The Chesapeake Bay Report Card and using indicators for improved outcomes

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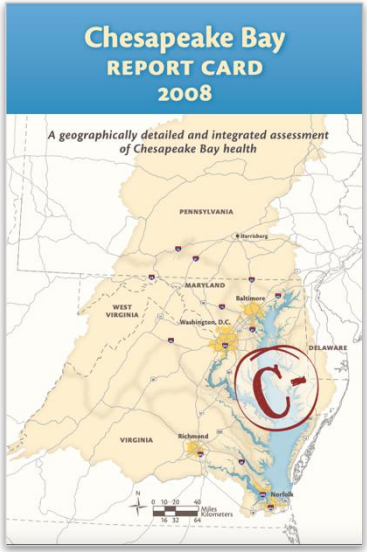
Scientific, Technical Assessment and Reporting (STAR) Team Meeting

Chesapeake Bay Report Card indicators used from 2007–2011

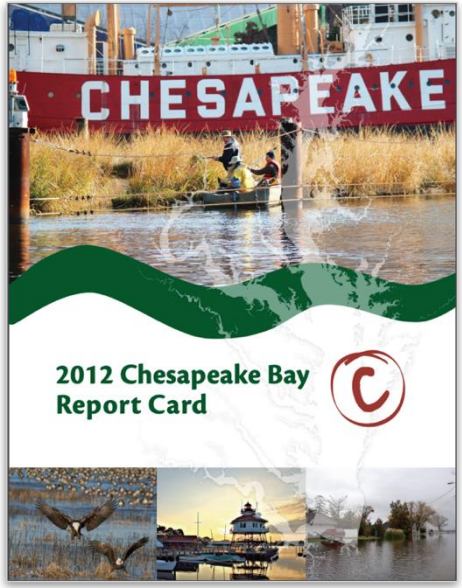


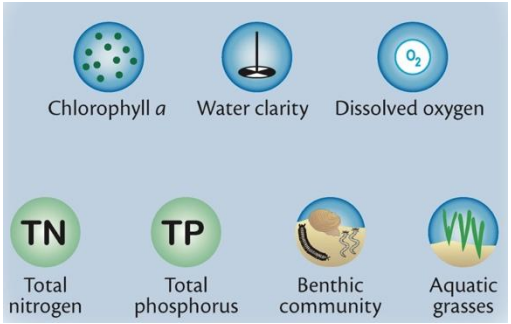
Indicators used in the report card

The aim of this report card is to provide a transparent, timely, and geographically detailed assessment of 2008 Chesapeake Bay health. Chesapeake Bay health is defined as the progress of **three water quality indicators** (chlorophyll *a*, dissolved oxygen, and water clarity) and **three biotic indicators** (aquatic grasses, phytoplankton community, and benthic community) toward scientifically derived ecological thresholds or goals. The six indicators are combined into one overarching Bay Health Index, which is presented as the report card score. Detailed methods available at *www.eco-check.org/reportcard/chesapeake/*.

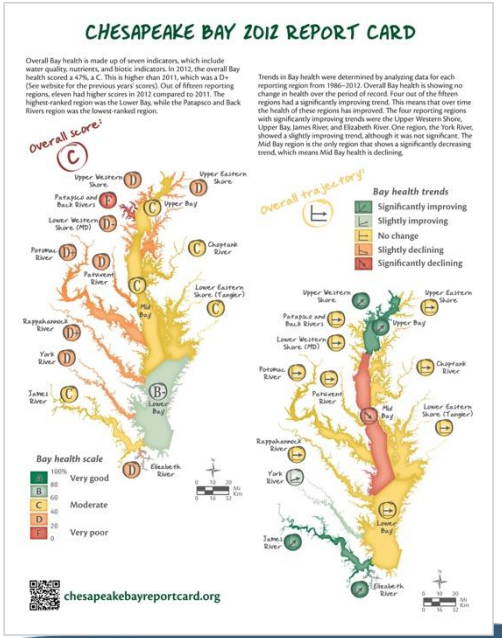
Three Water Quality and Three Biotic Indicators

Chesapeake Bay Report Card indicators used from 2012–2017

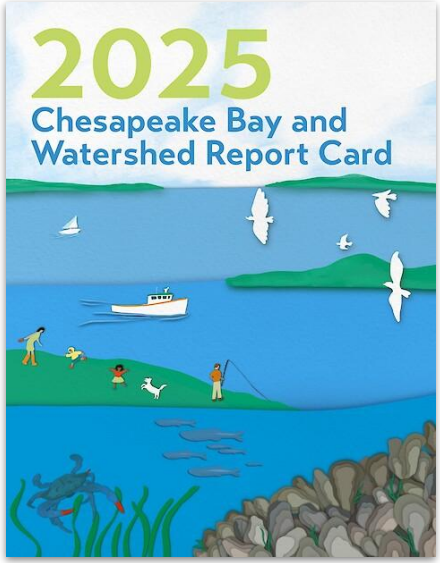




Seven indicators after 2011



Bay indicators used from 2017–present



Bay indicators

Total Phosphorus measures the amount of phosphorus in bay waters.

