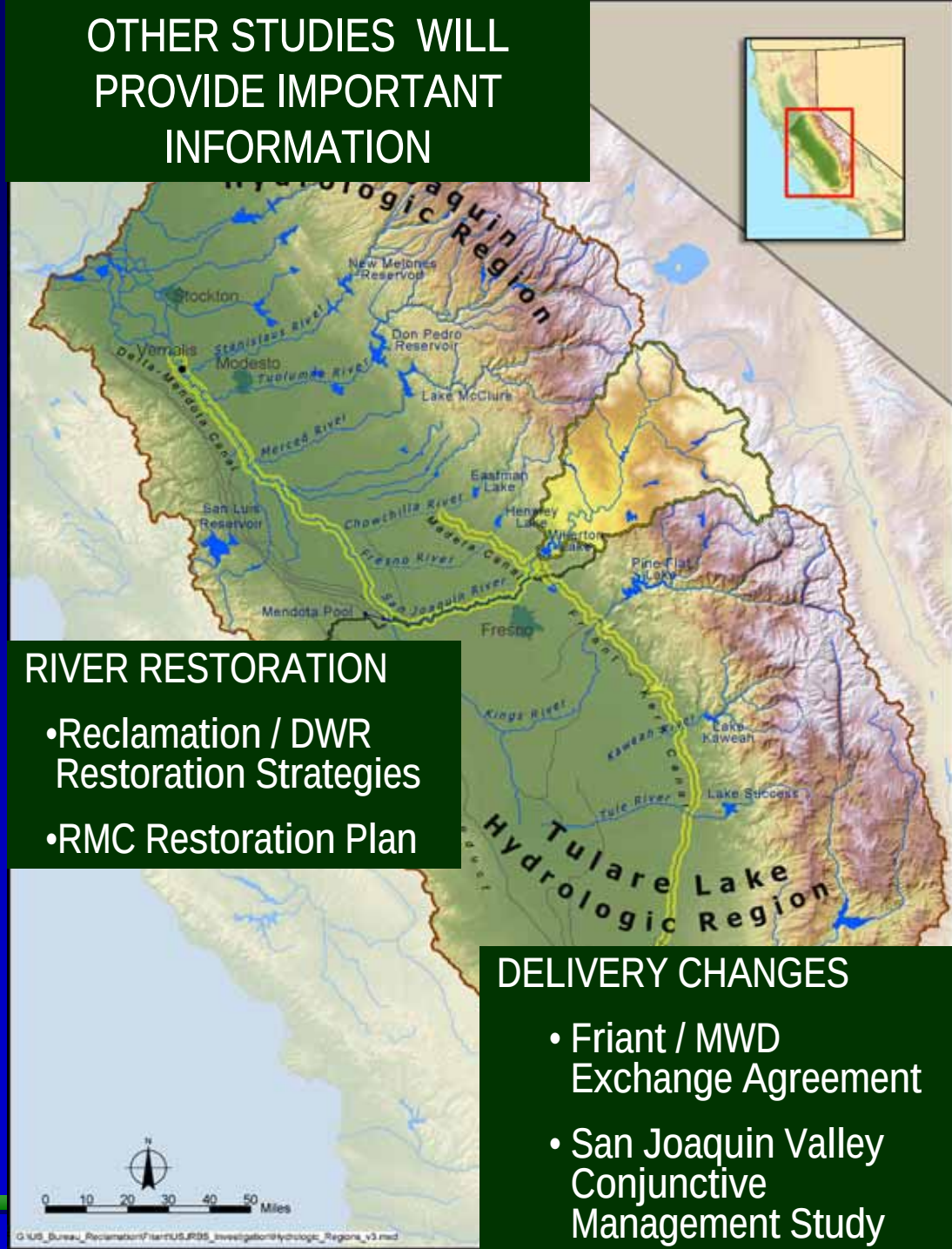
ROD

Fall 2009

Area Potentially Affected by New Water Storage

- Eastern San Joaquin Valley
  - CVP Friant Division
  - Groundwater basin
- San Joaquin River
  - Friant to Merced River
  - Merced River to Delta
- South of Delta Service Area

OTHER STUDIES WILL PROVIDE IMPORTANT INFORMATION



RIVER RESTORATION

- Reclamation / DWR Restoration Strategies
- RMC Restoration Plan

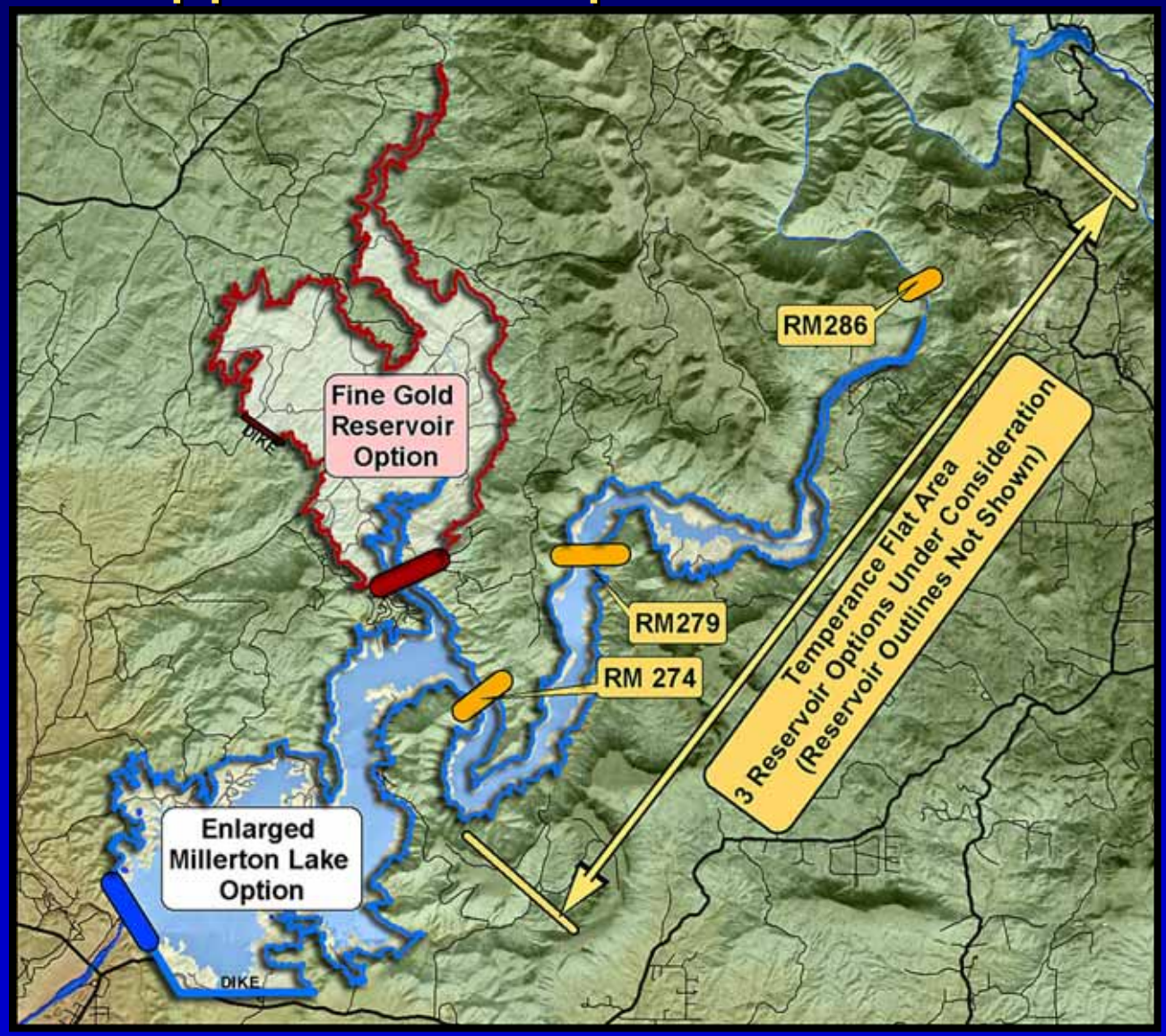
DELIVERY CHANGES

- Friant / MWD Exchange Agreement
- San Joaquin Valley Conjunctive Management Study

