# Synthesis?

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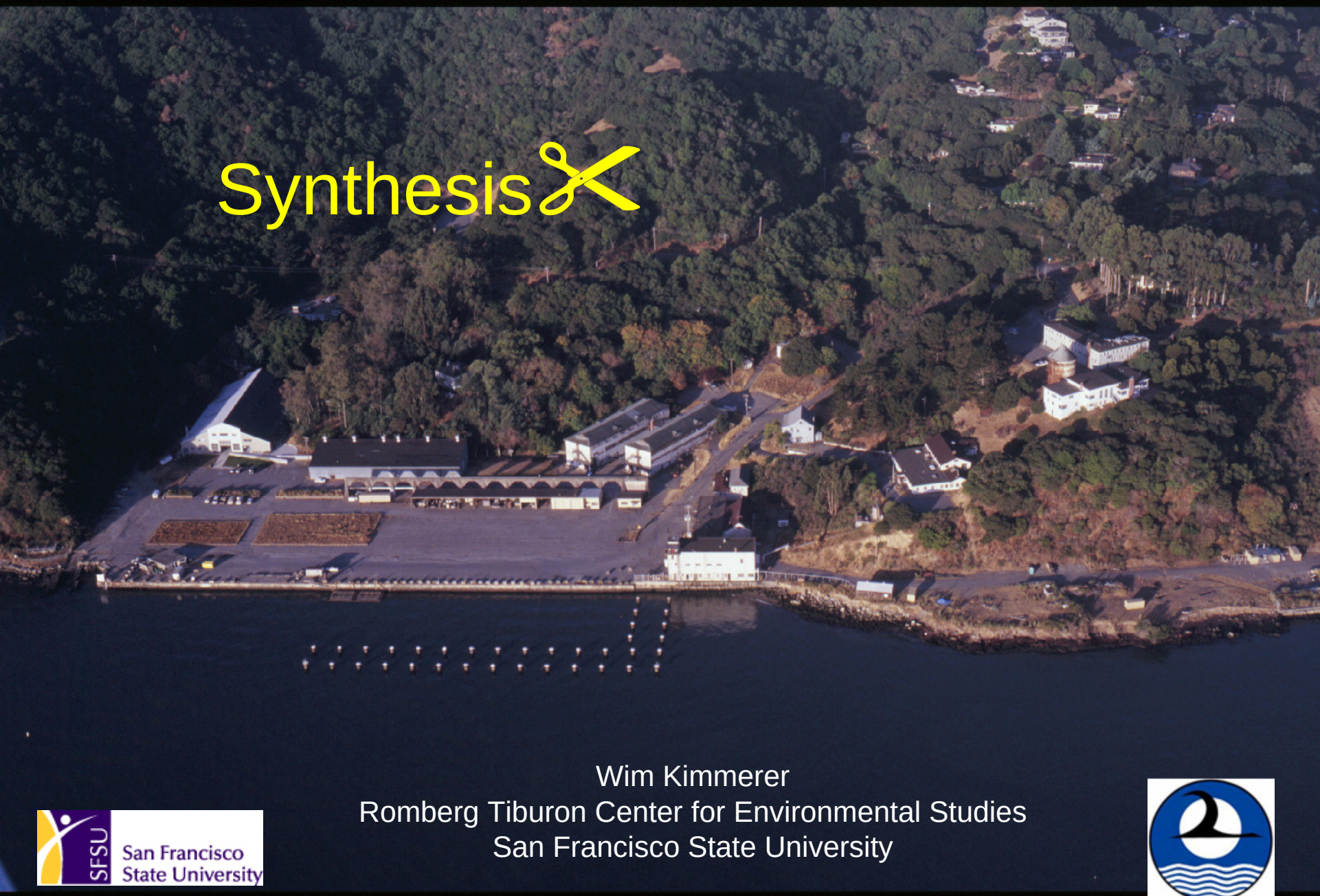
# Synthesis



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# Important Announcement

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The Sandwich market is efficient!

# Cautionary Tales: The Past

- Tehama “spawning” channel
- The CALFED Assumption (Field of Dreams)
- The Vernalis Adaptive Management Prgram
- The Environmental Water Account
- The Pelagic Organism Decline

# Cautionary Tales: The Future

- Consider the entire system
- Source water
- Selenium effects
- Impacts on delta smelt
- Other fish