Total Nitrogen measures the amount of nitrogen in bay waters.

Dissolved Oxygen measures how much oxygen is present at different depths in the bay.

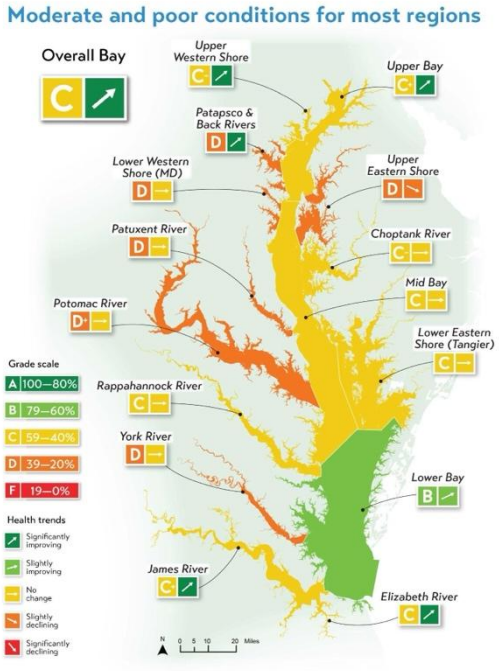
Benthic Community measures the condition of organisms living in or on the bottom areas of the bay.

Water Clarity is a measure of how deep light penetrates through the water column.

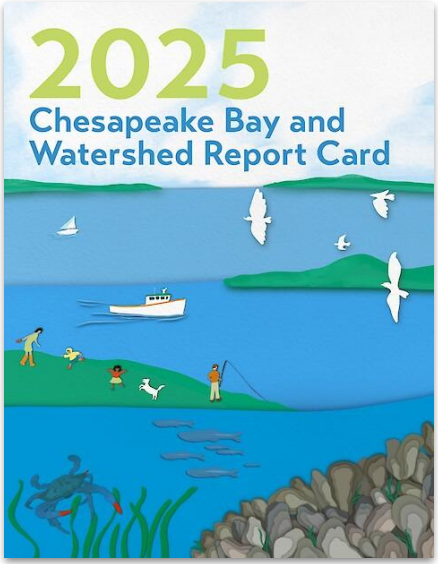
Chlorophyll *a* is used as a measure of phytoplankton (microalgae) biomass.

Aquatic Grasses, or submerged aquatic vegetation, measures the area of grass beds in bay regions.

No change in Bay indicators



New watershed indicators established



Watershed indicators

Ecology

Protected Lands measures the amount of all lands protected in the watershed.

Water Quality index includes metrics for total phosphorus, total nitrogen, turbidity, and conductivity.

Fish Community index, developed by the EPA, examines river health by assessing native species and pollution tolerance.

Benthic Community measures the condition of the organisms living on the bottom of streams.

Temperature Stress measures if summer water temperatures are too hot for many aquatic organisms.

Economy

Household Income measures the amount of money people are receiving through their employment.

Jobs Growth measures the percentage of jobs gained or lost (net) from 2021 to 2022.

Income Equality measures disparity between low and high earners.

Affordable Housing measures how much housing is available at a cost that is less than 30% of people's income.

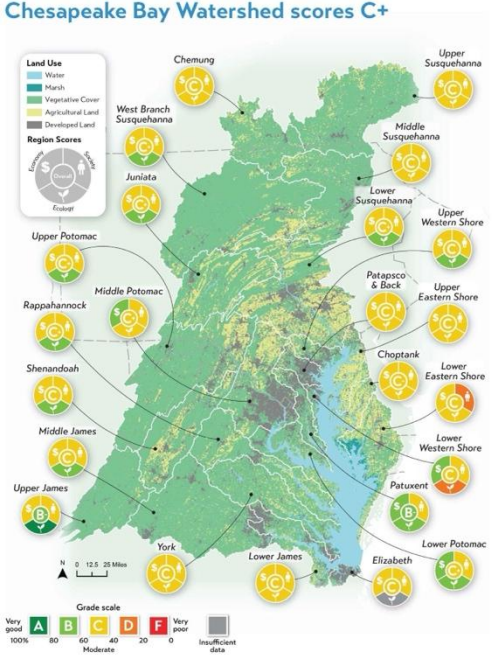
Society

Heat Vulnerability index uses metrics for tree canopy, impervious surfaces, air temperature, and households in poverty to assess vulnerability to heat.