Initial Alternatives Overview

Surface Storage Option Screening

Storage Options in the Upper San Joaquin River Basin

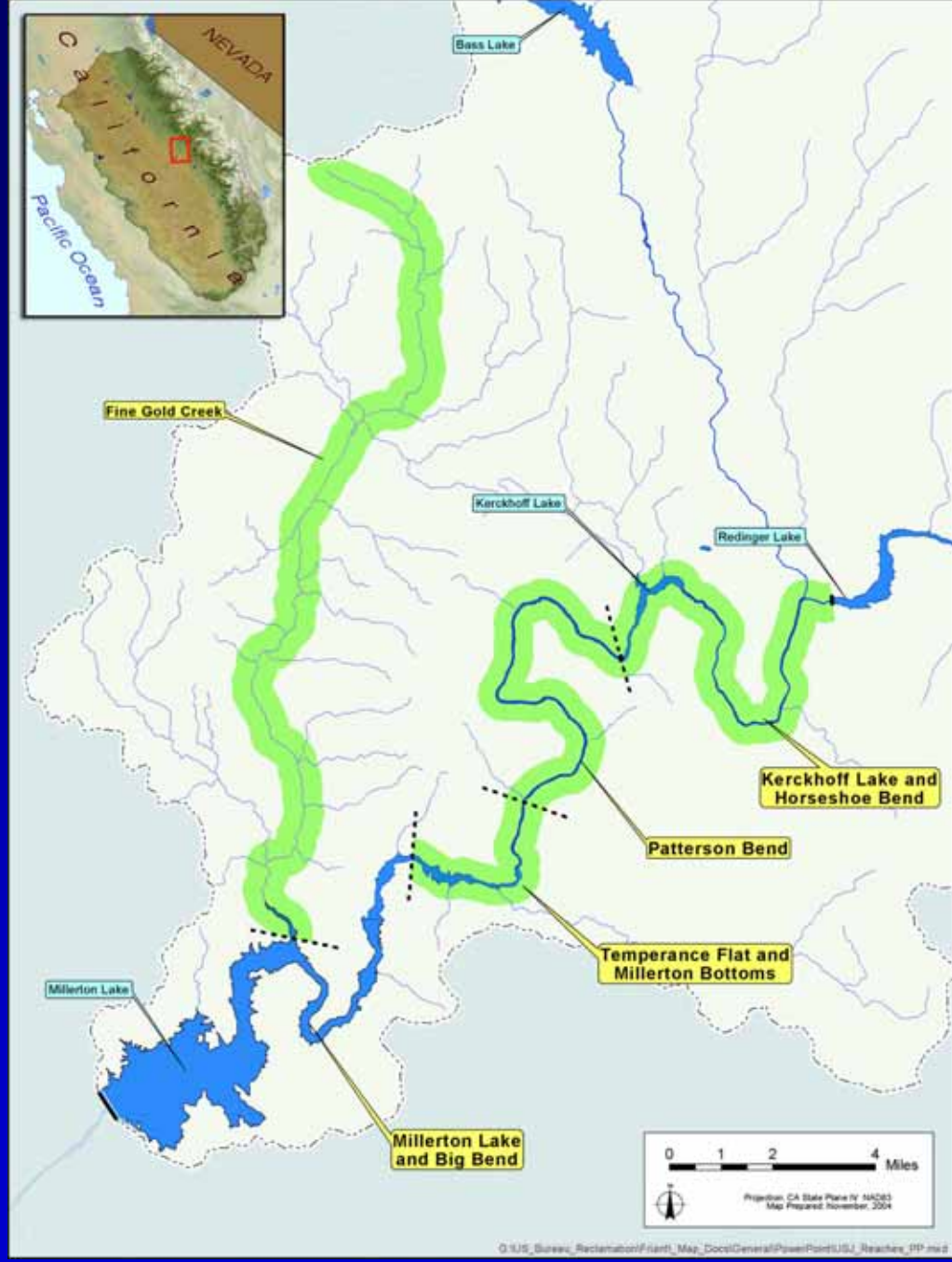


Approach to Screening Surface Storage Options

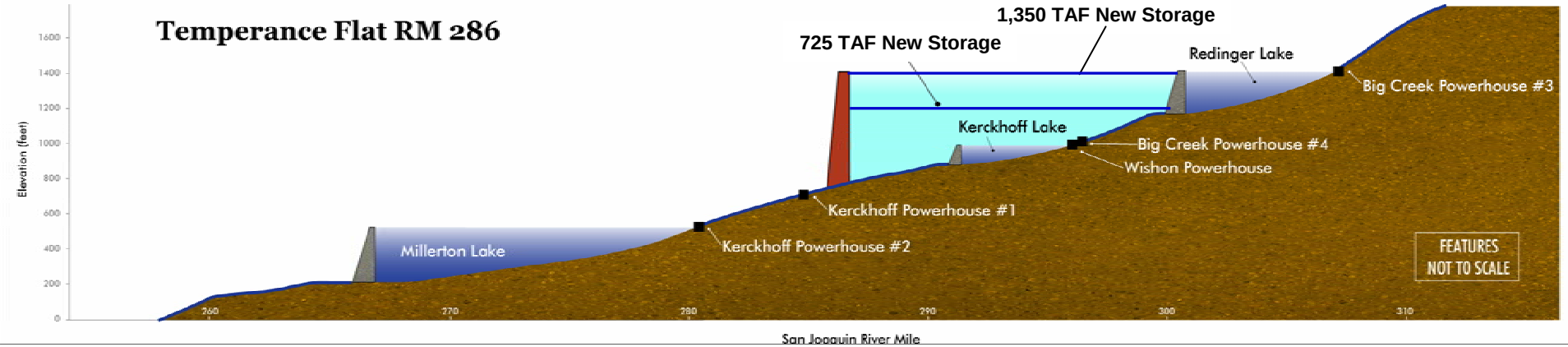
- Identify range of reservoir sizes at each site
- Identify significant cost and environmental changes
- Select options for each site
  - Range of sizes
  - Replacement power options where relevant
- Compare sites with similar yield
  - Consider cost, power, and environmental issues

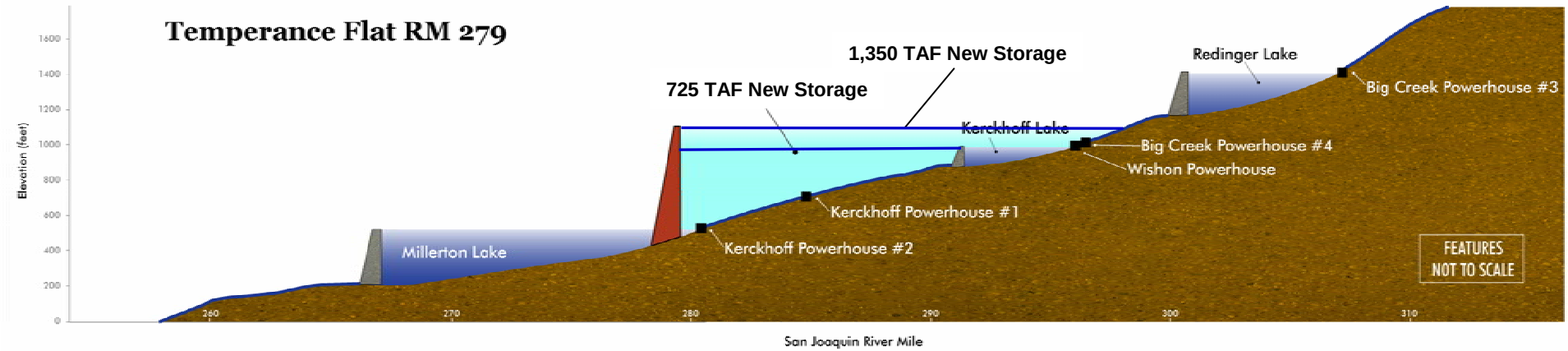
Reaches in the Upper San Joaquin River Basin

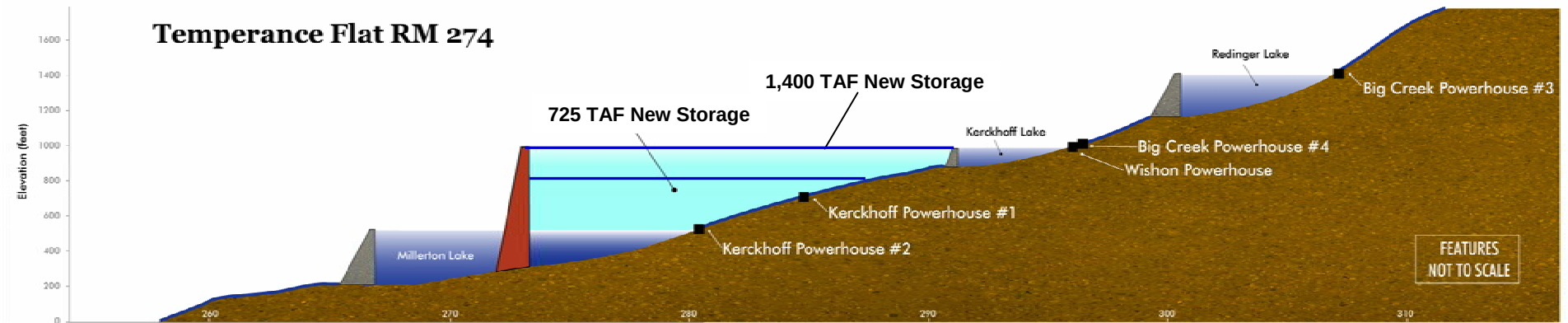
River Reach	From	To
Millerton Lake/ Big Bend	Friant Dam	RM 280
Temperance Flat/ Millerton Bottoms	RM 280	RM 284
Patterson Bend	RM 284	Kerckhoff Dam
Horseshoe Bend	Kerckhoff Dam	Redinger Dam
Fine Gold Creek	Millerton Lake	Fine Gold Creek headwaters



Temperance Flat Reservoir Options







Why is Hydropower Important?

- Primary source of renewable energy in the U.S.
- Generating costs are the lowest of all sources of electricity
- Constitutes 10 - 27% of California's annual energy supply
- In Upper San Joaquin River Basin, 19 powerhouses with total capacity of almost 1,300 MW, which represents about 9% of the hydropower generation capacity in California
- Many of the surface storage options would affect existing hydropower facilities

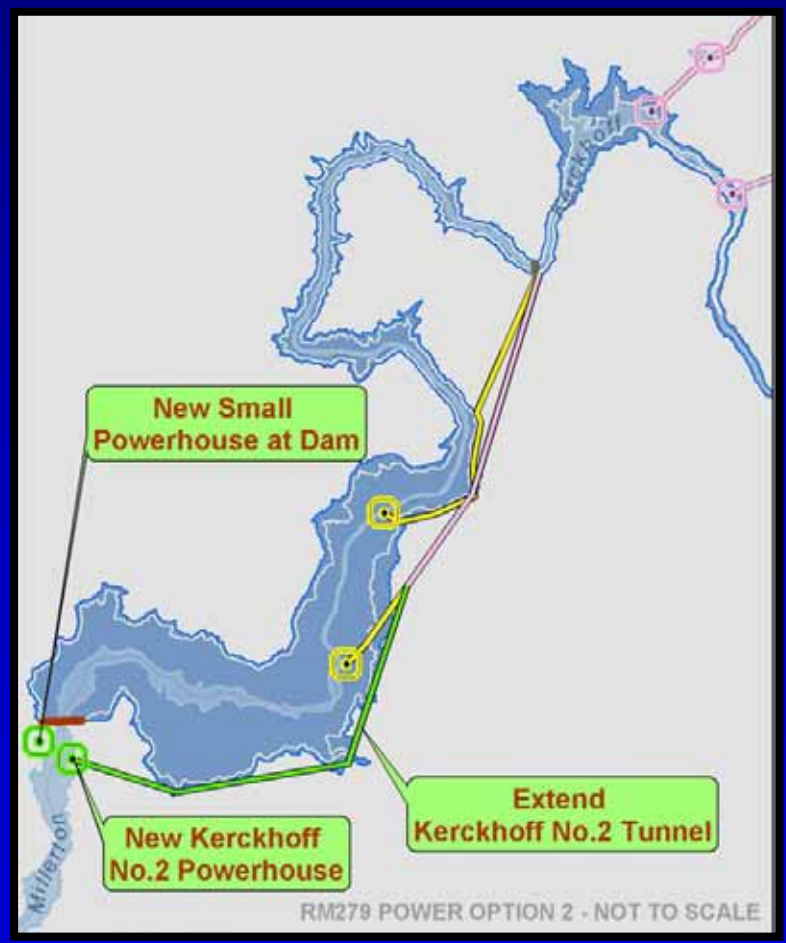
Example Replacement Power Options - RM 279

