



DRERIP: Scientifically Evaluating Restoration Actions

**CALFED Independent
Science Board
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Sacramento, CA**

Delta Regional Ecosystem Restoration Implementation = DRERIP

A Plan that consists of
**prioritized Restoration
Actions** that have been
scientifically 'vetted'



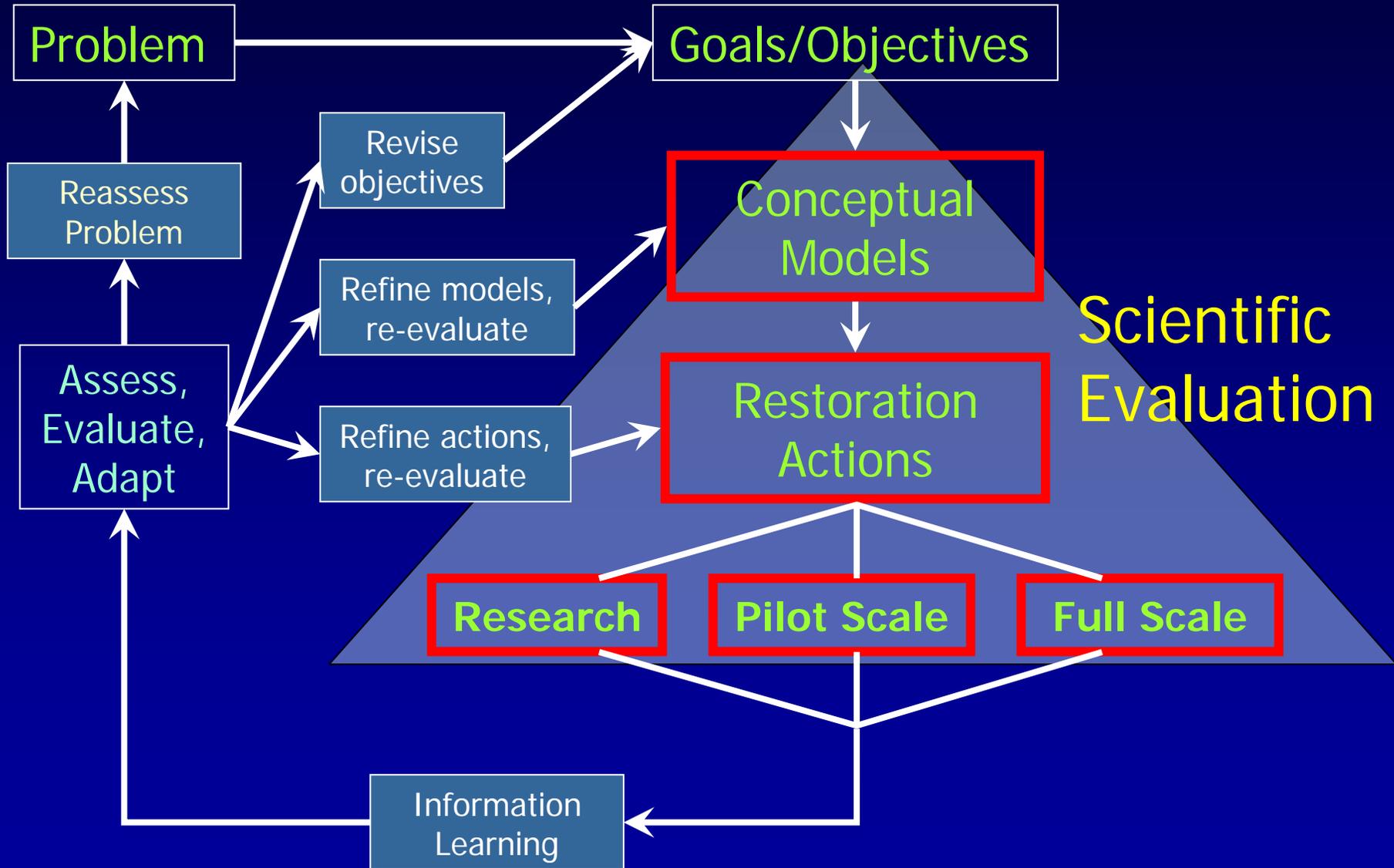
Purpose:

- To refine the existing ecosystem restoration approach (proposed actions and targets) based on the current state of scientific knowledge; and
- To guide long-term ecosystem restoration in the Delta.

