



# Delaware's Local Government Guide to the Chesapeake Bay

## Module 3: Clean Water for the Economy

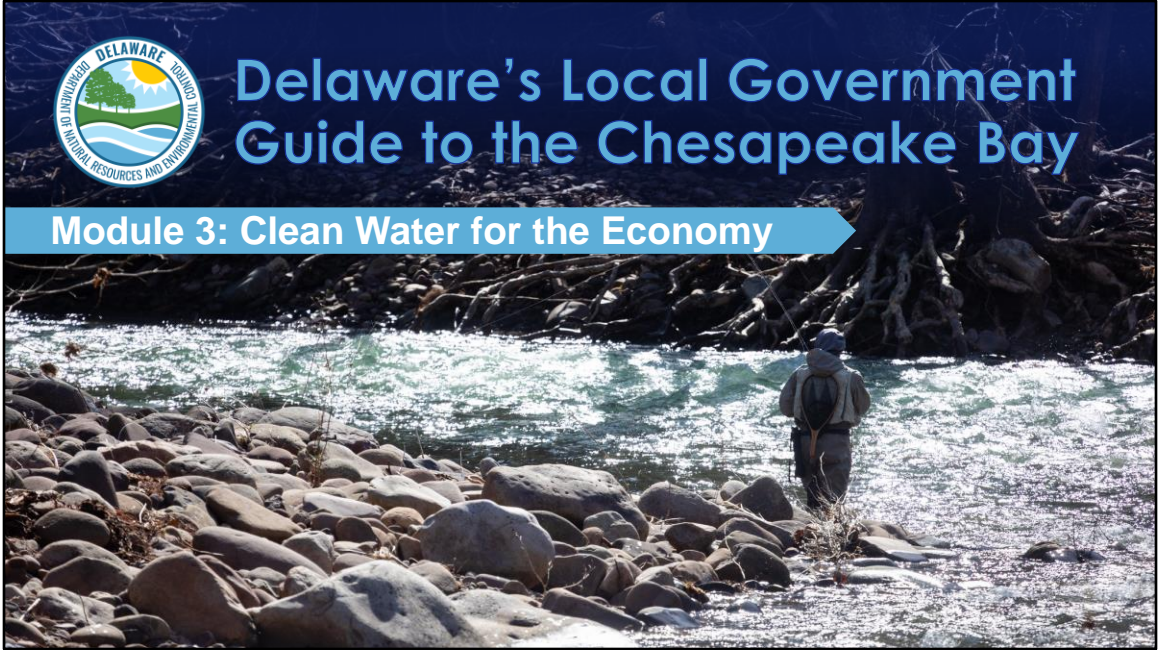


Photo by W. Parson/Chesapeake Bay Program

## Table of Contents

- 1 Purpose
- 2 What You'll Learn
- 3 Clean Water Means Business
- 4 Healthy Habitats, Healthy Economy
- 5 What You Can Do
- 6 To Learn More
- 7 Glossary

**\*Please refer to individual slide notes for data references and information sources.**

*Module 3: Clean Water for the Economy*



Photo by W. Parson/Chesapeake Bay Program

## A Guide For Local Governments

As a local leader, your decisions set the course for your community. Your actions determine the health and vitality of your jurisdiction, as well as that of your local waterways and the Chesapeake Bay. You can achieve win-win outcomes by prioritizing local economic development, infrastructure resiliency, public health, and education, while also protecting your environment.

This module is one in a series created by the Chesapeake Bay Program to support decision making by local officials. We encourage you to examine the full suite of modules:

1. How Your Watershed Works
2. Foundations of Clean Water
3. **Clean Water for the Economy**
4. Capitalizing on the Benefits of Trees
5. Preserving Local Character and Landscapes
6. Protecting Your Infrastructure Through Stormwater Resiliency
7. Building the Workforce of Today and Tomorrow

*Clean Water for the Economy*

Purpose

To help local government representatives better understand how the information in the modules aligns with their priorities, look for these icons:



Economic Development



Public Health & Safety



Infrastructure Maintenance & Finance



Education

Photo by W. Parson

## Laying Foundations

Local economies thrive when the environment around them is healthy. Maintaining environmental protections supports healthy habitats, water quality, and biodiversity. These habitats are vitally important to:



