Delta Science Panel Report

- The Delta Science Panel is:
  Dr. Jeff Mount - Dr. Robert Twiss - Dr. Richard Adams

- The intent of the report:
  - To guide upcoming visioning efforts through review of the principal forces that are influencing the Delta and will impact any efforts to manage it.
The Role of Science in the Delta Visioning Process

• The report addresses:
  – Some key scientific understandings that can inform current Delta restoration and management, which might help define and bracket the scope of alternative visions as they are developed.
  – Suggestion of ways that the scientific community may provide support for a visioning process to be started in the very near term.
  – Suggestions for design of the visioning process itself to more fully incorporate science and technical support.
Getting to a Delta Visioning Process

Science Panel Charge:
“Prepare a report, based on a synthesis of CALFED science, that will be used to inform the development of scenarios or options for a new long-term Delta vision.”

Richard Adams, Jeffrey Mount, Robert Twiss,
A Problem Facing the Delta Visioning Process:

- The Delta is a dynamic landscape and ecosystem undergoing significant change at multiple scales.
- Change, both gradual and abrupt, will impact management of the Delta and environmental services.
- Future “preferred states” of the Delta must accommodate hydrologic, ecologic and physical landscape change.
“Environmental Services” Provided by the Delta and Impacted by Change

- Farming
- Water Supply
- Flood Control
- Agricultural runoff disposal
- Urban runoff disposal
- Powerplant disposal
- Shipping
- Transportation
- Native Biodiversity
- Fishing
- Hunting
- Boating
- Urban development
Triangulating a Delta Solution

- Abandoned Delta
- Restored Delta
- Fortress Delta
Four End-Member Delta Visions
Constrain and Test Delta Options: Filtering through “Critical Certainties”

- Dynamic, not static conditions in the Delta
- Endogenous and exogenous forces acting on Delta at landscape scale
- Forces provide useful first-order “filter” of potential Delta solutions and reduce the proliferation of “what ifs”
Critical Certainties: Six First-Order Filters

- Subsidence
- Sea Level Rise
- Regional Climate Change
- Seismicity
- Exotics and Ecosystem Change
- Population Growth
Filter 1: Subsidence

- Reclamation the greatest influence on the Delta
- Subsidence and associated levee construction an important legacy effect
- Subsidence will continue into the future
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Filter 2: Sea Level Rise

- Character of Delta based on sea level
- All hydrodynamics, habitat conditions, levee heights tied to sea level
- Rate of sea level rise increasing
- A modest rise overwhelms current Delta levee network

Ryan et al., 2005
Filter 2: Sea Level Rise

- Character of Delta based on sea level
- All hydrodynamics, habitat conditions, levee heights tied to sea level
- Rate of sea level rise increasing
- A modest rise overwhels current Delta levee network

Source: Anderson et al., 2001
Filter 3: Changes in Runoff
Conditions: High Flows*

- Timing of peak runoff shifting to winter
- Intensity of winter storm events appears to be increasing
- Downscaled models suggest continued increase in intensity and frequency of high runoff events

From: Wimmerer, 2005

*modulated by water operations
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*modulated by water operations
Filter 3: Changes in Runoff

Conditions: Low Flows*

- Decline in spring flows extends low-flow periods
- Potential for increase in number of days failing to meet current environmental flow standards
- Significant decline in Delta water quality (relative to current standards) during low flow events

*modulated by water operations
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VanRheenan et al., 2004

Knowles and Cayan, 2004

*modulated by water operations
Filter 4: Seismicity

- Risk of levee failure significant at any time scale
- Risk highest in western Delta
- Unlike flood risk, seismic risk increases with time
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Filter 5: Exotic Species and Ecosystem Change

- Bay-Delta is the most invaded estuary in the world
- Pace of invasions *may* be accelerating
- Characteristics of the estuary appear ideal for future invasions from food web disruptors and ecosystem engineers
- Ecosystems will be different and respond in unpredictable ways to future management efforts

Bay-Delta Exotics

From Cohen and Carlton, 1998
Filter 5: Exotic Species and Ecosystem Change

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- Characteristics of the estuary appear ideal for future invasions from food web disruptors and ecosystem engineers
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Filter 6: Population Growth

- Fastest growing region in California
- Increasing population and water supply pressures
- Demand for conversion of the Delta to homes
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- Fastest growing region in California
- Increasing population and water supply pressures
- Demand for conversion of the Delta to homes*

*this can be managed directly, but some members of the committee believe we will be unable to
Critical Certainties: Six First-Order Filters

- Subsidence
- Sea Level Rise
- Regional Climate Change
- Seismicity
- Exotics and Ecosystem Change
- Population Growth
Defining a Solution Space
Defining a Solution Space

- Water Supply
- Farming
- Native Biodiversity
- Transportation
- Recreation
- Runoff Disposal
Defining a Solution Space

- Subsidence
- Sea Level Rise
- Seismicity
- Runoff Change
- Exotic Species
- Urbanization/Population

- Water Supply
- Farming
- Native Biodiversity
- Transportation
- Recreation
- Runoff Disposal