Approach

- ERP Strategic Plan
- Develop adaptive management planning tools (actions evaluation, priority setting)
- Science-based
- Engage experts
 - Document science foundation (conceptual models)
 - Evaluate restoration actions

Fulfilling the Vision of the ERP Strategic Plan



Developing a Refined Plan of Actions

☑ Actions Database

☑ **Conceptual Models**

☑ Scientific Evaluation Process

- Worth (Magnitude and Certainty of Ecological Benefit)
- Risk (Magnitude and Certainty of Adverse Outcome)
- Reversibility
- Potential for Learning

? *Feasibility Determination*

? *Action Prioritization*

Conceptual Models as the Scientific Foundation for Action

- What do they do?
 - Articulate species needs
 - Explain how the Delta ecosystem works
 - Web-based; tiered/linked
- Collaboratively Developed by Experts
- Externally Peer Reviewed
- Periodically Refined

Model Development Team

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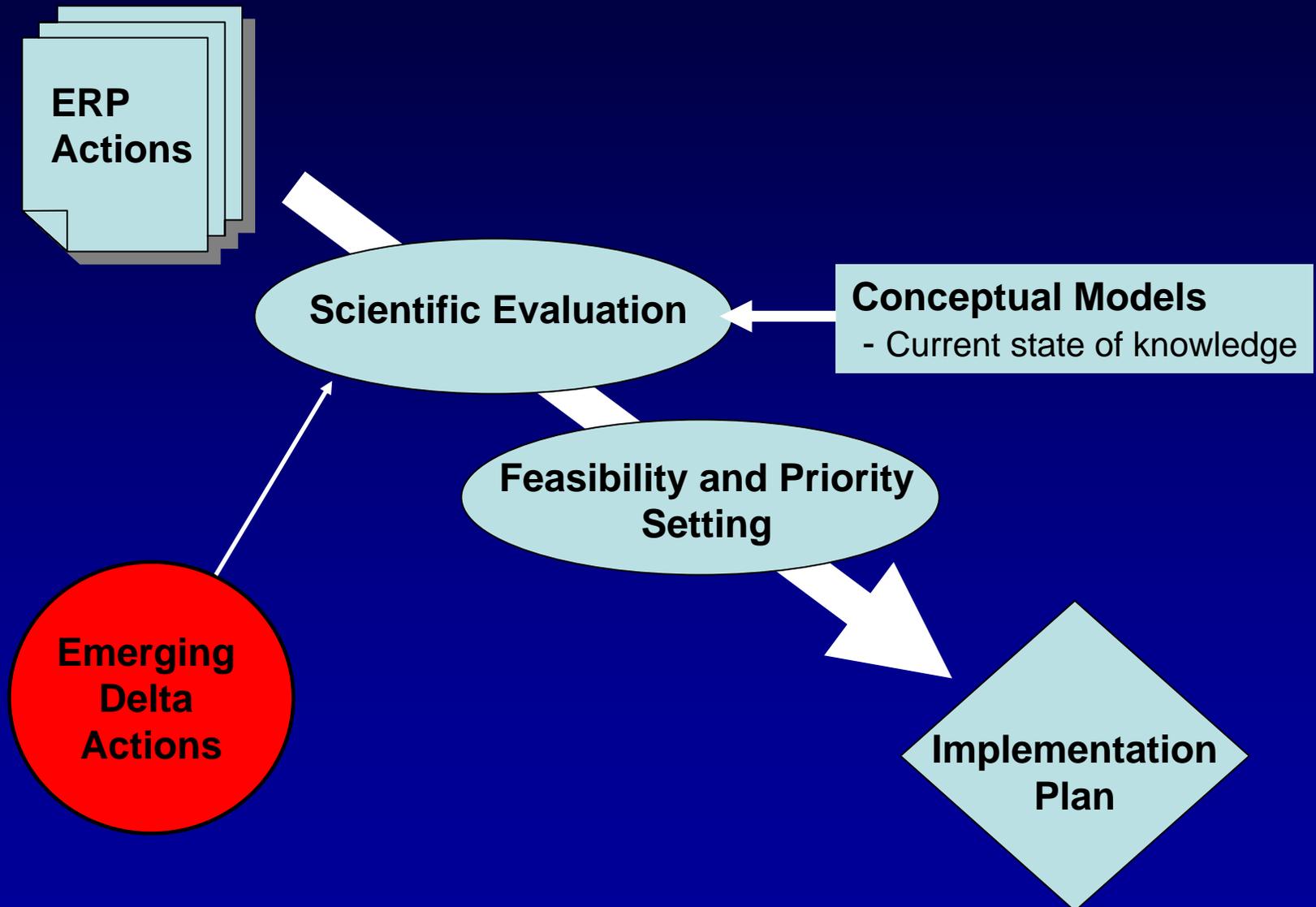
Inge Werner, U.C. Davis

