Overview of Chesapeake Bay Restoration: CBP Goals & Outcomes

Gary Shenk

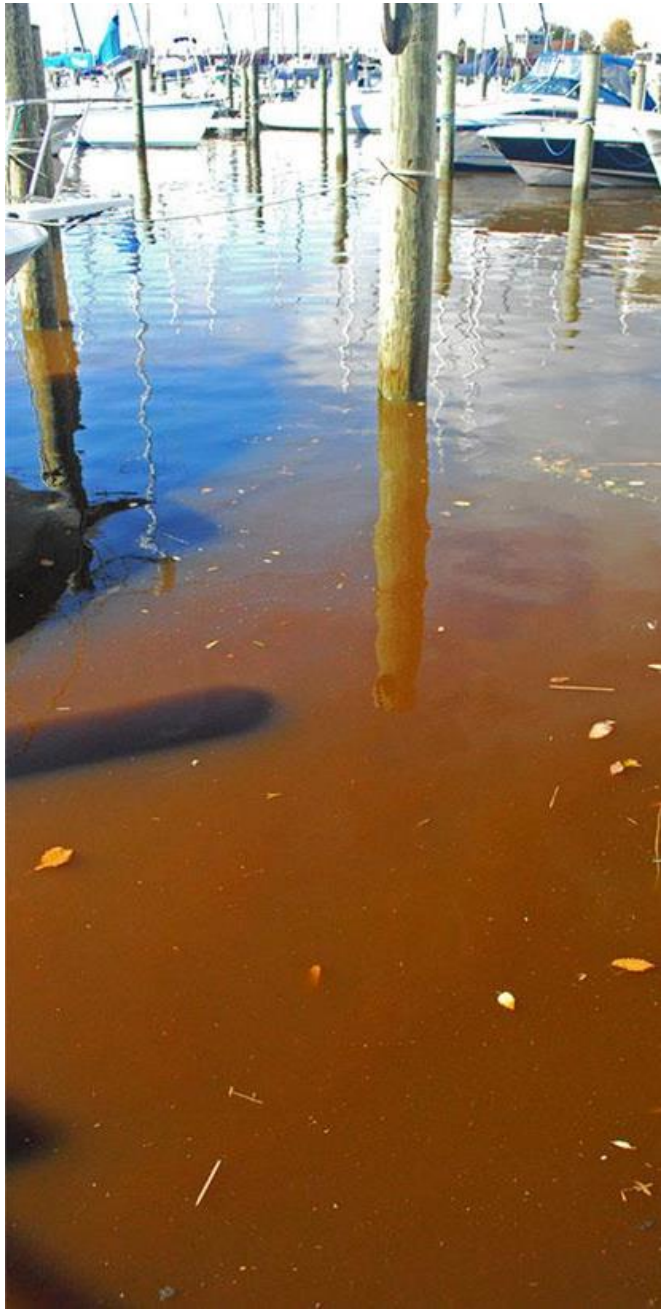
USGS Chesapeake Bay Program

STAC AI/ML Workshop

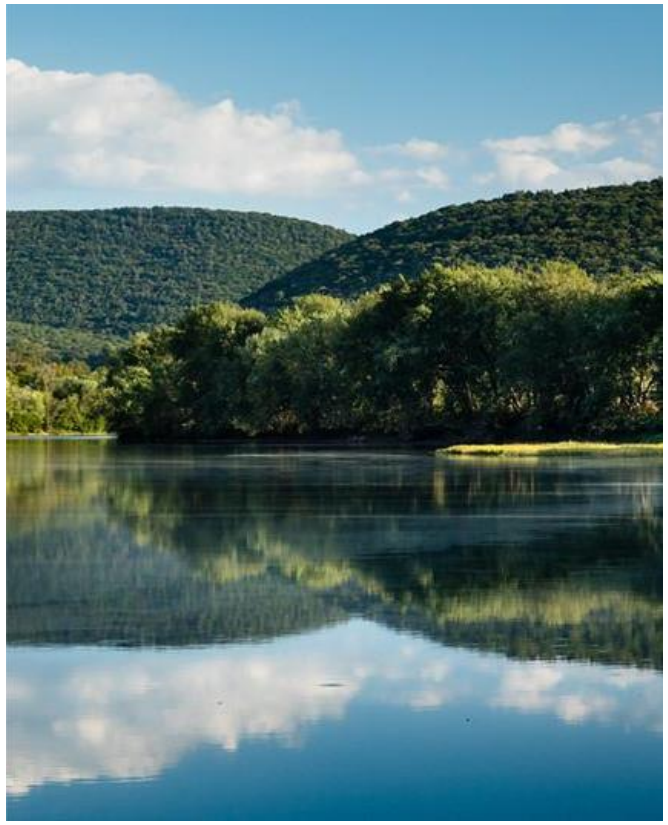
2/24/2025

A National Treasure


(Photo Credit: CBP)



