The State of the Bay: Water Quality

Jay Davis, Mike Connor – SFEI
Russ Flegal - UCSC

Presented at RMP Annual Meeting
October 2, 2007

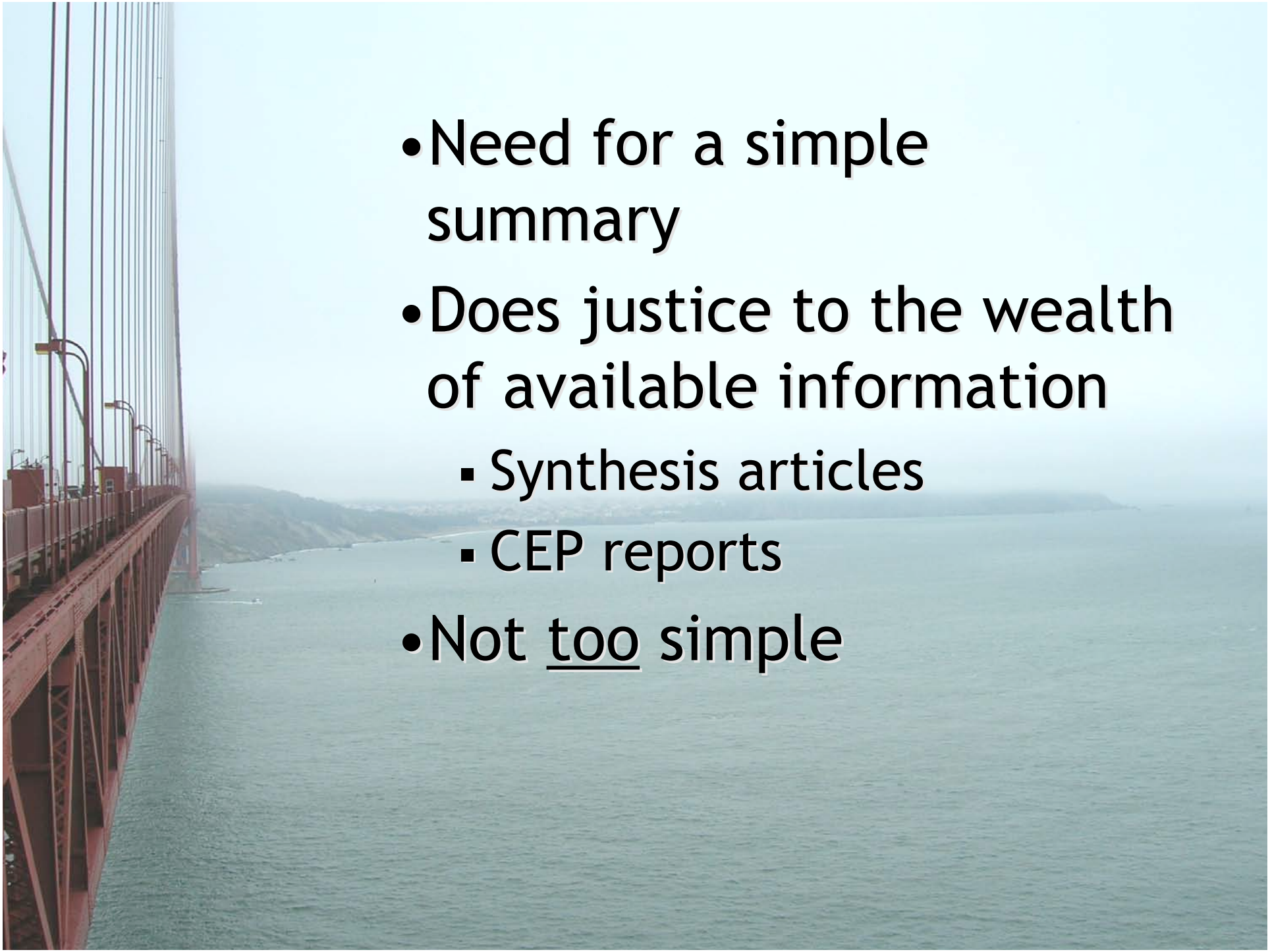
The Pulse of the Estuary

2007

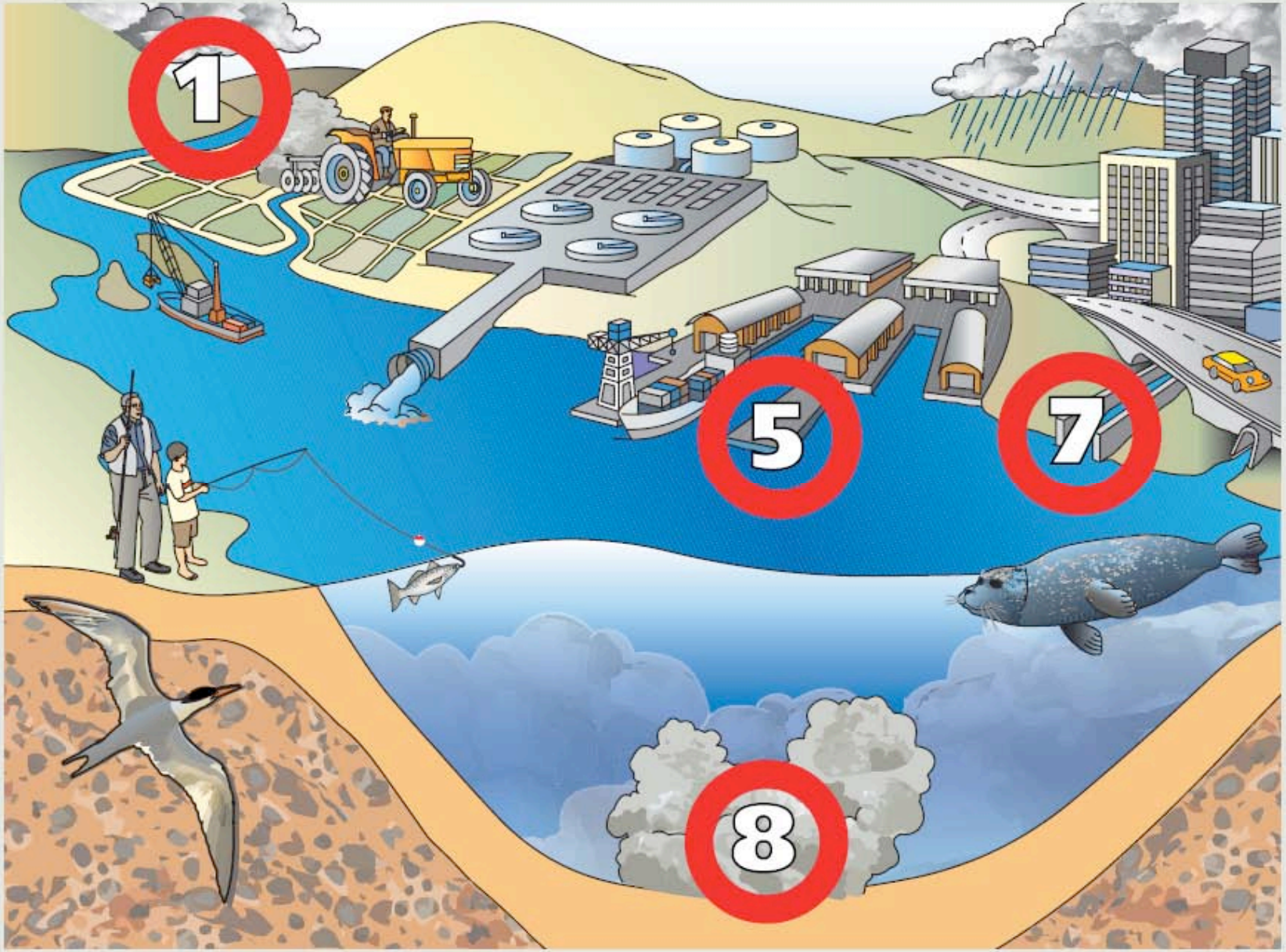
Monitoring and Managing Water Quality in the San Francisco Estuary

A report published by the San Francisco Estuary Institute
and the Regional Monitoring Program for Water Quality in the San Francisco Estuary

“How is the Bay doing?”