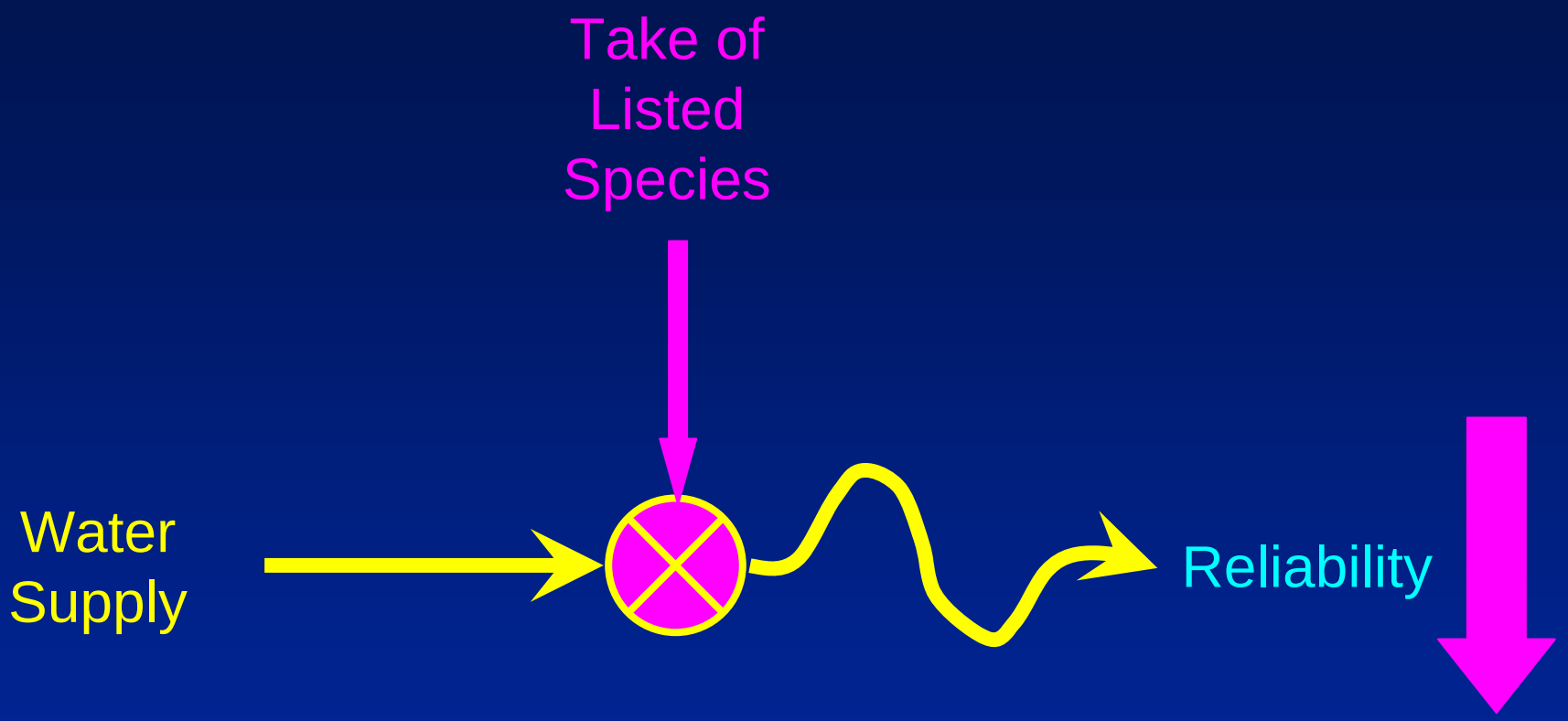
# Cautionary Tales: The Future

- Consider the entire system
- Source water
- Selenium effects
- Impacts on delta smelt
- Other fish
- Mammals (esp. self-important great apes)

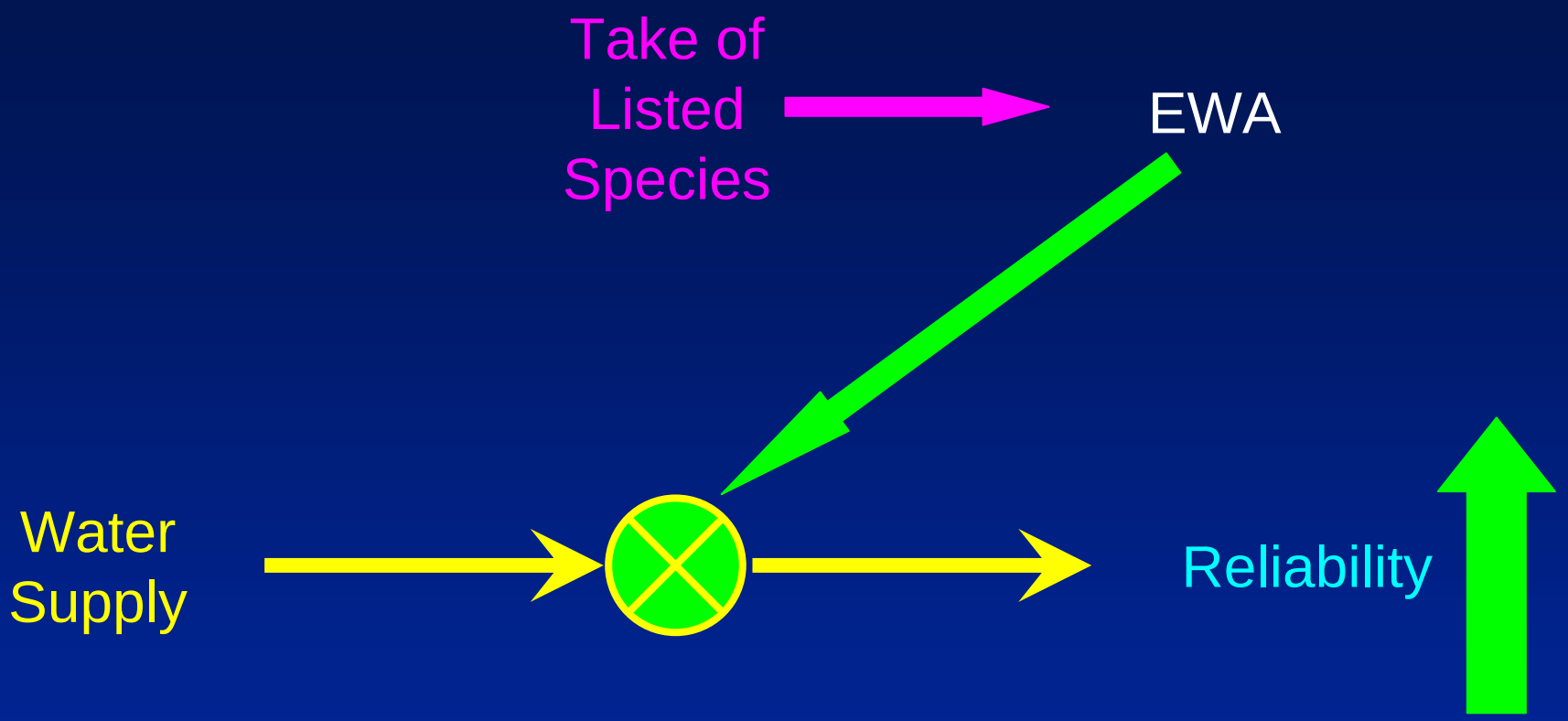
# What problems are we trying to solve?