Lucrative fisheries,  
like blue crab, oyster,  
and recreational fisheries



Recreation,  
like swimming, boating,  
hunting, and bird watching

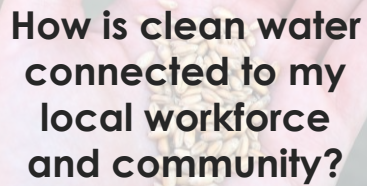


Attracting and  
retaining a young  
and diverse workforce

Clean Water for the Economy

Purpose

## What You'll Learn



**How is clean water  
connected to my  
local workforce  
and community?**



**How does my local  
economy benefit from a  
healthy ecosystem?**

*Clean Water for the Economy* What You'll Learn

Photos by C. Krikstan, S. Ballard, and W. Parson, Chesapeake Bay Program

## Clean Water Means Business

Healthy waterways are good for local economies. In 2014, the Chesapeake region was calculated to provide at least \$107.2 billion in natural benefits annually.



### References:

2014 Chesapeake Bay Foundation report "The Economic Benefits of Cleaning Up the Chesapeake: A Valuation of the Natural Benefits Gained by Implementing the Chesapeake Clean Water Blueprint."

Photo by W. Parson/Chesapeake Bay Program

## The Watershed Means Business

Some of the most economically valuable sectors of the Chesapeake Bay watershed – commercial fishing, tourism, recreational hunting and fishing, boating, and agriculture – all depend upon clean water, open land, and a healthy ecosystem.

**121** breweries joined the National Resources Defense Council (NRDC)'s Brewers for Clean Water as of Feb. 2021

"We need reliable sources of clean water to consistently produce the great beer that is key to our success."

– 2018 letter signed by 49 breweries



Small and independent craft brewers in the US contributed **\$82.9 billion & 580k jobs** to the economy in 2019.



Each acre of healthy wetland has an annual recreational value of

**\$199**

Wildlife viewing is a **\$75.9 billion** industry in the US (expenditures include lodging, food, equipment, and transportation).

There are more than **83k** farm operations

growing **50+** commodities in the Chesapeake Bay watershed.



The value of agricultural production in the watershed each year is over

**\$10 billion.**

Clean Water for the Economy

Clean Water Means Business

### References:

Breweries: <https://www.brewersassociation.org/statistics-and-data/craft-brewer-definition/>

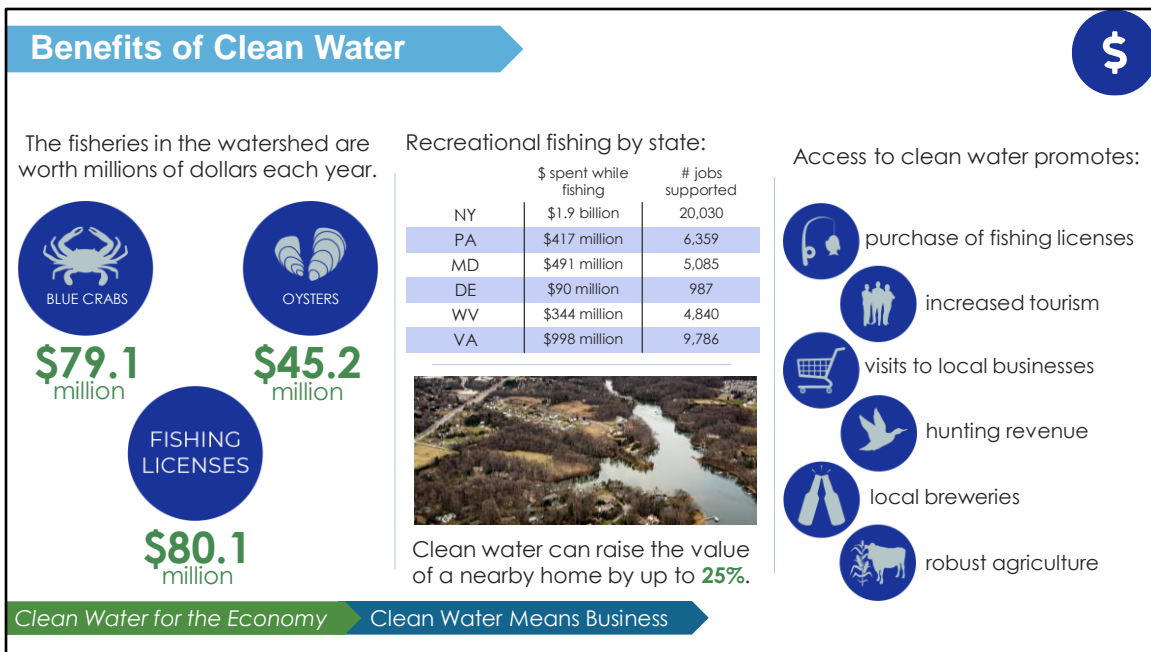
Tourism: Living Waters: Conserving the source of life (World Wildlife Foundation); National Survey of Fishing, Hunting, and Wildlife-Associated Recreation