- Need for a simple summary
- Does justice to the wealth of available information
  - Synthesis articles
  - CEP reports
- Not <u>too</u> simple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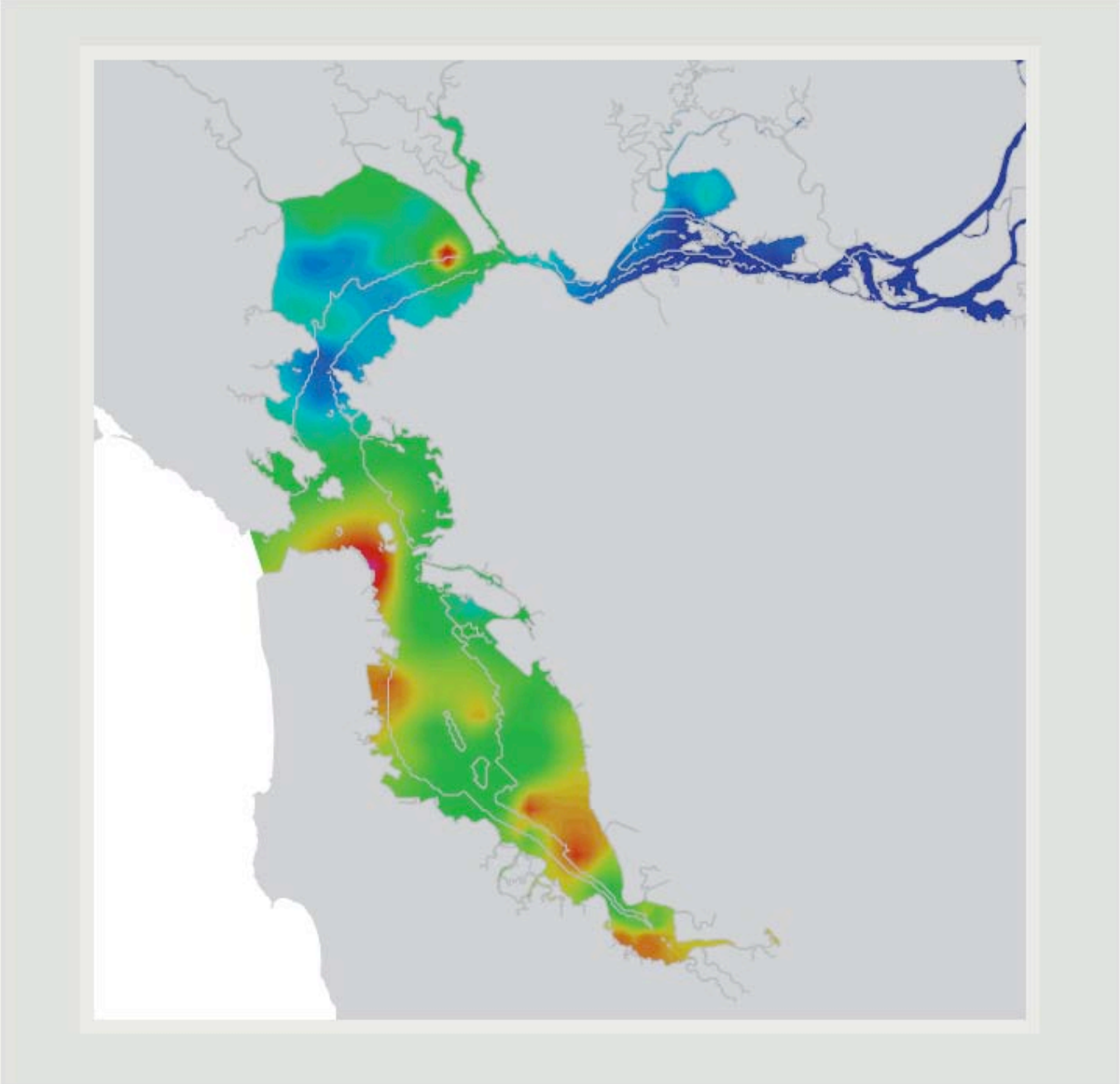
A Pi
Exam

Status



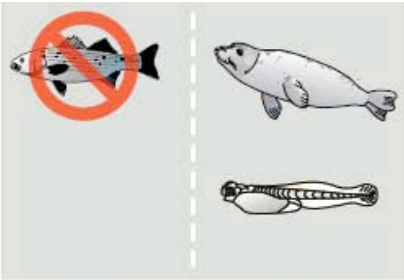
Forecast

A Pictorial Summary

Example: PCBs

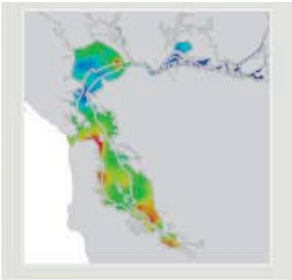
Status

Health Risks



Pathways

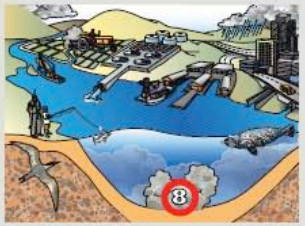
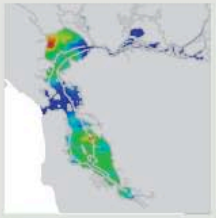
Spatial Pattern