- Water supply reliability
- Risk of levee failure → water supply
- Water quality (drinking, ag, environmental)
- Harm to ecosystem & listed fish
- Water conservation
- Restore “normal” water flow patterns

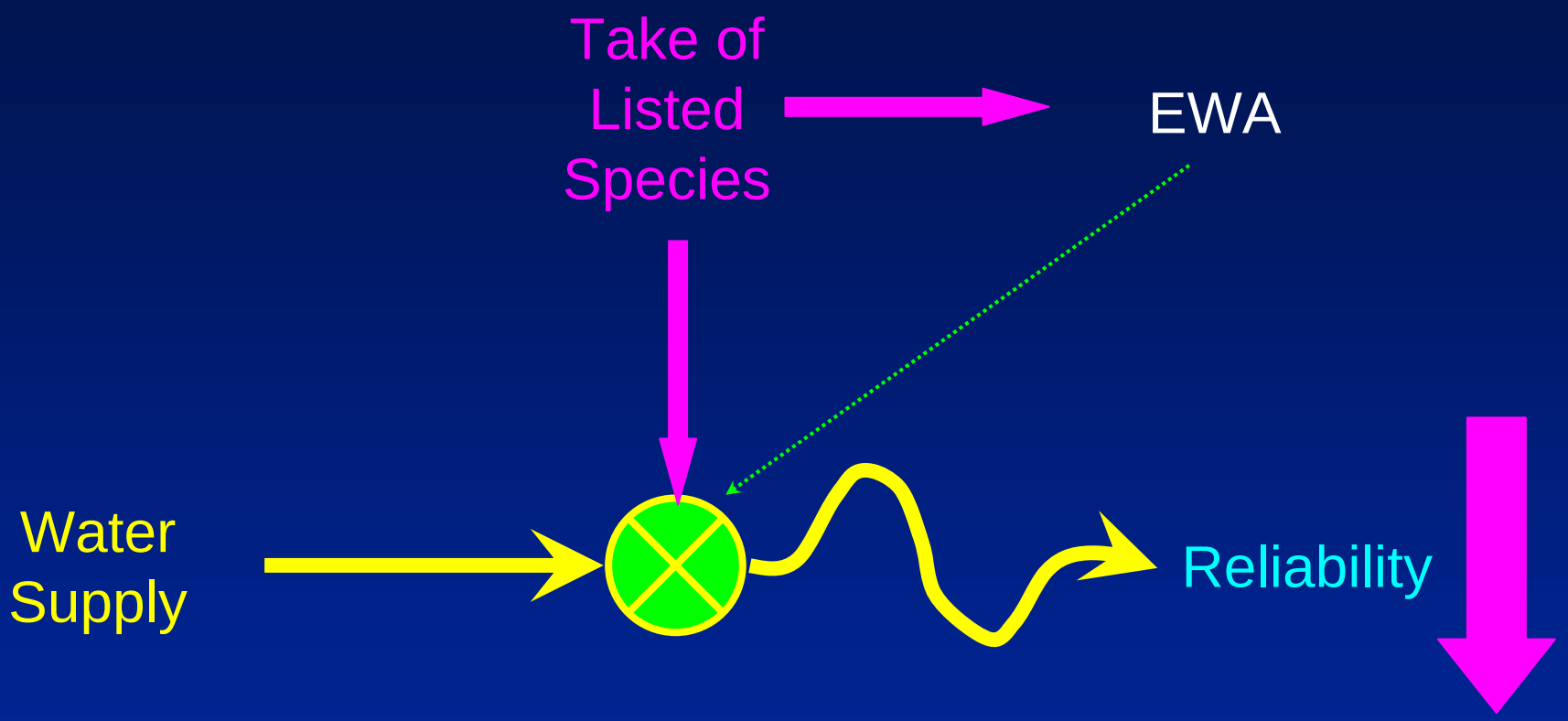
# Pre-Accord



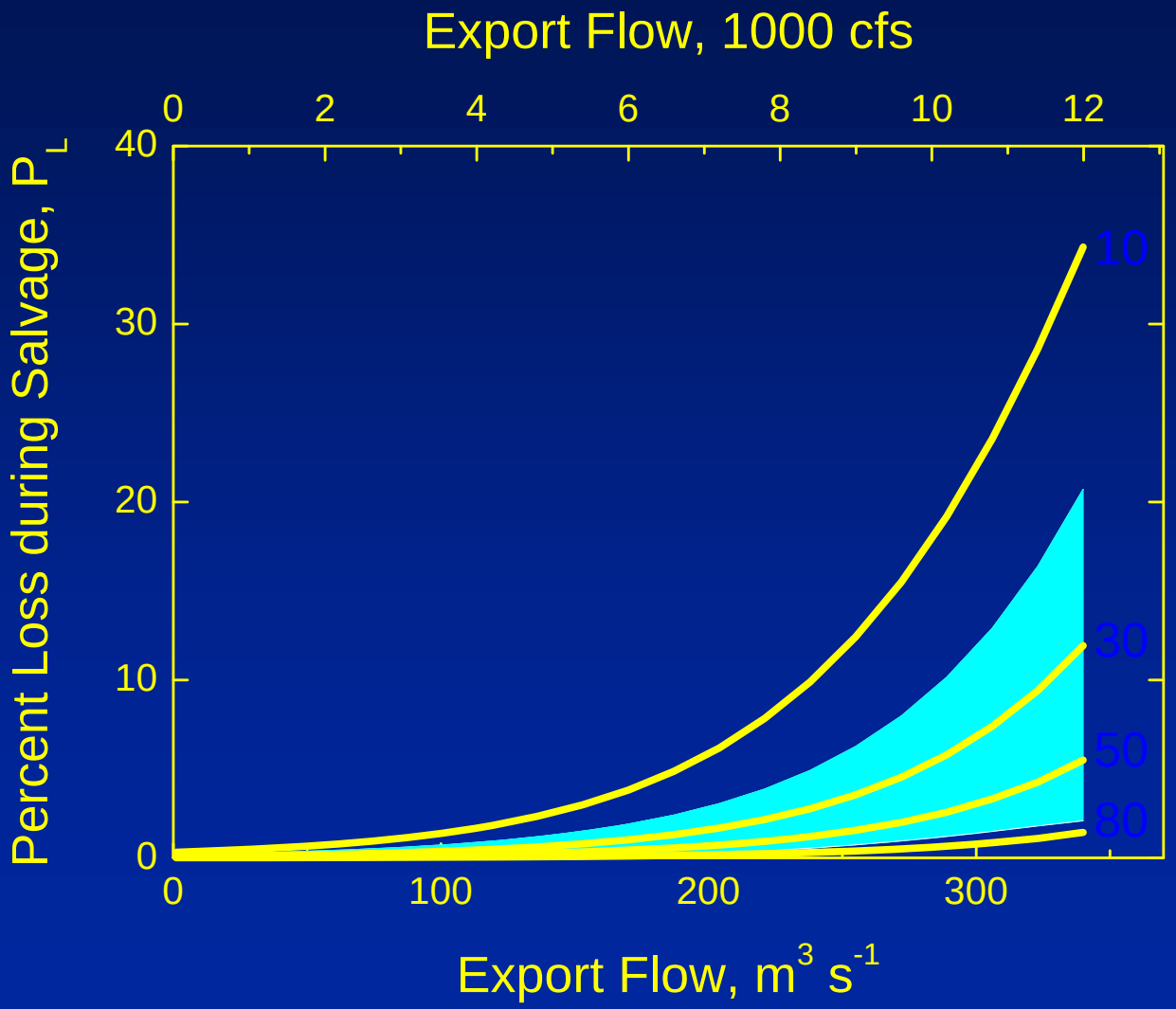