[https://www.fws.gov/wsfrprograms/Subpages/NationalSurvey/nat\\_survey2016.pdf](https://www.fws.gov/wsfrprograms/Subpages/NationalSurvey/nat_survey2016.pdf)

Agriculture:

<https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/programs/initiatives/?cid=stelprdb1047323>

Photo by W. Parson/Chesapeake Bay Program



## References:

Fisheries landings data – NOAA –

<https://foss.nmfs.noaa.gov/apexfoss/f?p=215:200:14654698964268::NO::>

Fishing license value –

<https://www.fws.gov/wsfrprograms/Subpages/LicenseInfo/Natl%20Fishing%20License%20Report%202020.pdf>

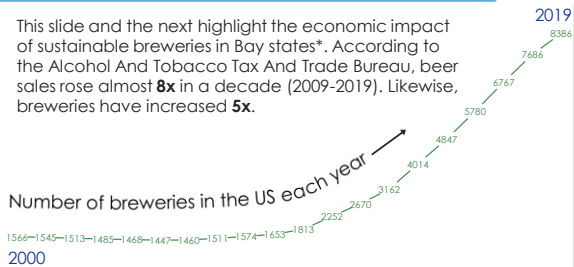
Recreational fishing – <https://asafishing.org/economic-impacts-of-recreational-fishing/>

Home values – EPA – <https://www.epa.gov/nutrientpollution/effects-economy>

Photo by R. Ross/Chesapeake Bay Program

## Breweries By Jurisdiction

This slide and the next highlight the economic impact of sustainable breweries in Bay states\*. According to the Alcohol And Tobacco Tax And Trade Bureau, beer sales rose almost **8x** in a decade (2009-2019). Likewise, breweries have increased **5x**.



12  
breweries



\$227 million  
value



1,404  
jobs

[Hellbender Brewing Company](#) (Washington, D.C.):

- ☒ Uses a mash filter to increase efficiency while using less water in the brewing process
- ☒ Works with organizations to protect the Hellbender salamander—a unique and threatened species found in the Chesapeake Bay watershed



DE



27  
breweries



\$430 million  
value



2,688  
jobs

[Dogfish Head Craft Brewery](#) (Milton, DE):

- ☒ Brews Re-Gen-Ale with regeneratively-grown wheat and grower-direct hops and barley malt
- ☒ Uses bio-degradable, ocean-friendly beverage carriers



MD



112  
breweries



\$956 million  
value



7,164  
jobs

[Ruhlman Brewing Company](#) (Hampstead, MD):

- ☒ Grows ingredients on-site without pesticides or artificial fertilizers
- ☒ Sources all water from a well on the property
- ☒ Has acres of accessible open space for visitors

Clean Water for the Economy

Clean Water Means Business

\* While the breweries included are in Bay watershed states, they are not all within the Chesapeake Bay watershed.