Option 1

- Abandon Kerckhoff Project
- Large powerhouse at dam

Option 2

- Relocate Kerckhoff No. 2
- Small powerhouse at dam



Summary of Replacement Power Findings

- Study suggests no new net energy could be developed
- One site may provide full replacement power
  - RM 279 site with 725 TAF capacity
- Remaining replacement power costs depend on the projected future value of power

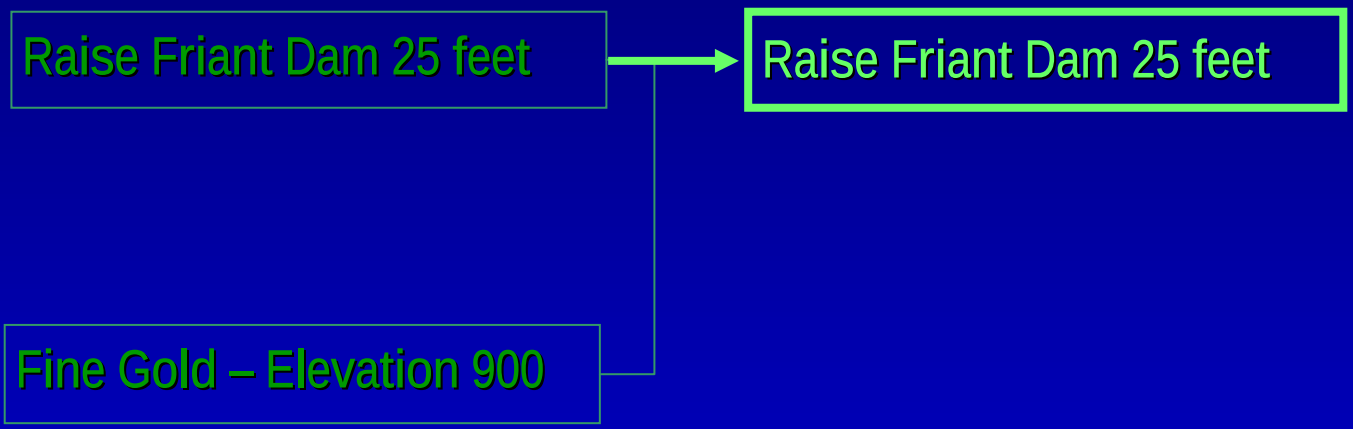
Surface Storage Measure Screening

Yield Range of 0 – 50 TAF/year

- Raise Friant Dam 25 feet
- Fine Gold – Elevation 900

Surface Storage Measure Screening

Yield Range of 0 – 50 TAF/year



Surface Storage Measure Screening

Yield Ranges of 50 – 100 TAF/year

- Raise Friant Dam 60 feet
- RM 274 – Elevation 800
- RM 279 –Elevation 900
- RM 286 –Elevation 1200
- Fine Gold –Elevation 1020
- Yokohl Valley – Elevation 800

Surface Storage Measure Screening

Yield Ranges of 50 – 100 TAF/year

Raise Friant Dam 60 feet

RM 274 – Elevation 800

RM 279 – Elevation 900

RM 279 –Elevation 900

RM 286 –Elevation 1200

Fine Gold – Elevation 1020

Fine Gold –Elevation 1020

Yokohl Valley – Elevation 800

Surface Storage Measure Screening

Yield Ranges of 100 – 150 TAF/year

- Raise Friant Dam 140 feet
- RM 274 – Elevation 865
- RM 279 – Elevation 985
- RM 286 – Elevation 1275
- Fine Gold – Elevation 1100

Surface Storage Measure Screening

Yield Ranges of 100 – 150 TAF/year

- Raise Friant Dam 140 feet
- RM 274 – Elevation 865
- RM 279 – Elevation 985 → RM 279 – Elevation 985
- RM 286 – Elevation 1275
- Fine Gold – Elevation 1100 → Fine Gold – Elevation 1100

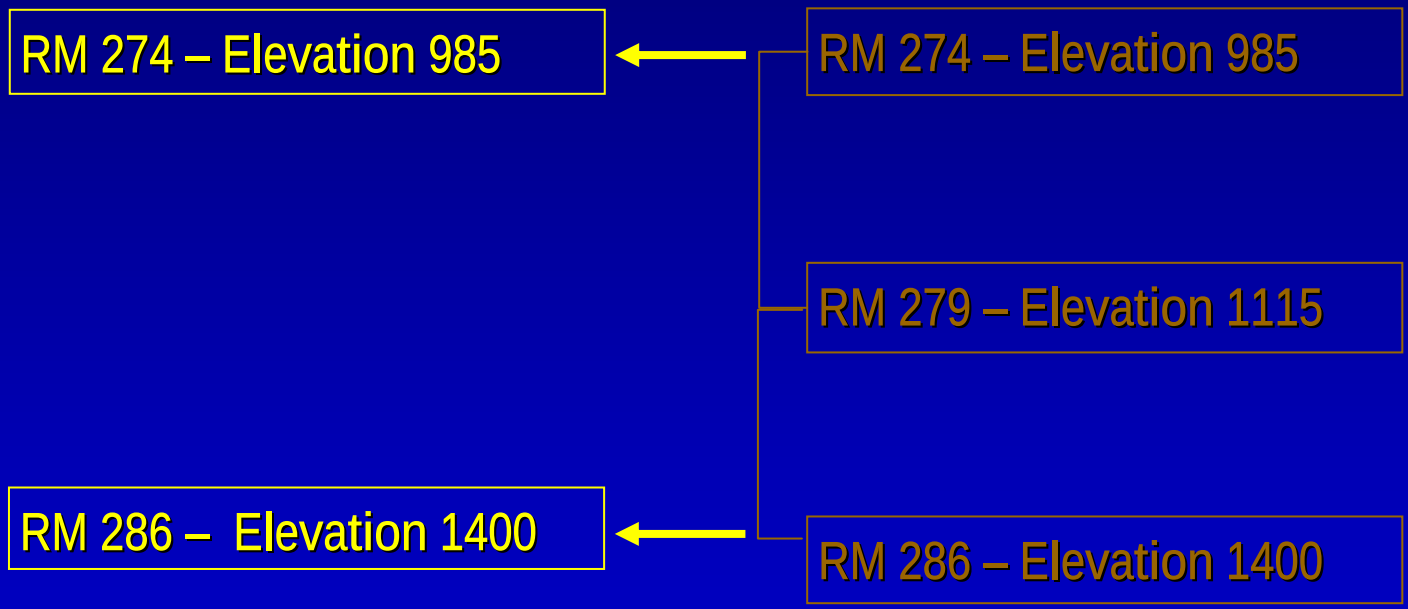
Surface Storage Measure Screening

Yield Ranges of 150 – 200 TAF/year

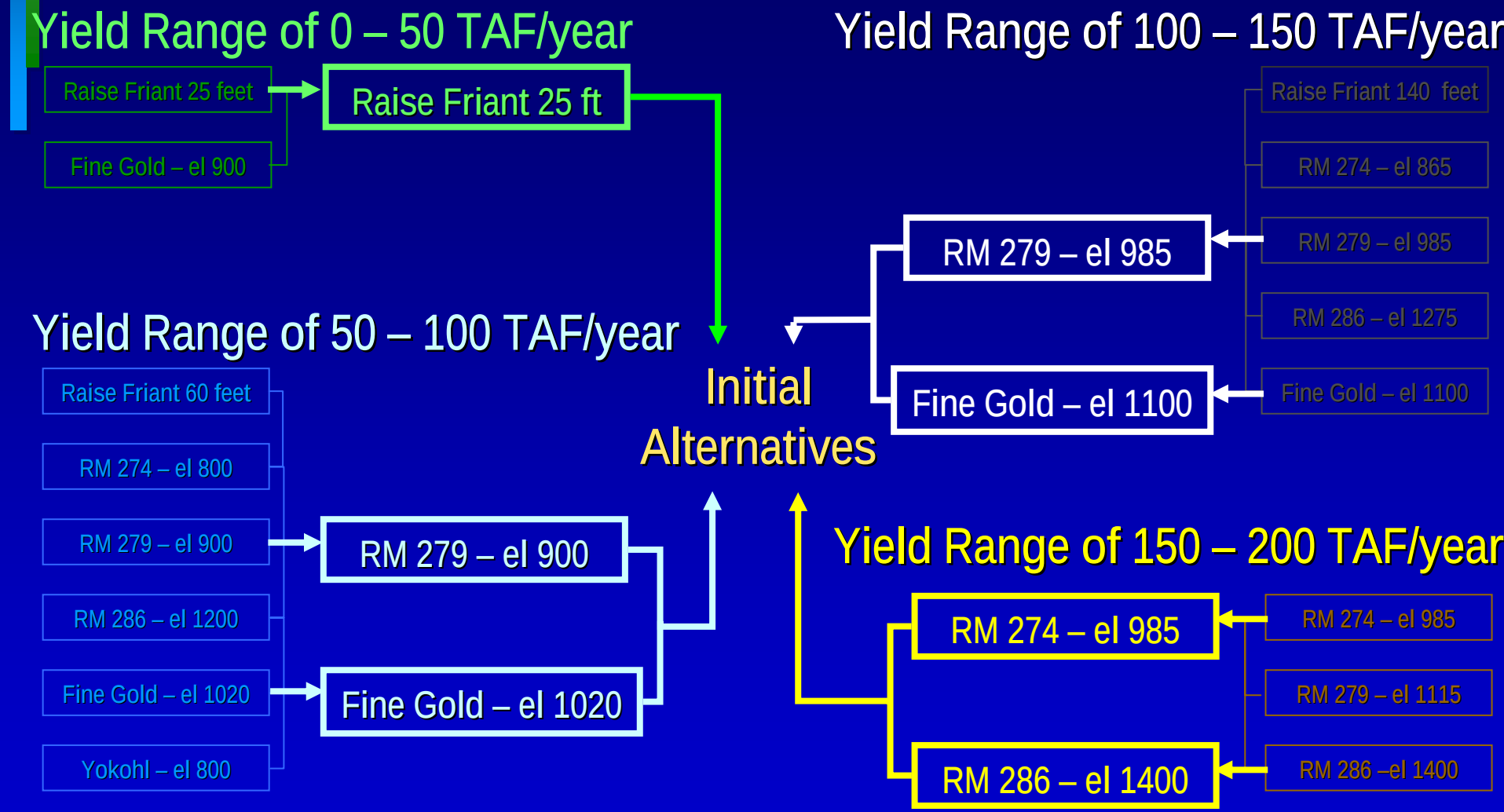
- RM 274 – Elevation 985
- RM 279 – Elevation 1115
- RM 286 – Elevation 1400

