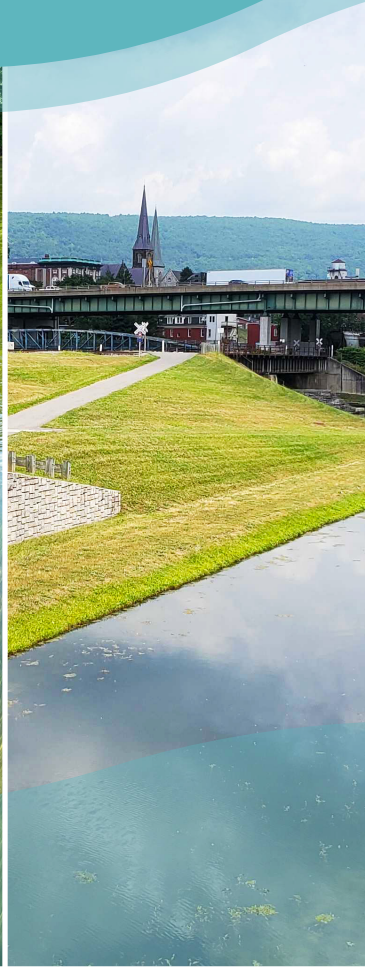# Potomac River and Watershed Report Card
2022

Developing a holistic vision of the watershed

The Potomac River watershed is an essential resource that holds interconnected and shared values. To ensure that informed decisions are made, adopting an inclusive and participatory approach allows for development of a comprehensive vision for the entire watershed. One such approach is the COAST Card or Coastal Ocean Assessment for Sustainability and Transformation framework.


The Potomac River is home to the nation's capital.

COAST Card builds on the Chesapeake Bay and Watershed Report Card produced by the University of Maryland Center for Environmental Science (UMCES) and is being introduced in the Potomac watershed, covering the Lower Potomac, Middle Potomac, Upper Potomac, and Shenandoah regions. This framework can bridge the gap between qualitative and quantitative information, allowing stakeholders to make informed management or policy decisions.

The 2022 Potomac River and Watershed Report Card is one of the foundations of the Potomac COAST Card that will be further developed in the coming years.
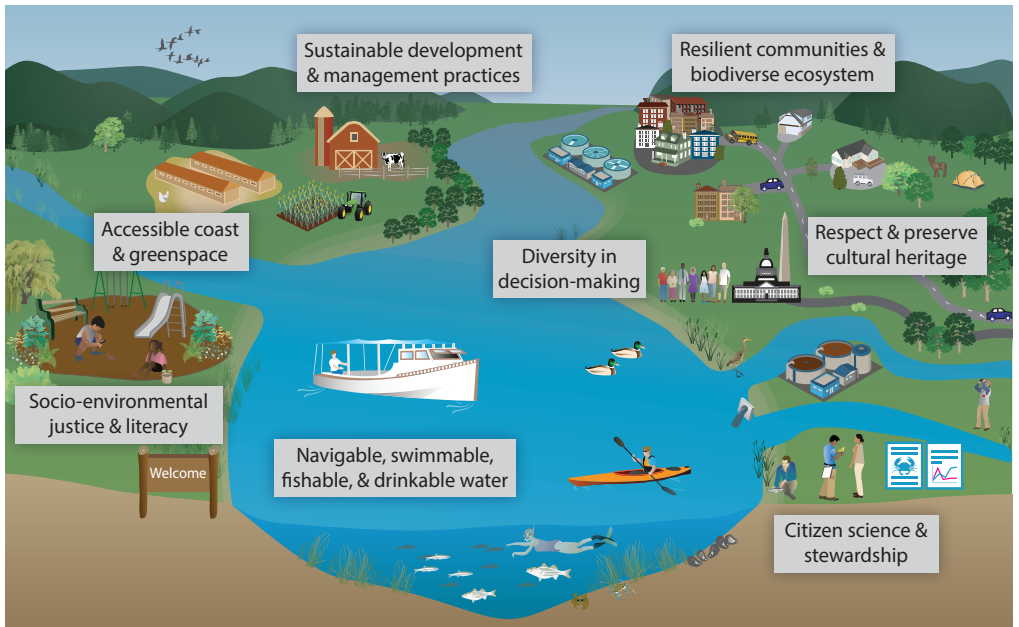
A conceptualized vision of a sustainable Potomac co-developed with stakeholders during a Listening Session at Hood College in Frederick, MD on July 21, 2022. The vision will be further honed with future sessions.