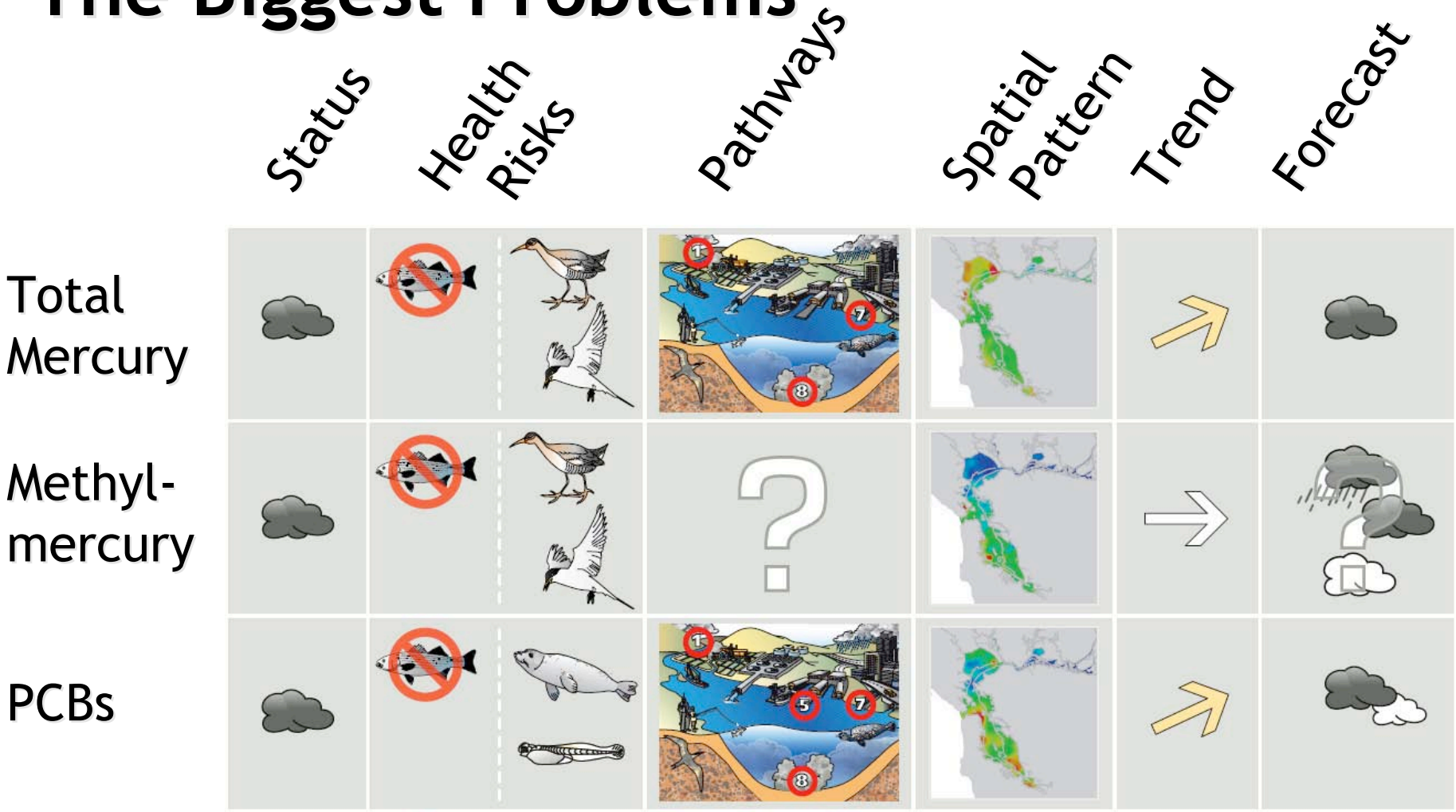
Trend

Forecast

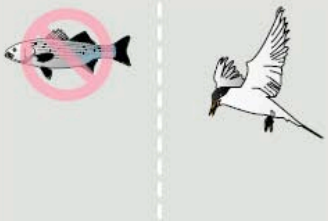
Problems Solved

	Status	Health Risks	Pathways	Spatial Pattern	Trend	Forecast
Organic Waste		Effects not likely				
Nutrients		Effects not likely				
Silver		Effects not likely				

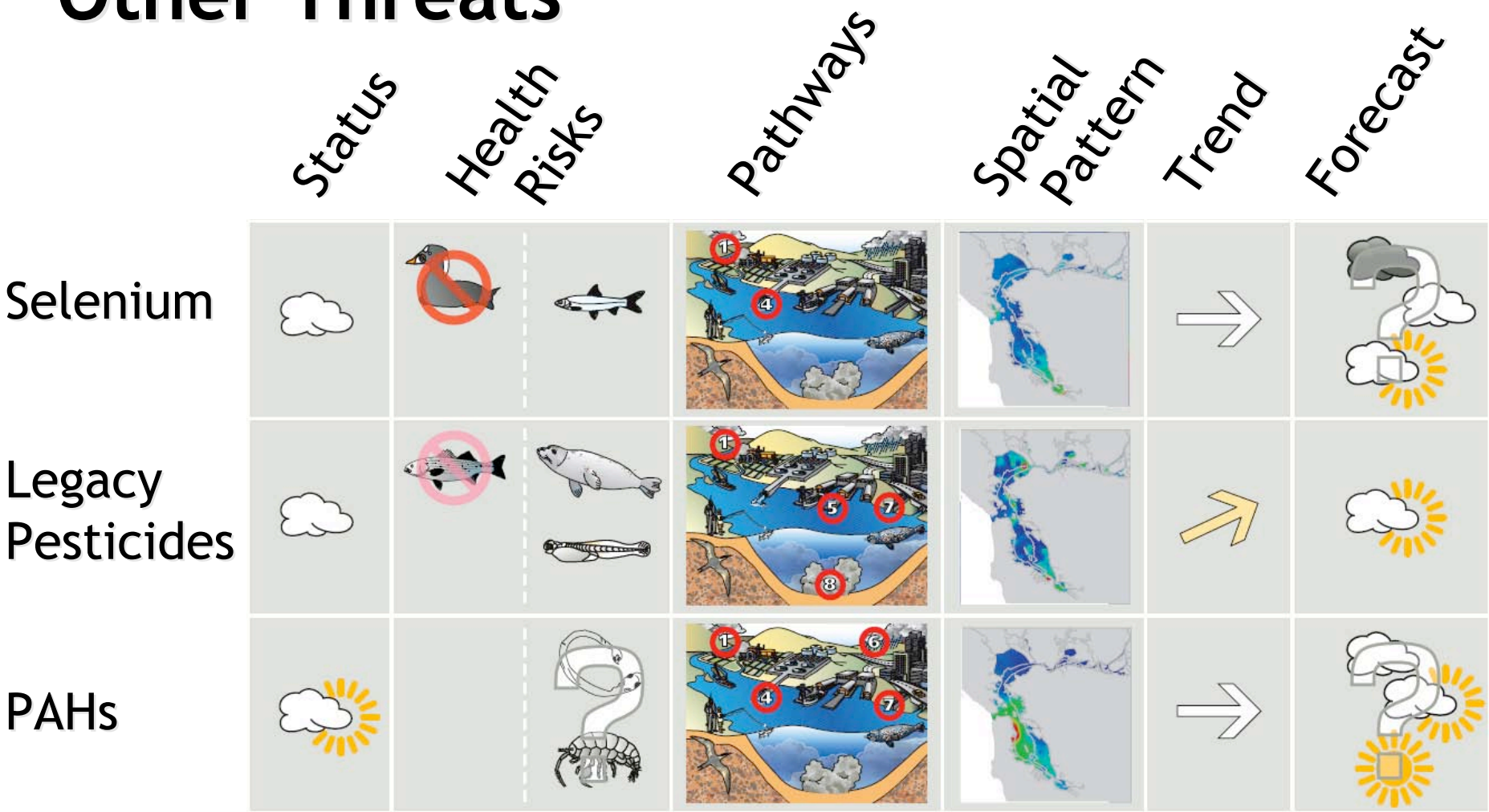
The Biggest Problems



The Biggest Problems

	Status	Health Risks	Pathways	Spatial Pattern	Trend	Forecast
Dioxins						
Exotic Species		Major impacts on virtually all types of invertebrates and some fish; possible impacts on some birds. So far only minor human health problems.	Ship ballast water Ship and boat hull fouling Bait imports and transfers	Except near the mouth of the Bay, common and dominant on hard and soft substrates and common in the water column.		