Surface Storage Measure Screening

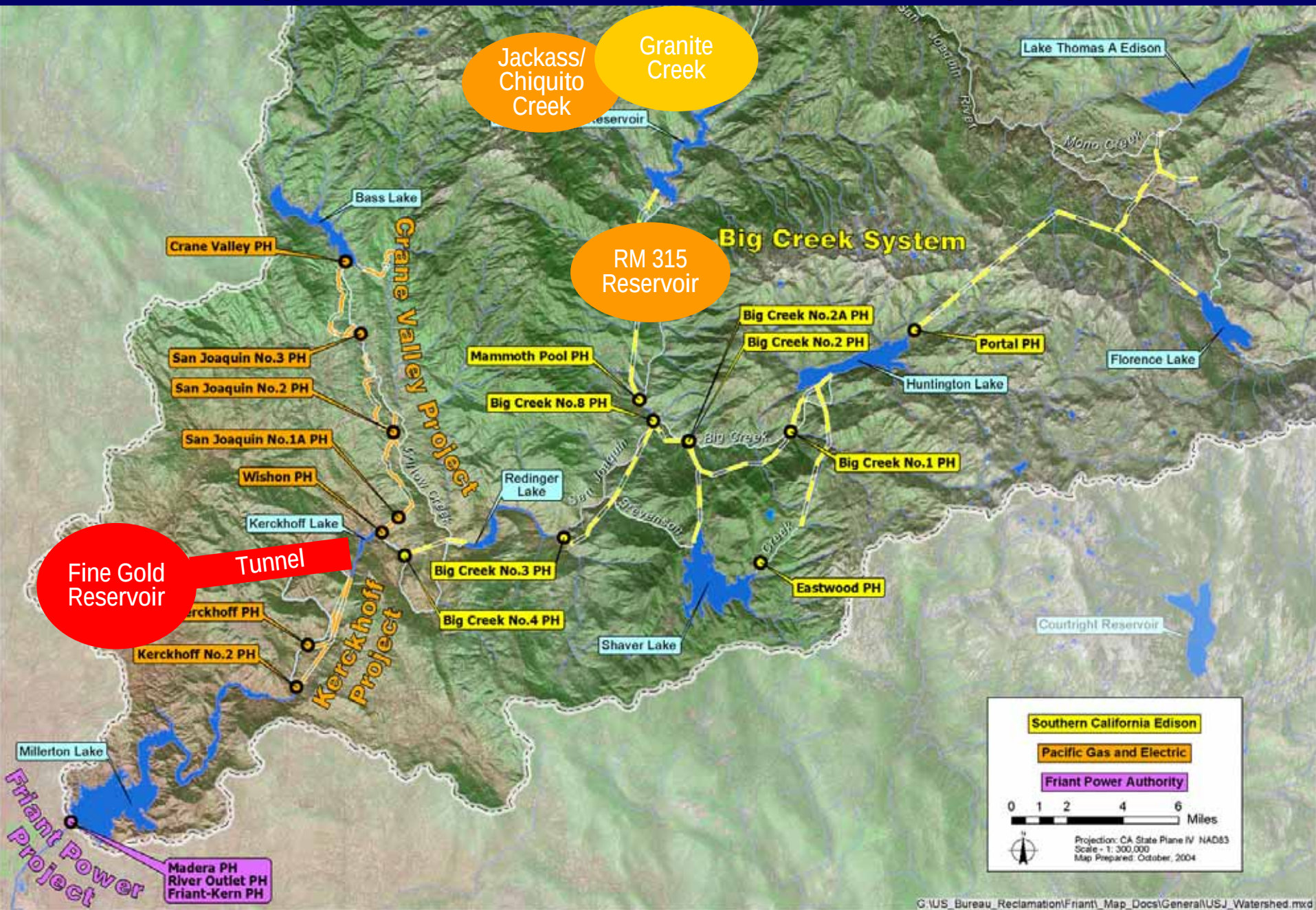
Yield Ranges of 150 – 200 TAF/year



Surface Storage Measure Screening

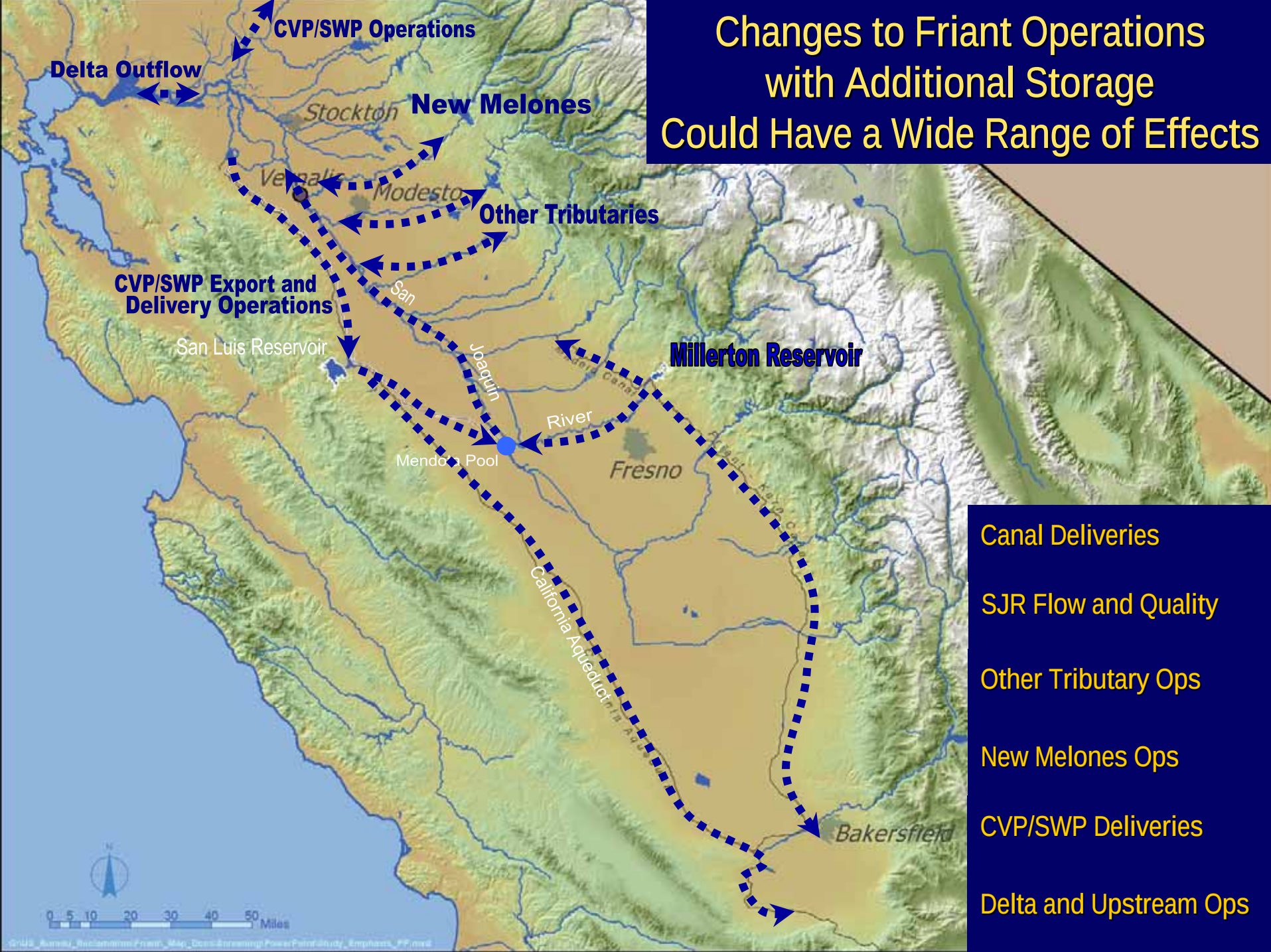


Suggestions for Avoiding Power Impacts



Initial Alternatives Overview

Water Operations


Changes to Friant Operations with Additional Storage Could Have a Wide Range of Effects
CVP/SWP Operations
Delta Outflow
New Melones
Other Tributaries
CVP/SWP Export and Delivery Operations
San Luis Reservoir
Millerton Reservoir
San Joaquin River
Mendota Pool
Fresno
Bakersfield
California Aqueduct
Stockton
Modesto
Canal Deliveries
SJR Flow and Quality
Other Tributary Ops
New Melones Ops
CVP/SWP Deliveries
Delta and Upstream Ops
0 5 10 20 30 40 50 Miles

Approach for Water Operations Analyses

- **Step 1:** Allocate Supply at Friant and Mendota Pool
  - Screening Model Based on CALSIM logic
  - Decisions at Friant - Canal or River Release
  - Decisions at Mendota Pool - Divert or Bypass
- **Step 2:** Estimate SJR Water Quality Effects in CALSIM
  - Mendota Pool to Lander Ave - Developed by Investigation
  - Lower San Joaquin River - Developed by Other Studies
- **Step 3:** Identify System-Wide Responses Using CALSIM

Allocation Decisions at Friant

Canal Diversions and River Releases

- Canal Diversions
  - Water quality exchanges
  - Conjunctive management enhancements
  - Supplemental deliveries
- River Releases
  - Objective of release - restoration or water quality
  - Divert releases at Mendota Pool - offset DMC deliveries
  - Bypass San Joaquin River releases past Mendota Pool

Primary Metrics for Water Operations

- Metrics for Operational Objectives
  - Changes in canal diversions
  - Increased prescribed river releases
  - Year-to-year diversion / release sustainability
  - San Joaquin River water quality
- Metrics for System Responses
  - Offset of DMC deliveries
  - CVP/SWP SOD deliveries
  - San Joaquin River flow / quality – New Melones
  - Other tributary operations depend on SJR conditions
  - Delta operations – interdependencies with CVP/SWP operations