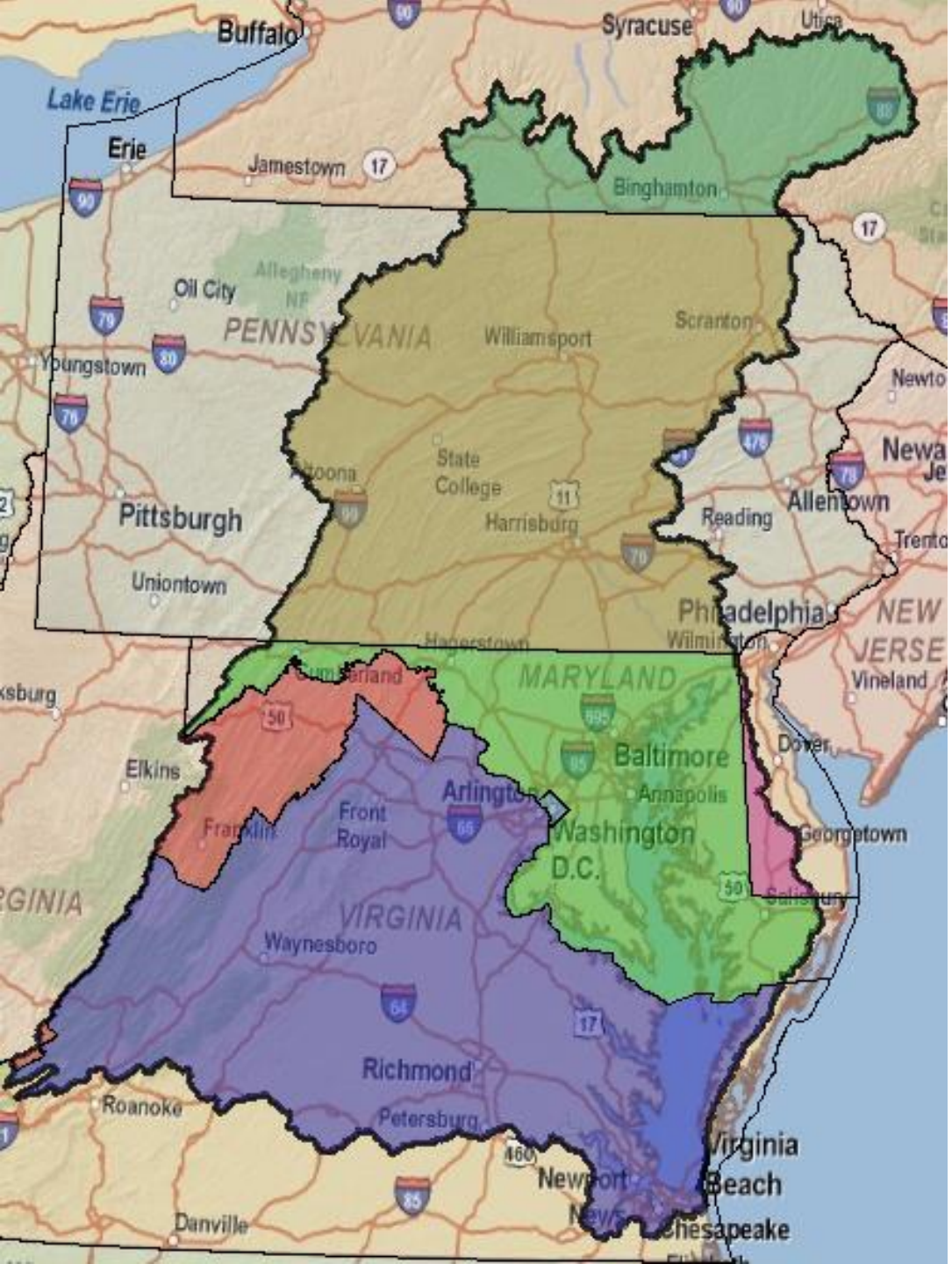
Less of This



More of This

Photos: Chesapeake Bay Program

http://store.rareearthgallery.com/rare-earth-gallery-chesapeake-bay-bathymetric-3-d.html