Scott Wright, USGS

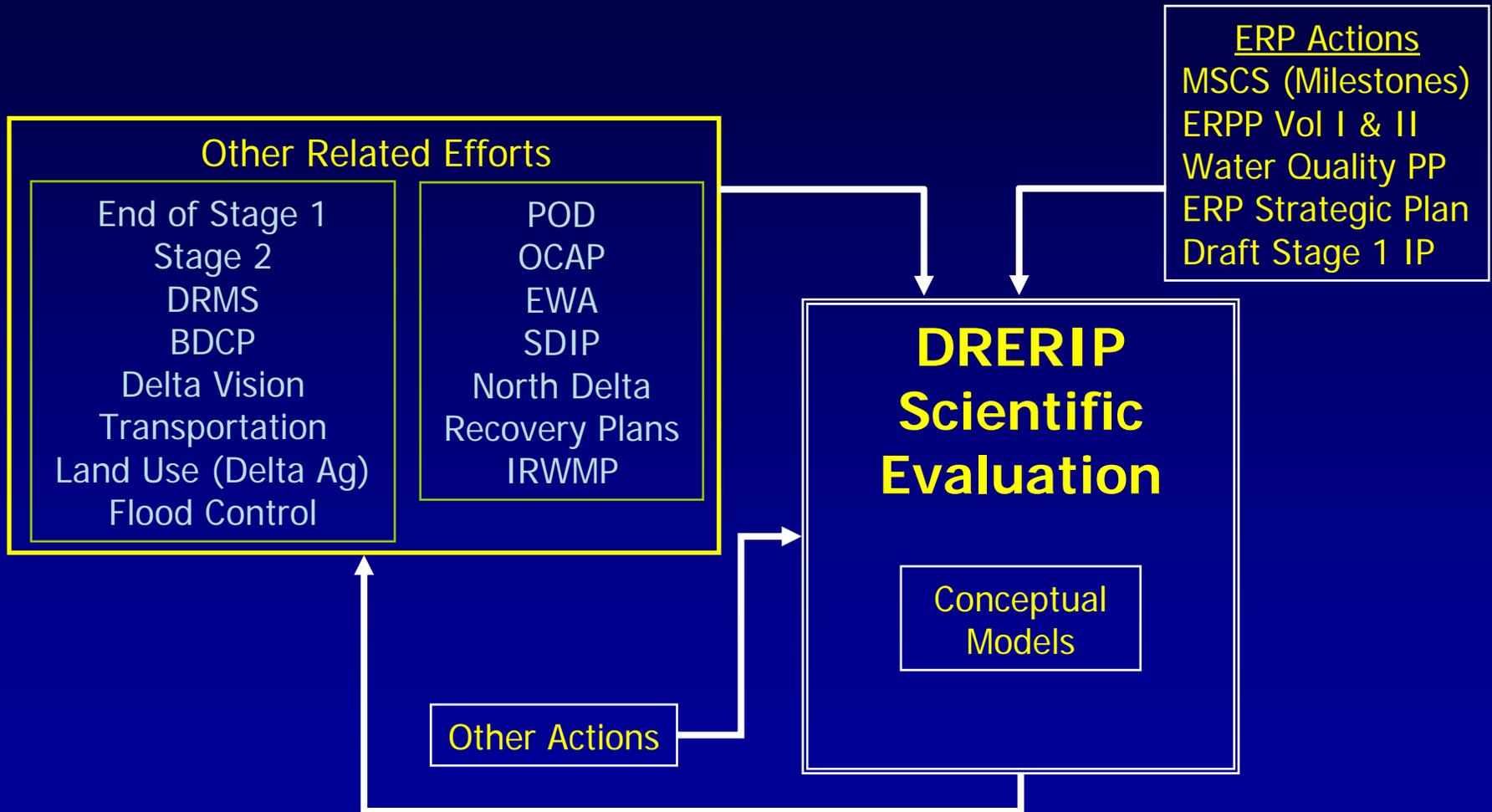
Carolyn Yale, EPA

(* = also involved in DRMS
and/or BDCP)