Preliminary Scenarios Illustrate a Broad Range of Operational Decisions

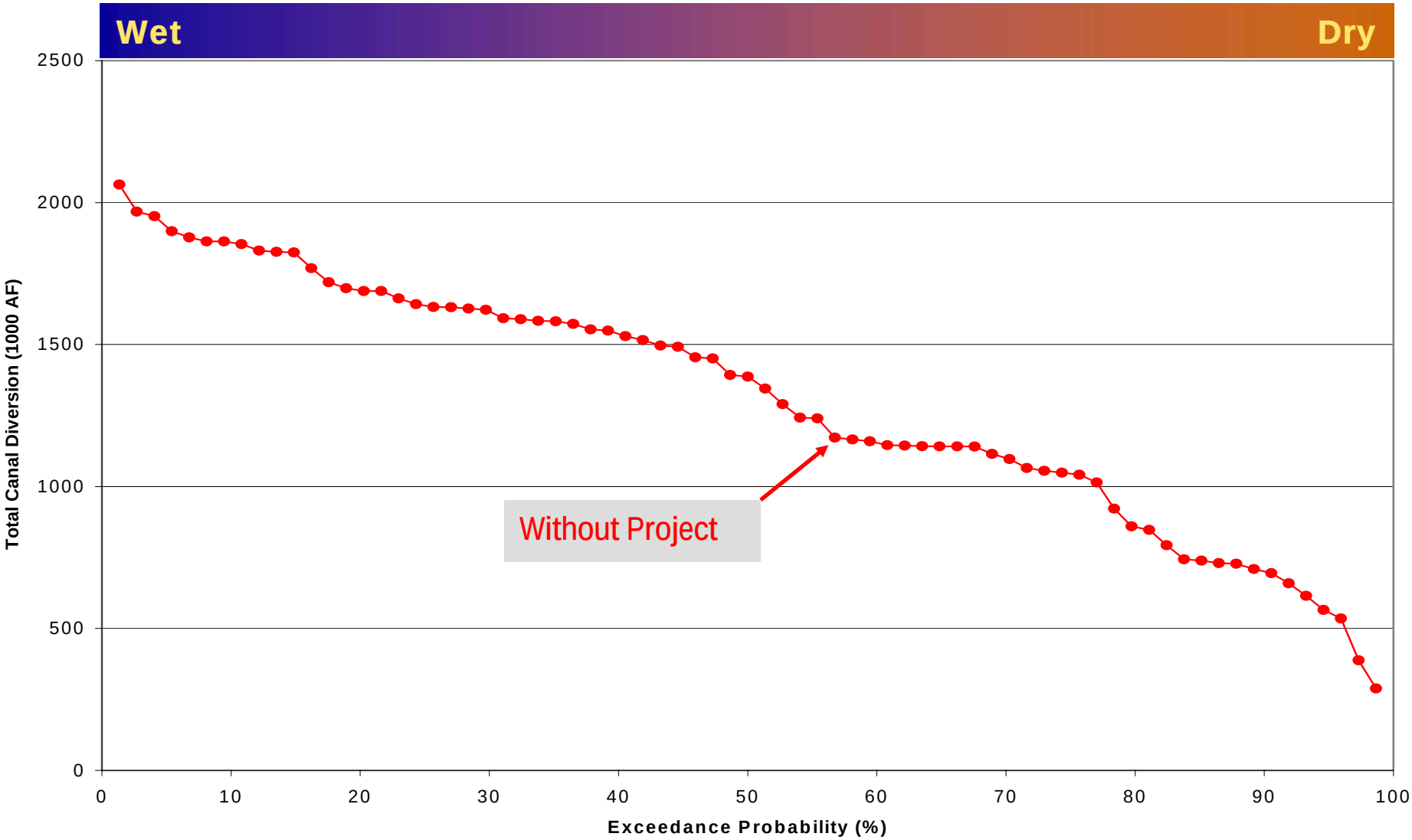
- Scenario 1 - Allocate for Canal Delivery
- Scenario 2 - Allocate for Restoration - Divert at Mendota Pool
- Scenario 3 - Allocate for Restoration - Pass Mendota Pool
- Scenario 4 - Allocate 175 TAF for Restoration with Carryover
- Scenario 5 - Allocate for River Water Quality with Carryover

All operational scenarios assume:

- Existing contracts
- Existing flood control operations
- Existing Friant downstream release (120 TAF)
- No re-allocation of existing supplies
- New storage of 1,400 TAF

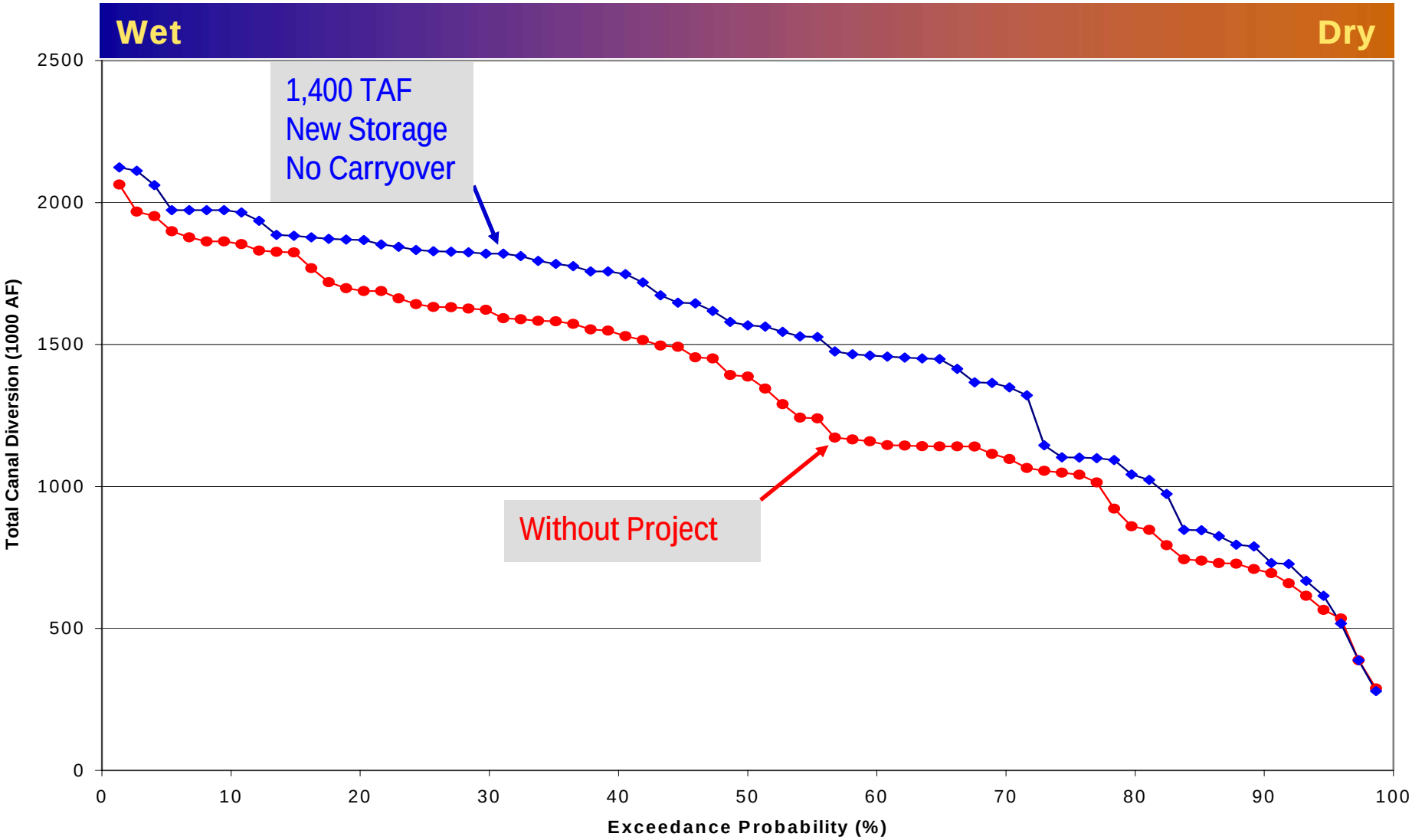
Scenario 1 - Allocate Supply for Canal Delivery

Total Canal Diversion



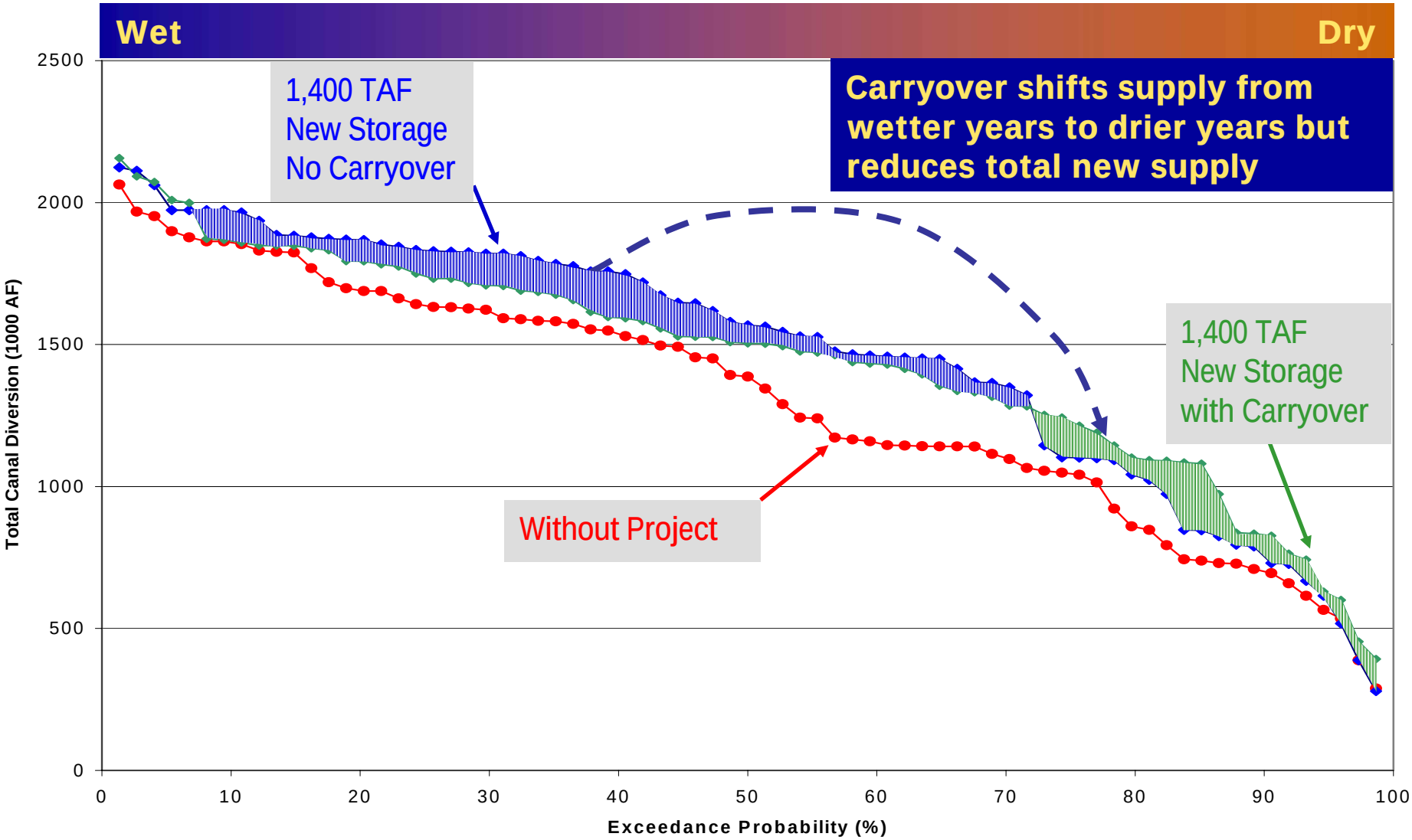
Scenario 1 - Allocate Supply for Canal Delivery

