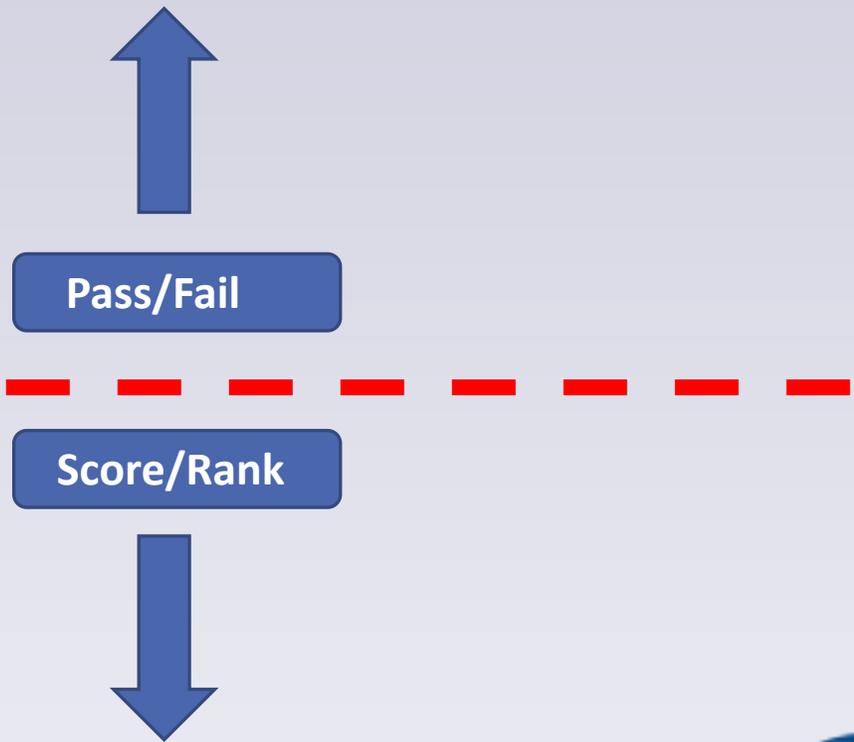


# Water Storage Investment Program Framework for Quantifying Benefits

# Quantification and Monetization Context

# How will projects be evaluated?

- Completeness
- Basic Eligibility
- Secondary Eligibility
- **Technical Review**



# Technical Review: Evaluation Criteria

Evaluation Criteria	Rationale
<b>Return on Public Investment</b>	“Projects shall be selected...based on the expected return for public investment...” (Section 79750 (c))
<b>Relative Environmental Value</b>	“Regulations shall include the priorities and relative environmental value of ecosystem...and water quality benefits...” (Section 79754)
<b>Water System Improvement</b>	The Commission shall fund “... projects that improve the operation of the state water system...” (Section 79750 (b))
<b>Implementation Risk</b>	<p>“... for public benefits associated with water storage projects that ... are cost effective...” (Section 79750 (b))</p> <p>“The commission has found and determined that the project is feasible...” (Section 79755 (B))</p>
<b>Benefit Resiliency and Non-Monetized Benefits</b>	<p>... and will advance the long-term objectives of restoring ecological health and improving water management for beneficial uses of the Delta(Section 79754 (5) (B))</p> <p>Not all public benefits could be monetized</p>

# Return on Public Investment

$$\text{ROI} = \frac{\text{Public Benefits}}{\text{Funding Request}}$$

# Potential Benefits of Storage

- Non-Public
  - M&I, Ag Water Supply
  - Hydropower
- Public
  - Ecosystem
  - Water quality
  - Flood control
  - Emergency response
  - Recreation



# Why do we Quantify Benefits?

§79750(c)

Projects shall be selected by the commission through a competitive public process that ranks potential projects based on the expected return for public investment as measured by the **magnitude** of the public benefits provided, pursuant to criteria established under this chapter.

# Why do we Monetize Benefits?

§79756

(a) The public benefit cost share of a project funded pursuant to this chapter, other than a project described in subdivision (c) of Section 79751, shall not exceed **50 percent** of the total costs of any project funded under this chapter.

(b) No project may be funded unless it provides ecosystem improvements .... that are at least **50 percent** of total public benefits of the project funded under this chapter.

# Many Physical Benefits of Storage Projects Are Measurable in Terms of Water Quantity

- Water supply
- In-stream flow for ecosystem, temperature control and water quality
- Emergency response
- Dedicated flood reservation space has a water supply cost that can be measured

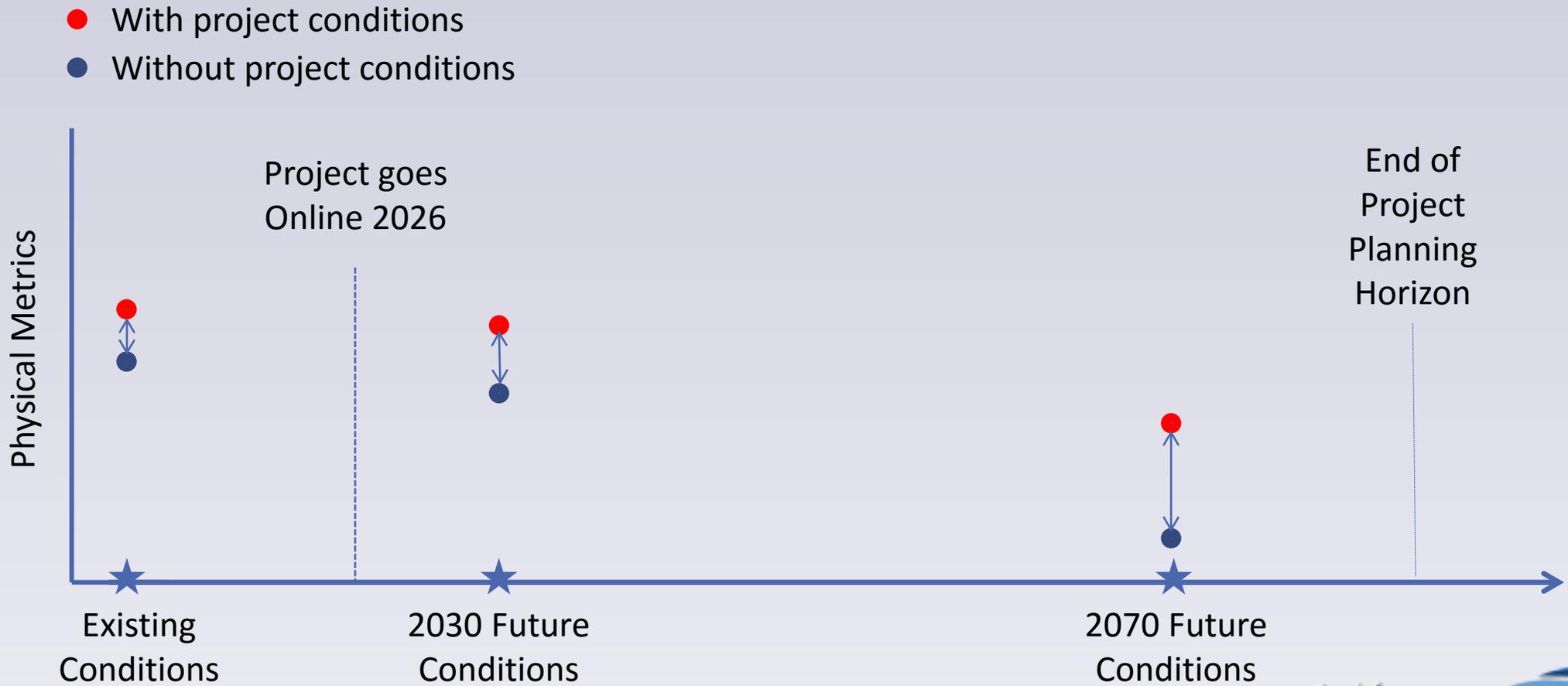
***Same water can serve more than one purpose***