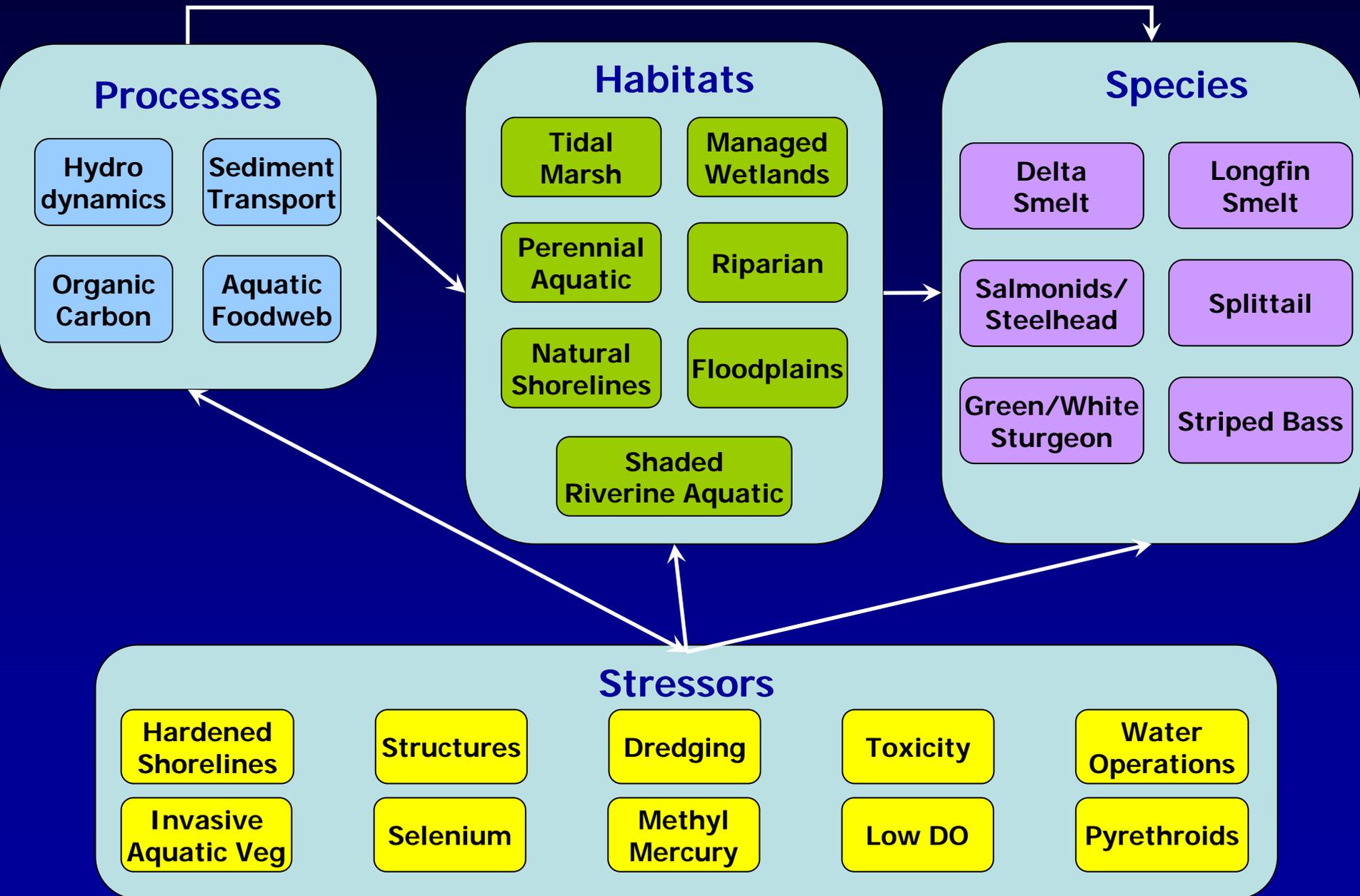
Refining Actions



Delta Restoration Actions



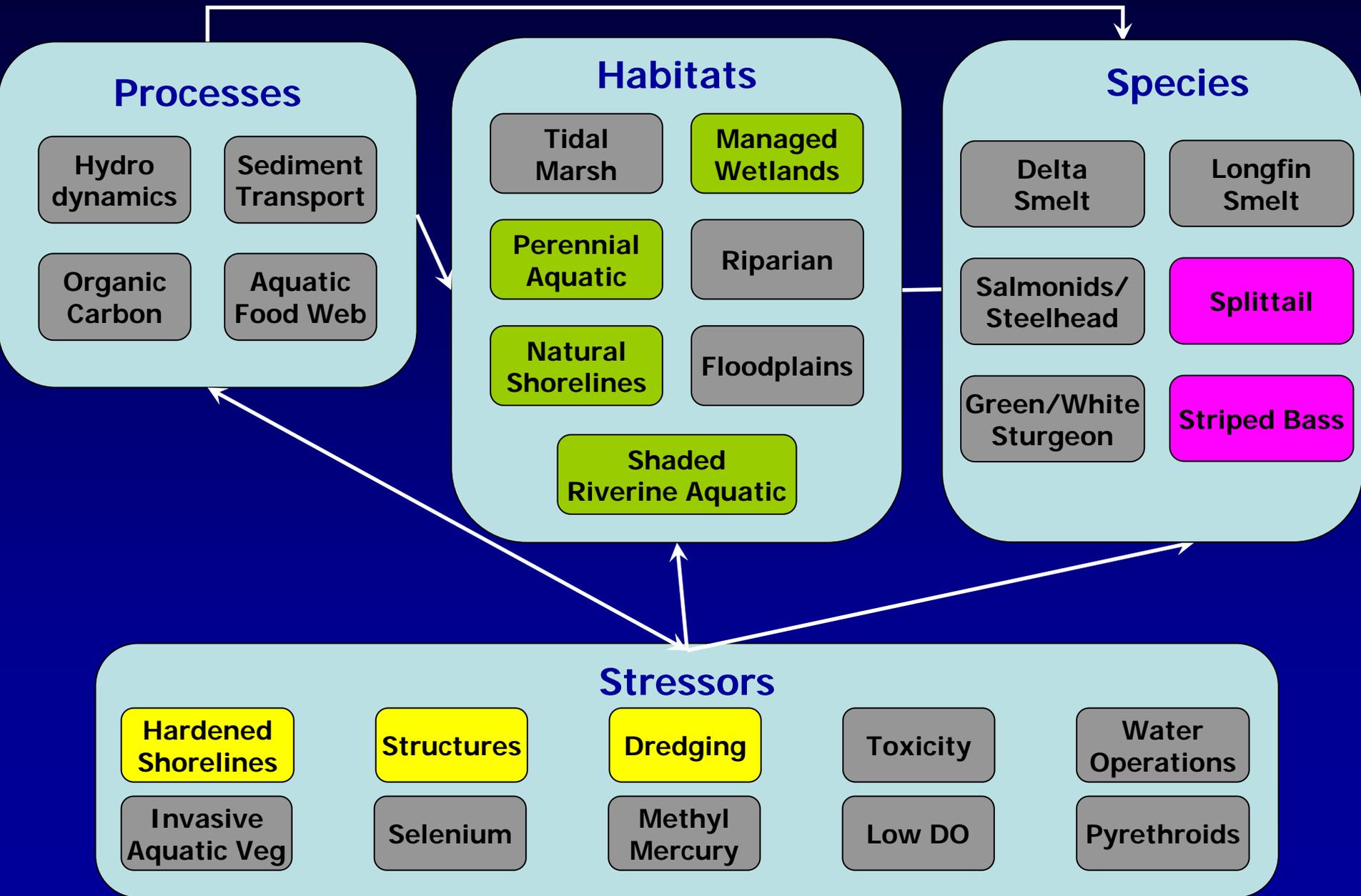
DRERIP Conceptual Models



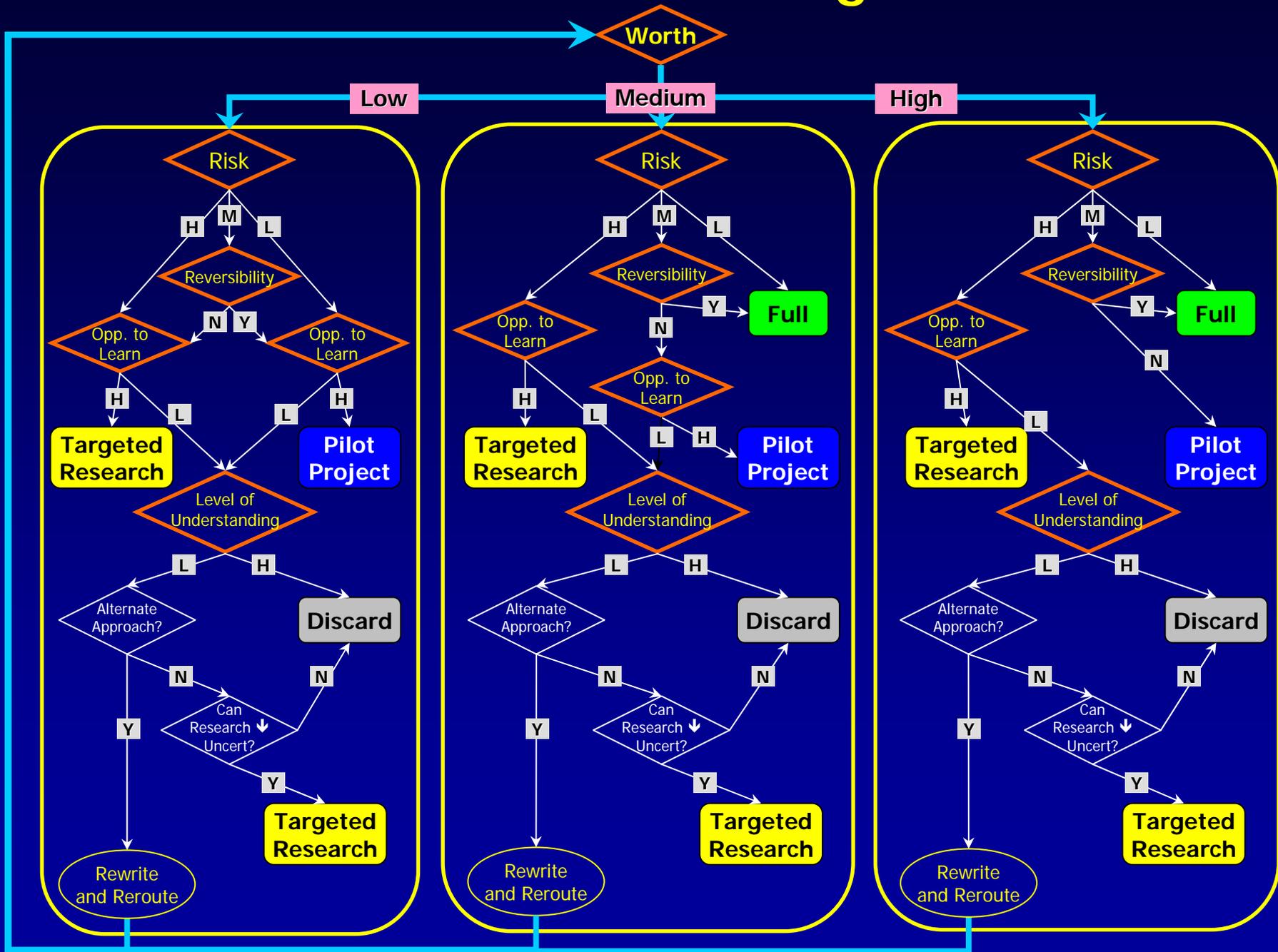
Peer Review of Conceptual Models

- Species Models
 - Independent expert review
 - Editor
- Ecosystem Models
 - Interactive Panel Review
 - Expert panel with knowledge of both system and restoration/management issues
 - Panels in March-April
 - Report to ISB in June 2007

DRERIP Conceptual Models



Decision Tree for Routing Actions



DRERIP Schedule

Convene Action Team to develop initial ecosystem models	August 2006 December 2006
Complete initial species life history and ecosystem conceptual models	June 2007
