

Putting Uncertainty in Context

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EcoAdapt



Climatic change is affecting all ecosystems, and will continue to do so for centuries, so...

- **We need to *incorporate climatic change into long-term planning***
 - **Minimize risk of wasting time, money, and effort**
 - **Maximize likelihood of success**

Data

Ecosystem
responses

Climate models

Hydrologic
& Vegetation
Models



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Societal
response

Laws,
Policies,
Institutions

Economics



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Laws,
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Objectives

Terminology

Values

Responses to uncertainty

Responses to uncertainty

- Ignore it/pretend you can get rid of it

Beware spurious precision!

Certain: death and taxes
Uncertain: everything else



Responses to uncertainty

- Wait for more certainty before taking action

Responses to uncertainty

- Frame the problem as one of uncertainty

Responses to uncertainty

- Focus on better-understood problems where uncertainty seems manageable

Responses to uncertainty

- Understand and work with it

**May I have the ability to reduce the
uncertainties I can, the willingness to work
with the uncertainties I cannot, and the
scientific knowledge to know the
difference.**

*Joe Barsugli, Cheis Anderson, Joel Smith and
Jason Vogel*

Known unknowns vs. Unknown unknowns

- Scenario planning, SDM can help build clarity and flexibility
- Describe/characterize uncertainty
 - Importance to decision?
 - Reducibility? Quantifiability?
 - Content: resource responses, sociological responses, synergistic effects



Reducibility

- Future greenhouse gas emissions

VS

- How global temperatures respond to increases in GHG concentration

VS

- How global precipitation regimes respond to increases in GHG concentration



Controllability

- Whether or not to buy a car
- Greenhouse gas emissions
- Massive methane belch from the deep sea



Directionality vs. magnitude

- All climate models say things will get warmer; they disagree on just how much warmer
- Models disagree on whether things get wetter or drier overall



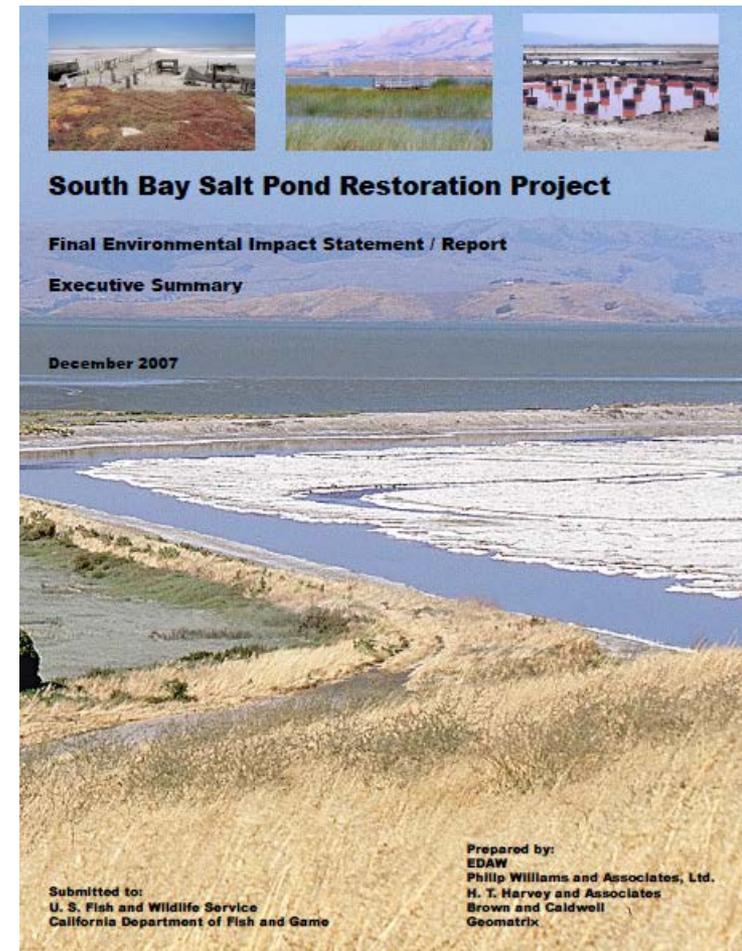
Surf the wave!