A lot of water flows into a thin veneer of Bay

The Chesapeake Bay Program is a Partnership


NY


DC


VA


MD

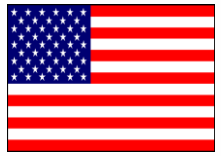

PA


DE


WV

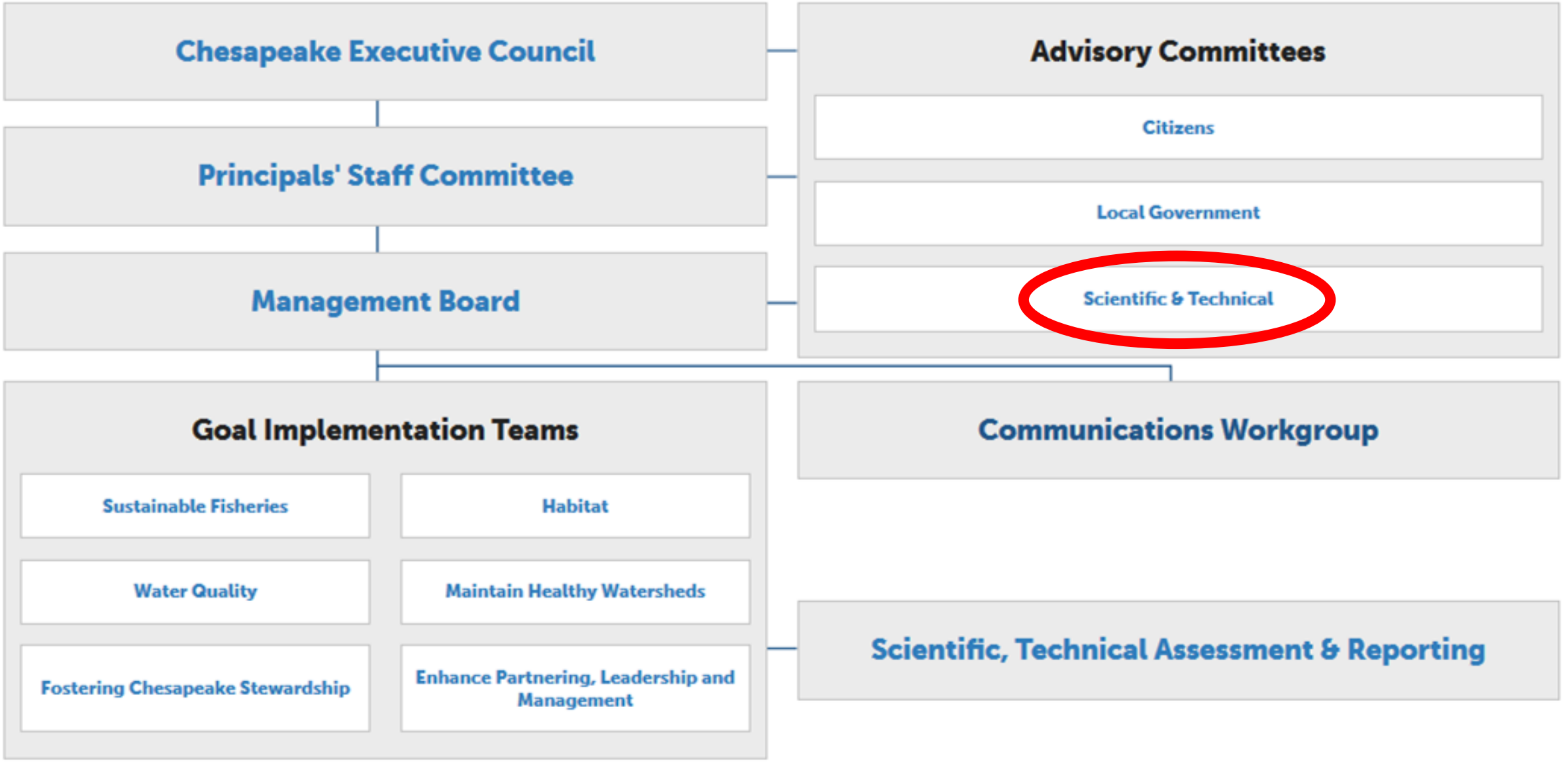
Bay Commission

Federal Partners

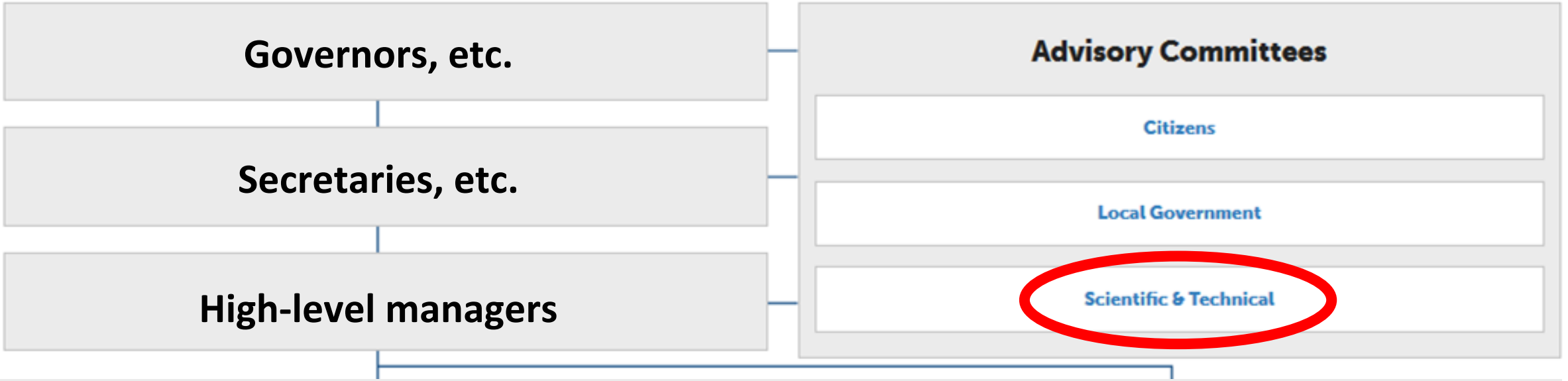


A partnership of all the major players in the Chesapeake region, working collaboratively on science, policy and restoration efforts.

STAC advises the partnership



STAC advises the partnership



Thousands of managers, environmental professionals, scientists, communicators, etc.

Chesapeake Bay Agreements set the priorites

1983 | 1987 | 2000 | 2010 | 2014

Signing of the Chesapeake Bay Agreement, 1987
(Source: chesapeakebay.net)

Chesapeake Executive Council

Governors, etc.

How can AI help the CBP with its priorities?

CHESAPEAKE WATERSHED AGREEMENT

2014

5

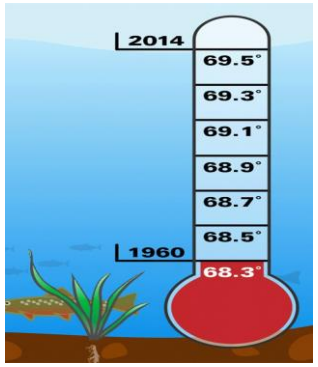
Themes

Abundant Life

Clean

Conserved Lands

Engaged communities



Climate Change

How can AI help the CBP with its priorities?

CHESAPEAKE WATERSHED AGREEMENT 2014

CHESAPEAKE WATERSHED AGREEMENT 2014

5 Themes

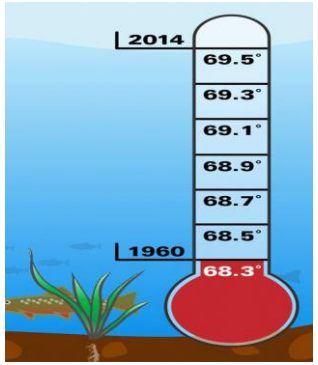
10 **Goals**

Sustainable fisheries
Vital habitats

Land Conservation

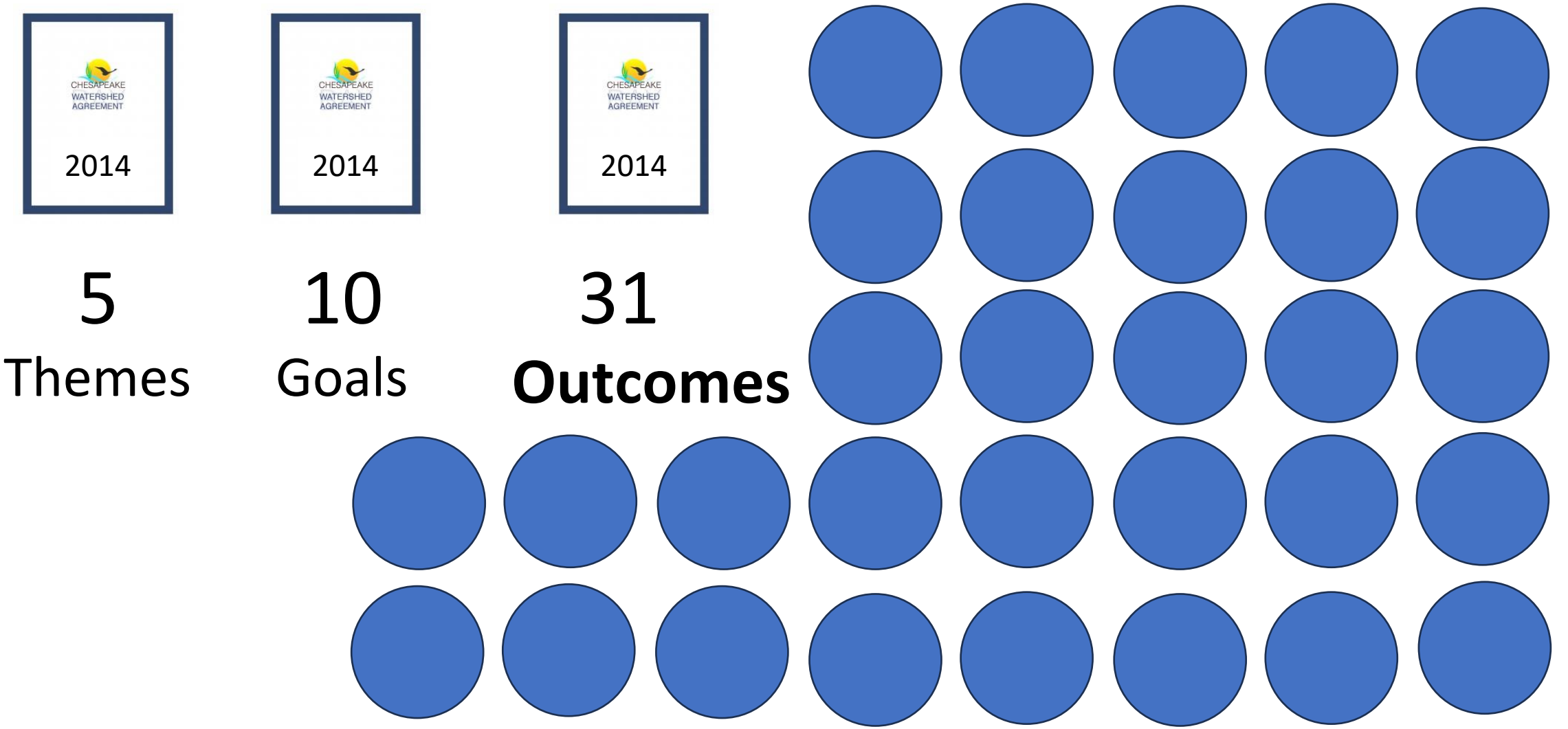
Water Quality
Toxics
Healthy watersheds

Stewardship
Public Access
Environmental Literacy



Climate Resiliency

How can AI help the CBP with its priorities?