# Quantification and Monetization Framework

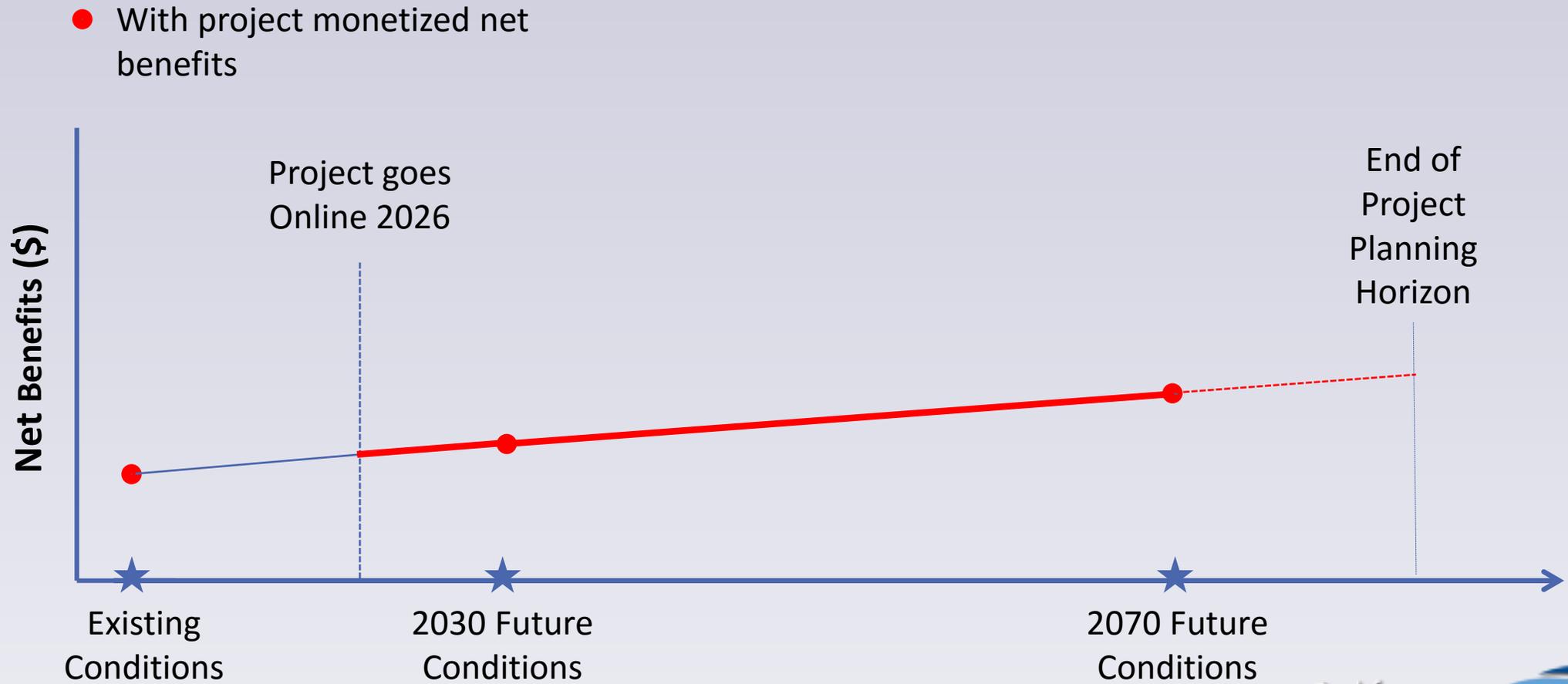
# Benefits Quantification/Cost Allocation Framework

- 1 Define the without-project future conditions
- 2 Define the with-project future conditions
- 3 Calculate physical changes
- 4 Monetize the value of project benefits
- 5 Estimate project costs
- 6 Compare benefits to costs
- 7 Allocate costs to beneficiaries

# Graphical Overview of Analysis



# Graphical Overview of Analysis (cont'd)



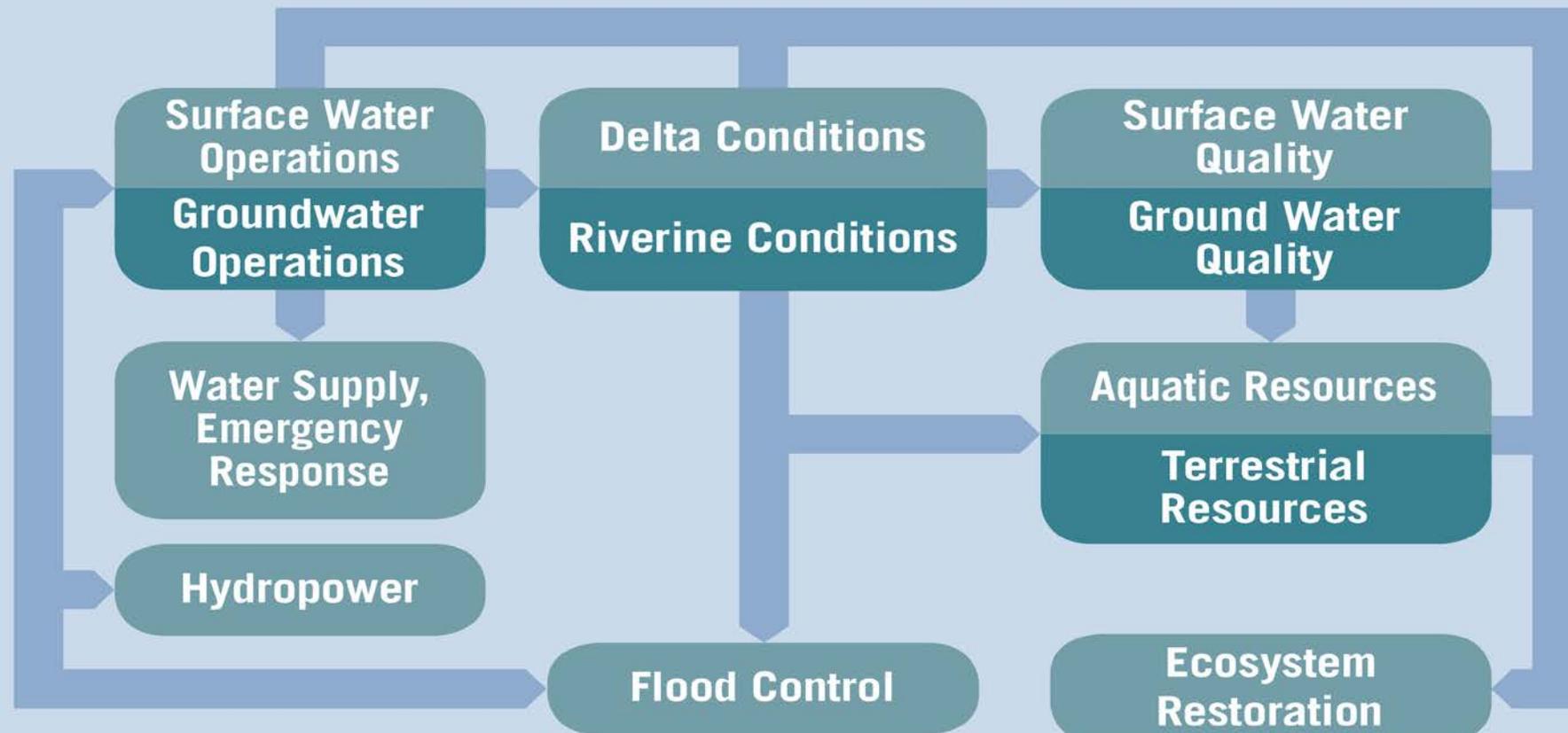
# Components of Analysis

Project Features and Operations

Methods and Models

Other Information

## Analysis of With and Without Project Conditions



## WSIP Outputs

Physical Change Metrics

Physical Benefits

Monetized Benefits

Operations

Climate Change

Sea Level Rise

Regulatory

Structural

Technological

Economic

Sources of Uncertainty

# Quantification and Monetization Framework Technical Reference

# Purpose of the Technical Reference

- Quantifying benefits can be complex – different models may be necessary for each benefit type and for determining physical and economic benefits
- TR supports applicants' project analysis and quantification of public benefits; assists applicants in producing competitive, technically sound applications
- TR includes and describes some models and methods that could be used to meet regulatory requirements of the WSIP
- TR will be incorporated by reference into the regulations

# Purpose of the Technical Reference

- The audience and users of this document are intended to be technical staff that will be responsible for running models and conducting the technical and economic analyses
- TR is similar to an encyclopedia in that the whole document will not apply to every applicant, few will read the document cover-to-cover
- TR provides guidance on appropriate analysis – There is no single methodology for quantifying public benefits that is applicable to every project; the methodology will depend on the project type, location, and other project-specific factors.