# Environmental Water Account



# Environmental Water Account



# Estimated Effects of Export Pumping on Winter Run Salmon

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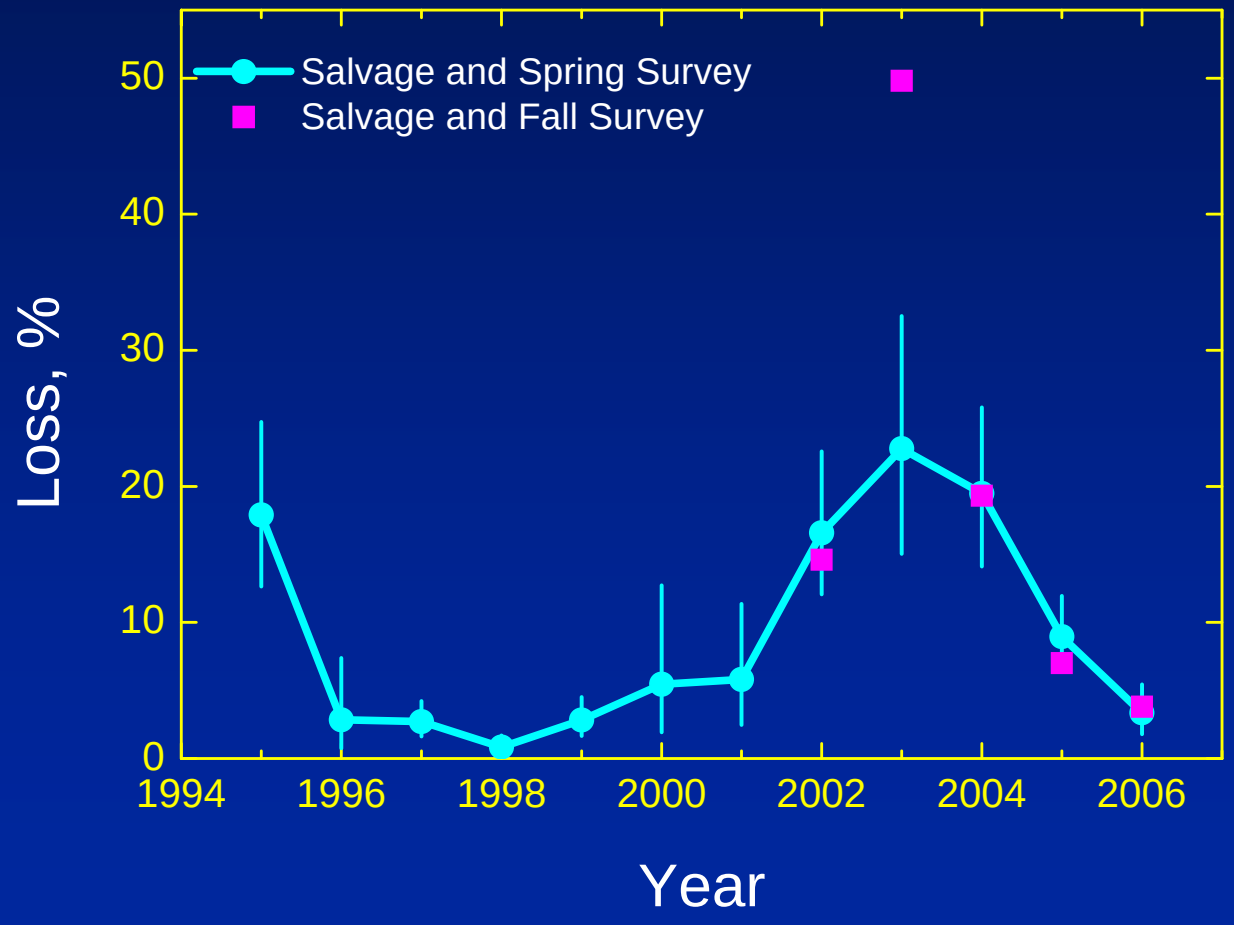
# Effects of Export Pumping on Adult Delta Smelt