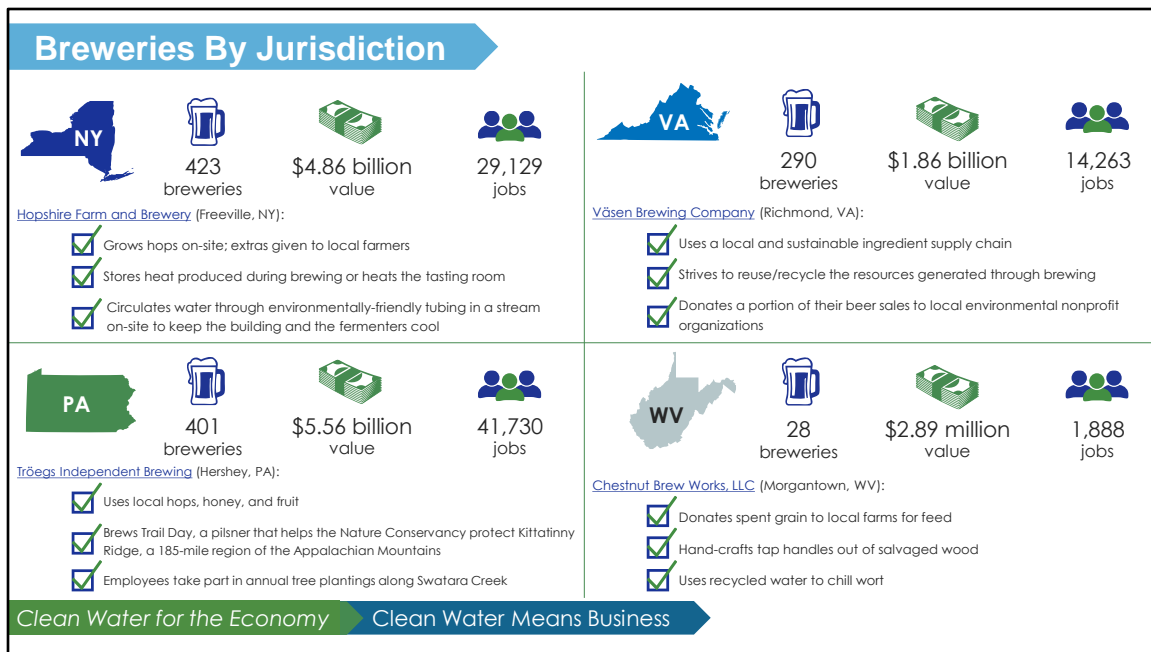
## References:

<https://brewersassoc.s3.us-west-2.amazonaws.com/wp-content/uploads/2020/08/2019-State-Breakdown.pdf>

[https://www.chesapeakebay.net/news/blog/having\\_a\\_beer\\_thank\\_clean\\_water](https://www.chesapeakebay.net/news/blog/having_a_beer_thank_clean_water)

<https://www.brewersassociation.org/statistics-and-data/state-craft-beer-stats/>

<https://www.ttb.gov/images/pdfs/statistics/aggregated/aggr-data-beer.pdf>



## References:

<https://brewersassoc.s3.us-west-2.amazonaws.com/wp-content/uploads/2020/08/2019-State-Breakdown.pdf>

[https://www.chesapeakebay.net/news/blog/having\\_a\\_beer\\_thank\\_clean\\_water](https://www.chesapeakebay.net/news/blog/having_a_beer_thank_clean_water)

<https://www.brewersassociation.org/statistics-and-data/state-craft-beer-stats/>

## Real Estate Benefits

Clean water nearby can raise property values by up to **25%** above properties near water with excessive nutrients.



On average, waterfront homes near underwater plants sell at a **5.7%** premium relative to nearby waterfront homes without those plants. Reaching the restoration goal for underwater plants in the Chesapeake Bay could lead to property value gains of **\$326+ million**.

Clean Water for the Economy

Clean Water Means Business

### References:

[https://www.epa.gov/sites/production/files/2015-01/documents/implicit\\_price\\_of\\_aquatic\\_grasses.pdf](https://www.epa.gov/sites/production/files/2015-01/documents/implicit_price_of_aquatic_grasses.pdf)

<https://www.epa.gov/nutrientpollution/effects-economy#:~:text=Clean%20water%20can%20raise%20the,and%20odor%20of%20algal%20blooms.>

<https://www.epa.gov/nutrientpollution/effects-economy#:~:text=Clean%20water%20can%20raise%20the,and%20odor%20of%20algal%20blooms.>

Photos by W. Parson/Chesapeake Bay Program

## Business Decisions

Businesses value green initiatives and the opportunity to market themselves as sustainable.