# Organization of Tech Reference

- 1.0 Introduction
- 2.0 Defining the Without Project Future Conditions
- 3.0 Defining the With-Project Future Conditions
- 4.0 Calculating Physical Changes
- 5.0 Monetizing the Value of Project Benefits
- 6.0 Estimating Project Costs
- 7.0 Comparing Benefits to Costs
- 8.0 Allocating Costs to Beneficiaries
- 9.0 Determining Cost Effectiveness and Return on Investment
- 10.0 Evaluating Sources of Uncertainty
- 11.0 Metrics

# TR Highlights: Section 2. Without-Project Conditions

- Defining study area, planning horizon
- Relationship to CEQA analysis, feasibility study
- Delta, SWP, and CVP operations
- Other future conditions
- Climate change and sea level rise information

# TR Highlights: Section 4. Calculating Physical Changes

- General concepts for project analysis
- Hydrologic data and other inputs
- Surface water and groundwater operations
- River and Delta hydrodynamics
- Benefit categories
  - Public
  - Non-public

# TR Highlights: Section 5. Monetizing Benefits

- General concepts for project analysis
- Three approaches to monetize
  - Avoided cost
  - Alternative cost
  - Willingness to pay
- Methods by benefit category
  - Public
  - Non-public

# Quantification and Monetization Framework

## Explanation and Example

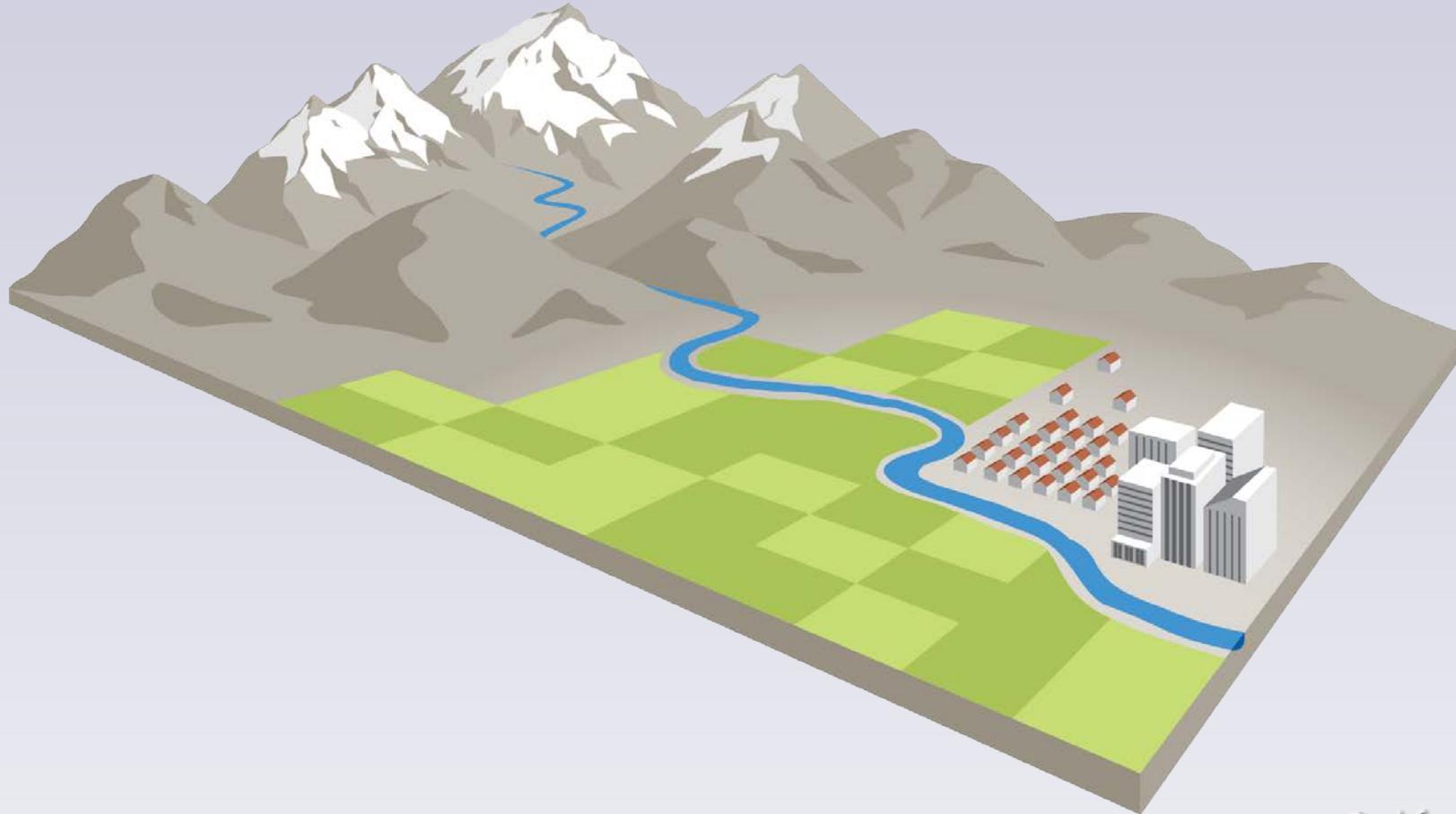
# Walk Through Example Project

- Surface storage project within the Delta watershed
- Formulated for non-public water supply, ecosystem, and recreation benefits (ecosystem benefits include temperature, so also provides improvement to water quality conditions)
- Project projected to go online in 2021