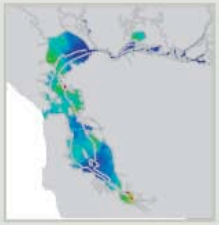
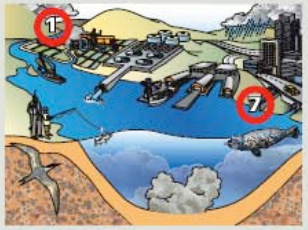
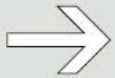
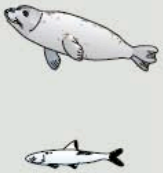
Other Threats



Below Thresholds…

	Status	Health Risks	Pathways	Spatial Pattern	Trend	Forecast
Nickel		Effects not likely				
Copper						

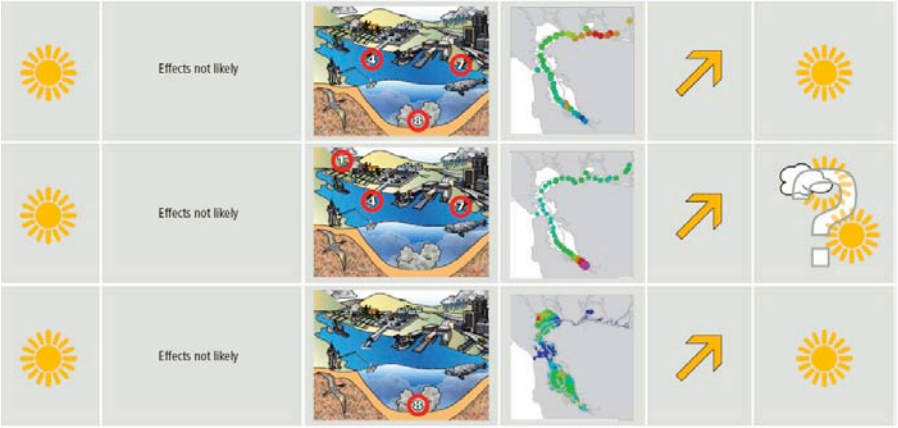
Rising Concerns

	Status	Health Risks	Pathways	Spatial Pattern	Trend	Forecast
PBDEs						
Pyre-throids				insufficient data		
Sediment Toxicity				?		?
Mixtures				?	?	?

The Pulse of the Estuary

The Pulse Water Quality Summary

- Tailored to RMP
- Consistent with 303(d) List
- By pollutant
- Flexible - incorporates all available information
- Highlights information gaps
- Includes forecast
- Not boiled down to one score



Lunchtime Referendum:

Summarizing Bay Water Quality

The Pulse of the Estuary

The Bay Institute

STATE OF THE SOUND 2007

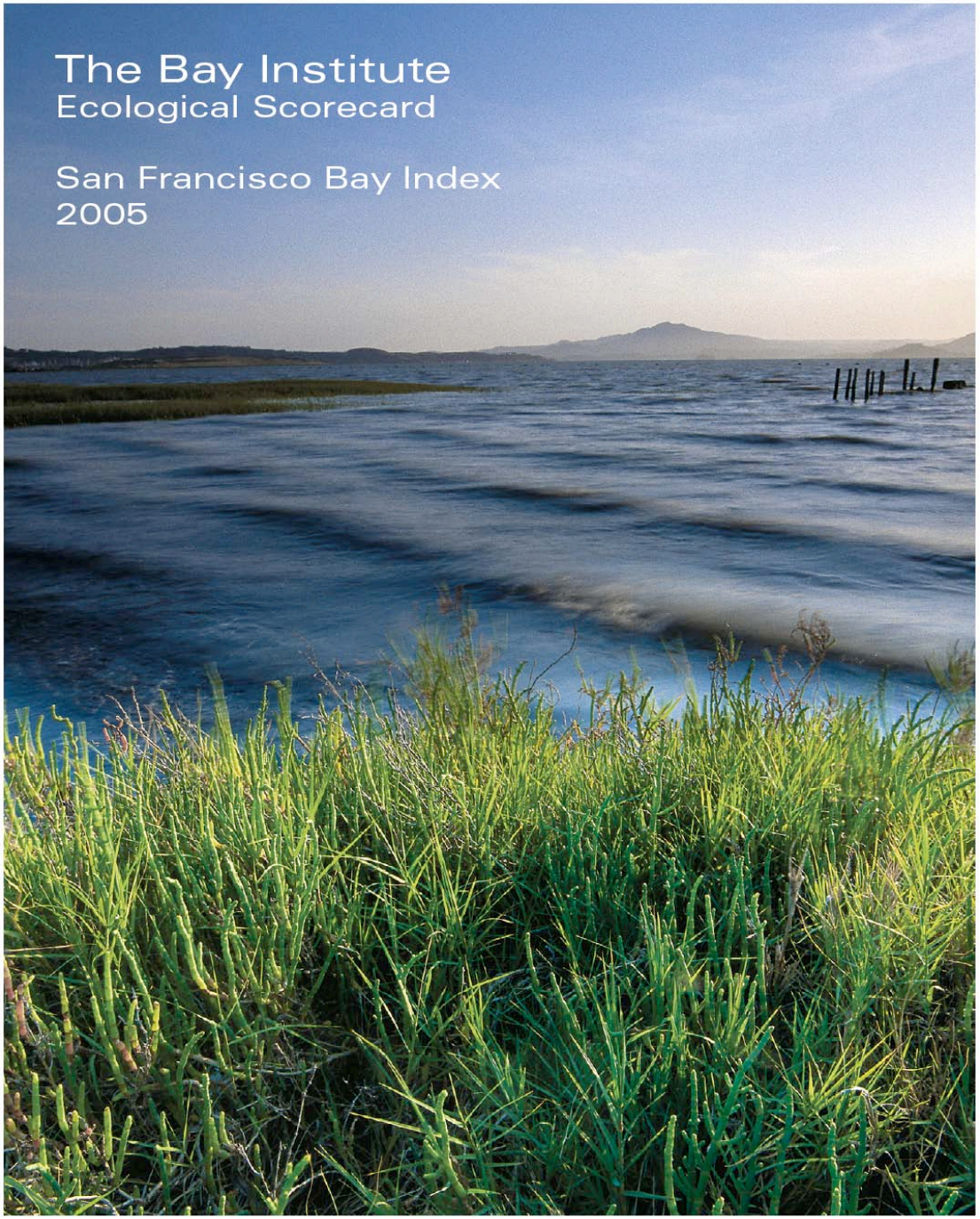
Chesapeake Bay Program
A Watershed Partnership

CHESAPEAKE EcoCheck
Assessing and forecasting ecosystem status
NOAA
University of Maryland
Center for Environmental Science

The Bay Institute

The Bay Institute
Ecological Scorecard

San Francisco Bay Index
2005



The Bay Institute

Ecological Scorecard

- Single letter grade
- Includes trend info
- Formulas using water concentrations - rigid
- Multifaceted evaluation framework
- Inconsistent with 303(d) List
- Unfounded fluctuations

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	▼	◀▶
	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	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.	▼	◀▶

http://www.bay.org/ecological_scorecard.htm

The Bay Institute

Water Quality Index Summary

Indicator	2005 Result	2003 Grade	2005 Grade
Trace elements	Copper exceeded water quality standard	C (2)	**B (3)**
Pesticides	Standards not exceeded but fewer pesticides measured	B (3)	**A (4)**
PCBs	Nearly 90% of all water samples exceeded standard but concentrations decrease	F (0)	**F (0)**
PAHs	Standards exceeded in 13% of samples and in all regions of the Bay	D (1)	**C (2)**
Dissolved oxygen	Standard not exceeded	B (3)	**A (4)**
Index Grade (grade point average)		C- (1.8)	**B- (2.6)**
Index Score (out of 100)		45	**65**

STATE OF THE SOUND 2007


JASON VANDEHEY


MARK B. BAUSCHKE

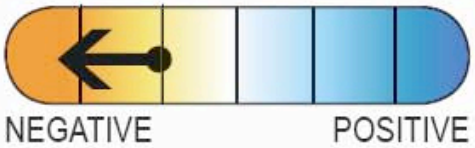
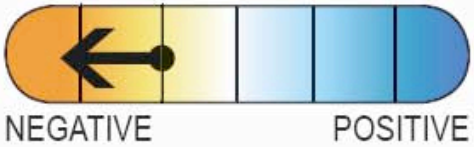

KEITH LEVIT


HIEP NGUYEN

LIEM BAHNEMAN

PUGET SOUND ACTION TEAM
Office of the Governor | State of Washington

STATE OF THE SOUND 2007

INDICATOR	DESCRIPTION	STATUS/TREND
WATER QUALITY | OVERALL		
Marine water quality	The Department of Ecology is monitoring data from 39 sites throughout Puget Sound. Of these, the eight sites rated of highest concern are southern Hood Canal, Budd Inlet, Penn Cove, Commencement Bay, Elliott Bay, Possession Sound, Saratoga Passage and Sinclair Inlet. Locations of high concern include: Bellingham Bay, Case Inlet, Oakland Bay, Discovery Bay, Strait of Georgia, Carr Inlet, Port Orchard, West Point, Skagit Bay and Port Susan.	
Marine and fresh water health	In 2004, there were approximately 1,474 listings of "impaired waters" in Puget Sound's fresh and marine waters. Fifty-nine percent of the waters tested were found to be impaired as a result of toxic contamination, pathogens, low dissolved oxygen or high temperatures. Less than one-third of these impaired waters have cleanup plans in place.	