Engaging stakeholders is a pivotal first step

The first step in the COAST Card framework was to engage a diverse set of stakeholders to co-develop the Potomac COAST Card. The first event was at Hood College in July 2022. To achieve this, additional Stakeholder Listening Sessions will be held across the Potomac watershed to include local perspectives in answering the following questions:

Stakeholders participate in a social network analysis activity at the Listening Session held at Hood College.

Why should you care?

Establishing a shared understanding with stakeholders and identifying their perspectives on current conditions, including values and threats facing the watershed is important for the COAST Card framework.

What do we measure?

After taking stakeholder's perspectives into account, the next step in the framework is identifying social, cultural, economic, and governance indicators in order to create an inclusive socio-environmental report card.
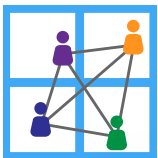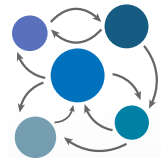
Where do we go?

Developing a shared vision and path forward for the watershed is necessary to ensure that the Potomac COAST card will be useful to the community.

What can be done?

Using system dynamics modeling, actions are ranked by quantifying indicator relationships, assessing management scenarios, and making recommendations for better outcomes.

Who should be involved?

Identifying stakeholders involved in Potomac watershed issues and determining who else should be included to improve collaborations through social network analysis.

Watershed indicators

Ecological

Water quality indicators include total phosphorus and total nitrogen.

Stream benthic community measures the condition of the benthic organisms living in streams.

Protected lands measures the amount of valuable lands that are protected in the watershed.

Fish community is an index developed by the EPA* that examines river health in categories including native species and pollution tolerance.

Economic

Median household income is a measure of economic vitality and uses data from the U.S. Census.

Income inequality uses the Gini Coefficient that measures the inequality in income distribution.

Jobs growth measures the percentage of jobs gained or lost (net) per capita from the past four years.

Housing affordability measures the percentage of households that spend 30 percent or more of their income on housing costs.

Societal

Social Index measures how a community can respond to hazardous events using CDC's** social vulnerability index.

Stewardship Index examines citizen's stewardship behavior, volunteerism, and civic engagement.

Walkability measures how many people (for total population and for diverse groups) can walk to a park in 10 minutes.

Heat Vulnerability Index indicates climate-safe neighborhoods using metrics for tree canopy, impervious surface, land surface temperature, and households in poverty.

River indicators

Total nitrogen measures the amount of nitrogen in river waters.

Total phosphorus measures the amount of phosphorus in river waters.

Dissolved oxygen is critical to the survival of the river's aquatic life.

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

Water clarity is a measure of how much light penetrates through the water column.

Aquatic grasses, or submerged aquatic vegetation, are a critical river habitat.

Benthic community measures the condition of the organisms living on the bottom areas of the river.

Environmental Protection Agency
*** Centers for Disease Control and Prevention*

Overall, the Potomac River watershed scored 46% (C), a combination o

Ecological, societal, and economic conditions in the watershed vary

The Potomac watershed scored 55% (C+) in 2022, based on the combined scores of the four Potomac regions in the UMCES Chesapeake Bay and Watershed Report Card. Overall, the Potomac watershed had a moderately good ecological score (64%, B-) and moderate economic (56%, C+) and societal (47%, C) scores. The highest-scoring indicators were protected lands (86%, A) and household income (81%, A-), while the lowest-scoring indicators were stewardship (33%, D) and housing affordability (38%, D+).