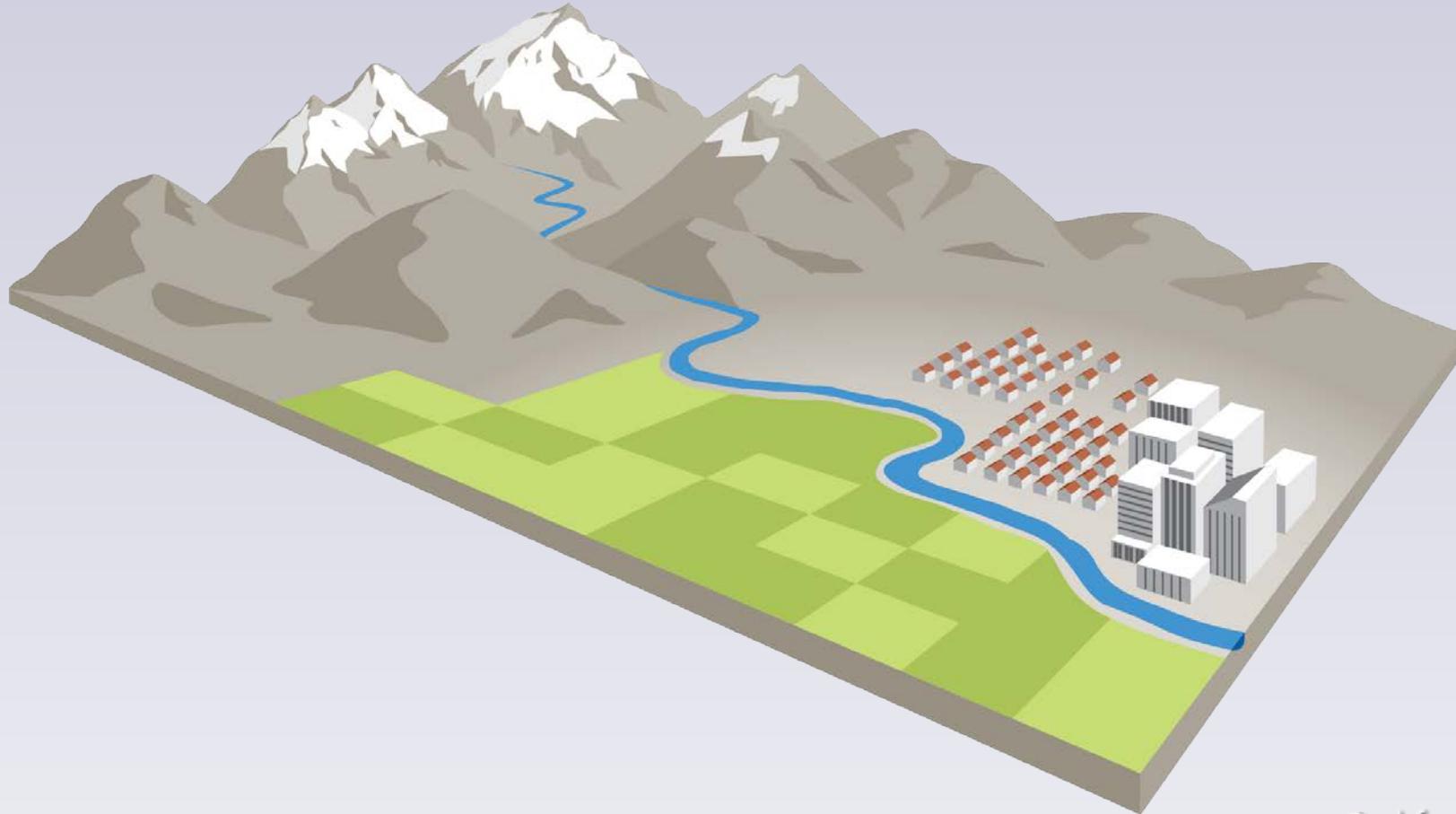
# Quantification and Monetization Framework