Total Canal Diversion



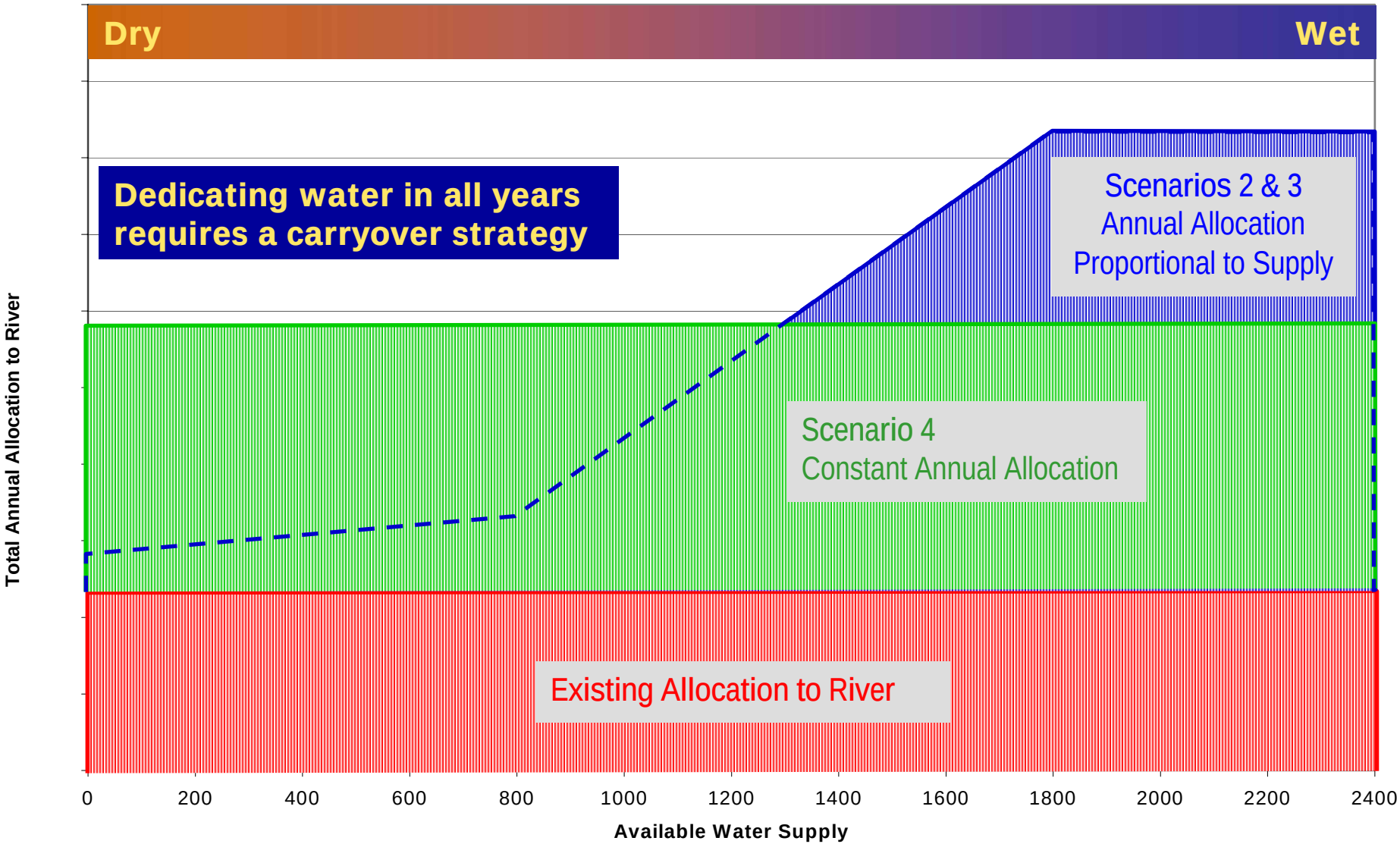
Scenario 1 - Allocate Supply for Canal Delivery

Total Canal Diversion



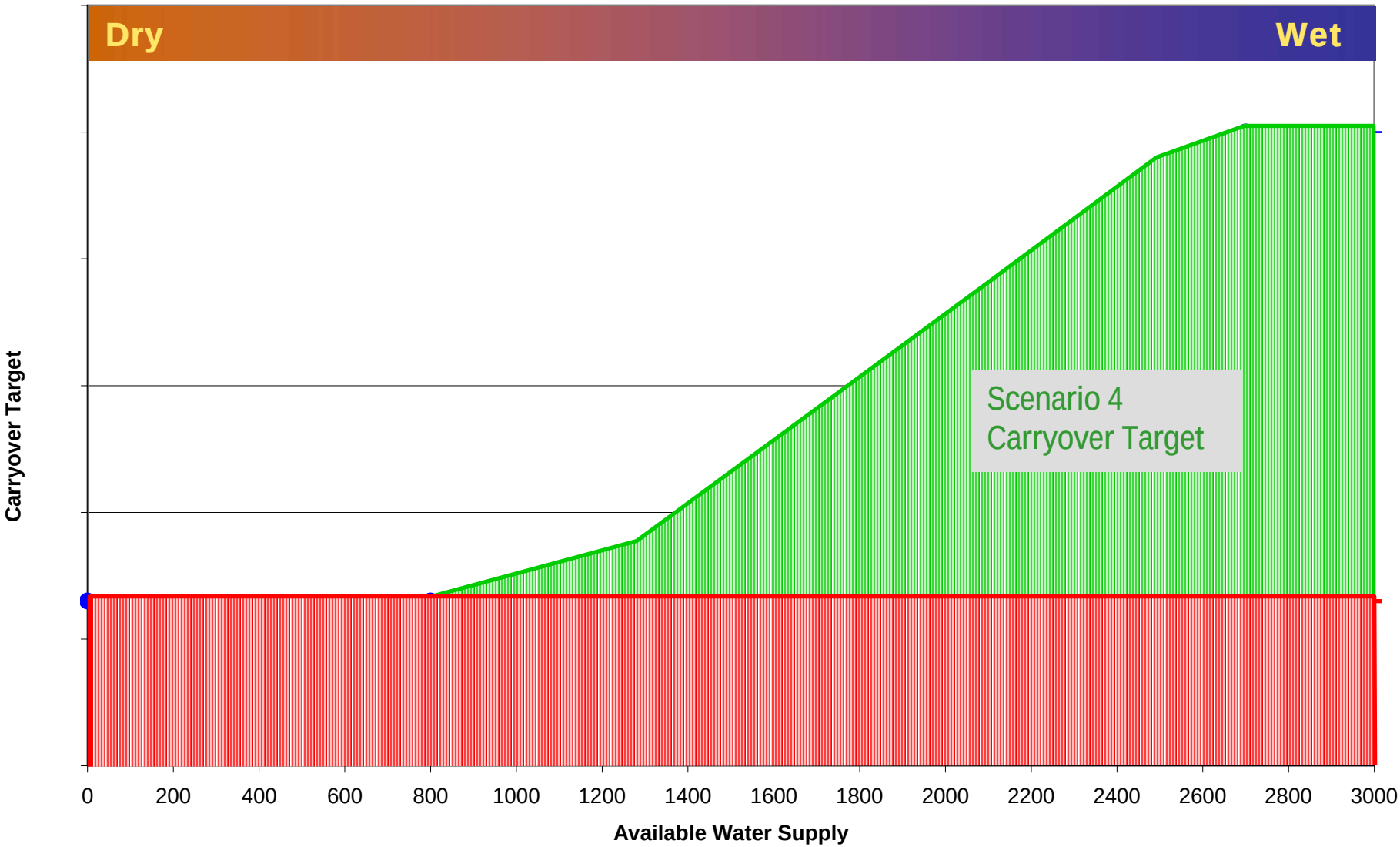
Scenarios 2, 3, and 4 - Allocate Supply for River Restoration

Allocation Rules



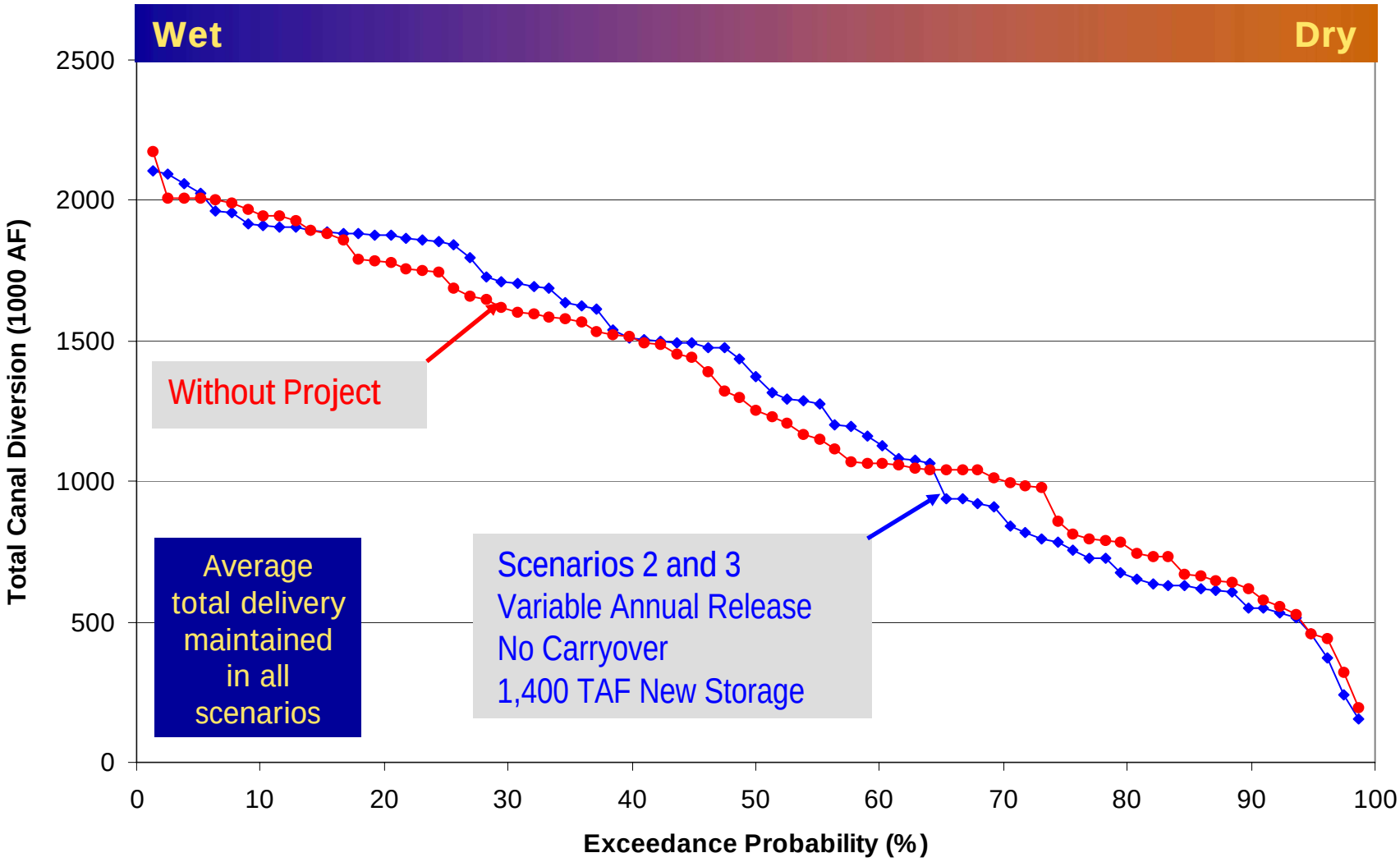
Scenario 4 - Allocate 175 TAF for River Restoration