5 Themes

10 Goals

31 **Outcomes**

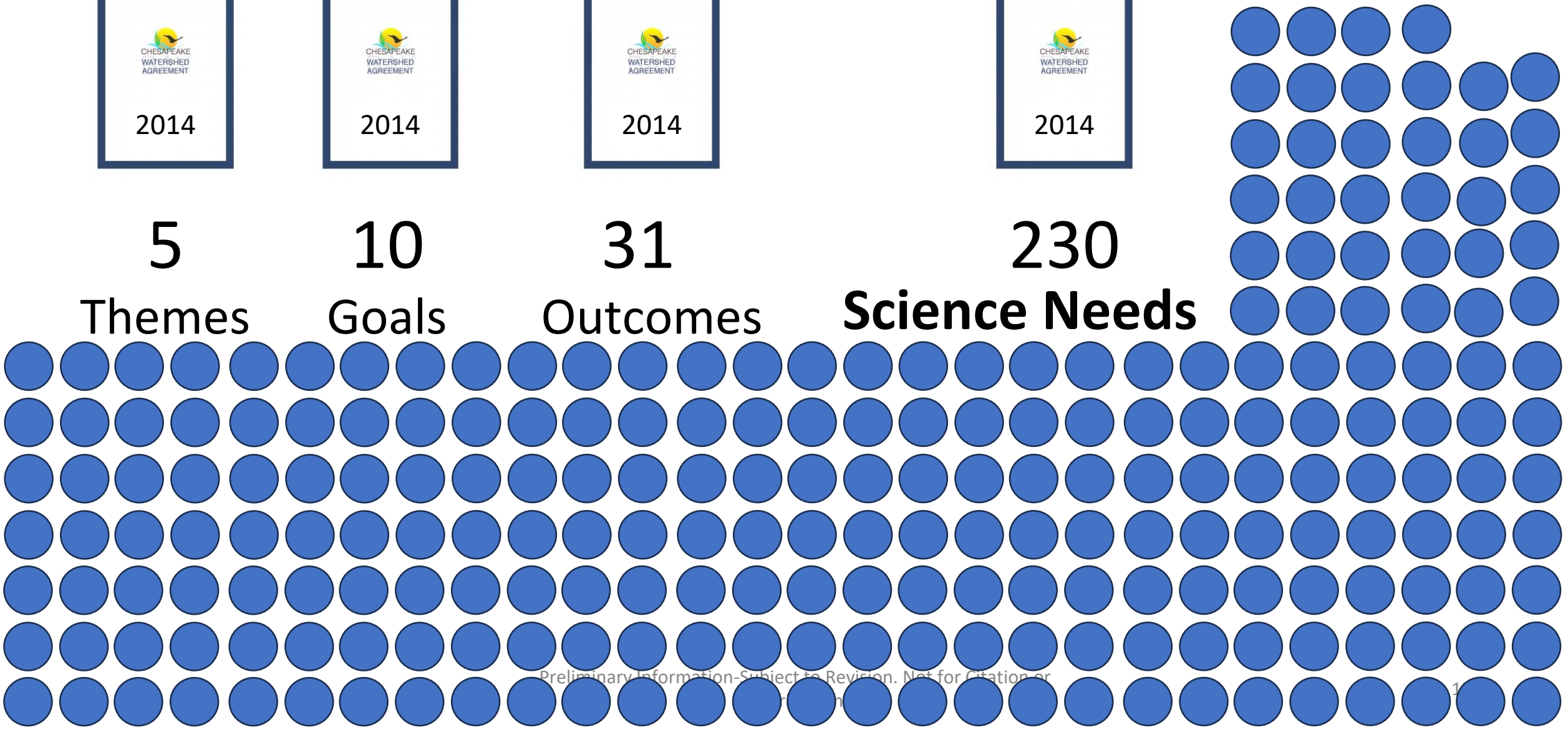
How can AI help the CBP with its priorities?

5 Themes

10 Goals

31 Outcomes

230 **Science Needs**



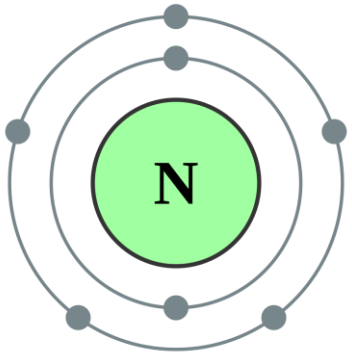
The CBP doesn’t officially know how AI can help.

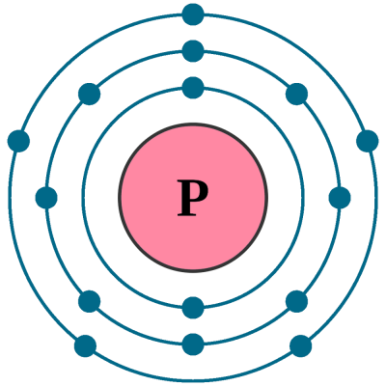
S**cience needs database** under Vital Habits => Submerged Aquatic Vegetation

- Develop algorithms to advance efforts in the use of **Artificial Intelligence** in the automated **detection of SAV** from satellite imagery.
- Support **collection of additional field data** to {support the above need}

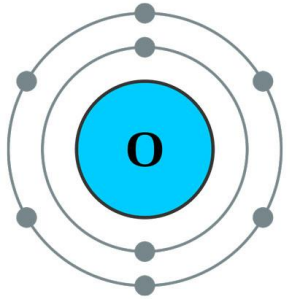
Practically, about half of the CBP time and resources are focused on the goal of reducing eutrophication

Nitrogen

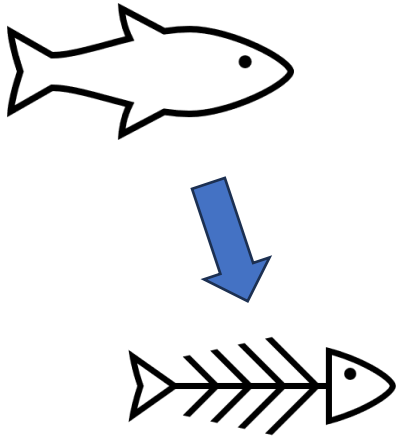




Phosphorus



Low
Oxygen



Photos: University of Maryland Center for Environmental Science

The Total Maximum Daily Load (TMDL) is an agreement to limit nutrients

What management practices…

…. will reduce nitrogen, phosphorus, and sediment to levels …

…. that will achieve levels of dissolved oxygen, clarity, and chlorophyll in the Bay that are supportive of living resources?