### Case study: Turkey Hill Clean Water Partnership



In 2018, Turkey Hill Dairy formed a partnership with the Alliance for the Chesapeake Bay and the Maryland and Virginia Milk Producers cooperative.

The partnership helps dairy farmers implement conservation plans that will prevent nutrients and sediment from flowing into local waterways.

Funding is from the Natural Resource Conservation Service and National Fish and Wildlife Foundation. Farms that implement plans using grant money receive a premium from Turkey Hill for their milk. To learn more, visit the [Alliance for the Chesapeake Bay's website](#).



Why is this important? Turkey Hill Dairy and other businesses know that **green cities and towns also attract and retain workers**. A survey of over 1,100 professionals listed parks and open spaces as the third most important non-work criteria for relocation, after cost of housing and weather.

Survey: Chapman University, <https://www.newgeography.com/content/005725-how-professionals-choose-where-to-live>

Photo by W. Parson/Chesapeake Bay Program

## Healthy Habitats, Healthy Economy

Protecting the watershed leads to improved water quality, wetlands, streams, and fish habitat. In turn, these healthy habitats support your local economy.



Photo by W. Parson/Chesapeake Bay Program

## Outdoor Recreation

Nationally, outdoor recreation contributes:

  
**\$887 BILLION**  
 in consumer spending

  
**7.6 MILLION**  
 American jobs

  
**\$65.3 BILLION**  
 in federal tax revenue

  
**\$59.2 BILLION**  
 in state & local taxes

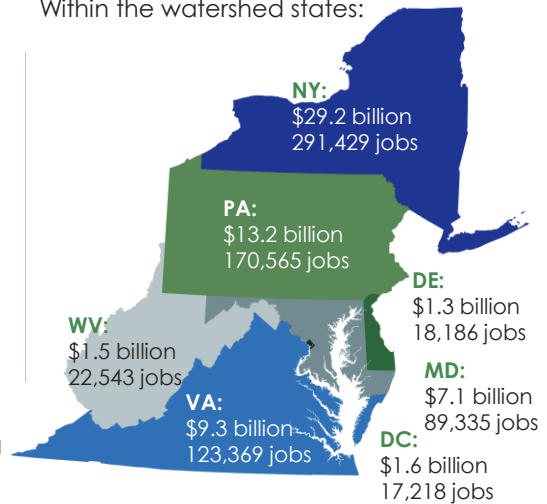
### Interpretive Outdoor Experiences

Outdoor recreation opportunities foster a more meaningful connection with nature. Nature centers and environmental educators play important roles in inspiring an appreciation for nature, which leads to more stewardship.

*Clean Water for the Economy*

*Healthy Habitats, Healthy Economy*

Within the watershed states:



### References:

The Outdoor Recreation Economy (Outdoor Industry Association)

<https://outdoorindustry.org/resource/2017-outdoor-recreation-economy-report/>

The Bureau of Economic Analysis <https://www.bea.gov/data/special-topics/outdoor-recreation>

## Outdoor Recreation

Outdoor recreation and parks support local businesses by attracting visitors. Outdoor recreation thrives on open spaces and idyllic locales, which in turn require comprehensive land use planning and healthy habitats at the local level.

For more information about comprehensive planning, see Module 5.

### Case study: Shamokin, PA



Anthracite Outdoor Adventure Area is located on 7,000 acres of reclaimed coal mines that were vacant for decades. Mine reclamation projects typically hire construction contractors who were often former mine operators themselves and who in turn employ many former miners and other local workers.

Tens of thousands of patrons pay to ride through the wilderness at the park each year, raising local and state tax dollars as well as filling local restaurants and shops with customers. A new hotel is also under development in Shamokin thanks to the business that AOAA brings in.

