Assessing & Forecasting Watershed Ecosystem Status within a Consistent Regional Framework

Standardized Watershed Report Cards

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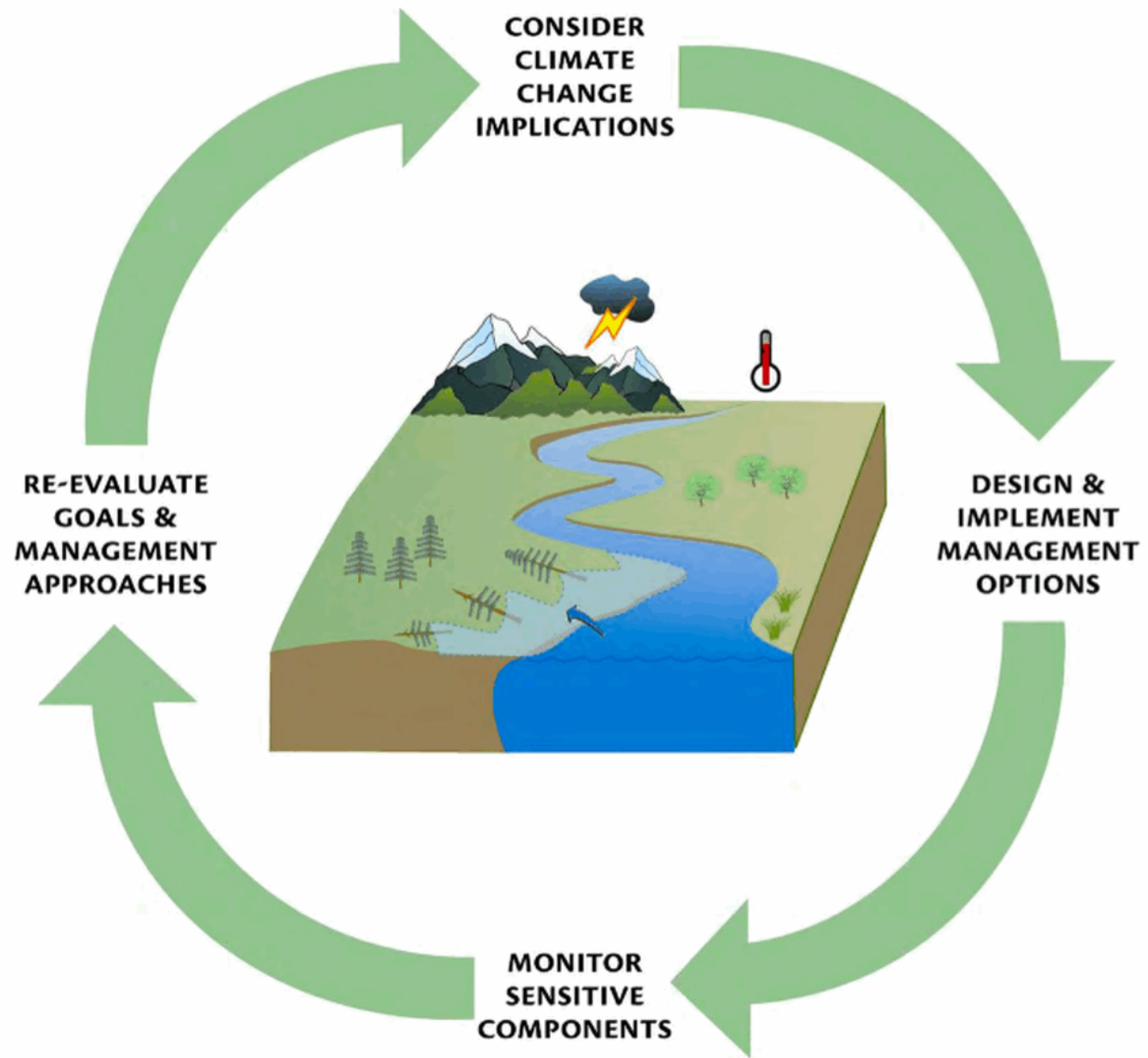
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Climate Change Prognosis

Altered Watershed Ecosystems

- Biodiversity
- Habitat connectivity
- Water quality & quantity
- Ecosystem services

Assessing & forecasting ecosystem status will become an important and necessary tool to decrease uncertainty

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Figure 9.2. The process of adaptive management.