Define the Without-Project Future  
Condition

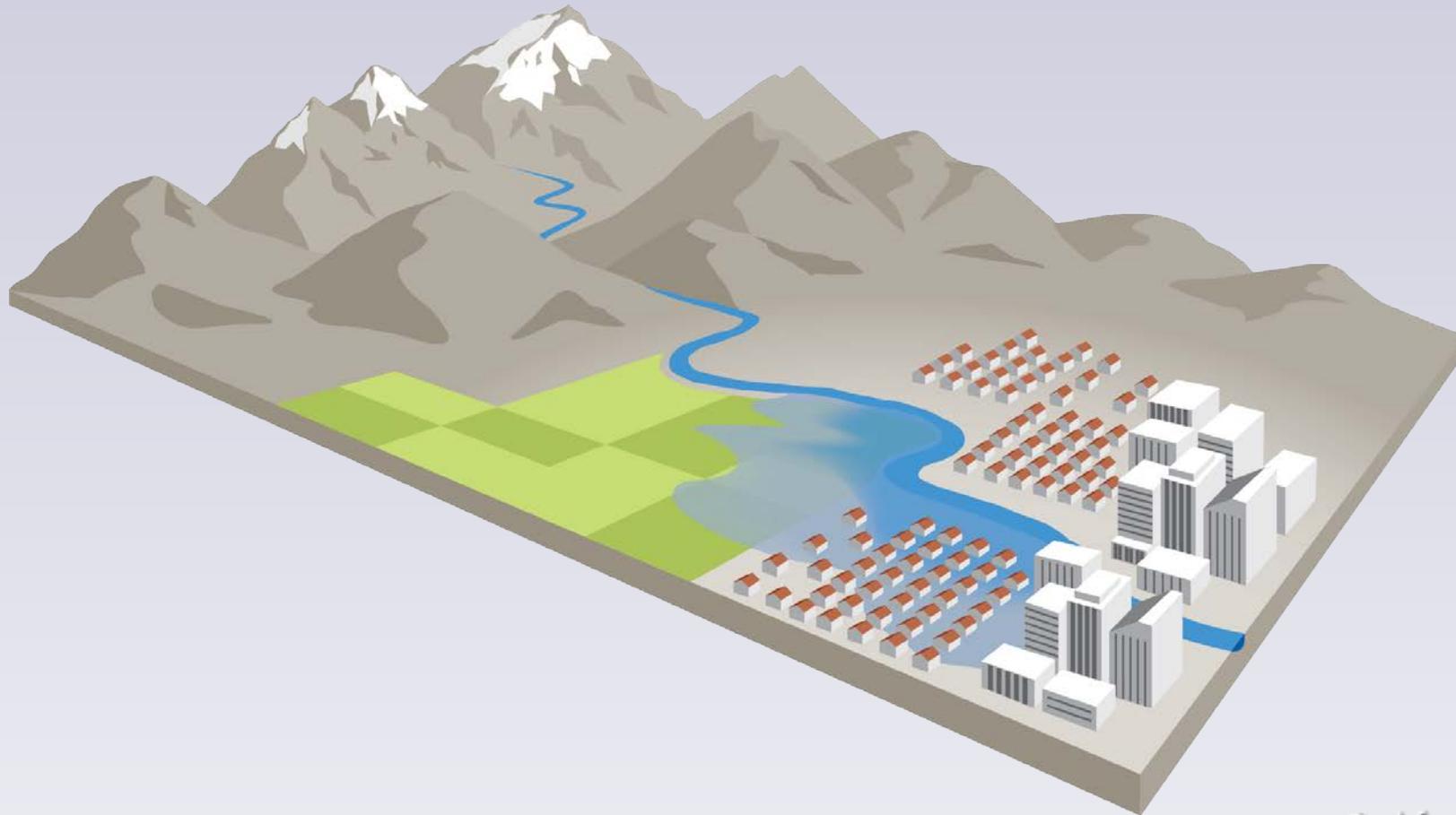
# 2015 Without Project



# 2030 Without Project



# 2070 Without Project



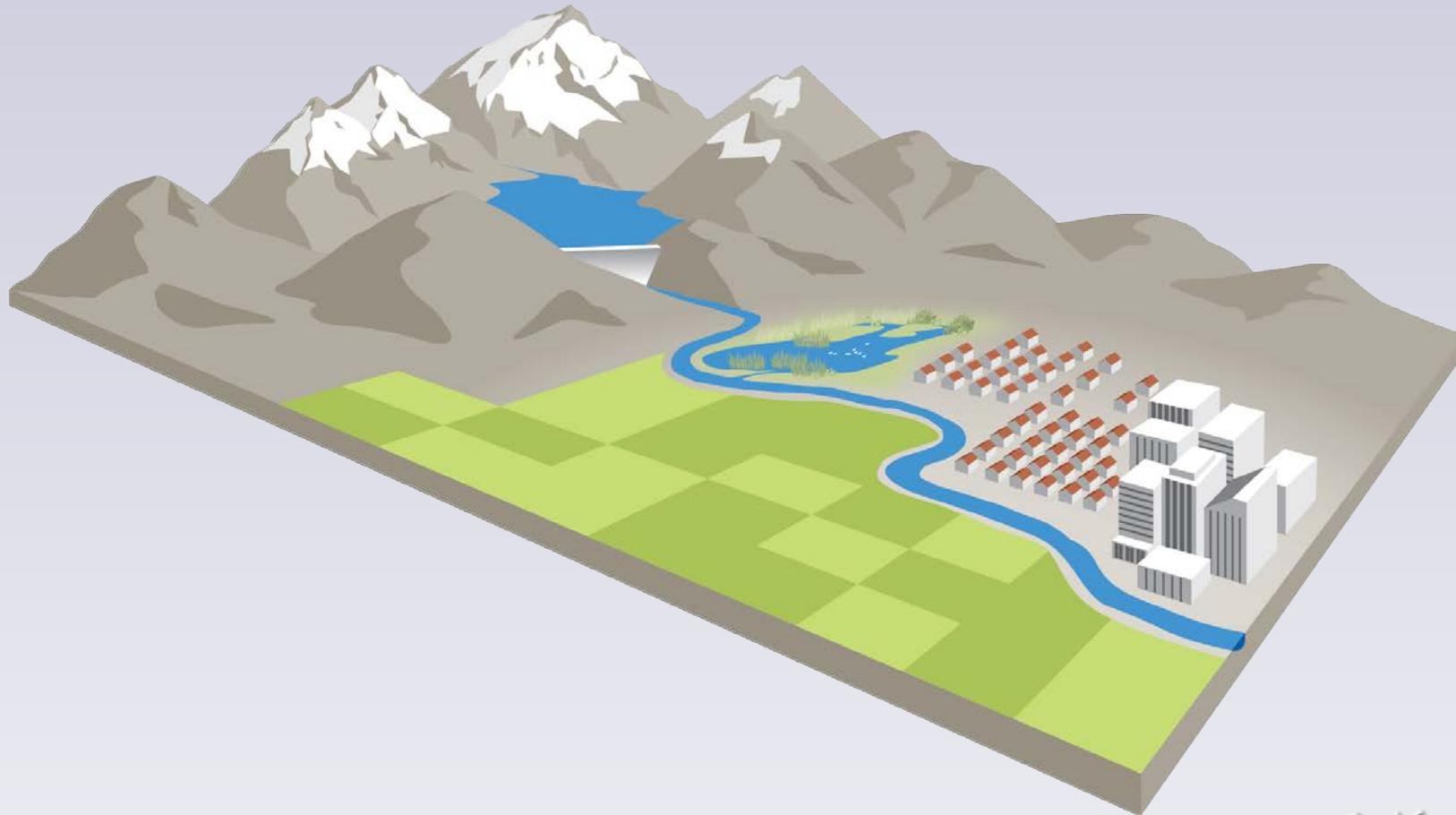
# Example Project: Without-Project Targeted Resource Conditions (2030)

Benefit Type	Without Project Condition
Non-public Water Supply	200 TAF
Ecosystem	
Winter-run Chinook	1,600 Fish
Fall-run Chinook	9,000 Fish
Recreation	
Surface Area	0 Acres
Trails	0 Miles
Boat Ramps	0
Facilities	0
Visitor Days	0 People

# Quantification and Monetization Framework

Define the With-Project Future  
Condition

# 2030 With Project



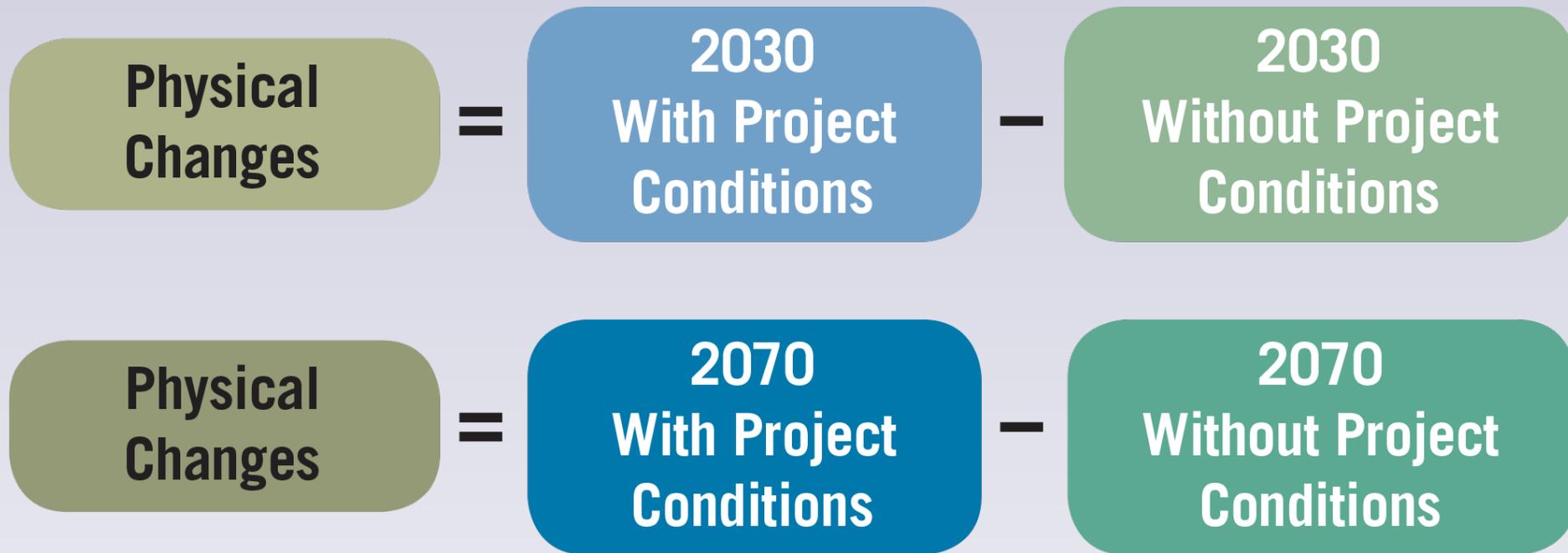
# Example Project: With-Project Targeted Resource Conditions (2030)

Benefit Type	With Project Condition	Without Project Condition
Non-public Water Supply	400 TAF	200 TAF
Ecosystem		
Winter-run Chinook	2,000 Fish	1,600 Fish
Fall-run Chinook	10,000 Fish	9,000 Fish
Recreation		
Surface Area	200 Acres	0 Acres
Trails	30 Miles	0 Miles
Boat Ramps	15	0
Facilities	4	0
Visitor Days	40,000 People	0 People