Social Index uses data about social vulnerability from the U.S. Census and measures how a community can respond to hazardous events.

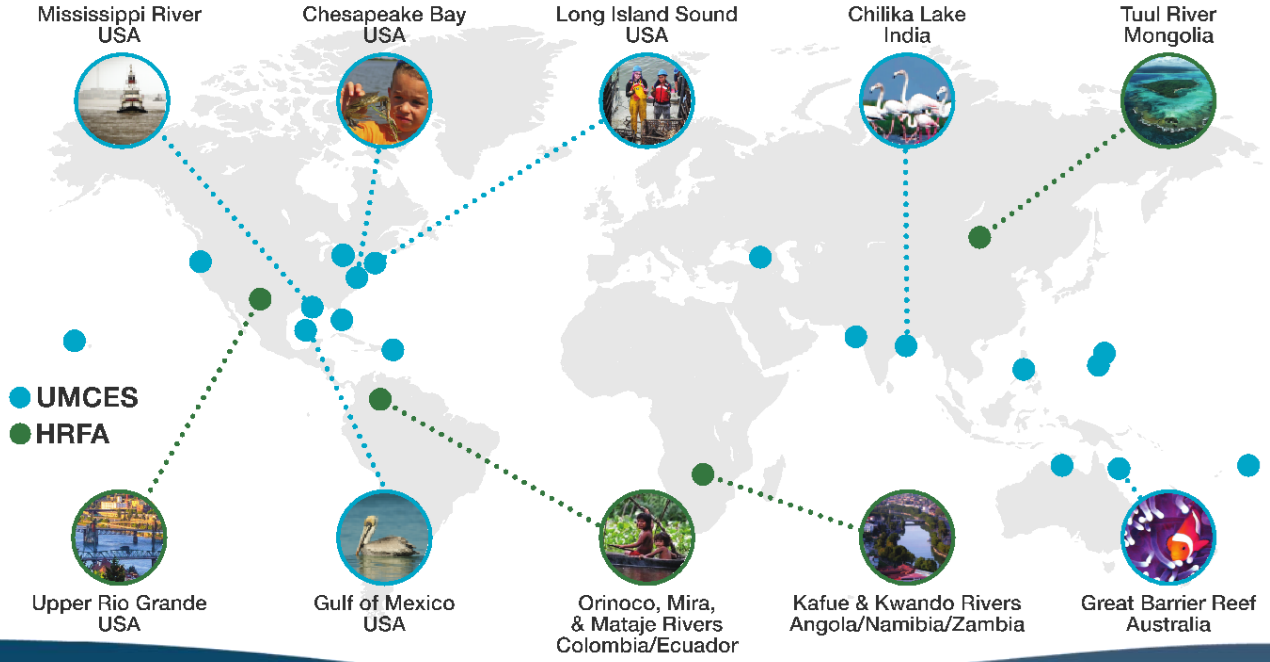
Walkability measures how many people can walk to a park in 10 minutes from where they live.

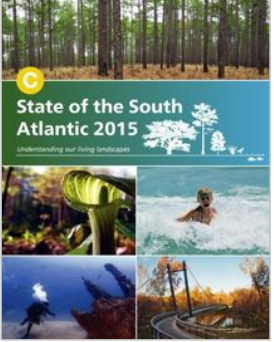
Chesapeake Bay Watershed scores C+

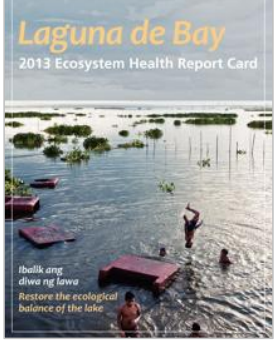


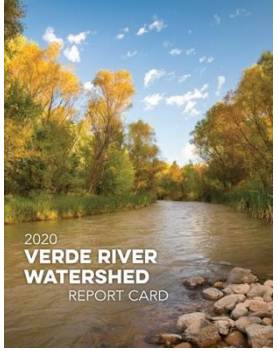
Watershed indicators provide context

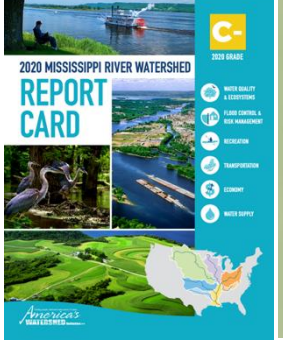
Work on socio-environmental report cards began in 2014