Photo credit: CBP

Models are used to answer these questions

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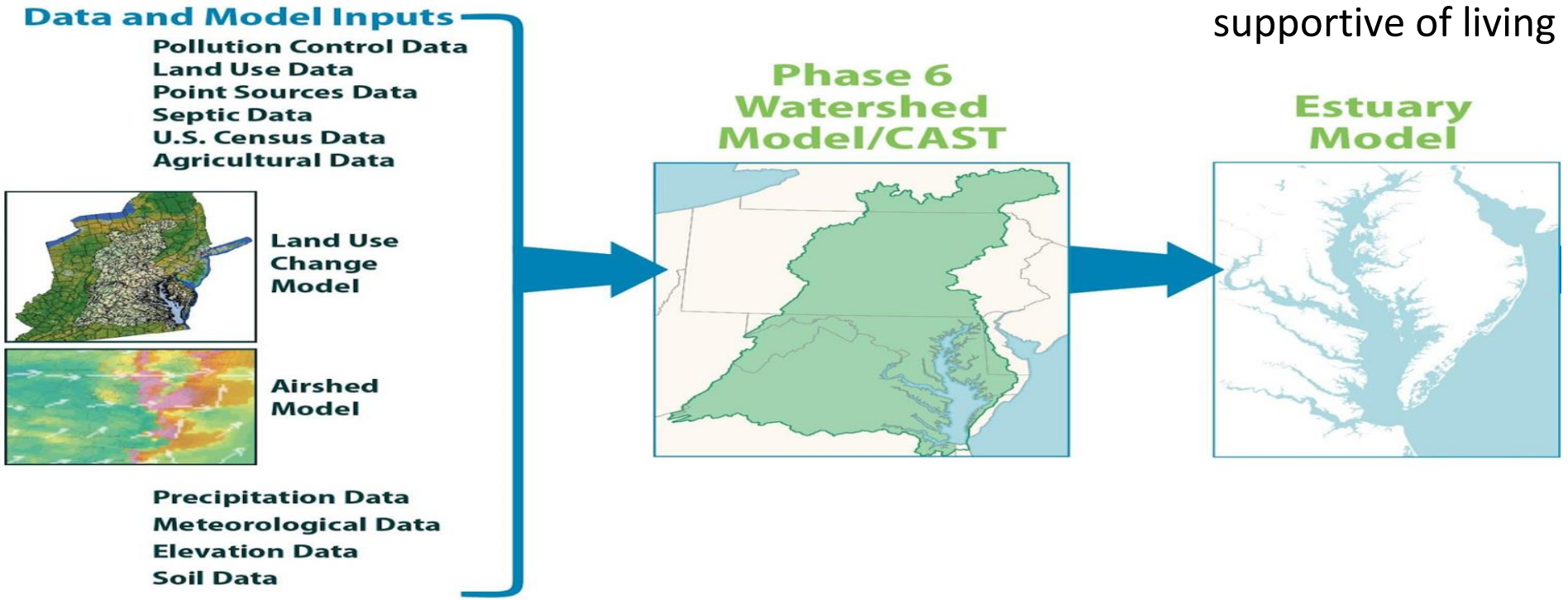