# Quantification and Monetization Framework

## Calculate Physical Changes

# Physical Changes



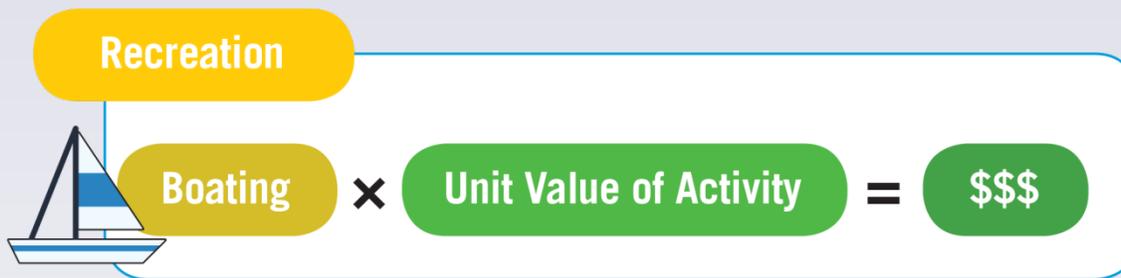
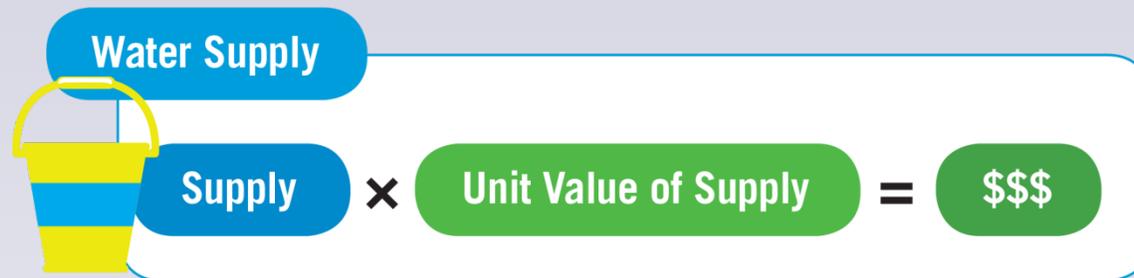
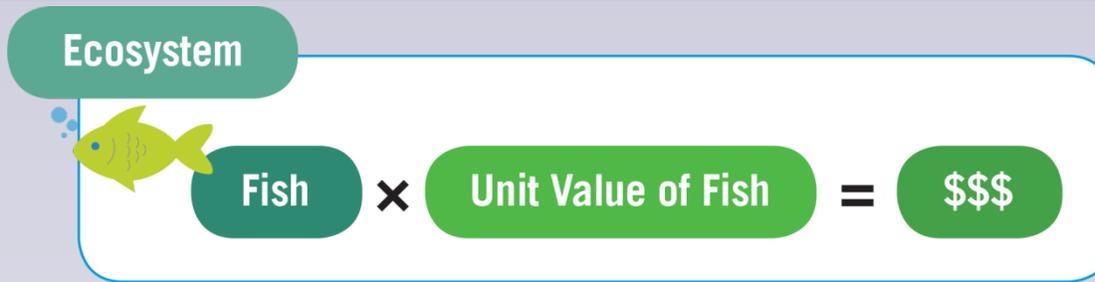
# Example Project: Calculate Physical Changes

Benefit Type	With Project Condition (A)	Without Project Condition (B)	Physical Change (C = A – B)
Non-public Water Supply	400 TAF	200 TAF	200 TAF
Ecosystem			
Winter-run Chinook	2,000 Fish	1,600 Fish	400 Fish
Fall-run Chinook	10,000 Fish	9,000 Fish	1,000 Fish
Recreation			
Surface Area	200 Acres	0 Acres	200 Acres
Trails	30 Miles	0 Miles	30 Miles
Boat Ramps	15	0	15
Facilities	4	0	4
Visitor Days	40,000 People	0 People	40,000

# Quantification and Monetization Framework

## Monetize the Value of the Project Benefits

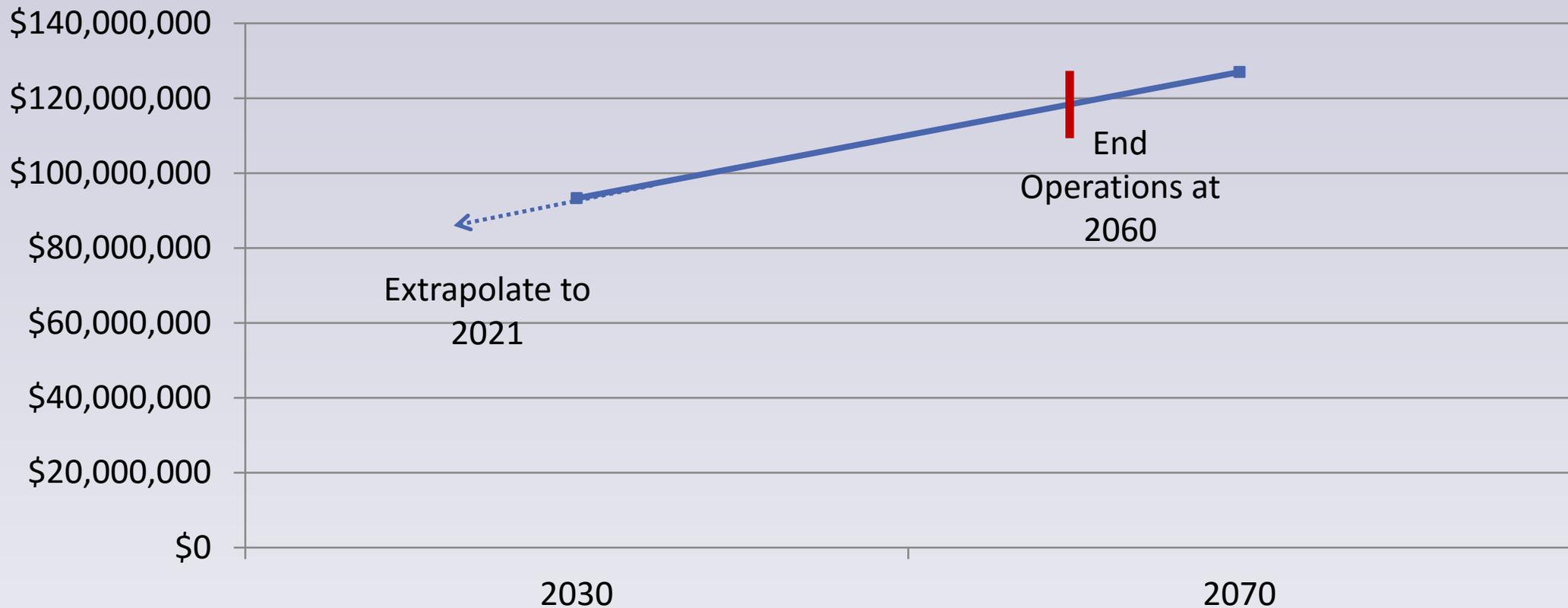
# Using Unit Values to Monetize the Project Benefits



# Example Project: Monetize Benefits (2030)

Benefit Type	With Project Condition (A)	Without Project Condition (B)	Physical Change (C = A-B)	Unit Value (D)	Economic Value of Changes (E = C*D)
<b>Non-public Water Supply</b>	400 TAF	200 TAF	200 TAF	\$250 per AF	\$50,000,000
<b>Ecosystem</b>					
<b>Winter-run Chinook</b>	2,000 Fish	1,600 Fish	400 Fish	\$100,000 per Fish	\$40,000,000
<b>Fall-run Chinook</b>	10,000 Fish	9,000 Fish	1,000 Fish	\$2,500 per Fish	\$2,500,000
<b>Recreation</b>					
<b>Surface Area</b>	200 Acres	0 Acres	200 Acres		
<b>Trails</b>	30 Miles	0 Miles	30 Miles		
<b>Boat Ramps</b>	15	0	15		
<b>Facilities</b>	4	0	4		
<b>Visitor Days</b>	40,000 People	0 People	40,000 People	\$20 per Visitor	\$800,000

# Example Project: Benefit Trend



# Example Project: Calculate Present Value from Annual Benefits

	<b>Present Value</b>		<b>Water Supply</b>		<b>Total Benefits</b>	
	<b>\$884,191,594</b>	<b>\$18,907,342</b>	<b>\$992,206,762</b>	<b>\$1,895,305,698</b>		
	↑		↑		↑	
<b>Year</b>	<b>Ecosystem Benefit</b>	<b>Recreation Benefit</b>	<b>Benefit</b>			
2015	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
⋮	⋮	⋮	⋮	⋮	⋮	⋮
2020	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
2021	\$ 37,437,500	\$ 530,000	\$ 47,750,000	\$	\$ 85,717,500	\$
2022	\$ 38,000,000	\$ 560,000	\$ 48,000,000	\$	\$ 86,560,000	\$
⋮	⋮	⋮	⋮	⋮	⋮	⋮
2030	\$ 42,500,000	\$ 800,000	\$ 50,000,000	\$	\$ 93,300,000	\$
2031	\$ 43,062,500	\$ 830,000	\$ 50,250,000	\$	\$ 94,142,500	\$
2032	\$ 43,625,000	\$ 860,000	\$ 50,500,000	\$	\$ 94,985,000	\$
⋮	⋮	⋮	⋮	⋮	⋮	⋮
2059	\$ 58,812,500	\$ 1,670,000	\$ 57,250,000	\$	\$ 117,732,500	\$
2060	\$ 59,375,000	\$ 1,700,000	\$ 57,500,000	\$	\$ 118,575,000	\$