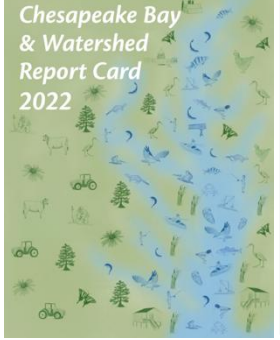



C
State of the South Atlantic 2015
Understanding our living landscapes


Laguna de Bay
2013 Ecosystem Health Report Card
Ibalik ang diwa ng lawa
Restore the ecological balance of the lake

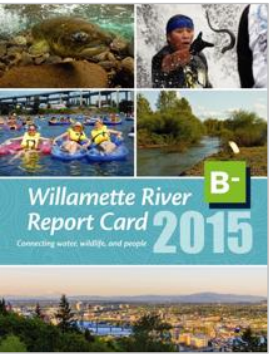

2020
VERDE RIVER WATERSHED
REPORT CARD

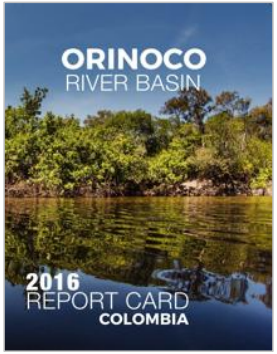

2020 MISSISSIPPI RIVER WATERSHED
REPORT CARD
C-
2020 GRADE
America's WATERSHED

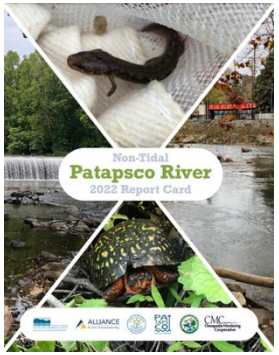

Chesapeake Bay & Watershed Report Card 2022

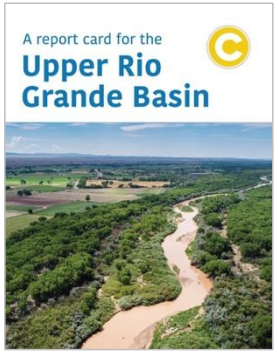

Long Island Sound Report Card
Grading the water quality and ecosystem health of the Urban Sea