AI is currently being used or tried in several areas

Land use mapping

Management practice mapping

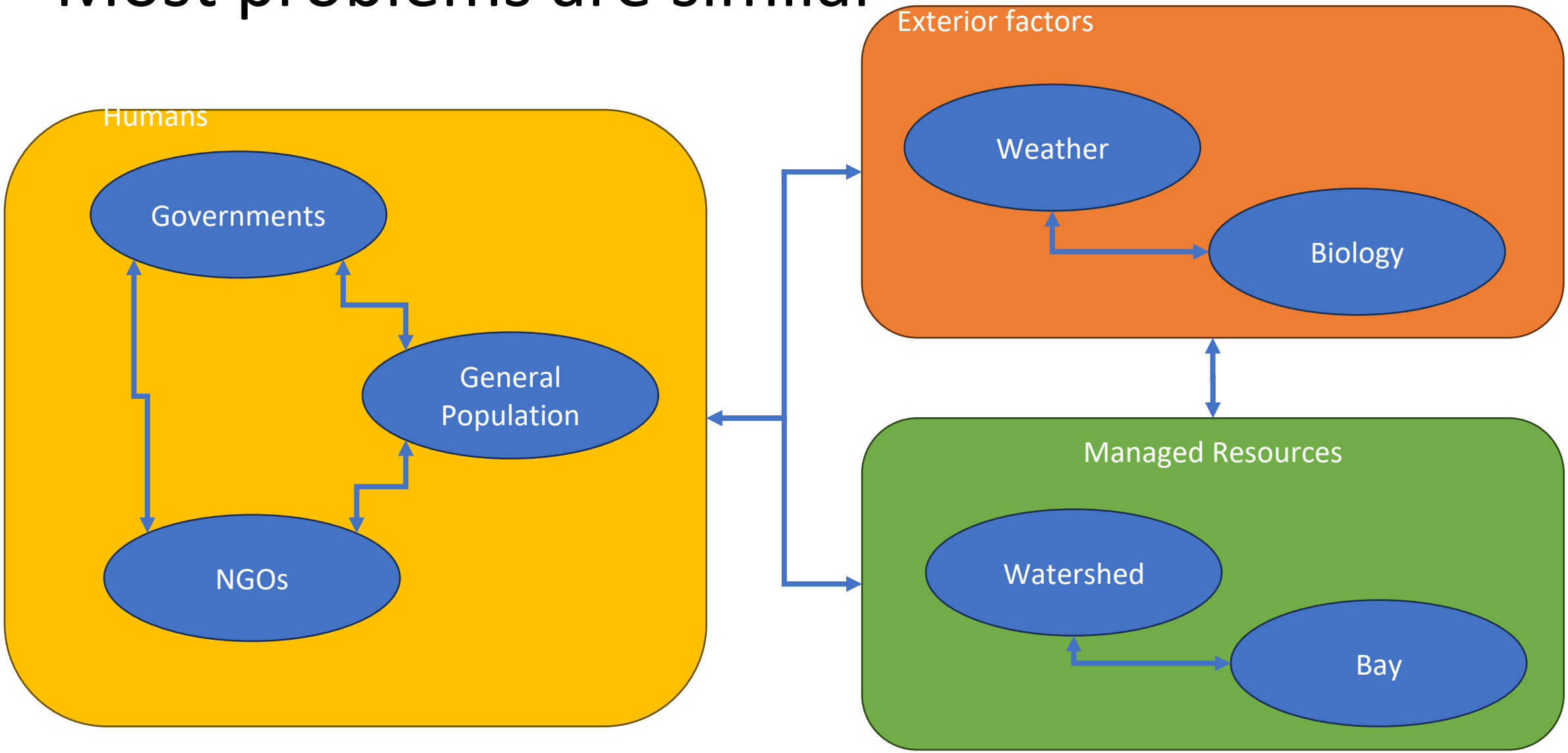
Landform effect on nutrient transport

Concentration time series

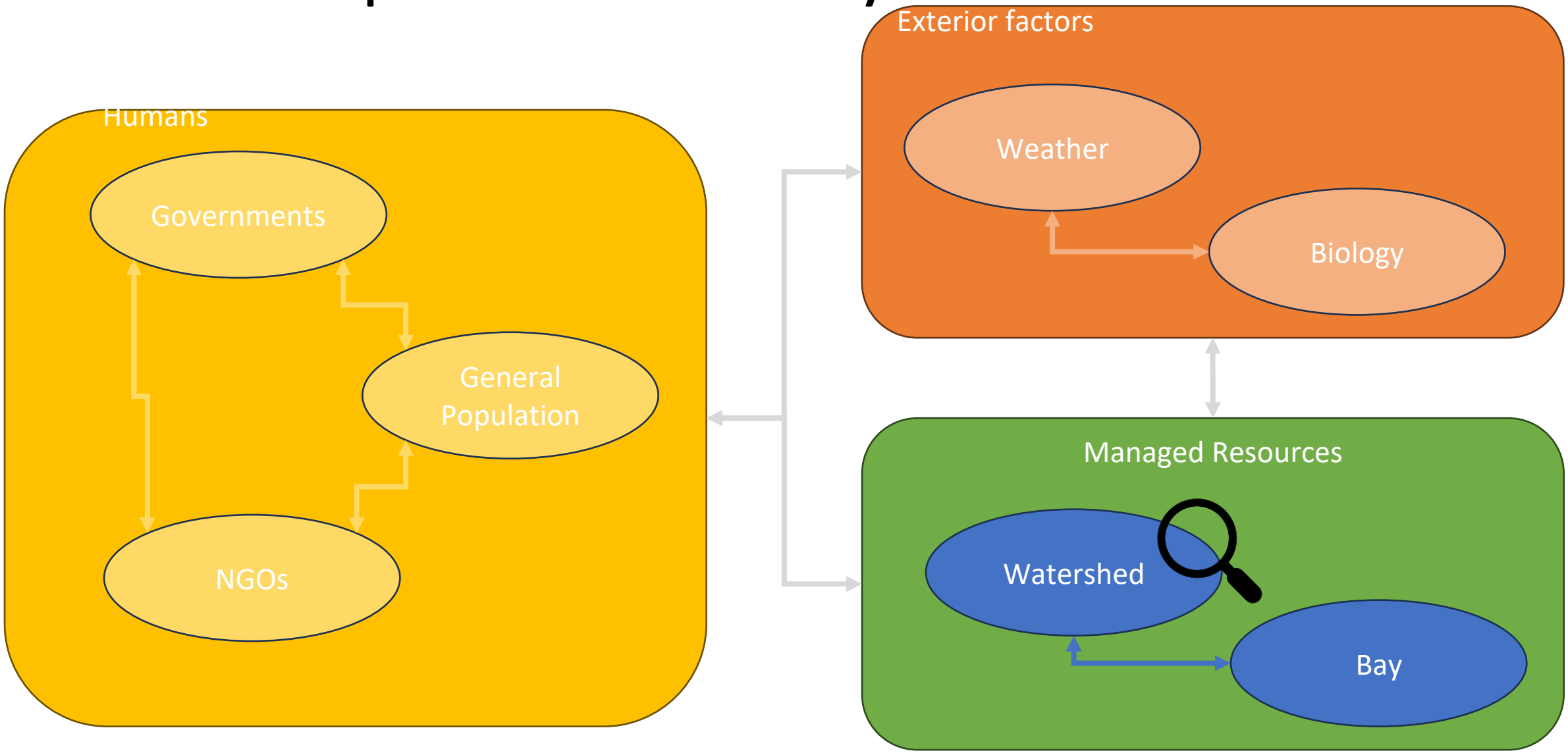
SAV and water quality mapping

Oxygen concentration across space and time

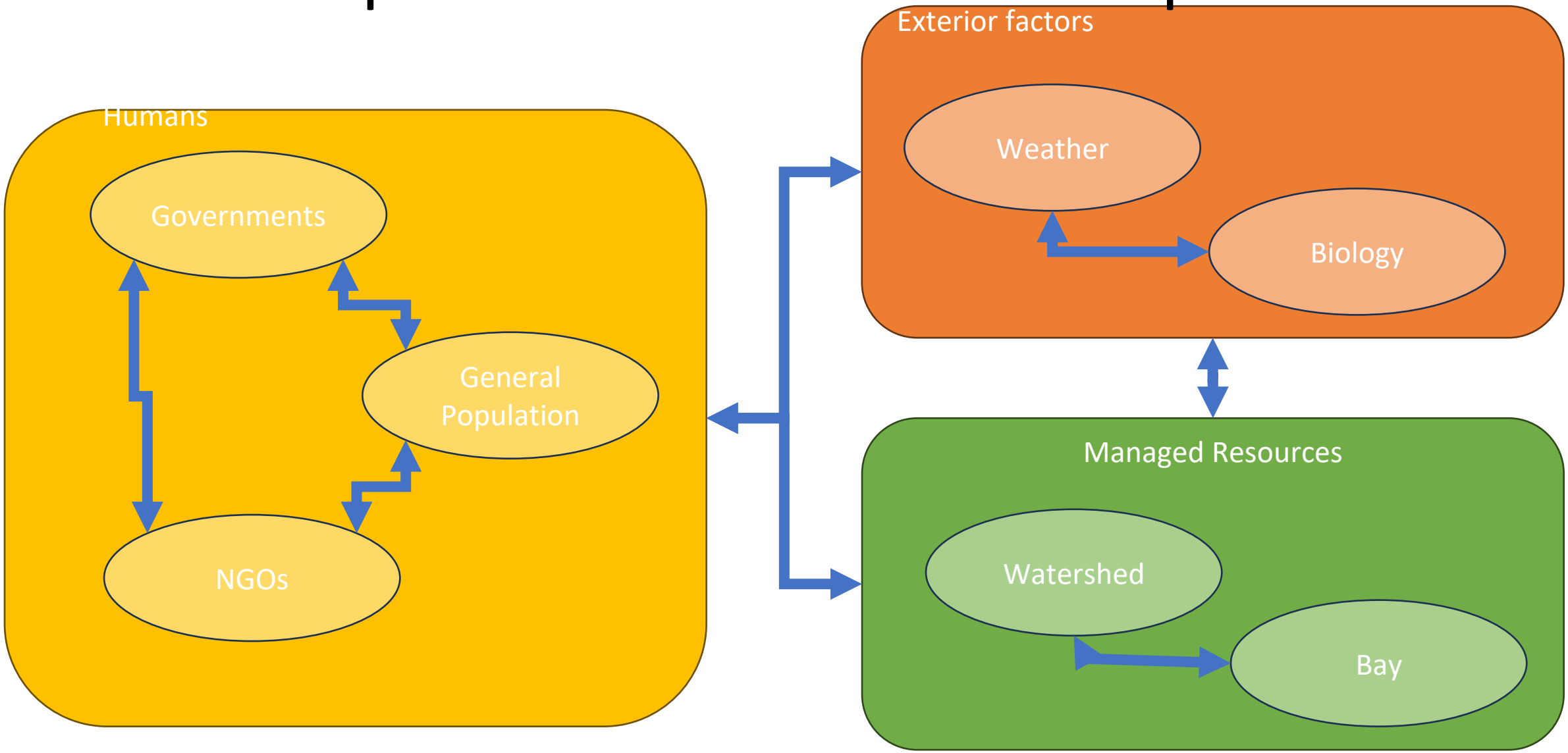