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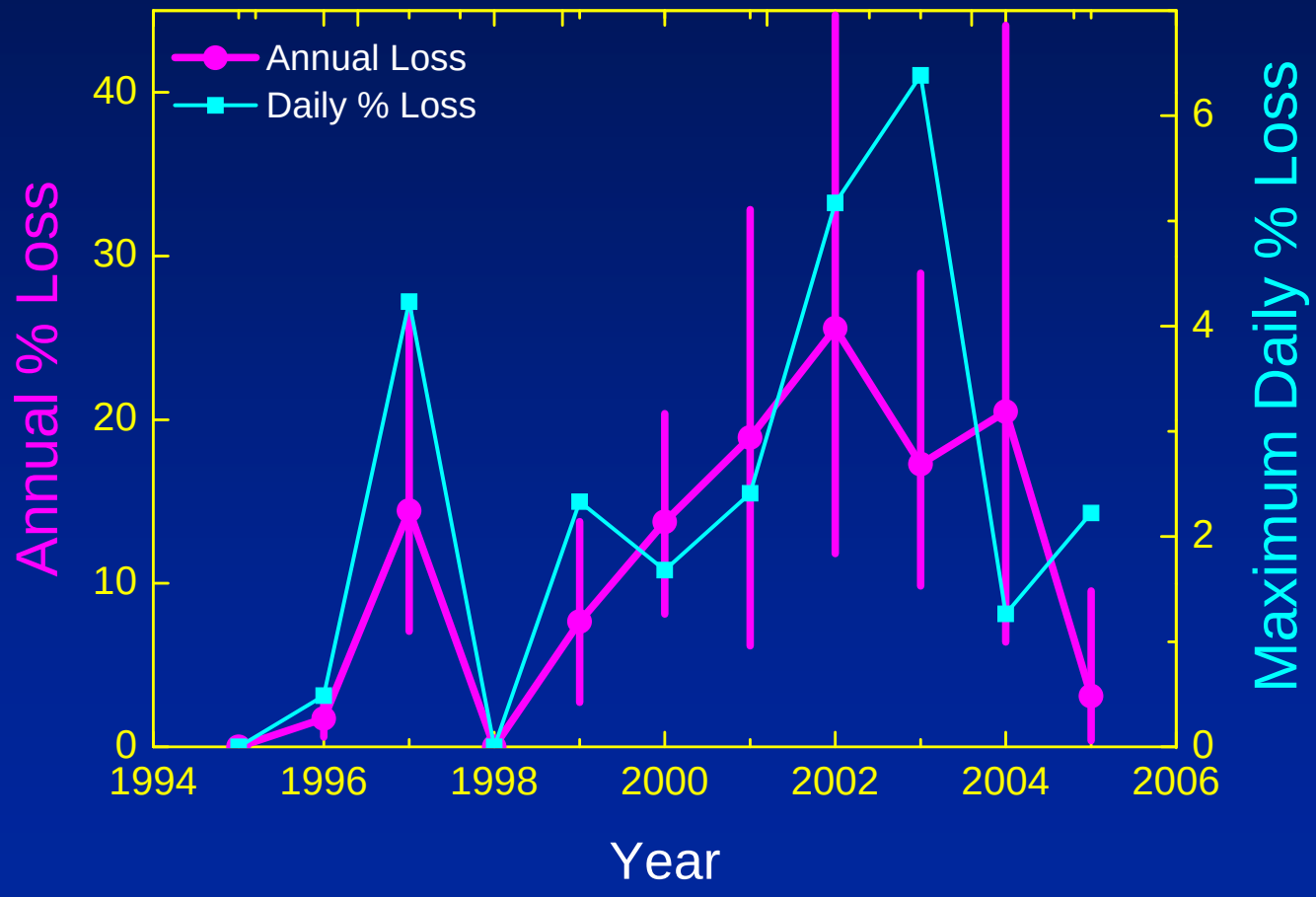
# Effects of Export Pumping on Juvenile Delta Smelt

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# The Big Question

Would eliminating take solve the problem with listed species?

# The Big Question

That depends:

How will it be sized?

Where will it go?

How will it be operated?

What assurances will there be?

# The Big Question

That depends:

How will it be sized?

Where will it go?

How will it be operated?

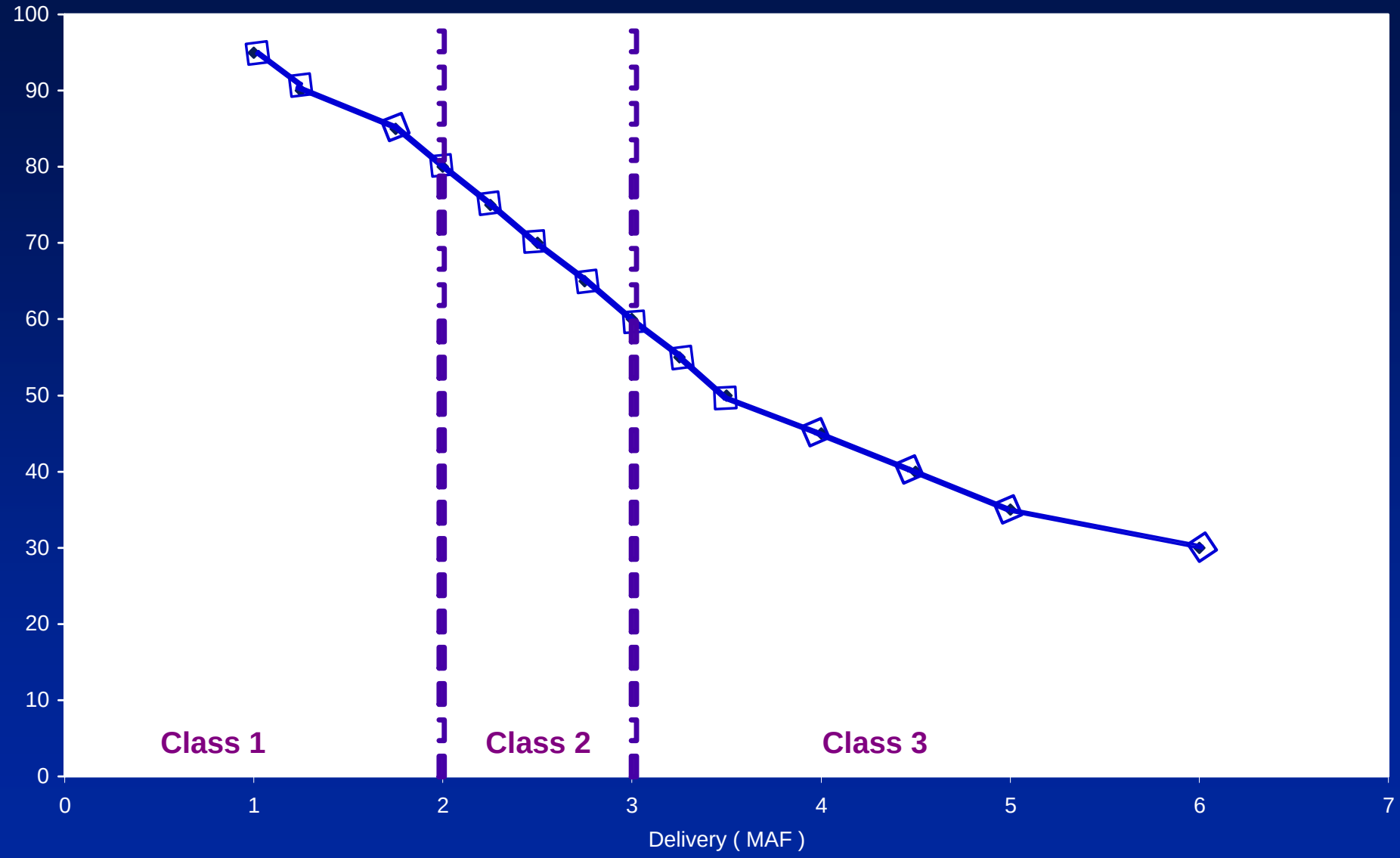
What assurances will there be?