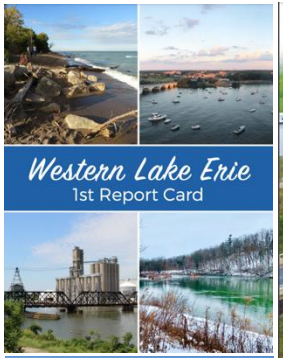

Maryland
Coastal Adaptation Report Card 2021
B-

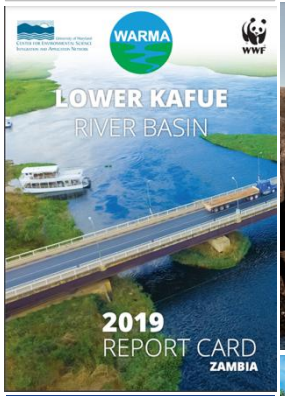

Willamette River Report Card 2015
Connecting water, wildlife, and people
B-

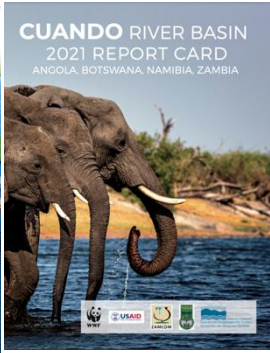

ORINOCO
RIVER BASIN
2016
REPORT CARD
COLOMBIA

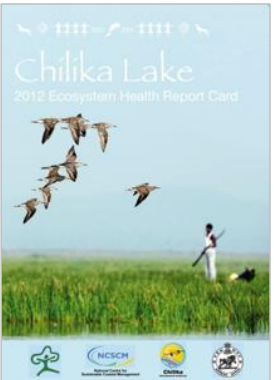

Non-Tidal
Patapsco River
2022 Report Card
ALLIANCE

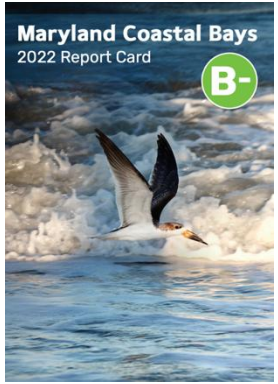

A report card for the
Upper Rio Grande Basin
C

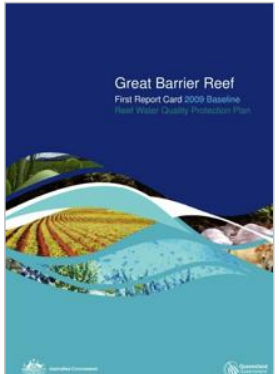

Western Lake Erie
1st Report Card

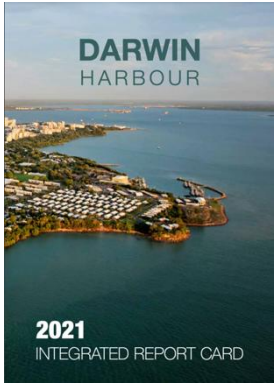

WARMA
WWF
LOWER KAFUE
RIVER BASIN
2019
REPORT CARD
ZAMBIA

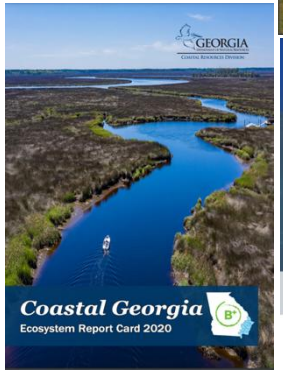

CUANDO RIVER BASIN
2021 REPORT CARD
ANGOLA, BOTSWANA, NAMIBIA, ZAMBIA
WWF
USAID
ZAMCOM

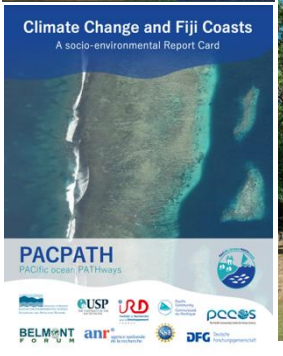

Chilika Lake
2012 Ecosystem Health Report Card
NCSCM
Chilika

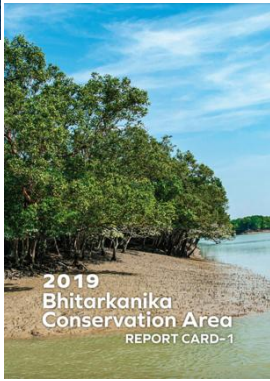

Maryland Coastal Bays
2022 Report Card
B-


Great Barrier Reef
First Report Card 2009 Baseline
Reef Water Quality Protection Plan


DARWIN
HARBOUR
2021
INTEGRATED REPORT CARD


GEORGIA
Coastal Resources Division
Coastal Georgia
Ecosystem Report Card 2020
B+


Climate Change and Fiji Coasts
A socio-environmental Report Card
PACPATH
PACific ocean PATHways
USP
IRD
pccos
BELMONT FORUM
anr
DFG

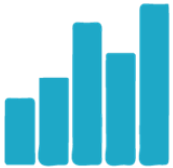

2019
Bhitarkanika Conservation Area
REPORT CARD-1

The report card process has 5 steps

1 Co-design

2 Choose Indicators

3 Determine Thresholds



4 Calculate Grades

5 Communicate Results

Indicator selection is an important step

- Consider the visioning of the region
- Understand values and threats
- Determine what indicators can represent the values and threats to tell us about conditions and health
- Start with a long list of indicators, every idea is a good one!
- Consider the indicators critically using SMART criteria

Good indicators are SMART

- Specific, measurable, attainable, relevant, time-bound (SMART)
- Sensitive to change
- Reflect management goals and/or actions
- Cost effective and easy to collect
- Good spatial and temporal coverage
- Will be measured into the future
- Have a threshold/goal
- Available data
- Good quality data
- High frequency data

Choosing SMART indicators

Specific (to what is being measured)

Measurable (also reliable, comparable, contextually appropriate and unambiguous)

Attainable (also achievable, feasible, cost-effective)

Relevant

Time-bound (also sensitive, i.e. the change in values can be tracked over time)

Socio-environmental report card categories

Some of the indicator categories to consider are:

- Water (quality and quantity)
- Biodiversity
- Ecology
- Ecosystems and landscapes
- Management
- Governance
- Infrastructure
- Economy
- Human health
- Society and culture