Complete actions evaluation	September 2007
Priority setting	October 2007
Complete plan	December 2007

Conceptual Models Application

Linking Actions with Outcomes

Evaluate

Conceptual Models Inform Four Topics:

Magnitude & certainty of beneficial outcomes

Opportunities for learning

Reversibility

Magnitude & certainty of possible negative impacts

Route

Full implementation

Pilot project

Targeted research

Set aside

Scientific Evaluation Criteria

Linking Actions with Outcomes

Consider

- **Positive** ecological outcomes - magnitude *and* certainty*
- **Negative** ecological outcomes - magnitude *and* certainty*
- **Reversibility** of the action
- **Opportunity** for learning

* *Certainty = understanding + predictability*

Rating Magnitude of Outcomes

- 4 = High magnitude:** expected sustained major population level effect (e.g., addresses key limiting factor) or landscape scale habitat effect.
- 3 = Medium magnitude:** expected sustained minor population effect or effect on large area of habitat.
- 2 = Low magnitude:** expected sustained effect limited to small fraction of population or limited spatial or temporal effects.
- 1 = little or no effect.**

Rating Understanding of Outcomes

- 4 = Based on peer-reviewed studies from within system and scientific reasoning supported by most experts within system.
- 3 = Based on peer-reviewed studies from outside the system and corroborated by non peer-reviewed studies within the system.
- 2 = Based on non peer-reviewed research within system or elsewhere.
- 1 = Scientific basis unknown or not widely accepted

Is It Worthwhile?

Combining Magnitude and Certainty

		Understanding			
		1	2	3	4
Positive Outcome	1	<i>Low</i>	<i>Low</i>	<i>Low</i>	<i>Med</i>
	2	<i>Low</i>	<i>Low</i>	<i>Med</i>	<i>High</i>
	3	<i>Low</i>	<i>Med</i>	<i>High</i>	<i>High</i>
	4	<i>Med</i>	<i>High</i>	<i>High</i>	<i>High</i>

Reversibility

Yes/Easy = Action could likely be reversed as or more quickly and cheaply than original action