Goal

Coordination of a standardized framework for the regular status assessment of Bay Area watersheds by 2015

To assess:
– Ecosystem Function ('Health')
– Ecosystem Services (incl. Ag systems)
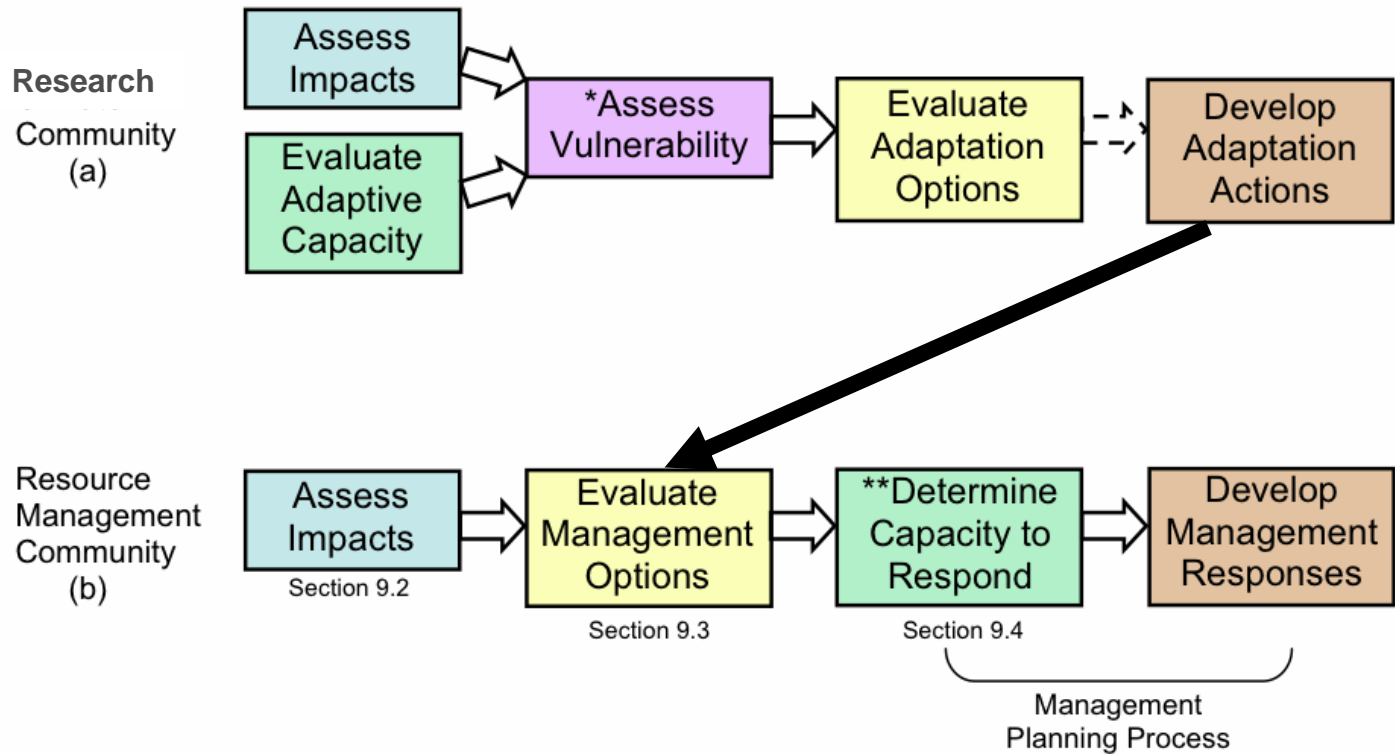– Conservation, Restoration and Management Progress
– Climate Change Impacts

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Source: Preliminary Review of Adaptation Options for Climate-Sensitive Ecosystems and Resources
U.S. Climate Change Science Program And the Subcommittee on Global Change Research
Final Report, Synthesis and Assessment Product 4.4 June 2008

Integrated Watershed Assessment Framework

Considerations:

- Scale & Jurisdictions – 'bottom-up'
  - Local: Sub-watershed/watershed - Laguna
  - County scale - Sonoma
  - Regional scale – Bay Area
- Consistent Standardized Methods
  - 'Puzzle' pieced together one piece at a time
  - Allows for collaboration of multiple entities to contribute to a coherent whole –easy to plug in!
- Coordination
  - Joint Venture Model
    - Public agency, academic, NGO & private stakeholder participation
    - Shared Data networks
- Regular Progress Assessment
  - Time Frame