Health scale

Very good A B C D F Very poor

100 80 60 40 20 0
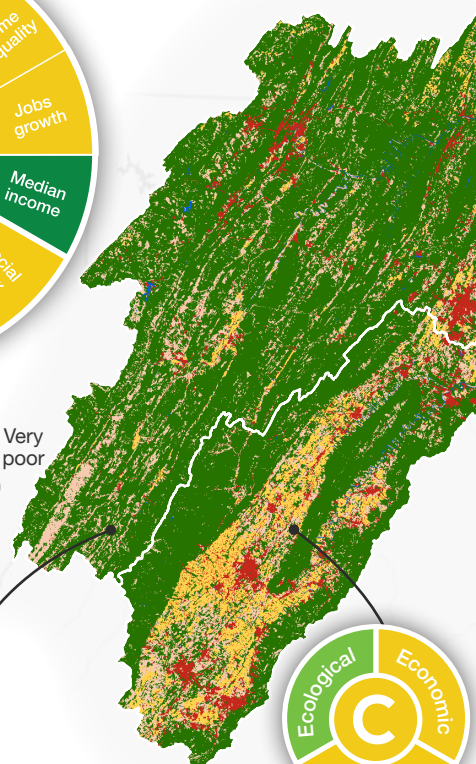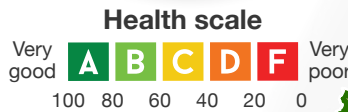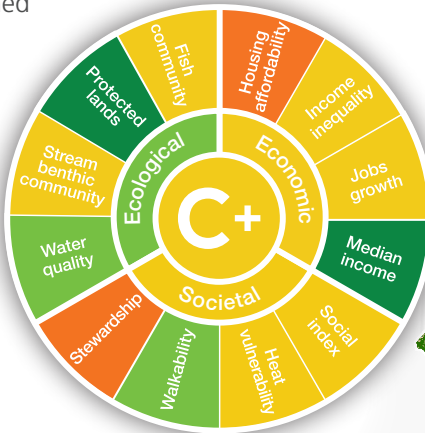
Upper Potomac

The Upper Potomac was the highest scoring region with a score of 58% (C+). It is mostly forested and received the highest score in the ecological category. It also had the highest score among the regions in the social index, fish community, housing affordability and jobs growth.
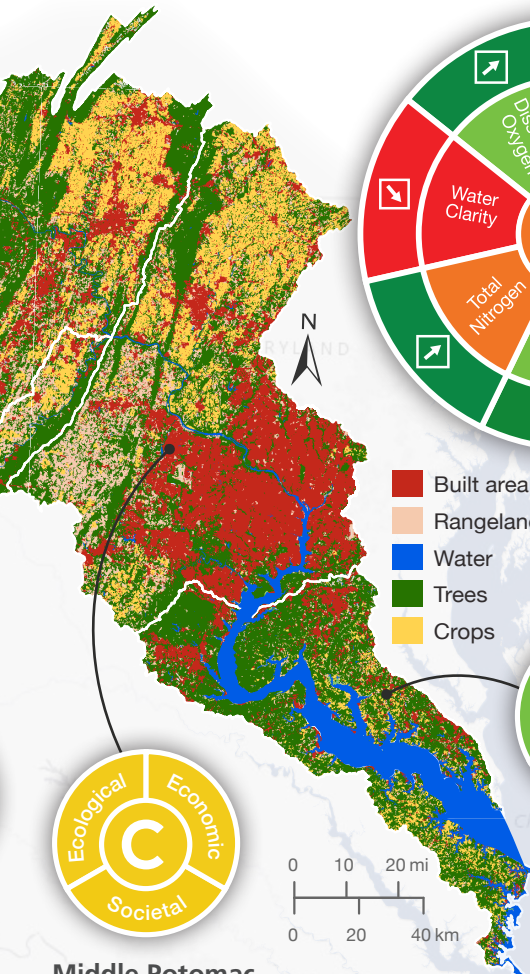
Shenandoah