What about the ecosystem?

What about water quality?

Who wins and who loses?

# Hypothetical IF Exceedence Curve



# A Simple example of Simultaneous Pricing and Sizing

| Base Cost | | | |
|---|---|---|---|
| | Capacity | Total Cost | Annual Cost |
| | MAF | $ Billion | $ Million |
| | 7.722 | 3.606 | 540.99 |
| | | | |
| | Agriculture | Environment | Urban |
| Quantity | 5.057 | 1 | 1.665 |
| Price | 26.44 | 70.06 | 202.54 |
| **50% Cost Increase** | | | |
| | Capacity | Total Cost | Annual Cost |
| | MAF | $ Billion | $ Million |
| | 7.106 | 5.288 | 793.33 |
| | | | |
| | Agriculture | Environment | Urban |
| Quantity | 4.516 | 1 | 1.59 |
| Price | 39.84 | 111.65 | 315.66 |

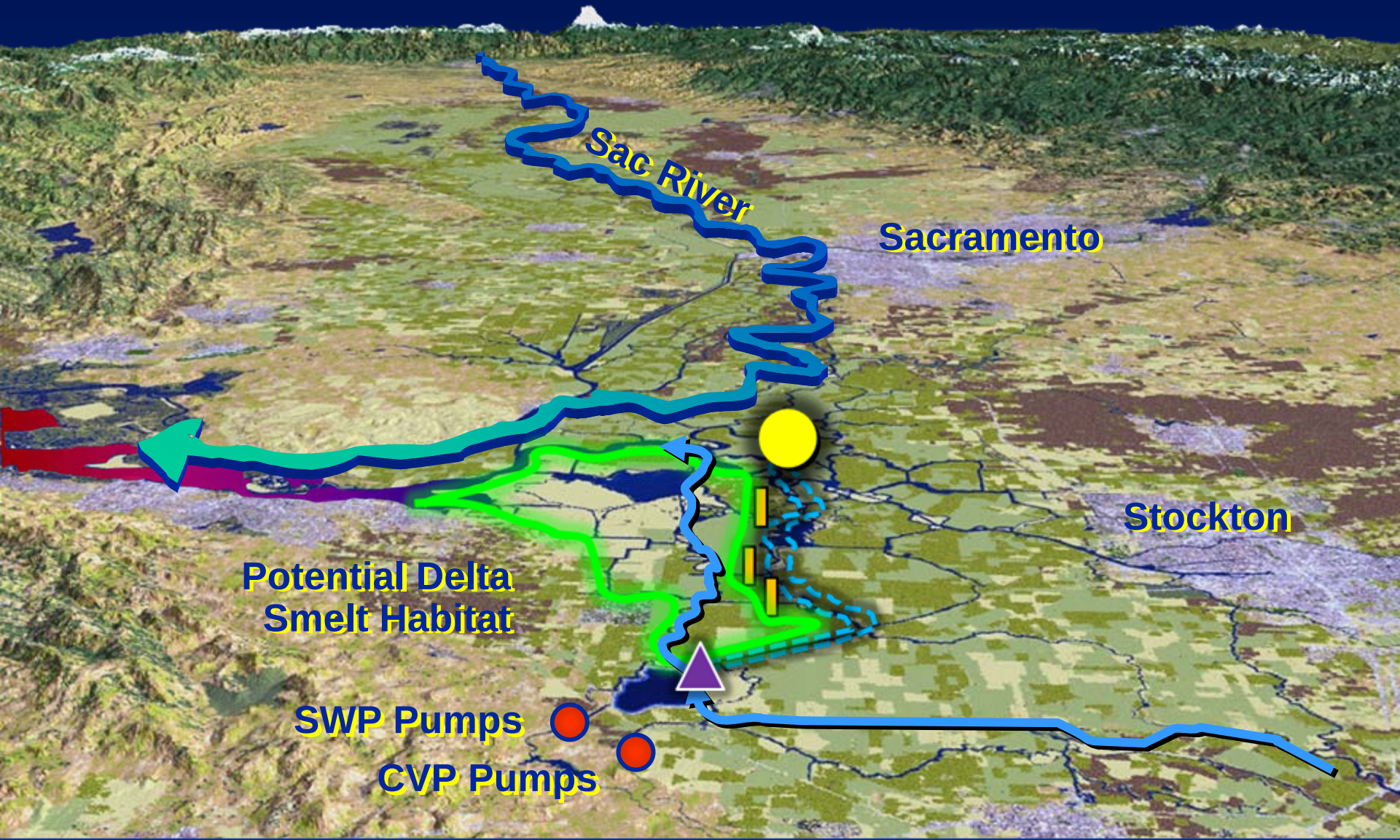
# Effects of changing operations &/or infrastructure

Monsen, Cloern and Burau, 2007, *SFEWS*

- *Transport routes change*
- *Source mixtures change*
- *Flushing times change*
- *therefore Habitat changes*