- Adaptive management
- Expert elicitation
- Scenario planning
- Decision sensitivity analysis
- Value of information analysis

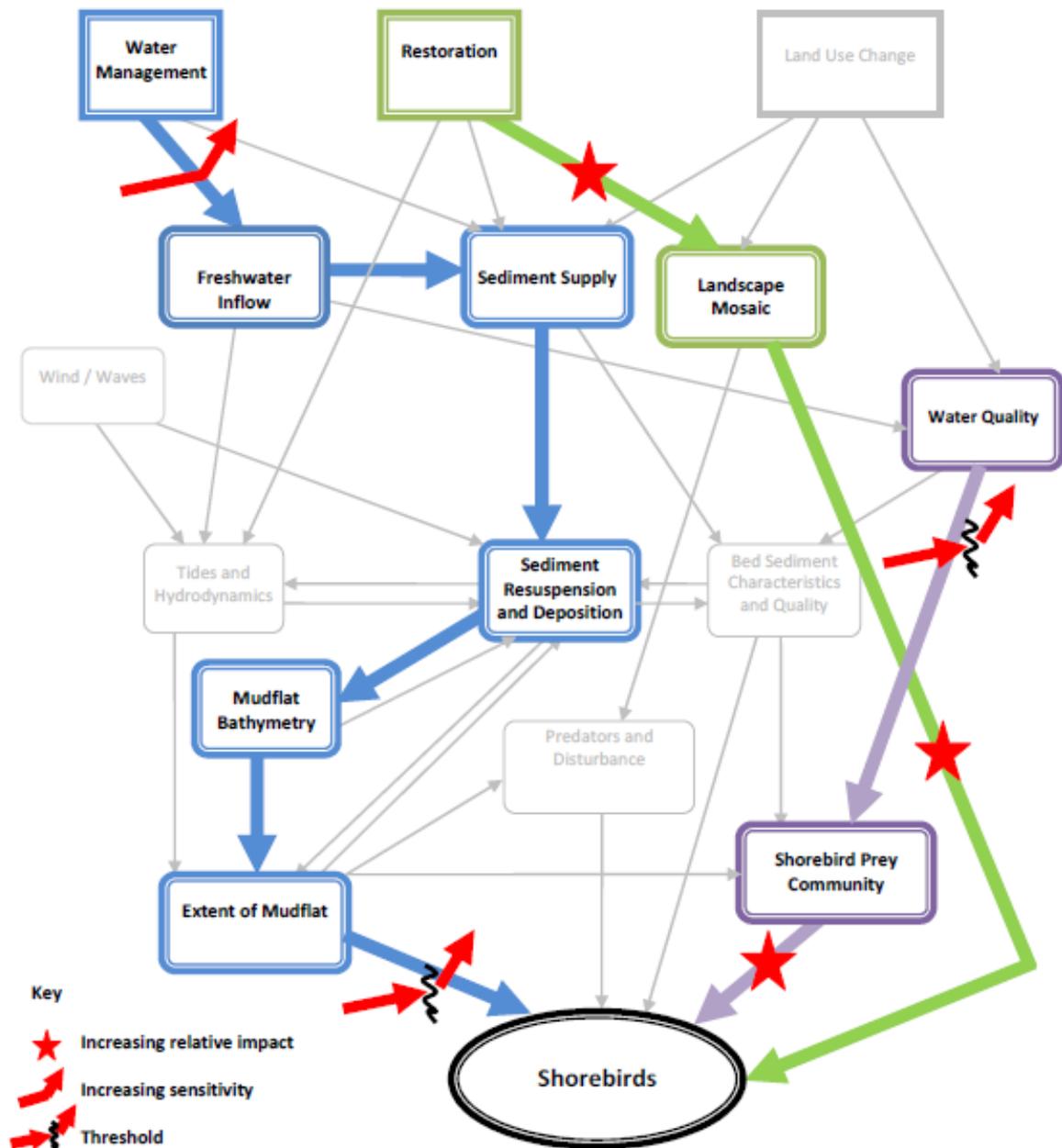


Adaptive Management Plan for South Bay Salt Pond Restoration Project

- Specified key uncertainties and research to address them
- Specified triggers for action
- Specified necessary science and institutional structure for adaptive management to work