Most problems are similar



AI can help describe the system



AI can help examine the relationships



CBP Models are for scenarios

- Prediction
  - Temporal
  - Spatial
- Research
- Scenarios

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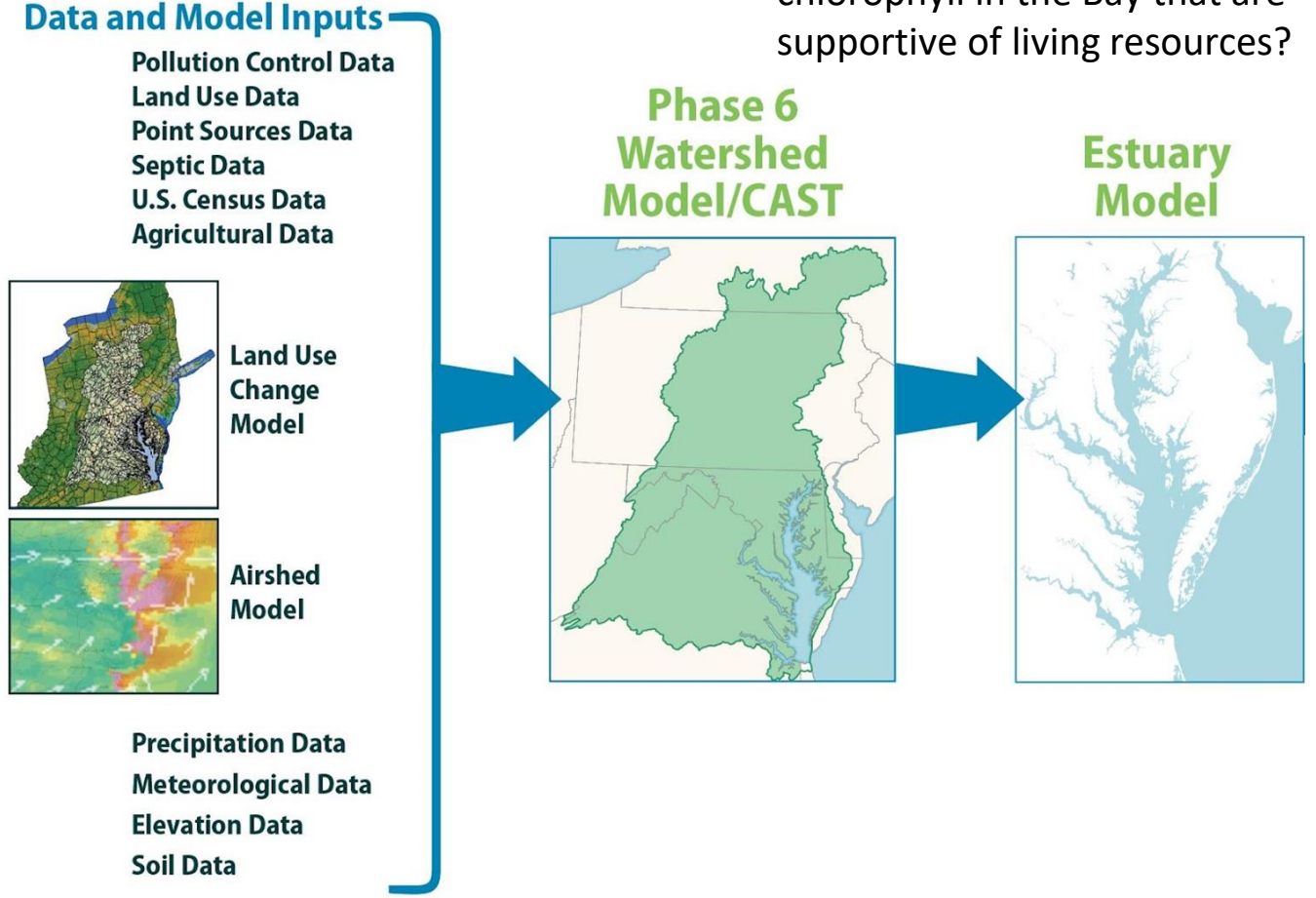
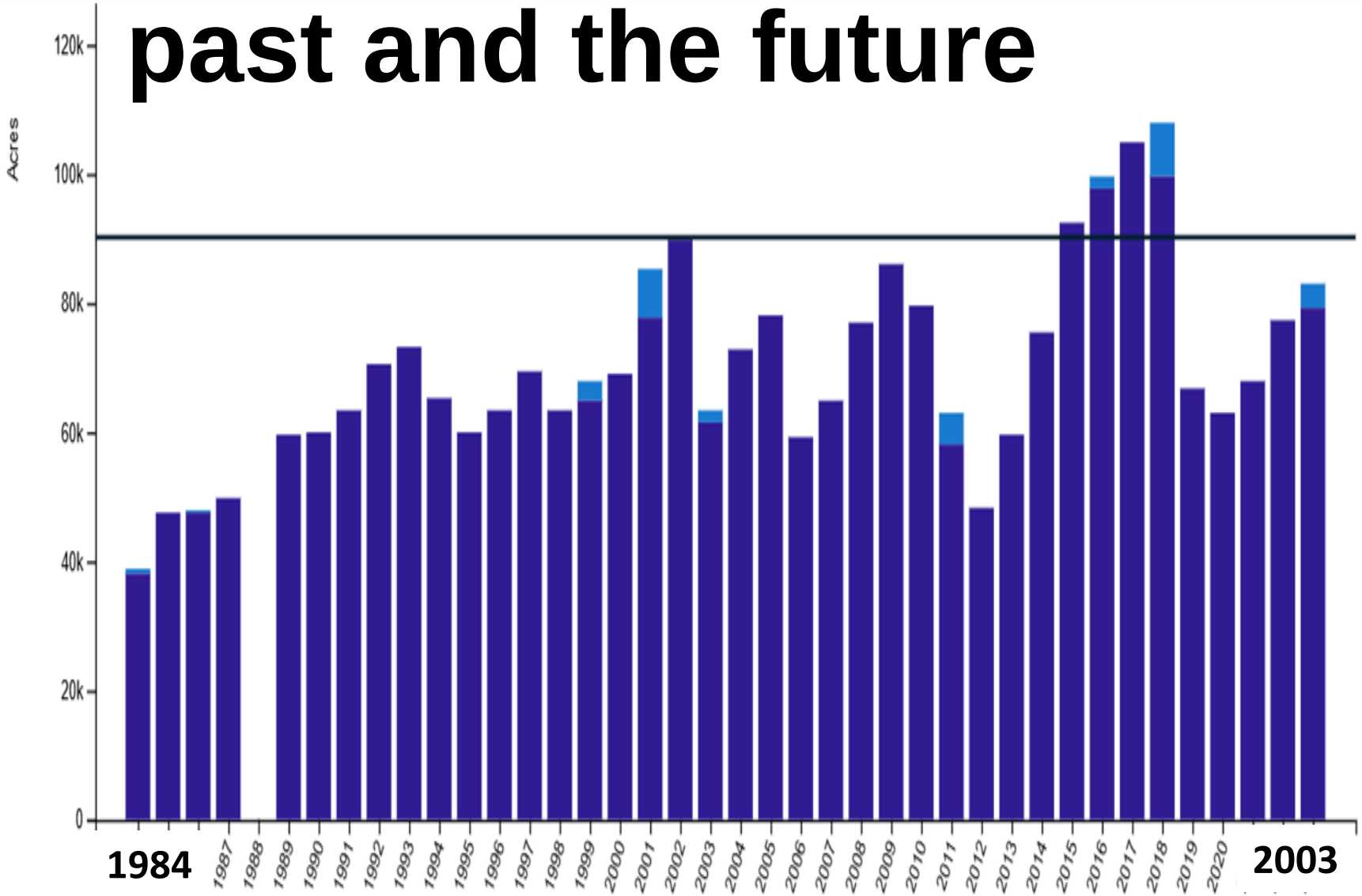
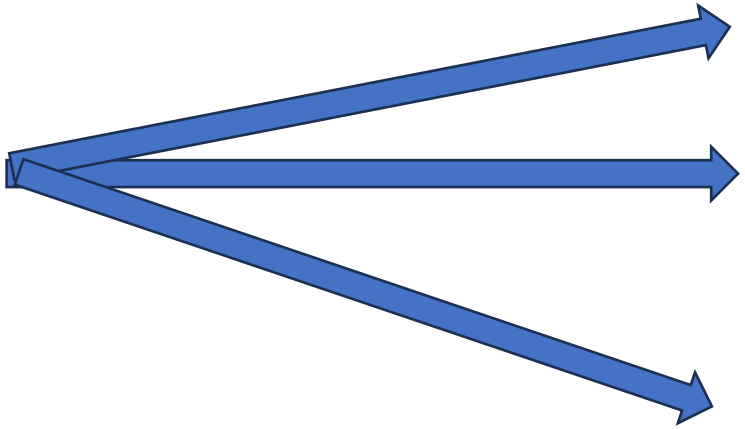