# Is this where delta smelt spawn?

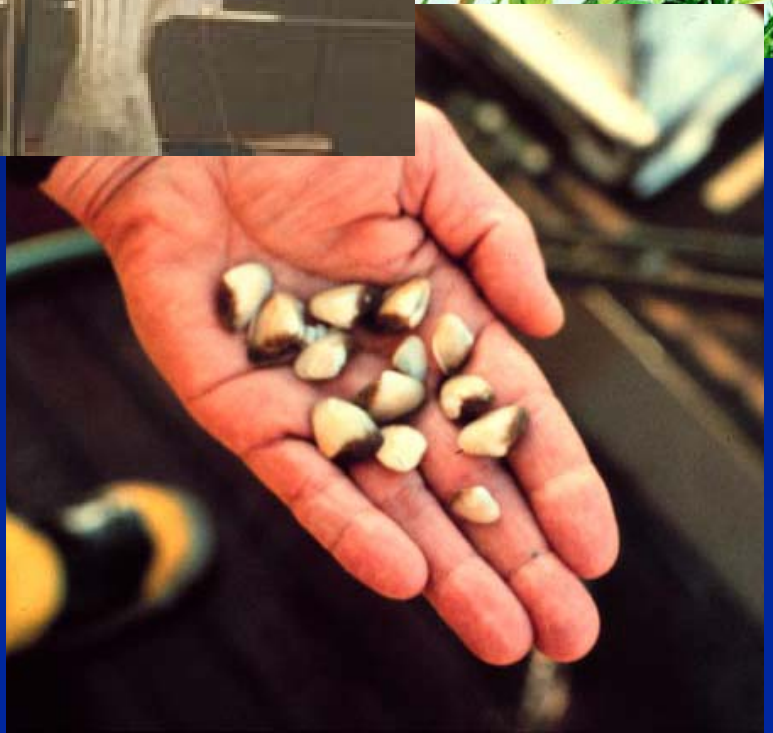
# Eco-crescent / Middle River Conveyance



# Knowns (current state)

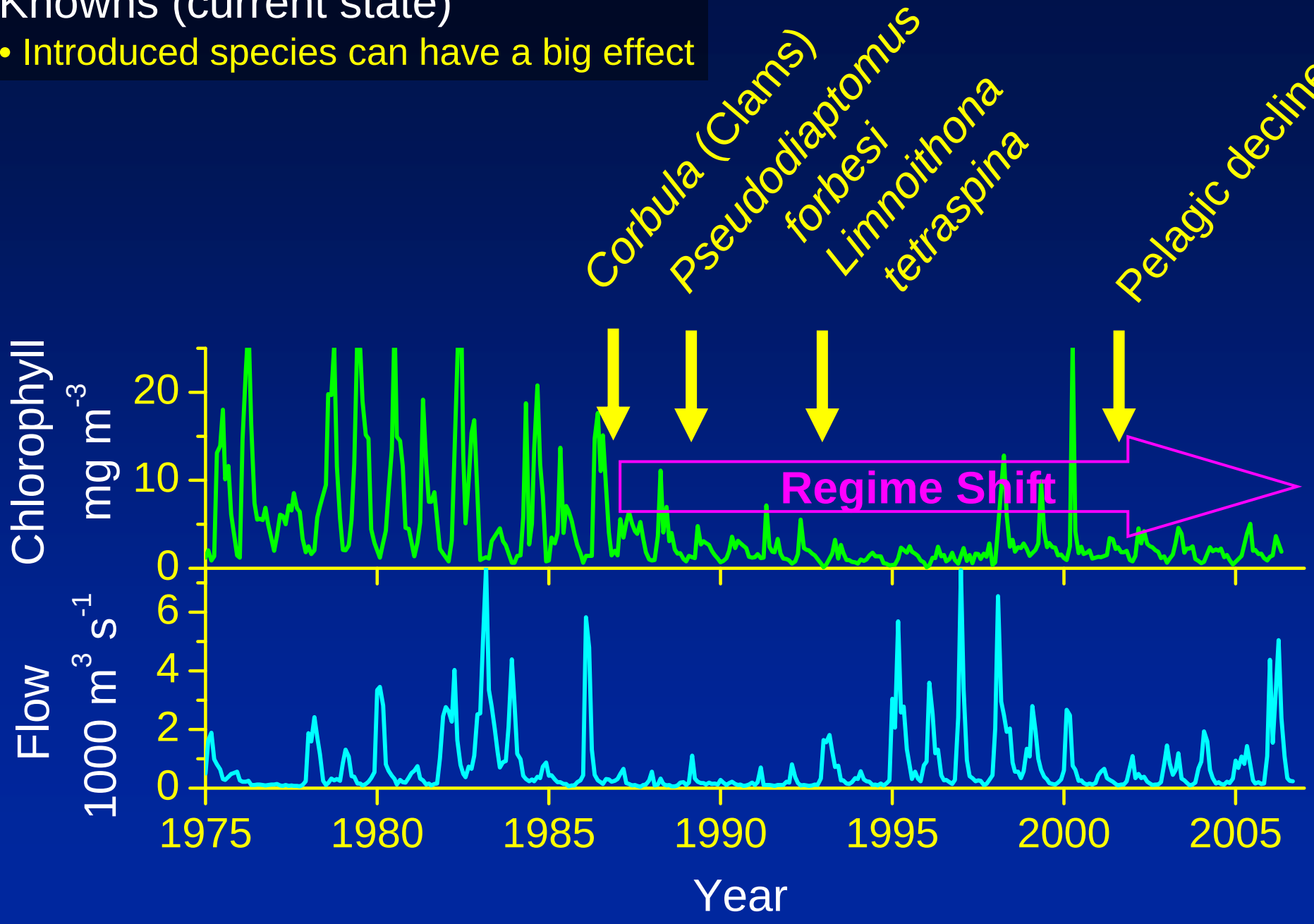
- Introduced species galore!