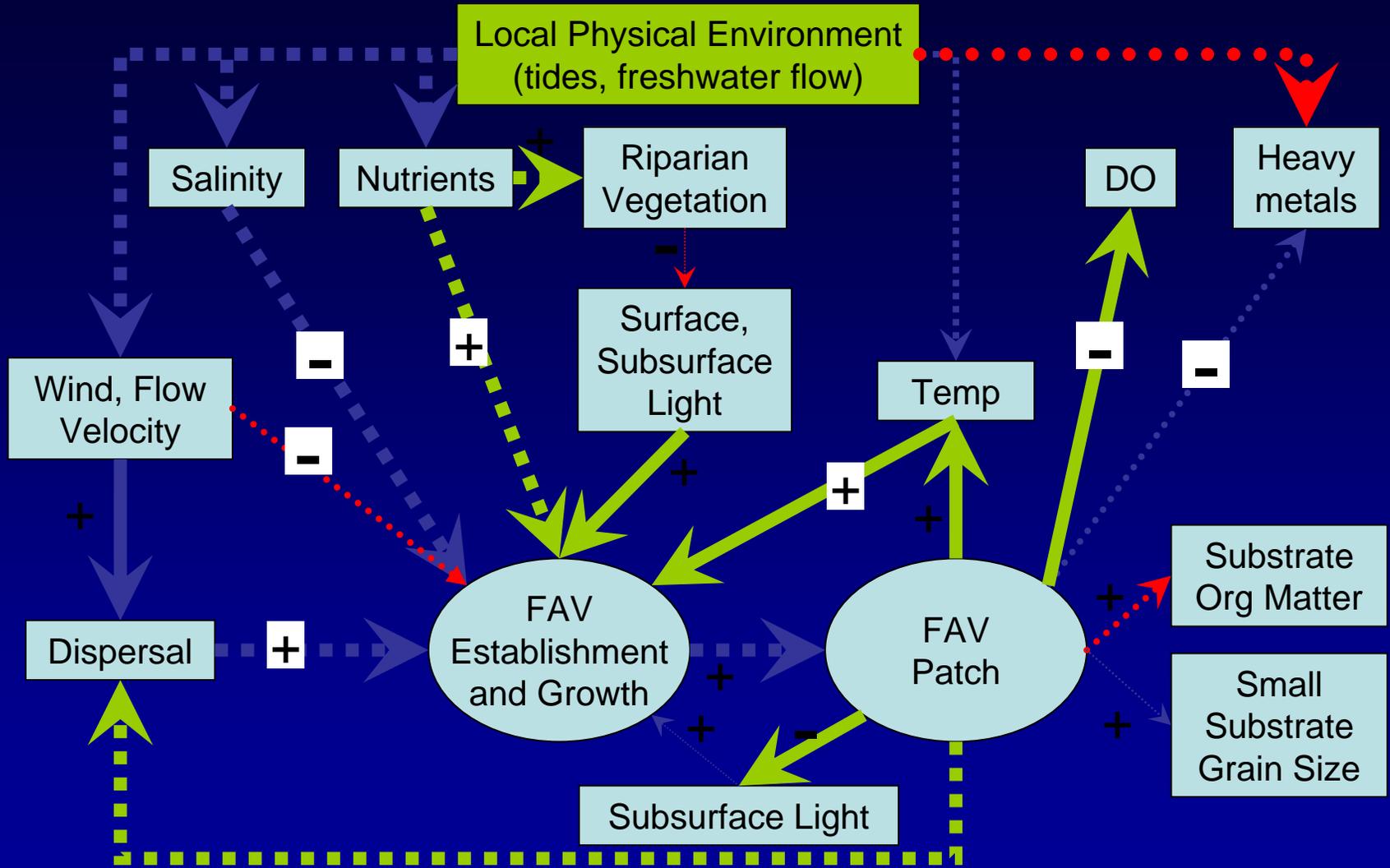
No/Hard = Reversing action would require more time or more money than implementing action; action may not be completely reversible

Opportunity for Learning

High = Expect to advance our understanding of critical uncertainties as identified in Conceptual Models in a quantifiable manner.

Low = Impractical or excessive time or resources likely required to achieve such understanding.

Physical Environment Feedback Sub Model to FAV



Importance:

- High – thick line
- Med – medium line
- Low – thin line

Understanding:

- High – green arrow
- Med – blue arrow
- Low – red arrow

Predictability:

- High – solid line
- Med – dashed line
- Low – dotted line

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 Stuart Siegel, WWR
 Mark Stacey, UCB