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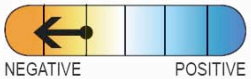
Marine and fresh water health	In 2004, there were approximately 1,474 listings of "impaired waters" in Puget Sound's fresh and marine waters. Fifty-nine percent of the waters tested were found to be impaired as a result of toxic contamination, pathogens, low dissolved oxygen or high temperatures. Less than one-third of these impaired waters have cleanup plans in place.	 NEGATIVE POSITIVE

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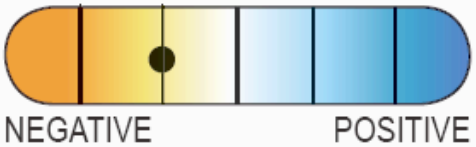
WATER QUALITY | TOXIC CONTAMINATION

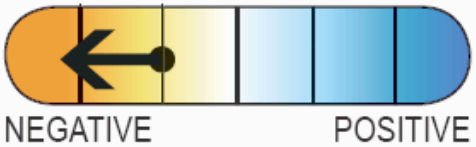
Toxics in sediments

Long-lasting chemicals discharged into Puget Sound have accumulated in its mud and sediment and from there into the tissues of living organisms. In a study of 584,000 acres of submerged lands, about one percent (5,700 acres, primarily in urban bays) was found to be contaminated with high levels of toxic substances, and another 31 percent (179,000 acres) was moderately contaminated. PBDEs have been identified as an emerging contaminant of concern in the sediments of Puget Sound.



Toxics in chinook and coho salmon

Chinook salmon from Puget Sound have two-to-six times the PCBs and five-to-17 times the PBDEs in their bodies compared to other West Coast chinook populations. PCB levels are staying stable but rising PBDE levels measured in Puget Sound seals suggest that PBDE levels in salmon are also increasing. Because of contamination, the Department of Health recently issued a consumption advisory for Puget Sound chinook.



STATE OF THE SOUND 2007

State of the Sound Report Card

- Non-loaded grading terminology
- Incorporates trend
- Flexible
- Multifaceted framework: water, habitat, species, climate

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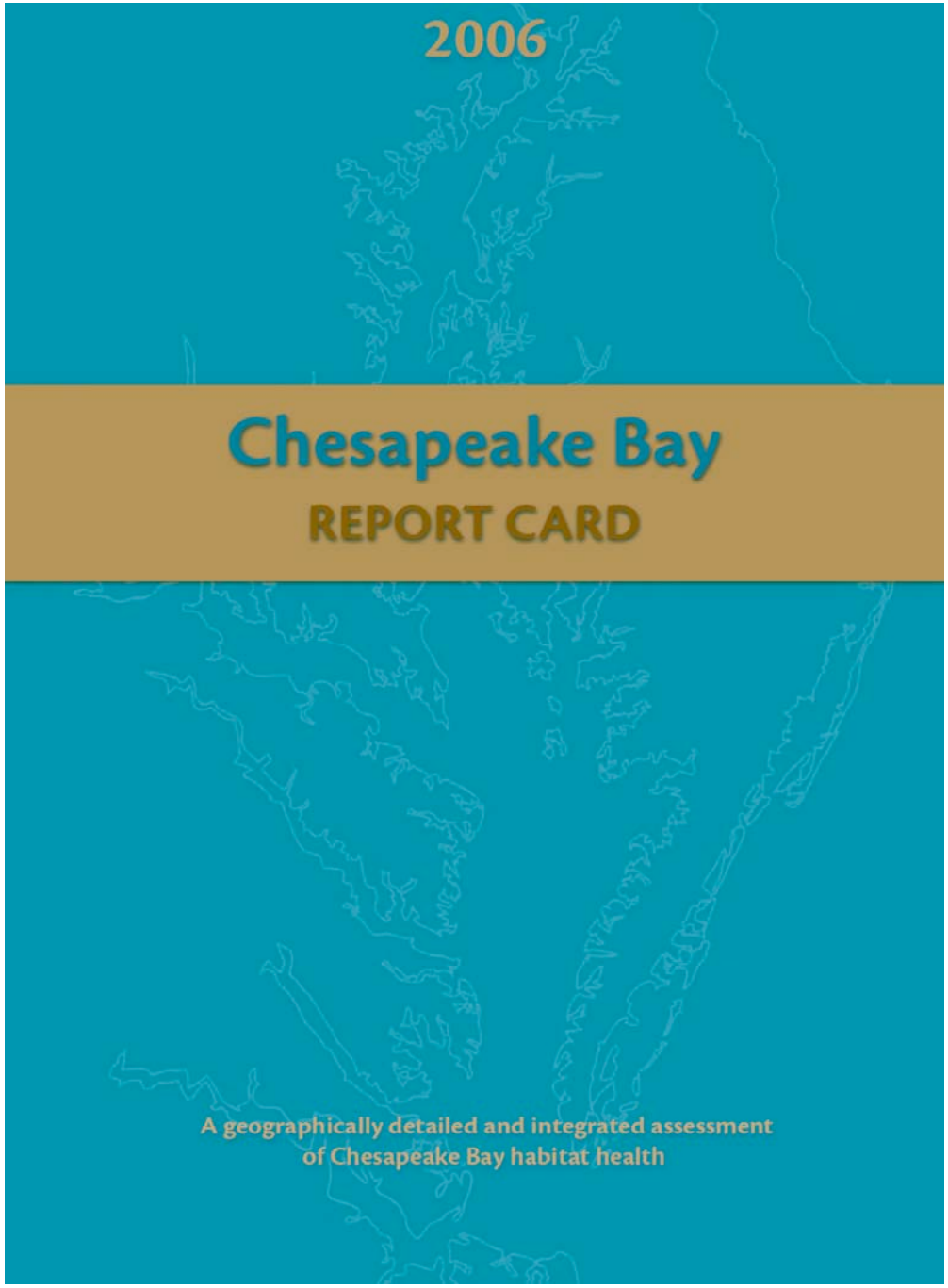
CHESAPEAKE