*(not to scale)*

## Knowns (current state)

- Introduced species can have a big effect



# Highest priority water quality issues

- Salinity
- Drinking water quality,
- Dissolved Oxygen,
- Pesticides,
- Selenium,
- Mercury,
- Toxicity of Unknown Origin,
- *Endocrine disrupters & other emerging issues*

# What do we need?

- Project design and sizing
- Hydrodynamic models
- Study design
- Commitment to process

# What do we need?

- Project design and sizing
  - Exceedence curves
  - Demand functions
  - Environmental water needs
- Hydrodynamic models
- Study design
- Commitment to process

# What do we need?

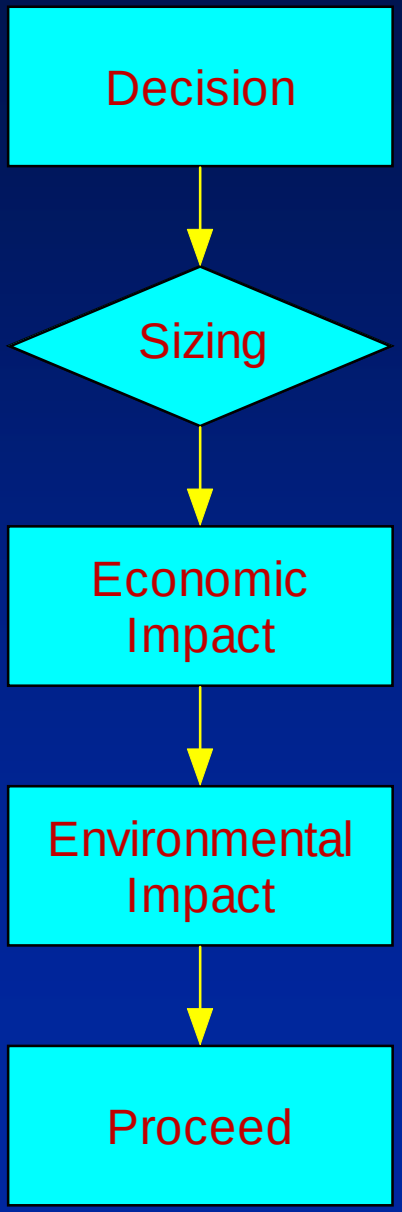
- Project design and sizing
- Hydrodynamic models
  - Public domain
  - Entire system
  - 1D, 2D, 3D
  - Particle tracking
  - Calibrated! (and compared)
- Study design
- Commitment to process

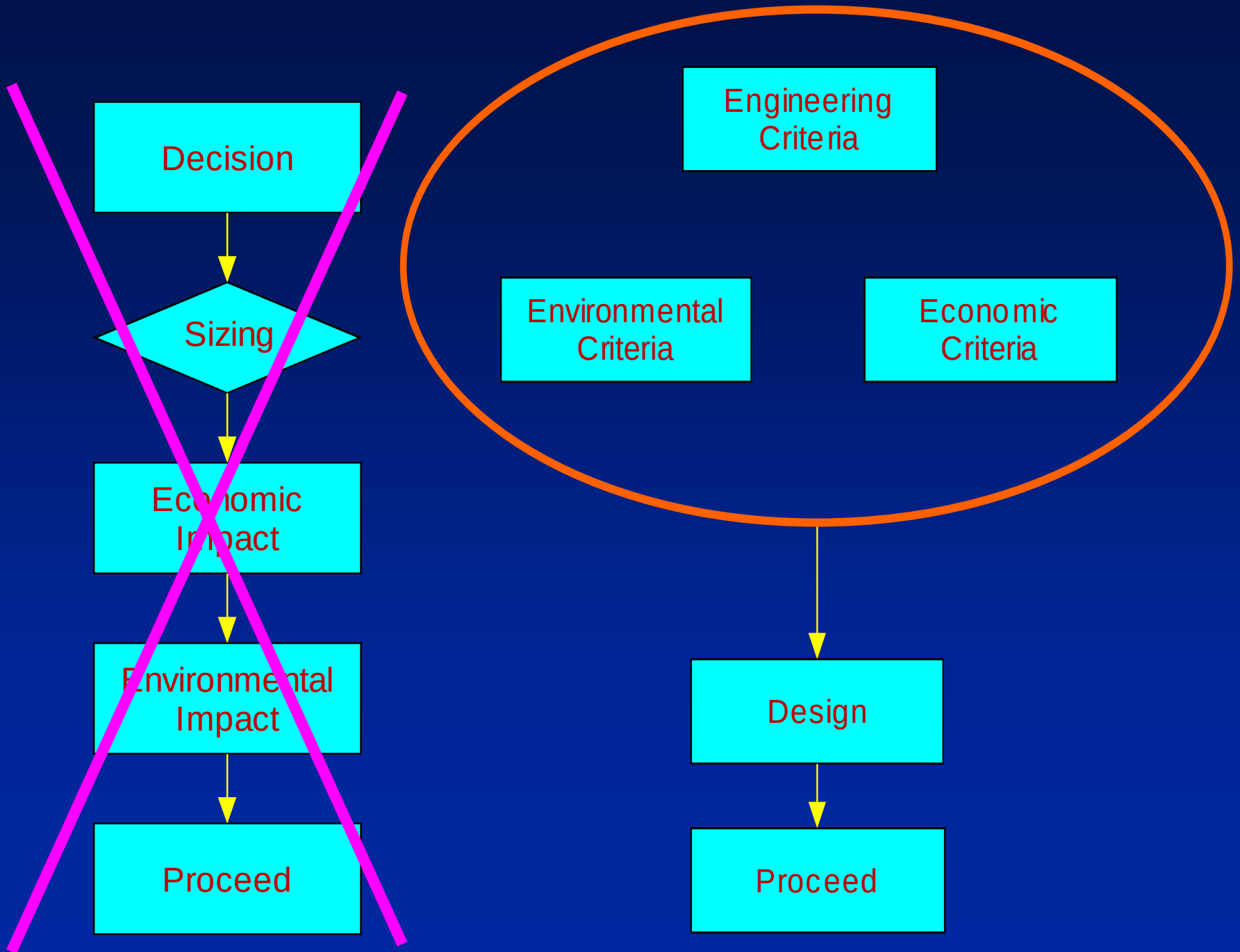
# What do we need?

- Project design and sizing
- Hydrodynamic models
- Study design
  - What are the key unknowns?
  - What are the key interactions?
  - What time frame do we need?
  - How much manipulation can we have?
  - What is the reliability class for the environment?
- Commitment to process

# What do we need?

- Project design and sizing
- Hydrodynamic models
- Study design
- Commitment to process
  - Willingness to experiment
  - Long-term view
  - I.e., something like CALFED was supposed to be!


Decision
Sizing
Economic Impact
Environmental Impact
Proceed


Decision
Sizing
Economic Impact
Environmental Impact
Proceed
Engineering Criteria
Environmental Criteria
Economic Criteria
Design
Proceed


We have a lot of work to

# Knowns (current state)

- Physical habitat not always the answer
- Not all habitat is created equal