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Existing Assessment Programs

- ## San Francisco Bay
  - The Bay Institute Ecological Scorecard

    Developed scientific evaluation index per category– Score driven process

- ## Chesapeake Bay
  - Ecocheck - Assessing and Forecasting Ecosystem Status
    - Developed set of goals per category - Goal driven process

San Francisco Bay

Bay Institute

- Habitat Index

- Freshwater Inflow Index

- Water Quality Index

- Food Web Index

- Shellfish Index

- Fish Index

- Fishable-Swimmable-Drinkable Index

- Stewardship Index

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2003

🦆	**D+** Score = 32	**Habitat** Bay habitat loss is slowly being reversed, but it could take nearly 200 years to reach the tidal marsh restoration goal.	long-term ↓	short-term ↑
〰	**D** Score = 29	**Freshwater Inflow** Reduced inflows are still degrading the Bay ecosystem, and recent gains from wetter years and new standards are being eroded	long-term ↓	short-term ↓
☠	**C** Score = 55	**Water Quality** Open waters are cleaner, but standards are not met in parts of the Bay. Toxic sediments and storm runoff are a major problem.	long-term ↑	short-term ↔
⭯	**F** Score = 10	**Food Web** Plankton levels in the upper Bay have crashed, reducing food sources for fish and birds. Alien species are locally dominant.	long-term ↓	short-term ↔
🦀	**B-** Score = 63	**Shellfish** Crab and shrimp numbers are increasing, but commercial harvest is still down from previous high levels.	long-term ↓	short-term ↑
🐟	**C-** Score = 39	**Fish** After a long decline, fish populations are stable at low levels, but some species are still endangered.	long-term ↓	short-term ↔
🏊	**D+** Score = 31	**Fishable-Swimmable-Drinkable** Fish are harder to catch, and unsafe to eat. Beach closures are up, drinking water violations are down.	long-term ↓	short-term ↔
👪	**C-** Score = 43	**Stewardship** Water conservation, pollution limits, monitoring, and restoration efforts are finally underway, but progress is slow.	long-term ↓	short-term ↔

2005

AREA	GRADE	SUMMARY	LONG-TERM	SHORT-TERM
🦆	**D+** Score = 31	**Habitat** Bay habitat loss is slowly being reversed, but pace of restoration unchanged since 2003 – at current rate, more than 150 years to reach tidal marsh restoration goal.	▼	▲
〰	**C+** Score = 58	**Freshwater Inflow** Reduced inflows still degrade the Bay ecosystem – inflow improved in 2004, but overall conditions since 2000 are worse than two previous decades.	▼	◀▶
☣	**B-** Score = 65	**Water Quality** Open waters are cleaner than in 2003, but not all standards are met in parts of the Bay. Toxic sediments, stormwater runoff are major problems. South and San Pablo Bays are most polluted.	▲	▲
⭕	**F** Score = 10	**Food Web** Plankton levels in Suisun Bay are still critically low, reducing food resources for fish and birds. Phytoplankton levels in all other parts of the Bay are improving.	▼	◀▶
🦀	**B** Score = 73	**Shellfish** Crab and shrimp numbers rise in Central and South Bays, but not in the upper Bay. Estuarine species lose ground to marine shellfish.	▼	▲
🐟	**C-** Score = 45	**Fish** Recent upward trend reverses, fish populations return to critically low levels. Estuarine species of the upper Bay are hardest hit.	▼	◀▶
🎣	**C-** Score = 38	**Fishable-Swimmable-Drinkable** More fish were caught but most are still unsafe to eat. Beach closures continue to rise, drinking water violations hold steady.	▼	◀▶
👪	**C-** Score = 46	**Stewardship** Little progress towards conserving more water, reducing pesticide use, and restoring freshwater inflows, but some efforts to issue pollution limits move forward.	▼	◀▶

Grades are for the 2002-2005 period

A = Excellent   **D** = Poor   ▲ = improving
B = Good   **F** = Critical   ▼ = declining
C = Fair   ◀▶ = stable