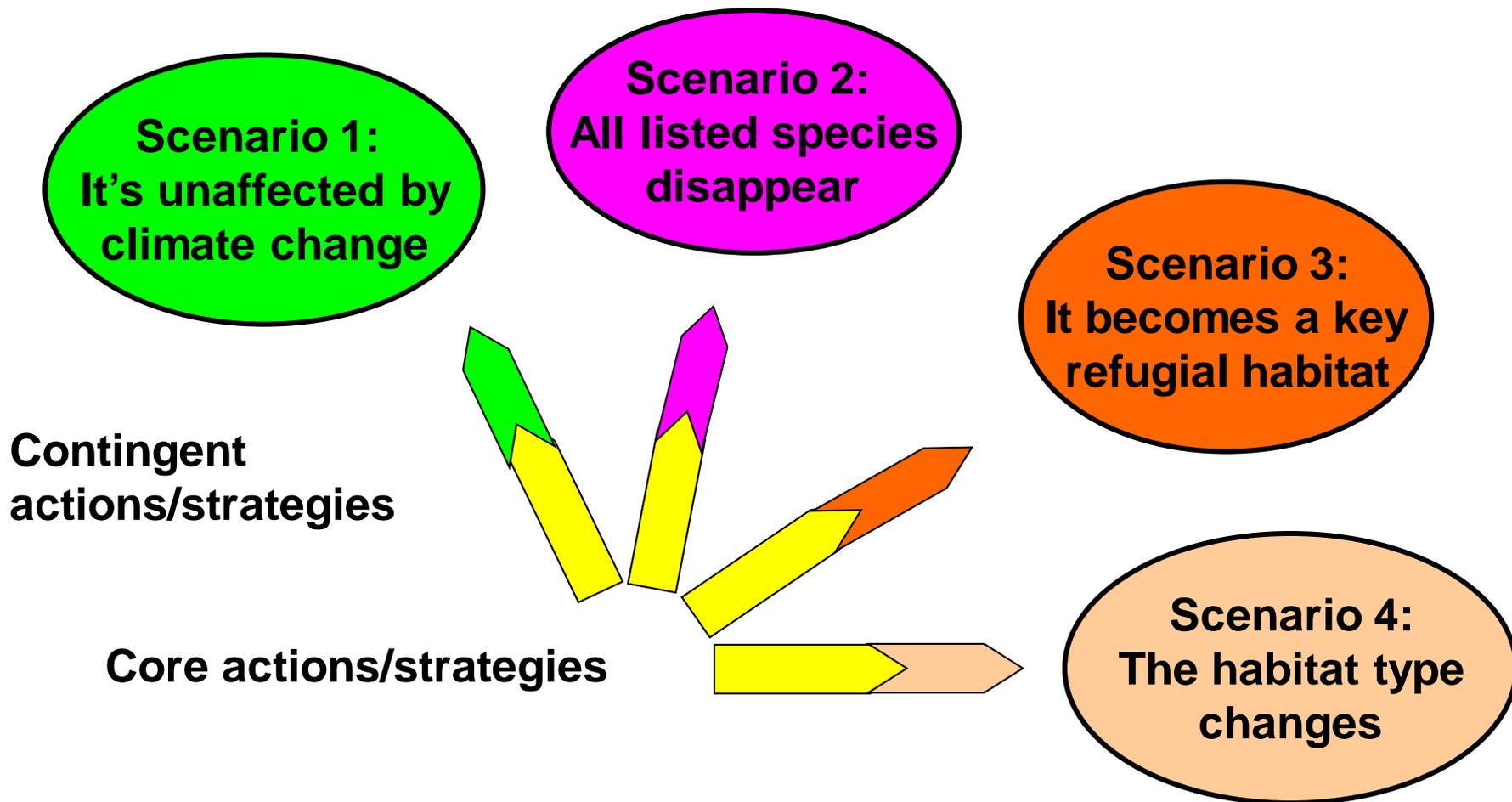
Climate Ready Estuaries “EE-type exercise”



Scenario planning and robust decision-making,

or

Should I buy this piece of property?



How sensitive is my decision to this uncertainty?

- How sensitive is my decision to this uncertainty?
 - How likely is it that resolving this uncertainty would change my decision?
- What is the value of the information?
 - What's the potential payoff were I to get perfect information?