EcoCheck

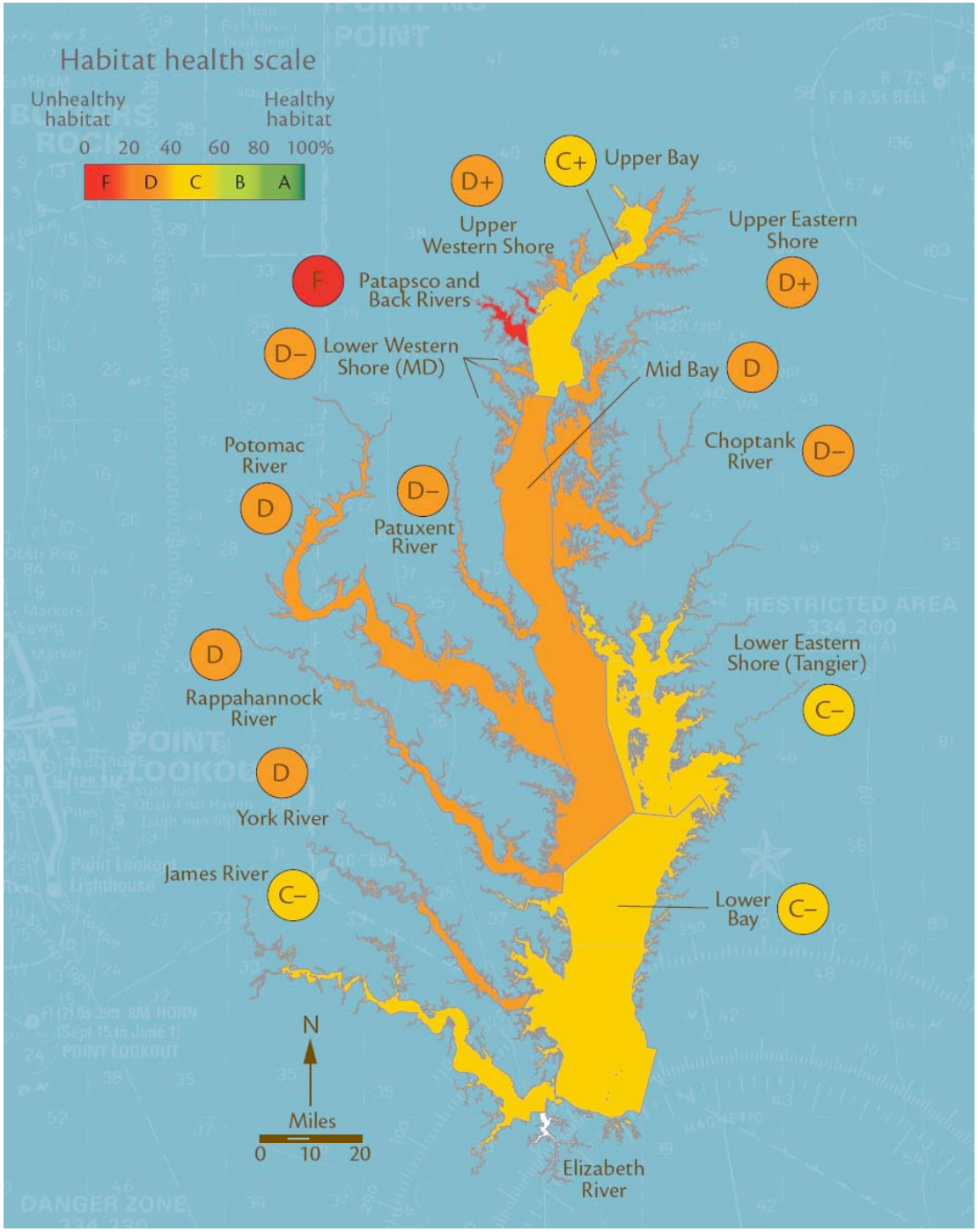
Assessing and forecasting ecosystem status

NOAA

University of Maryland
CENTER FOR ENVIRONMENTAL SCIENCE



www.eco-check.org/reportcard/chesapeake/


Habitat health scale
Unhealthy habitat
Healthy habitat
0 20 40 60 80 100%
F D C B A
C+ Upper Bay
D+ Upper Western Shore
Upper Eastern Shore D+
F Patapsco and Back Rivers
D– Lower Western Shore (MD)
Mid Bay D
Choptank River D–
Potomac River D
D– Patuxent River
D Rappahannock River
Lower Eastern Shore (Tangier) C–
D York River
James River C–
Lower Bay C–
N
Miles
0 10 20
Elizabeth River

CHESAPEAKE EcoCheck

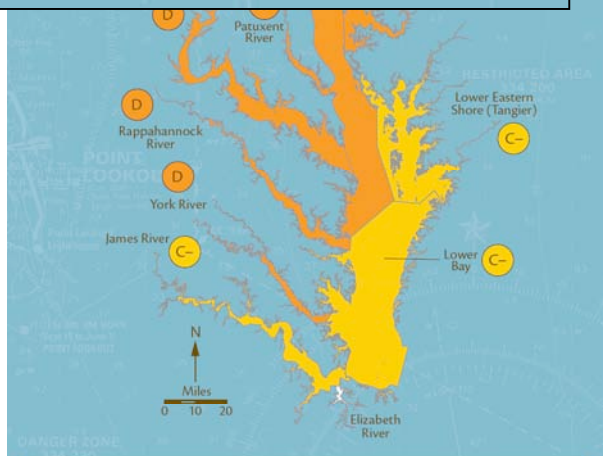
Assessing and forecasting ecosystem status

NOAA

University of Maryland Center for Environmental Science

CHESAPEAKE BAY

REGION	SCORE (%)	COMMENTS
Overall Bay	37	**Overall average grade for Chesapeake Bay: D+** • Poor Water Quality Index due to very poor water clarity, poor chlorophyll *a* and good dissolved oxygen, except in the deep channels. • Poor Biotic Index due to moderate benthic community, and poor phytoplankton community and bay grass scores.



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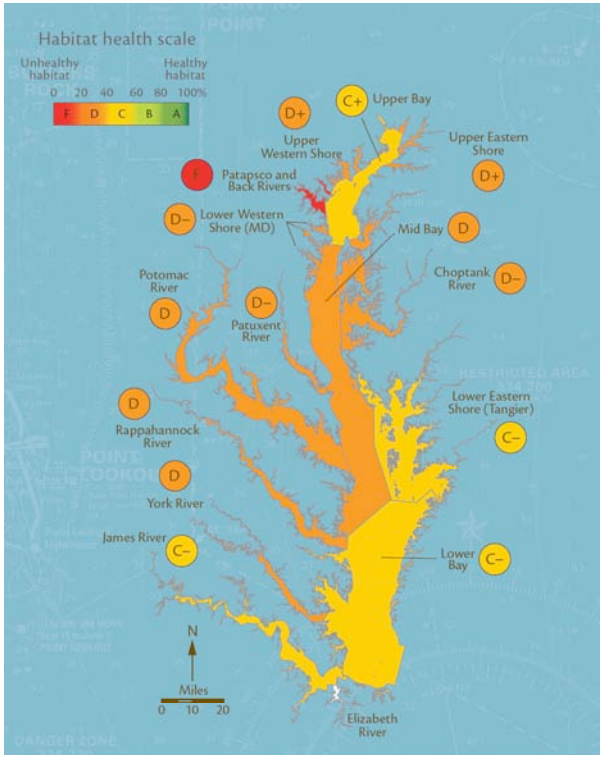

Chesapeake Bay 2006 Report Card

- Geography-based
- Habitat health index – one score
- Letter grades
- Works better for fixed-station design