Chesapeake Bay

'Ecocheck' Priority Areas

- Bay Health

- Watershed Health

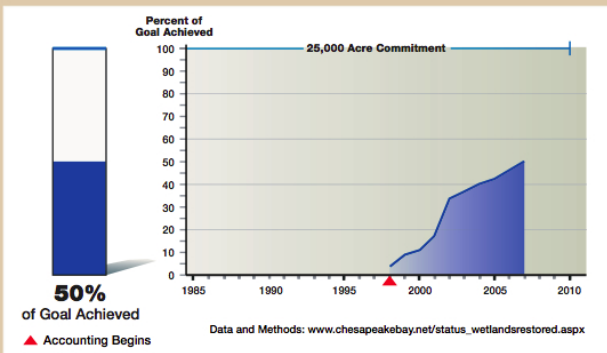- Restoration & Protection Efforts

- Background Factors

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Indicators

Bay Health

1. Water Quality
2. Habitats & Lower Food Web
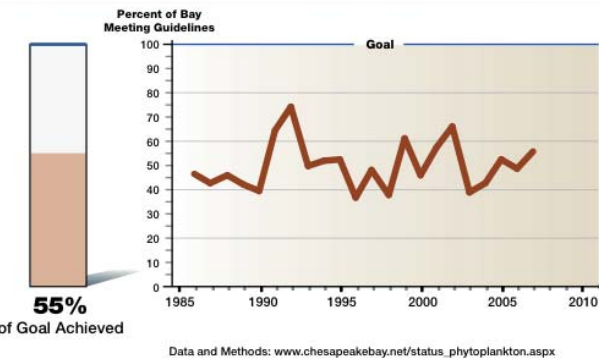3. Fish & Shellfish
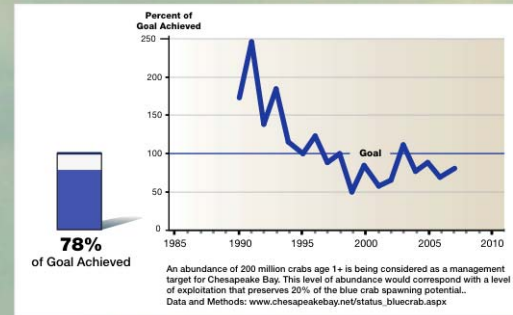
DISSOLVED OXYGEN STANDARDS ATTAINMENT

12% of Goal Achieved

Standards attainment: data represent 3 year period (data year and preceding 2 years)
Data and Methods: www.chesapeakebay.net/status_dissolvedoxygen.aspx
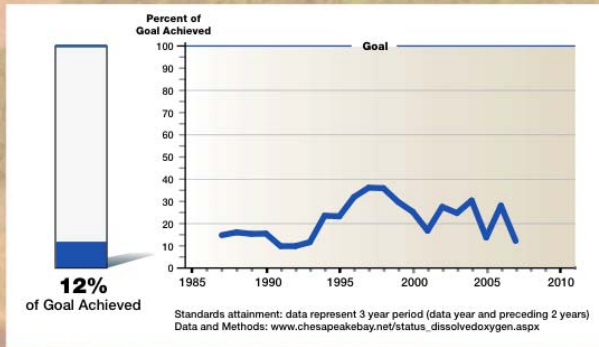
WETLANDS RESTORATION EFFORTS

50% of Goal Achieved
▲ Accounting Begins

25,000 Acre Commitment

Data and Methods: www.chesapeakebay.net/status_wetlandsrestored.aspx

PHYTOPLANKTON
Index of Biotic Integrity

55% of Goal Achieved

Percent of Bay Meeting Guidelines

Data and Methods: www.chesapeakebay.net/status_phytoplankton.aspx

BLUE CRAB ABUNDANCE
(age 1 and Older)

78% of Goal Achieved

An abundance of 200 million crabs age 1+ is being considered as a management target for Chesapeake Bay. This level of abundance would correspond with a level of exploitation that preserves 20% of the blue crab spawning potential..
Data and Methods: www.chesapeakebay.net/status_bluecrab.aspx