# Quantification and Monetization Framework

## Estimate the Project Costs

# Example Project: Estimate Costs

- The applicant shall estimate and display the capital costs, including construction, initial environmental mitigation or compliance obligations, and land acquisition, for the purpose of establishing eligible capital costs for WSIP funding.
- **Capital costs = \$1,000,000,000**
- **Total PV of all costs = \$1,145,100,000**

# Quantification and Monetization Framework

## Compare Benefits to Costs

# Compare Benefits to Costs

- Benefit-cost measures are required to document the expected return for public investment. All project benefits, and all public benefits, are compared to project costs to help establish appropriate cost shares, and to help consider and establish the financial feasibility of the project.

# Benefit-Cost Ratio

$$\text{BCR} = \frac{\text{Total Project Benefits}}{\text{Total Project Costs}}$$

# Example Project: Compare Benefits to Costs

$$\begin{aligned}\text{Overall Project BCR} &= \$1,895,300,000 / \\ &\quad \$1,145,100,000 \\ &= 1.65\end{aligned}$$

BCR > 1?

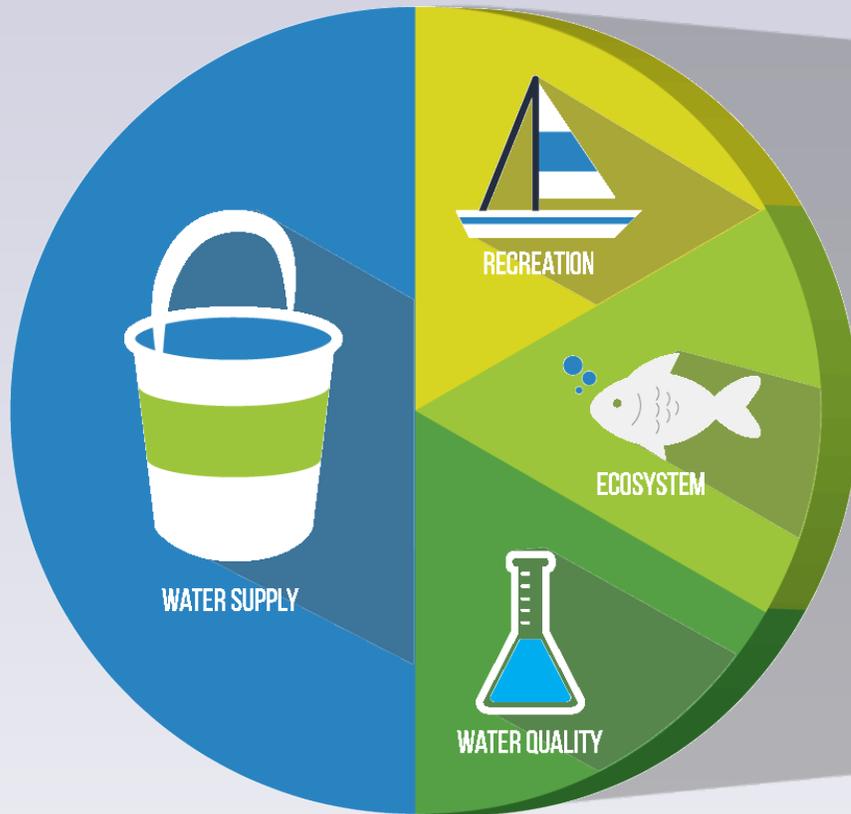