Aim for 3–6 indicators for each goal

Protecting water for human and ecological health

Supporting human health

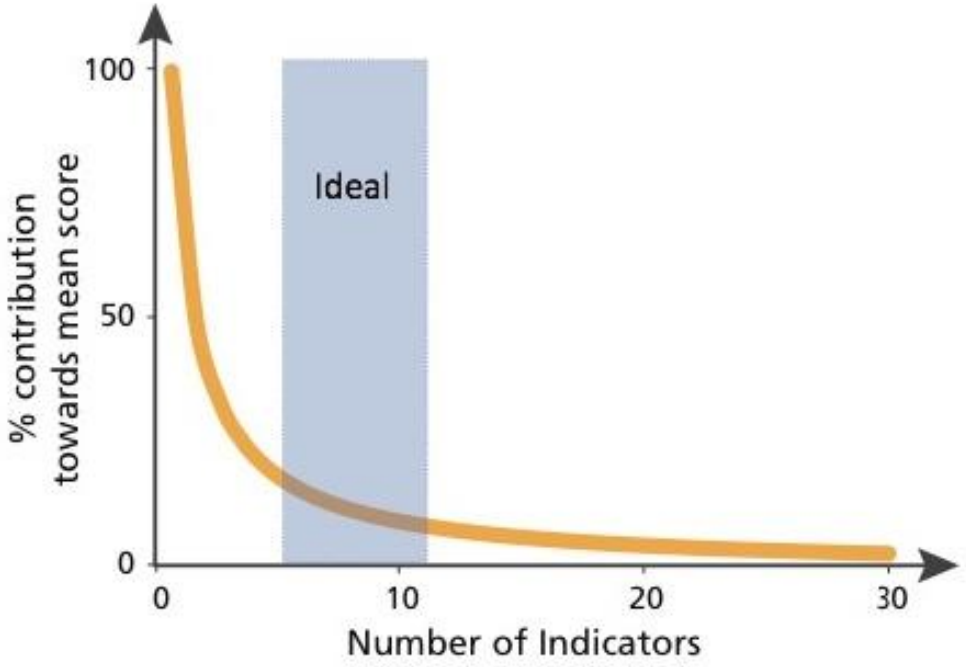
Engaging and empowering communities

Protecting habitats and species

Enhancing understanding and adaptation

Environmentally sustainable economic opportunities and innovation

How many indicators are needed?



Indicators should reflect stakeholder values

Key point:

Alignment of stakeholder views, management needs, planning and monitoring

Indicator nuts and bolts

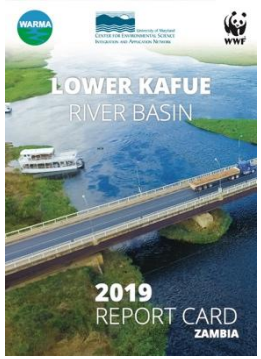
- Identify a long list of indicators
- Group indicators into categories (these can change)
- For each potential indicator determine data availability (temporal and spatial)
- Determine threshold, target, or goal for each indicator
- Compare indicators to SMART criteria
- Narrow down indicator list based on above
- Use an iterative process to reach final indicators and scoring
- Document decision process and methods throughout
- Be transparent and realistic

Examples from the Kafue River Report Card in Zambia

Water Quality and Quantity

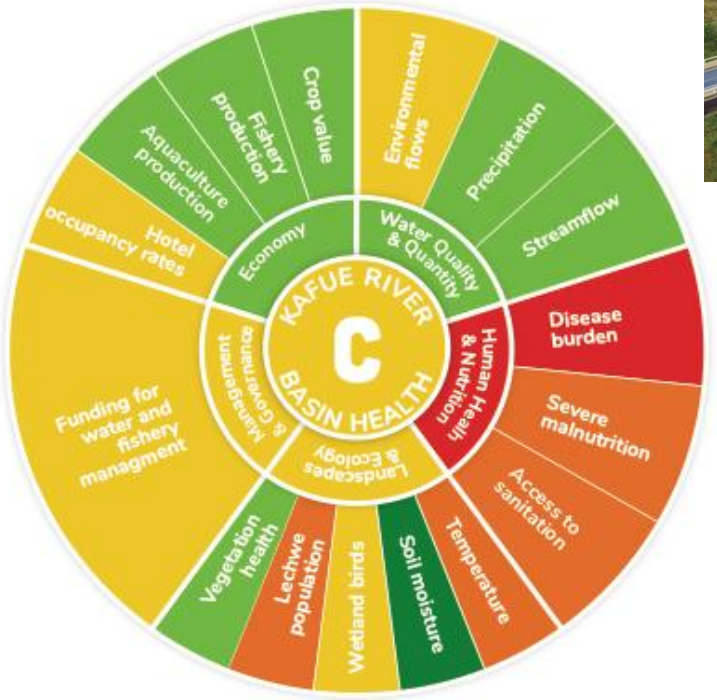
Value	Indicator	Measured by
Water for agriculture	Agricultural Water stress	% of time agricultural demand exceeded supply
Drinking and Domestic Water Use	Domestic water stress	% of time domestic water demand
	Water quality violations	Number of violations of above standards for drinking water
Water for Ecosystems	Environmental Flows	% of time monthly env Flow requirement met
	Ecosystem Water Quality	% of time DO, pH, nutrients and Conductivity