Managers need information about the past and the future





What will happen if certain actions are taken

Submerged Aquatic Vegetation Abundance

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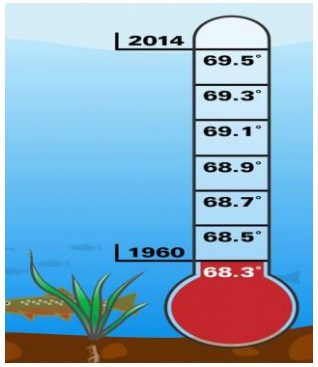
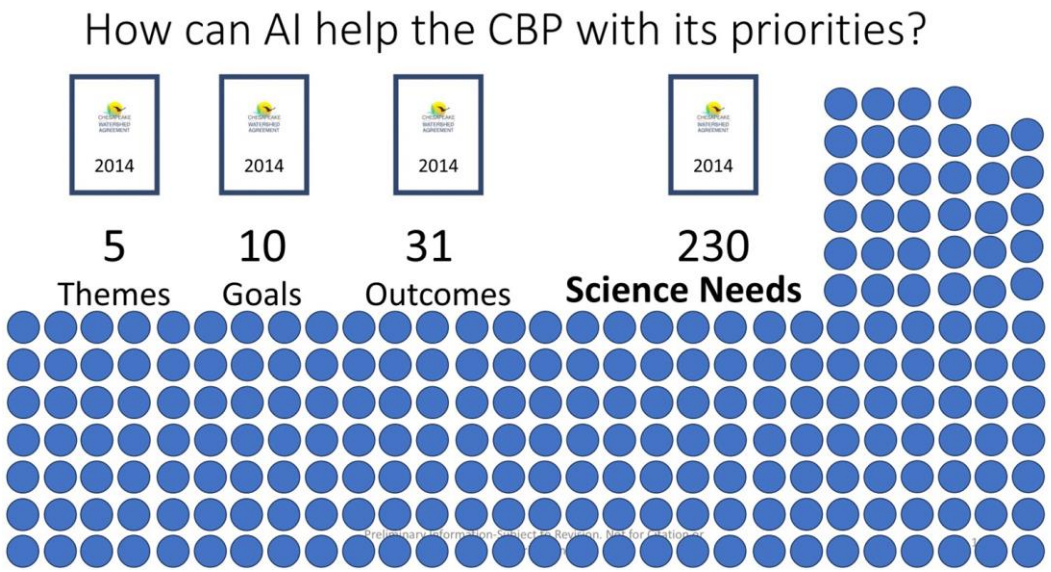


Climate Change

What Priorities can AI help the CBP with?



Discussion

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