# Quantification and Monetization Framework

## Allocate Costs to Beneficiaries

# Cost Allocation

NON-PUBLIC/PUBLIC BENEFITS

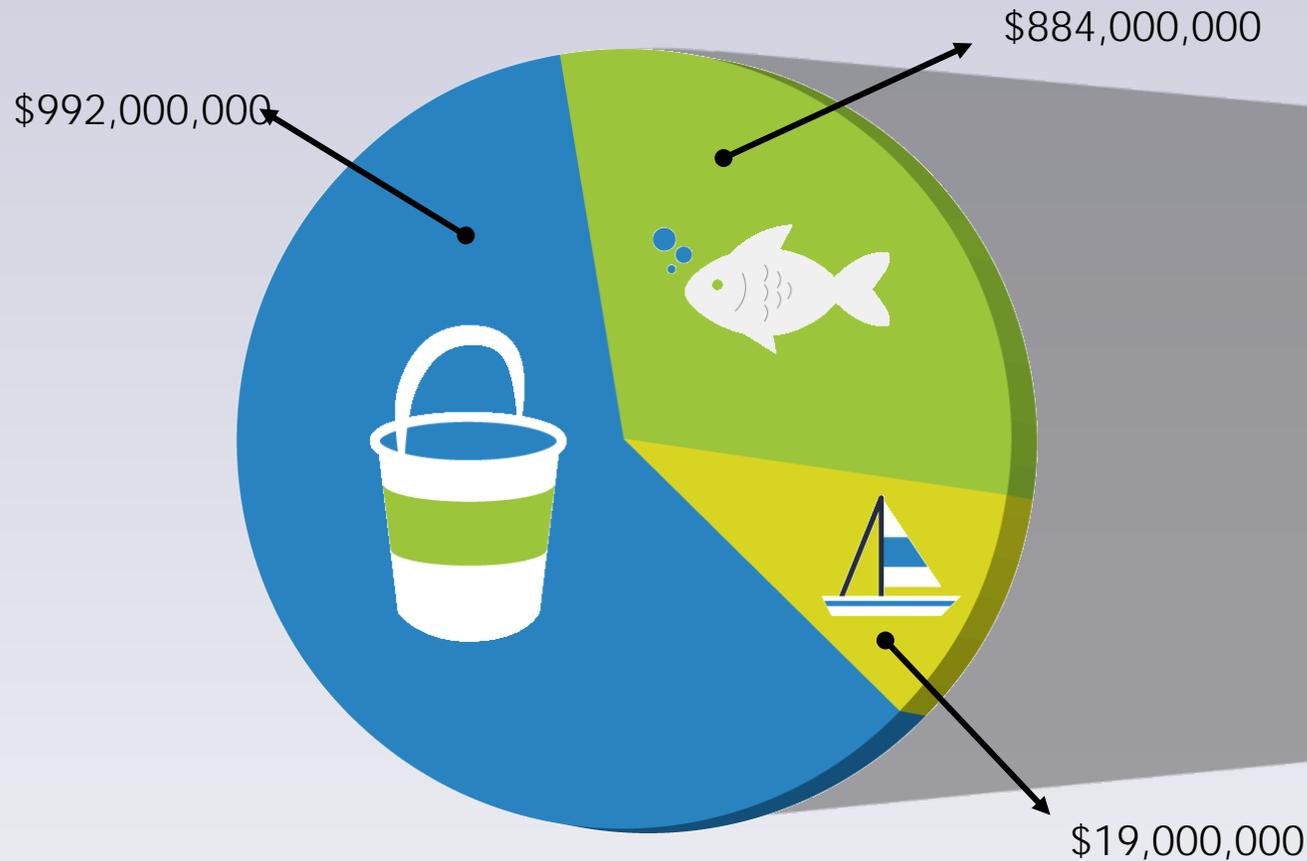


COST ALLOCATION

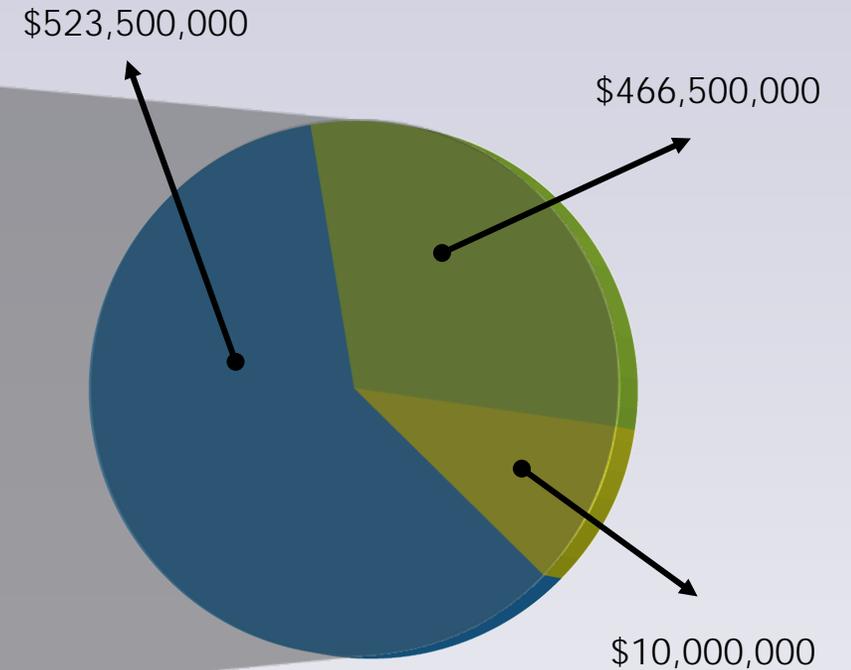


# Example Project: Allocate Costs to Beneficiaries

## BENEFIT SHARES

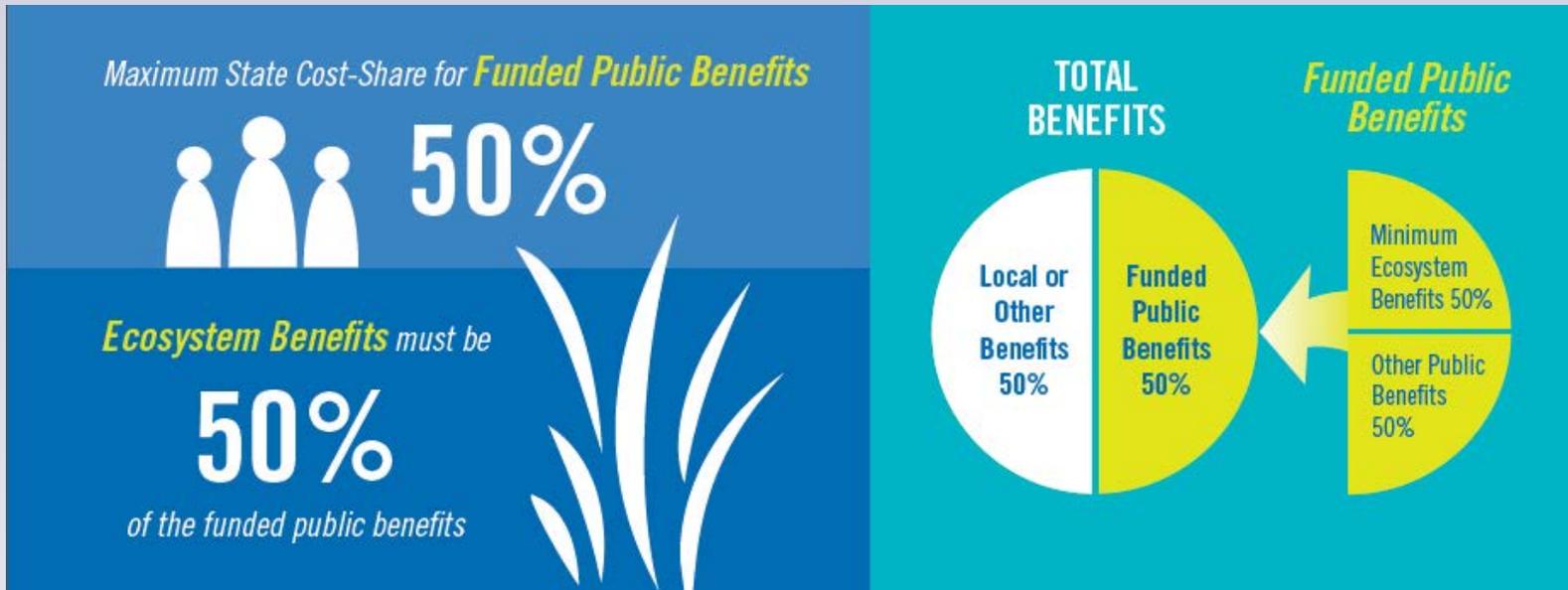


## COST ALLOCATION

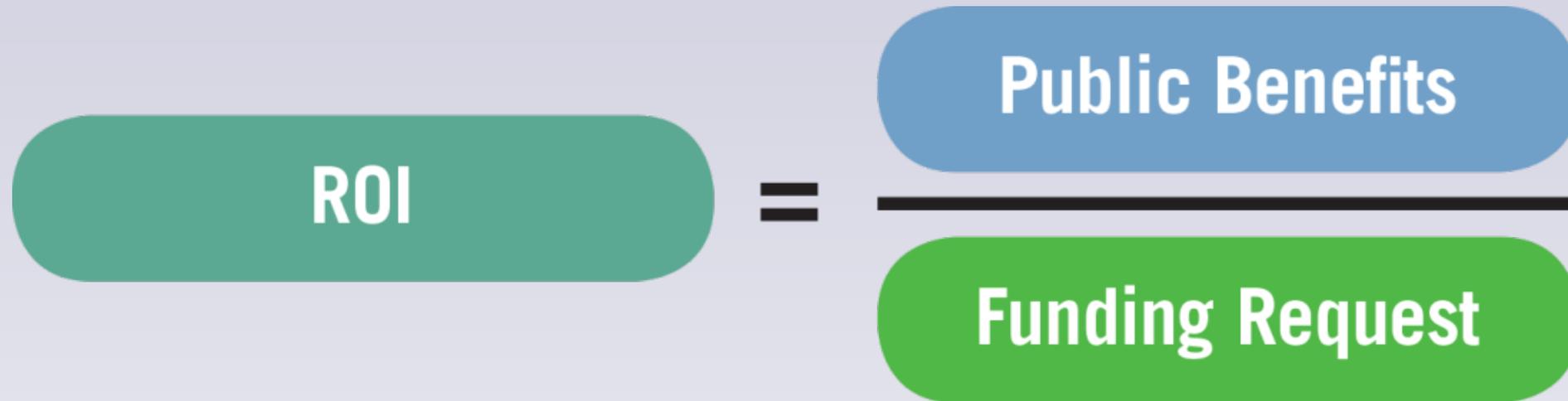


\*\* Graphical representation – not to scale

# Apply Rules from Statute



# Return on Investment



The diagram illustrates the Return on Investment (ROI) formula. On the left, a green rounded rectangle contains the text "ROI". To its right is an equals sign. Further right is a fraction: a blue rounded rectangle containing "Public Benefits" is positioned above a horizontal black line, and a green rounded rectangle containing "Funding Request" is positioned below the line.

$$\text{ROI} = \frac{\text{Public Benefits}}{\text{Funding Request}}$$

# Example Project: Compare Benefits to Costs

$$\text{ROI} = \$903,000,000 / \$476,500,000 \\ = 1.9$$

WSIP cost share < 50% of total project costs?



Ecosystem benefits at least 50% of total public benefit funded by WSIP?



# Questions?