The Shenandoah was the lowest scoring region, with a score of 52% (C). Mostly agricultural, it had the lowest economic score among the regions, having the lowest scores in household income, income inequality, and jobs growth.

shed is in moderate condition

Potomac River in poor health but some indicators are improving

The Potomac River scored 37% (D+), six points lower than in 2021. This decrease was due to lower dissolved oxygen, chlorophyll *a*, benthic community, and total phosphorus. The good news is that dissolved oxygen, total phosphorus, total nitrogen, and aquatic grasses scores all had improving trends. These scores are based on the UMCES Chesapeake Bay and Watershed report card.

Dissolved Oxygen
Chlorophyll a
Water Clarity
Benthic Community
Total Nitrogen
Aquatic Grasses
Total Phosphorus

D+

Map legend
- Built area
- Rangeland
- Water
- Trees
- Crops

Lower Potomac

The Lower Potomac had a score of 56% (C+), scoring highest in the economic category. It had the highest scores in water quality, heat vulnerability, and income inequality. It also had the lowest societal score, with poor scores in stewardship and walkability.

C+ — Ecological, Economic, Societal

C — Ecological, Economic, Societal
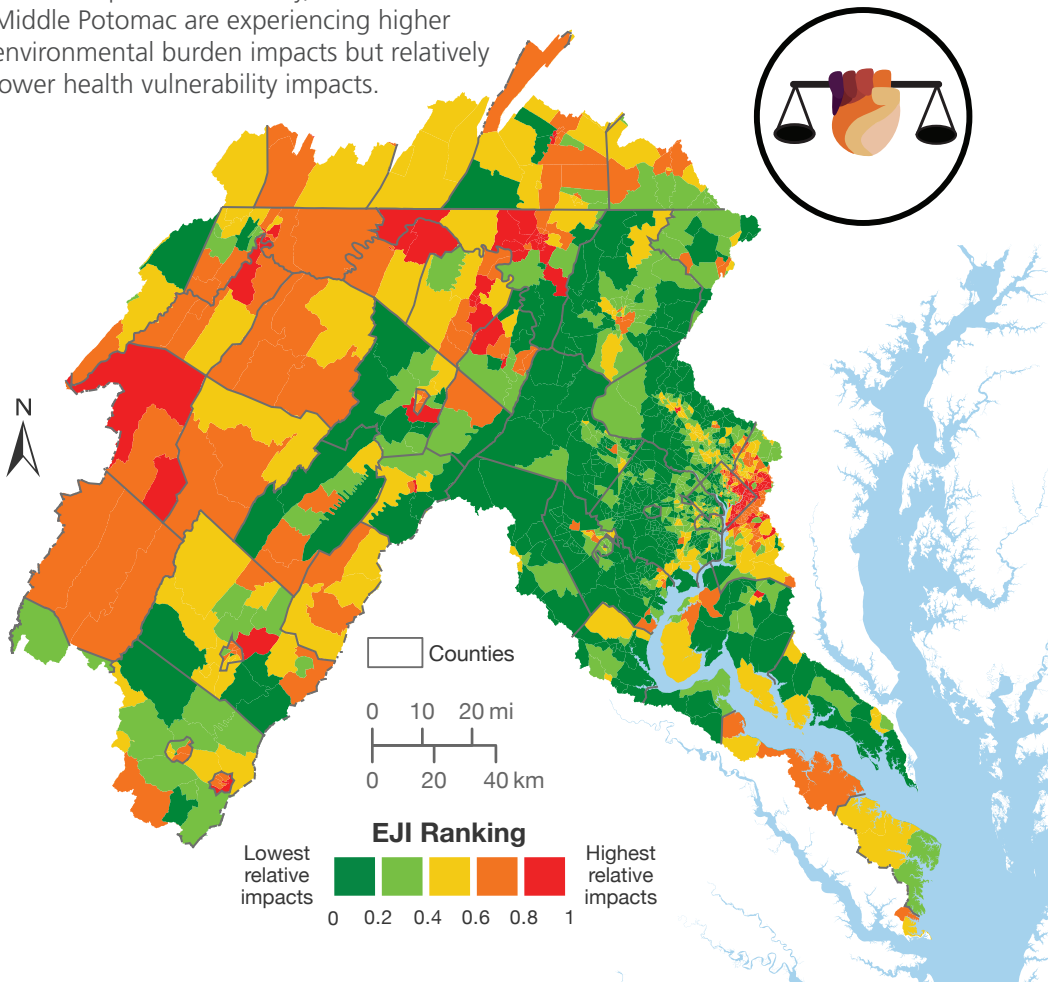
0 10 20 mi
0 20 40 km