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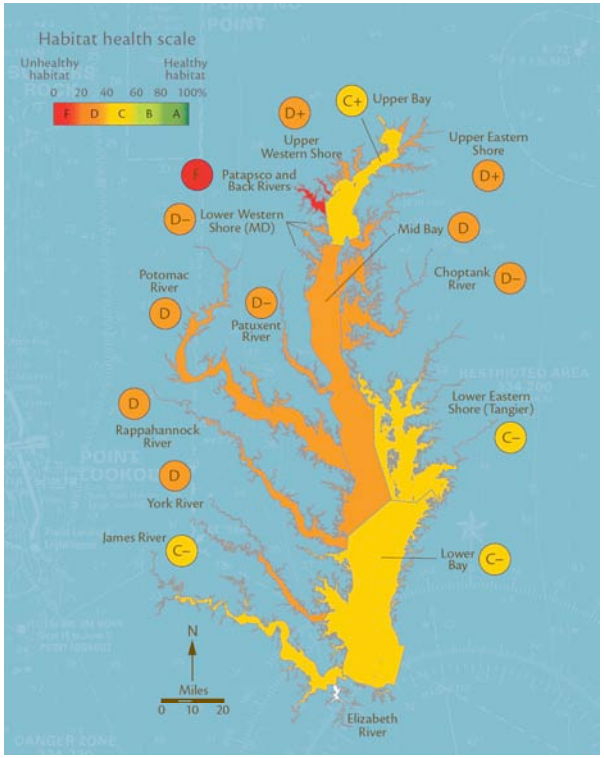


Chesapeake Bay Program
A Watershed Partnership

A Report to the Citizens of the Bay Region

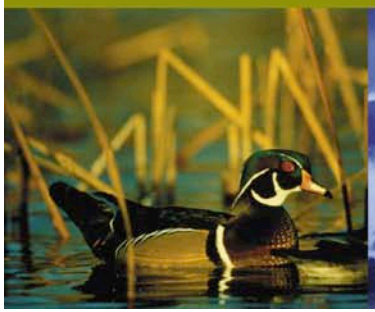
www.chesapeakebay.net

CBP/TRS 283/07
EPA 903R-07001
April 2007

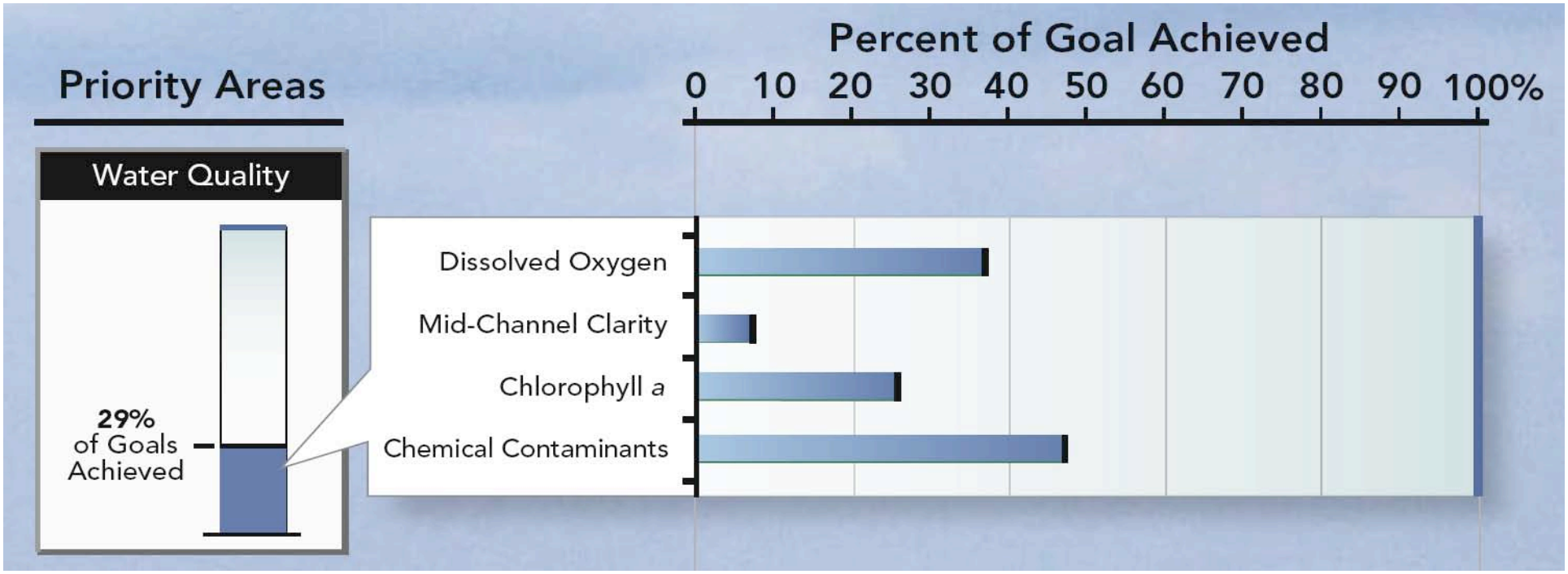
CHESAPEAKE BAY

2006 Health & Restoration Assessment

PART ONE: **Ecosystem Health**



Chesapeake Bay Program
A Watershed Partnership



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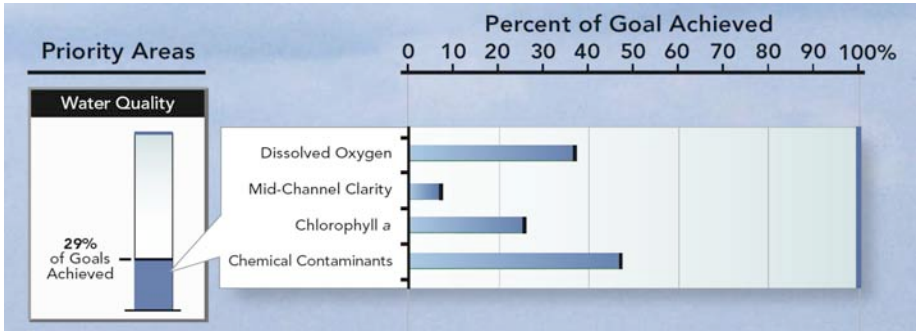