BAY GRASS ABUNDANCE

35% of Goal Achieved

Percent of Goal Achieved
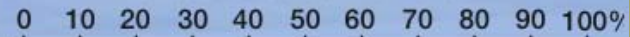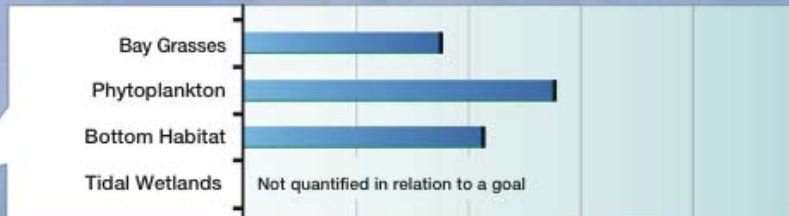
Data and Methods: www.chesapeakebay.net/status_baygrasses.aspx

SUMMARY: 2007 BAY HEALTH ASSESSMENT
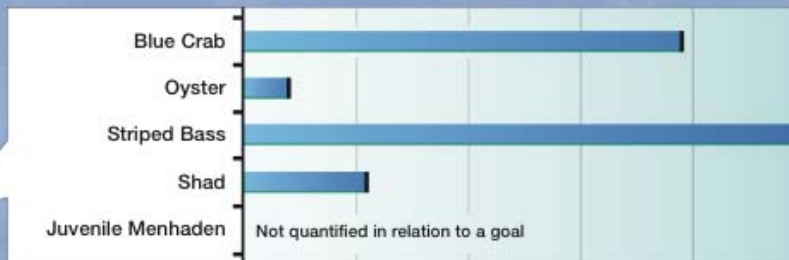
Watershed Assessment

Priority Areas:

- Watershed Function/Health
- Watershed Conservation/Restoration
- Ecosystem Services/Working Landscapes

Nested Indicator Categories
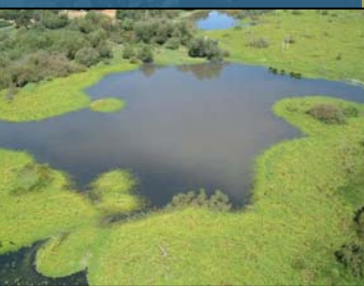
- **Watershed Function/Health**
  - Water Quality
    - Physical, chemical & biotic indices
  - Biodiversity
    - Habitat Diversity
    - Species diversity
    - Genetic diversity of indicator species
    - Endangered species status
    - Invasive species status
  - Habitat Quality
    - Connectivity
    - Land use
    - Threats & disturbance
  - Habitat Diversity
    - Aquatic habitat extent by ecosystem type
    - Terrestrial habitat extent by ecosystem type

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Nested Indicator Categories

- **Watershed Conservation/Restoration**
  - Restored Habitat
    - Community type (e.g. riparian, wetland etc)
    - Corridor function
  - Preserve Extent
    - Area protected by community type
  - Preserve Quality
    - Biotic indices
    - Active Management
    - Preserve connectivity
  - Fostering Stewardship
    - Public Education
    - Public Outreach
    - Public Access

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- **Ecosystem Services**
  - Flood Capacity
    - Hydrology
    - Sedimentation
    - Floodplain encroachment
    - Impervious surfaces
  - Working Landscapes
    - Soil status
    - Crop pollination
    - Crop & livestock health
    - Economic viability
    - Wildlife use

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Watershed Assessment Framework

Challenge: Conservation, Restoration & Management of Habitat Function in Face of Changing Conditions

Moving forward to understand CC impacts:
"Can't measure everything!"

Regional Framework:

- Localized, step-by step approach – 'puzzle'
- Integrated collaborative approach – 'bottom-up'
- Nested indicator categories – index/goal based
- Standardized methods – mostly available
- Coordination of framework – joint venture
- Plug into existing initiatives – e.g. Upland goals
- Establish data collection networks
- Cost-effective approach – collaboration, citizen science

'Watershed Climate Adaptation Joint Venture'

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Watershed Assessment Framework

Conservation, Restoration & Management of Habitat Function in Face of Changing Conditions

Call to Action:

- Set measurable goals for indicator categories and utilize standardized methodologies:

  - to test climate model predictions
  - to inform future climate change modeling
  - to measure progress
  - to inform the public
  - to decrease uncertainty & better understand the watershed system along the way
  - to become model for State & the country

Figure 9.2. The process of adaptive management.

CONSIDER CLIMATE CHANGE IMPLICATIONS

DESIGN & IMPLEMENT MANAGEMENT OPTIONS

MONITOR SENSITIVE COMPONENTS

RE-EVALUATE GOALS & MANAGEMENT APPROACHES