Carryover Targets



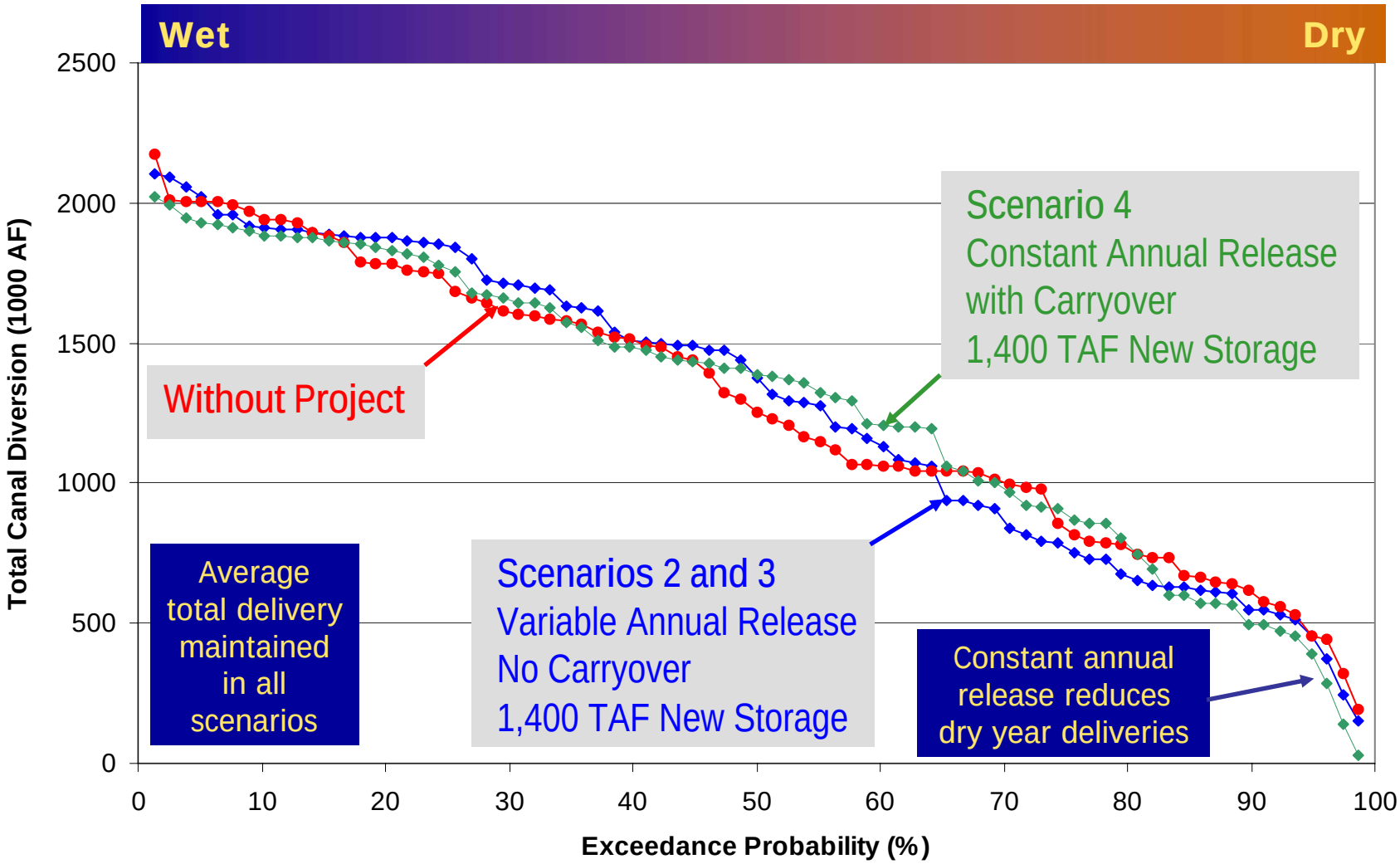
Scenarios 2, 3, and 4 - Restoration Allocation Scenarios

Total Canal Diversion



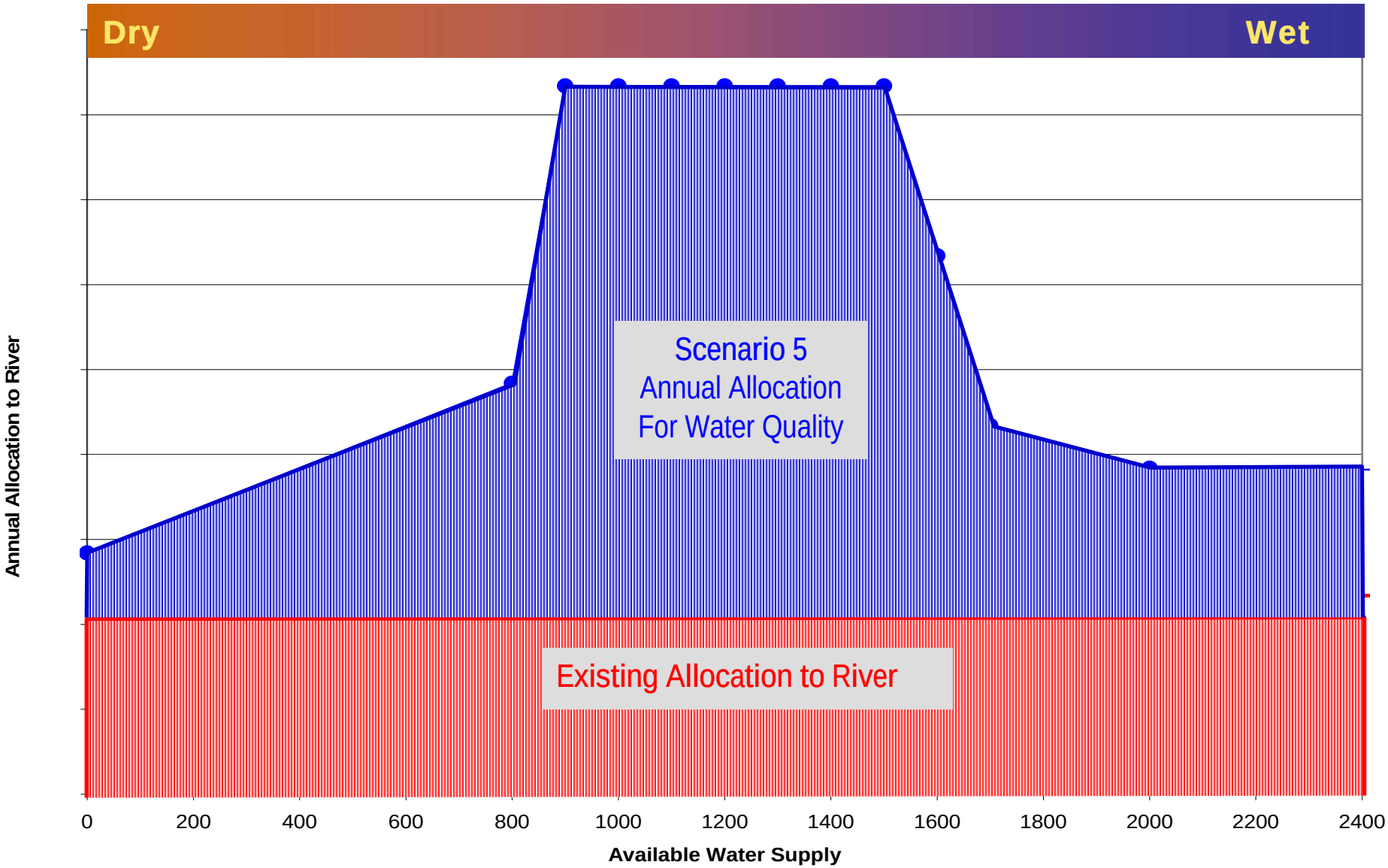
Scenarios 2, 3, and 4 - Restoration Allocation Scenarios