Risk Management

FUTURE 1

FUTURE 2

Robust

FUTURE 3

FUTURE 4

Risk Management

FUTURE 1

FUTURE 2

Bet the farm

FUTURE 3

FUTURE 4

Risk Management

FUTURE 1

FUTURE 2

**Hedge
bets**

**Hedge
bets**

**Hedge
bets**

**Hedge
bets**

FUTURE 4

FUTURE 3

Risk Management

FUTURE 1

Core

FUTURE 2



Satellite

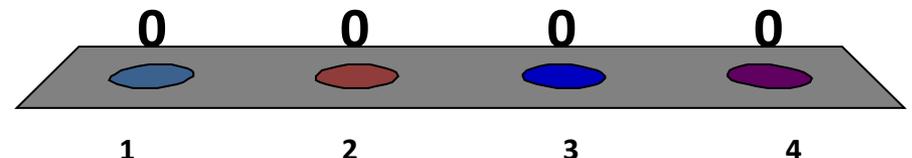
Satellite

FUTURE 3

FUTURE 4

What is the most likely response at your office when key data gaps are encountered during a decision-making process?

1. We don't move forward; we don't want to compromise outcomes with inadequate data
2. We find substitute data—it isn't ideal, but it's better than nothing
3. We make acquiring the missing data a higher priority
4. Other



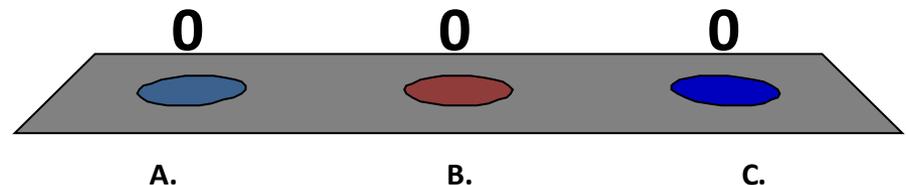
Your pet is sick

9 of 10 vets say it will die without treatment

The treatment is established, effective, has few side effects and is affordable.

Do you opt for:

- A. Giving it the drug
- B. Not giving it the drug
- C. Trying an herbal remedy that worked for a friend's pet



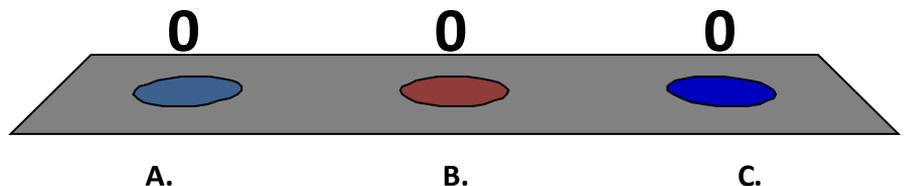
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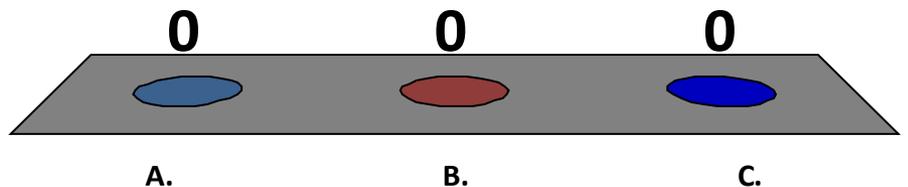
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There is no proven treatment, but there's an expensive experimental drug with uncertain risks and effectiveness.

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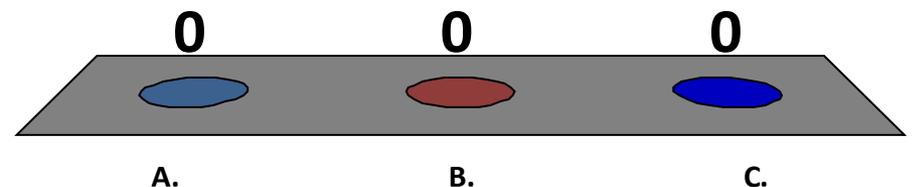
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Your child is sick

9 of 10 doctors say she will die without treatment

There is no proven treatment, but there's an expensive experimental drug with uncertain risks and effectiveness.

Do you opt for:

- A. Giving her the drug
- B. Not giving her the drug
- C. Trying an herbal remedy that worked for a friend's child