Middle Potomac

The Middle Potomac scored 53% (C). It is the most developed region with the lowest score in the social and heat vulnerability indexes, housing affordability, income inequality, water quality, and benthic community. Among the four regions, it scored the highest in the societal category but the lowest in the ecological category.

Addressing environmental justice is key

Ensuring that all communities in the Potomac River watershed have access to clean water and a healthy environment requires addressing environmental justice. The Centers for Disease Control and Prevention's Environmental Justice Index (EJI) measures and tracks environmental inequality, identifying areas that need action.

The map below displays the EJI score for each census tract in the Potomac watershed, highlighting significant disparities between them. These differences could be due to various factors, as the EJI considers social vulnerability, health vulnerability, and environmental burden indicators. For example, communities in the Upper Potomac region face higher health and social vulnerability impacts but lower environmental burden impacts. Conversely, most communities in the Middle Potomac are experiencing higher environmental burden impacts but relatively lower health vulnerability impacts.

Counties

0   10   20 mi

0   20   40 km

EJI Ranking

Lowest relative impacts

0   0.2   0.4   0.6   0.8   1
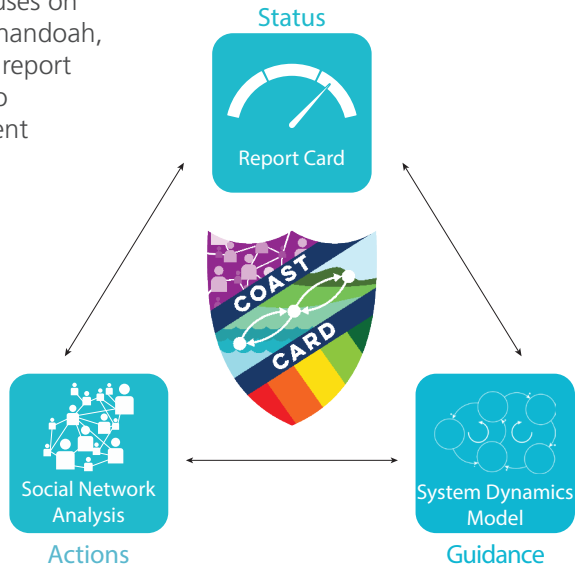
Highest relative impacts

Co-producing the Potomac COAST Card

The COAST Card framework is a useful tool for communities to address socio-environmental challenges. By combining socio-environmental report cards, system dynamics modeling, and social network analysis, it provides a comprehensive understanding of the issues affecting the Potomac watershed.

Report cards offer an easily understandable overview of key indicators, while system dynamics modeling (SDM) helps to comprehend the interaction between variables over time. The Potomac SDM currently focuses on three counties in the watershed—Shenandoah, Frederick, and St. Mary's. It brings the report card to life by enabling stakeholders to analyze the dynamic patterns of nutrient pollution, assess best management practices, and test policy options.

Lastly, social network analysis helps identify key players in a system, develop strategies to engage with them, and highlights potential areas for coordinated actions. By working together, a more sustainable and equitable future can be created for all.

Acknowledgments

Land use/land cover map data source:
Impact Observatory, Microsoft, Esri (2022)

All photos courtesy of UMCES IAN