Lower Kafue River Basin Report Card

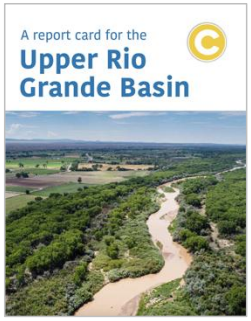


Indicators for

- Water Quality and Quantity
- Landscapes and Ecology
- Management and Governance
- Human Health and Nutrition
- Economy



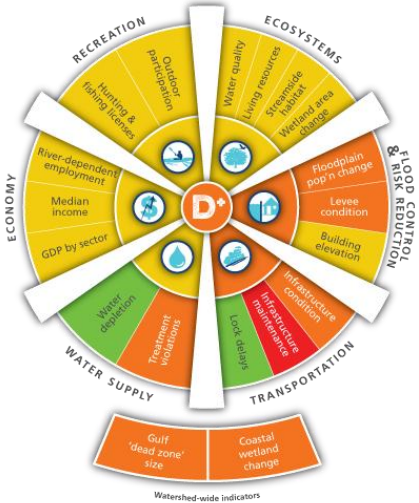
Upper Rio Grande Watershed Report Card



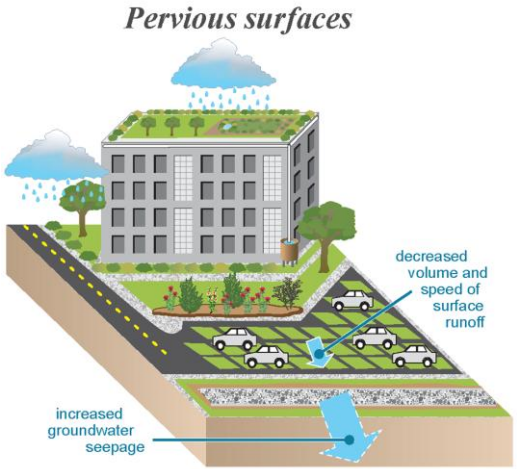
Key soNative peoples & acequias support cio-economic indicators are:

- Native peoples & acequias representation
- Water resource governance
- Water resource management
- Park visitation
- Recreation access
- Cultural and historic places
- Affordable housing
- Heat Vulnerability Index
- Air quality

Effective science communication combines indicator results with storytelling



Interpret & synthesize data



Sense of place: who, what, where, when, how, and why

Provide context

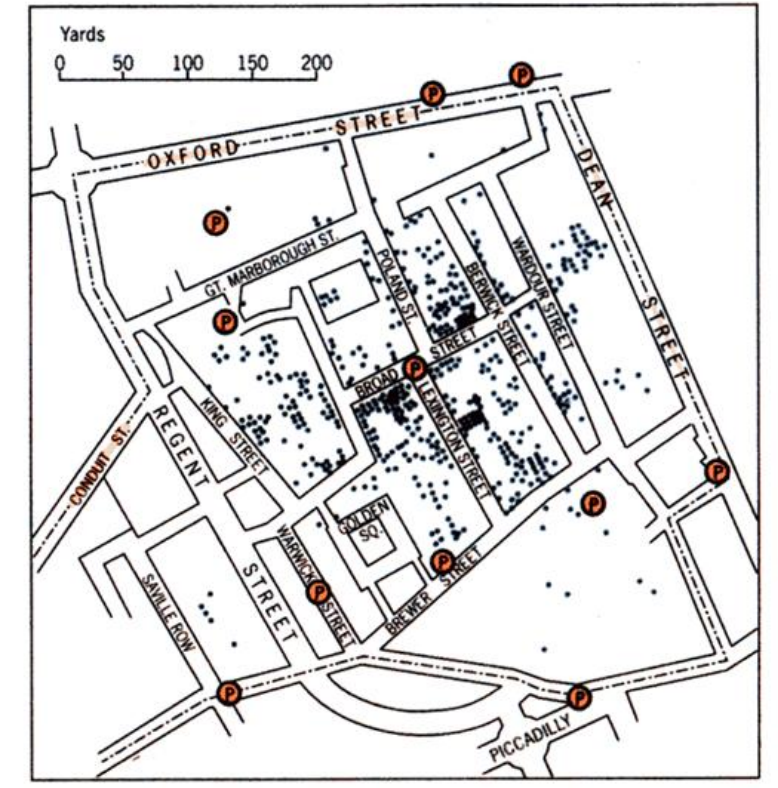
What does storytelling have to do with science?