Total Canal Diversion



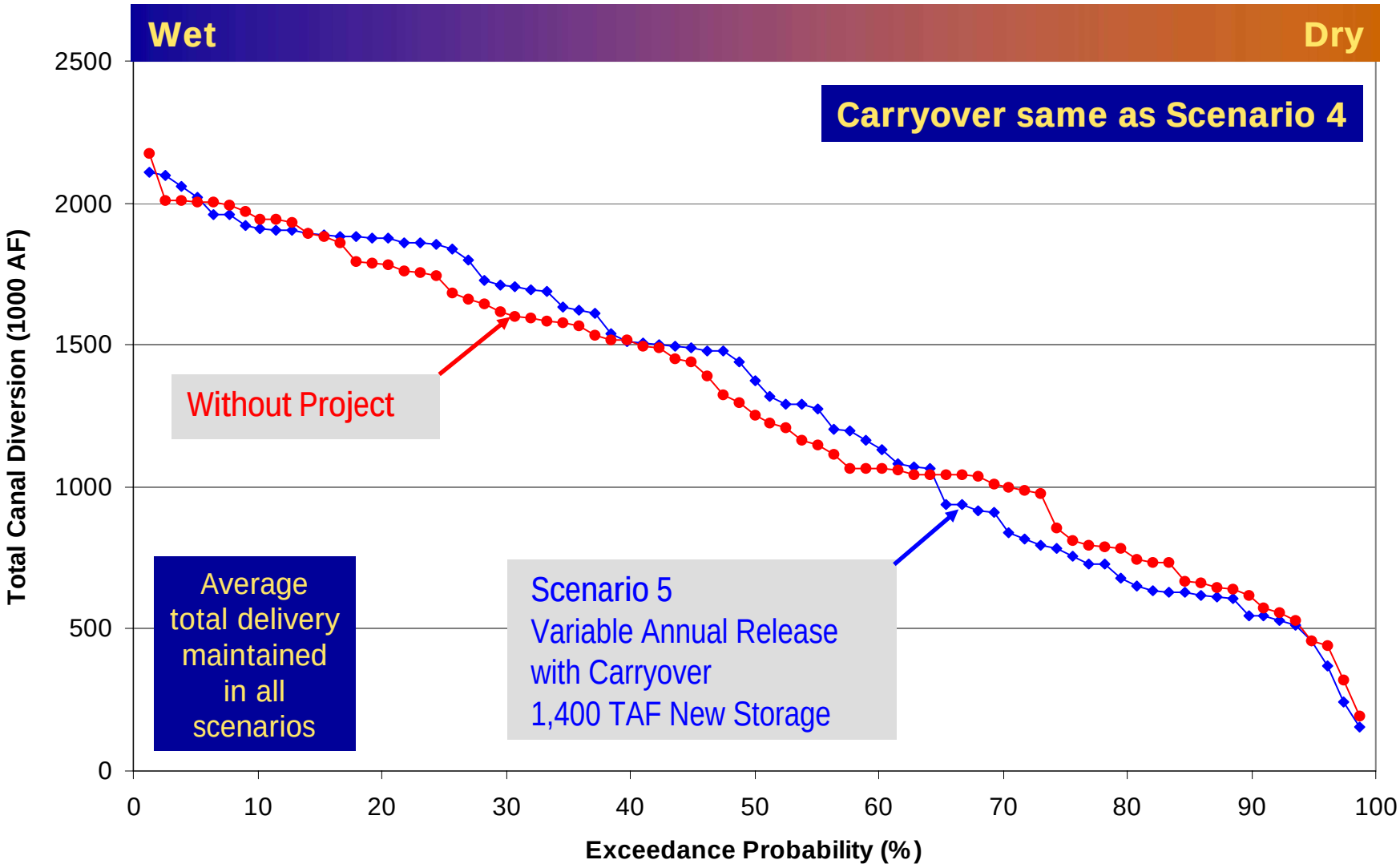
Scenario 5 - Allocate Supply for River Water Quality

Allocation Rules



Scenario 5 - Allocate Supply for River Water Quality

Total Canal Diversion



Water Operations Summary

- Allocation and water management rules will support multiple-purpose operations scenarios
- CALSIM will be used to estimate system-wide effects
- Model refinements / enhancements
  - Gains, losses, & flow paths from Friant to Merced River
  - CALSIM water quality module - Mendota Pool to Lander Ave
  - CALSIM water quality module - Vernalis
- Define and evaluate multiple-purpose scenarios

Initial Alternatives Overview

Conjunctive Management

Upper San Joaquin River Basin
Conjunctive Management Opportunities Study

- Step 1: Identify potential for conjunctive management
  - Completed during Phase 1 of Investigation
- Step 2: Identify projects and initial screening
  - Stakeholder input
  - Assessed and screened projects
- Step 3: Evaluate projects and programmatic concepts
  - Assess conjunctive management project ability to support USJRBSI goals and objectives
  - Quantify additional yield, capital, and O&M costs

San Joaquin Valley Groundwater Basin

Six sub-basins appear to have the greatest potential for large-scale conjunctive management opportunities

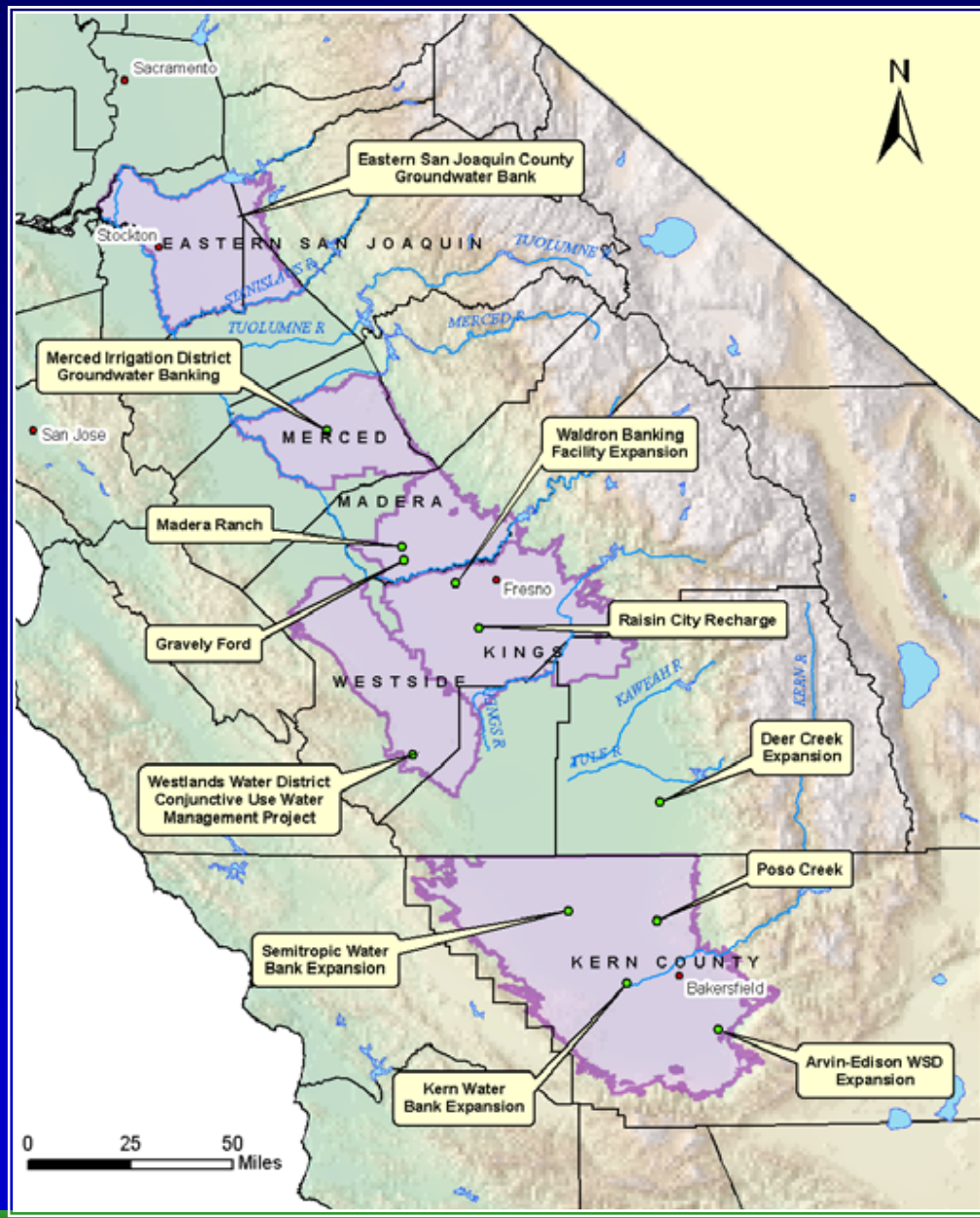
- Eastern San Joaquin
- Merced
- Madera
- Westside
- Kings County
- Kern County

Step 2 - Initial Screening

- 177 projects and programmatic concepts were screened for:
  - Potential yield
  - Ability to contribute to multiple (local/regional) CALFED objectives
  - Potential stakeholder acceptance and support
- 12 projects and 2 programmatic concepts retained for further study

Projects Retained for Further Study

- New Projects
  - Eastern San Joaquin County Groundwater Bank
  - Merced Irrigation District Groundwater Bank
  - Madera Ranch Groundwater Bank
  - Gravelly Ford Groundwater Bank
  - Westlands Water District Conjunctive Use Water Management Project
  - Raisin City Recharge Project
  - Poso Creek Conjunctive Management Project
- Expand Existing Projects
  - Waldron Banking Facility
  - Arvin-Edison Water Storage District
  - Kern Water Bank
  - Semitropic Water Bank
  - Deer Creek Recharge Project



Potential Evaluation Criteria

- Increase in urban and agricultural water supply reliability
- Geographic location
- Cost (including conveyance)
- Reduction in groundwater overdraft and subsidence
- Improvement in groundwater quality (reduce saline intrusion)
- Contribution to river releases for restoration and water quality
- Contribution to other local and regional benefits
- Effectiveness of groundwater storage to alleviate local flooding
- Stakeholder acceptance and support
- Local control

Next Steps for Conjunctive Management

- Evaluate ability of projects and programmatic concepts to support USJRBSI goals and objectives
  - Estimate surface water availability
  - Quantify additional yield, capital, and O&M costs
  - Evaluate legal and institutional issues

Conjunctive Management Options Schedule

- Develop Modeling Strategy & Begin Technical Evaluations – Spring 2005
- Draft Conjunctive Management Alternatives Report – Fall 2006
- Stakeholder Workshops
- Finalize Conjunctive Management Alternatives Report – February 2007

Next Steps

Next Steps for the Investigation

- Initial Alternatives Information Report
  - Technical analysis is complete
  - Finalizing preliminary operations scenarios
- Plan Formulation Report
  - Estimate project benefits
    - Water supply, water quality, restoration
    - Hydropower and flood protection
  - Identify environmental impacts
    - Reservoir and downstream areas
    - Water service areas
  - Refine cost estimates

A Joint Study by:

U.S. Bureau of Reclamation
Mid-Pacific Region

California Department
of Water Resources

Upper San Joaquin River Basin Storage Investigation

Public Meeting

CALFED
BAY-DELTA
PROGRAM

April 13, 2005