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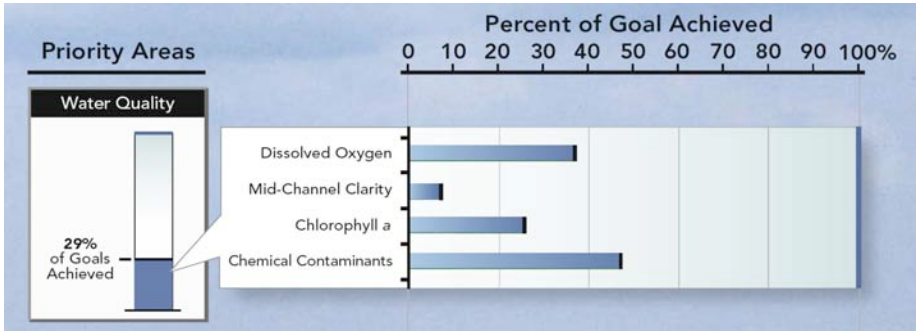
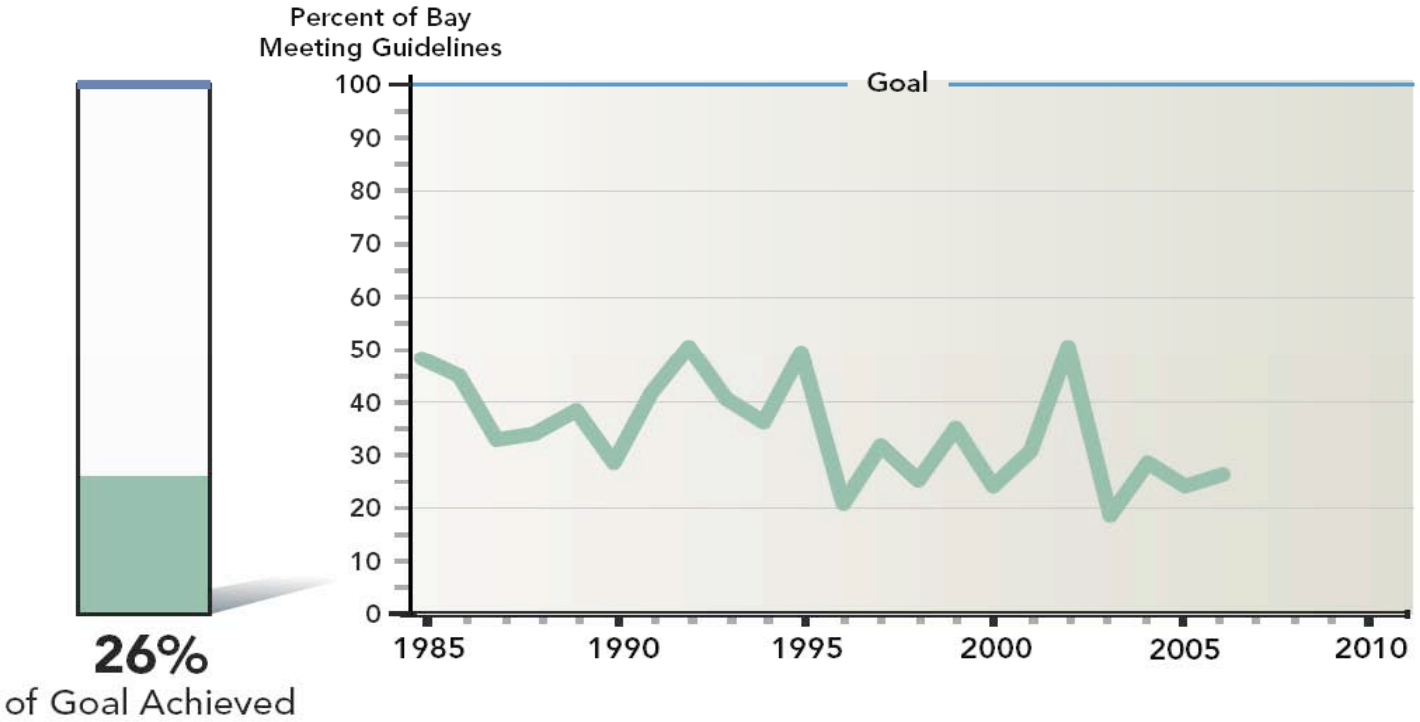
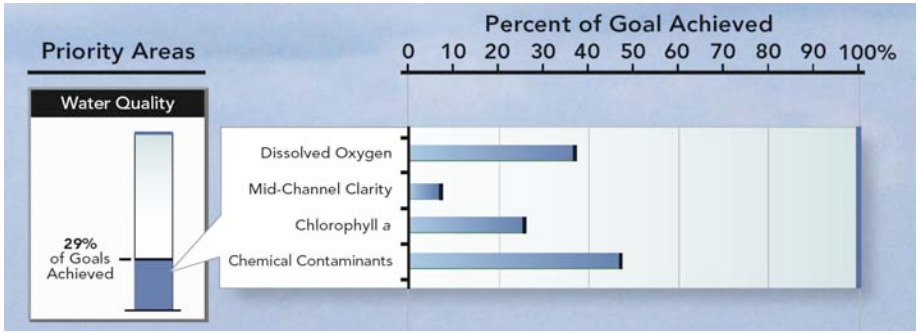


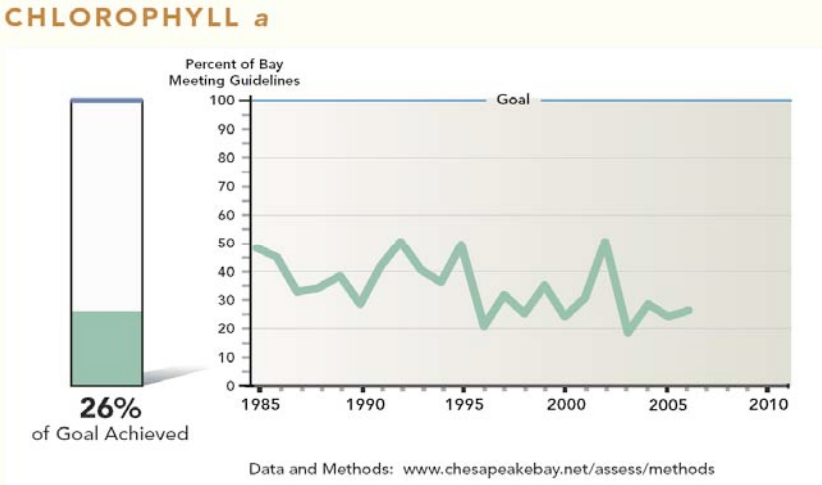
CHLOROPHYLL *a*

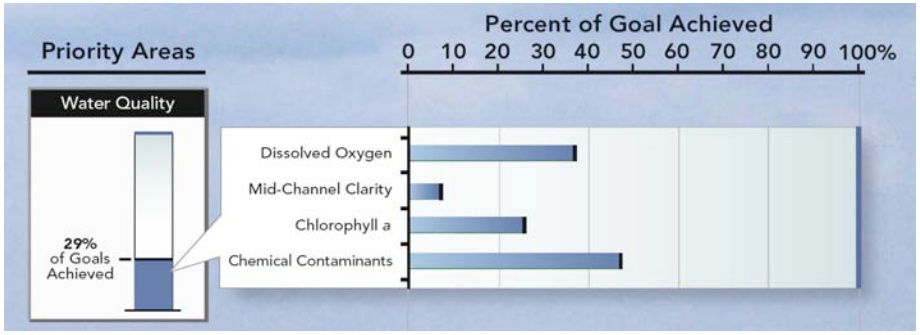


Data and Methods: www.chesapeakebay.net/assess/methods

Chesapeake Bay Program
A Watershed Partnership

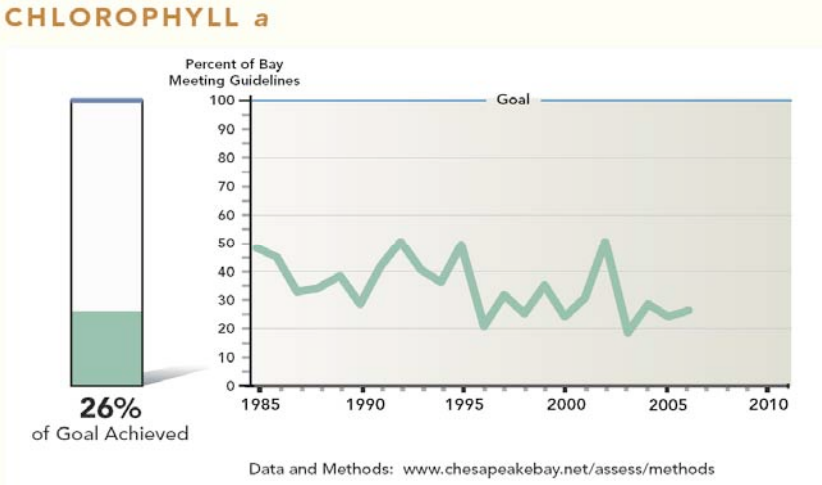






Bay Health Assessment

- Goal-oriented
- Water quality boils down to one score - % goals achieved
- Multifaceted framework
- Only works if goals exist



Lunchtime Referendum:

Summarizing Bay Water Quality

Favorite – blue

Second favorite – orange

Read the Pulse – more feedback always welcome – jay@sfei.org

Please complete the Meeting survey!

Questions?

Bon apetit!