Stories are a powerful communication device:

- **Engage an audience:** stories are more interesting than a string of facts, compelling visuals illustrate points
- **Improve information retention:** it's easier to remember good stories and effective visual elements
- **Makes information more accessible and shorten reading time:** audience/reader can follow storyline and view visual elements quickly

Science communication in society

- Cholera outbreak in London in 1854
- John Snow mapped cholera cases
  - Linked cholera cases to pump locations
- Pump handle removed, cholera subsided



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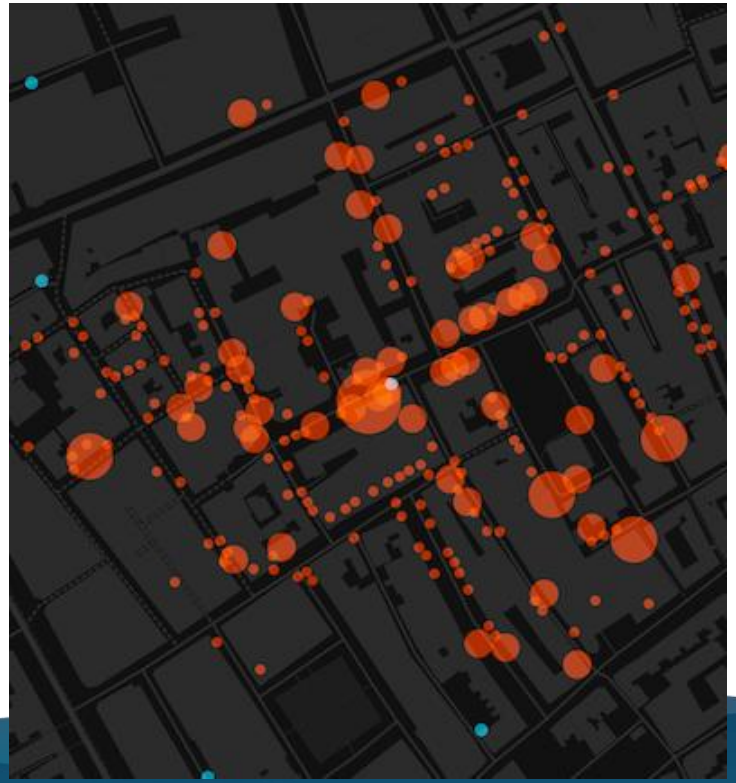
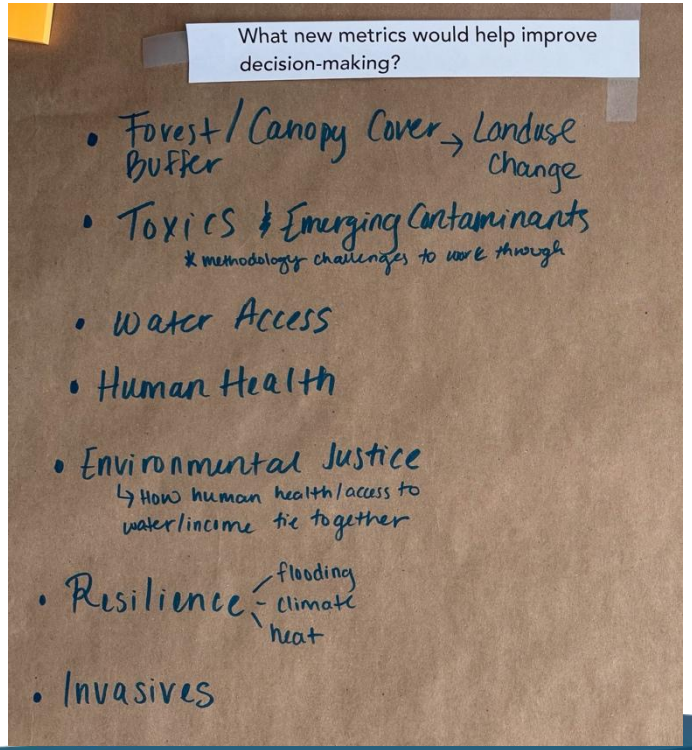


Improving the Chesapeake Bay Report Card

- New indicators are being developed
- Goals are to align with other Chesapeake efforts like
  - the new CBP watershed agreement goals
  - CESR report and
  - other organization's efforts like CBF and CBP



Thank you

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Chesapeakebayreportcard.org