Clean Water for the Economy

Healthy Habitats, Healthy Economy

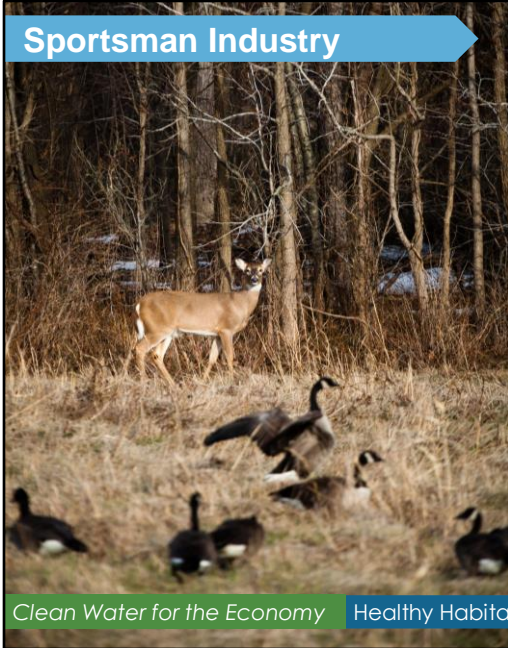
### References:

<https://www.eenews.net/stories/1060044504>

[https://www.dailymail.com/news/local\\_news/developer-describes-hotel-proposal-in-shamokin/article\\_ed22dec5-31bd-5ea4-be75-6a5621201879.html](https://www.dailymail.com/news/local_news/developer-describes-hotel-proposal-in-shamokin/article_ed22dec5-31bd-5ea4-be75-6a5621201879.html)

[http://files.dep.state.pa.us/Mining/Abandoned%20Mine%20Reclamation/AbandonedMinePortalFiles/SMCRA\\_Funded\\_AML\\_Program\\_FAQ.pdf](http://files.dep.state.pa.us/Mining/Abandoned%20Mine%20Reclamation/AbandonedMinePortalFiles/SMCRA_Funded_AML_Program_FAQ.pdf)

## Sportsman Industry



In 2016:



Hunters spent **\$27+ billion** on gear, travel, lodging, licenses, permits, tags, and other hunting-related purchases.



**525,000 jobs** were supported by hunting.



Spending by hunters brought in **\$3.4 billion** in state and local taxes.

Clean Water for the Economy

Healthy Habitats, Healthy Economy

### References:

Southwick Associates. Hunting in America:

[https://www.fishwildlife.org/application/files/3815/3719/7536/Southwick\\_Assoc\\_-\\_NSSF\\_Hunting\\_Econ.pdf](https://www.fishwildlife.org/application/files/3815/3719/7536/Southwick_Assoc_-_NSSF_Hunting_Econ.pdf)

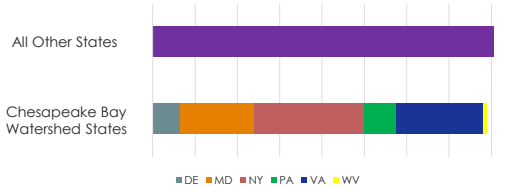
Photo by W. Parson/Chesapeake Bay Program

## Sportsman Industry

In 2016, **2.6 million** people hunted migratory birds and spent over **\$2.9 billion** during hunting trips, including the cost of food, lodging, and transportation.

Black ducks are known for being a challenging prize by Chesapeake watershed hunters. A healthy black duck population needs quality wetland habitat for wintering, foraging, and breeding.

### Black Duck Harvest



Black duck harvest within the Chesapeake Bay watershed is approximately equal to the harvest in the other 44 states combined.

Clean Water for the Economy

Healthy Habitats, Healthy Economy

### References:

[https://www.fishwildlife.org/application/files/3815/3719/7536/Southwick\\_Assoc\\_-\\_NSSF\\_Hunting\\_Econ.pdf](https://www.fishwildlife.org/application/files/3815/3719/7536/Southwick_Assoc_-_NSSF_Hunting_Econ.pdf)

<https://www.fws.gov/migratorybirds/pdf/surveys-and-data/HarvestSurveys/MBHActivityHarvest2018-19and2019-20.pdf>

Photos by S. Droter/Chesapeake Bay Program

## Recreational Fishing



Brook trout need clean, cold water to survive; their presence is a sign of a healthy stream.

The American Sportfishing Association reported over **30 million anglers** in the US generating over **one million jobs** and over **\$45 billion** in retail sales annually. Healthy ecosystems are essential to the viability of commercial and recreational fishing. They are threatened by improper stormwater management and poorly planned development. Learn about stormwater in Module 6 and comprehensive planning in Module 5.



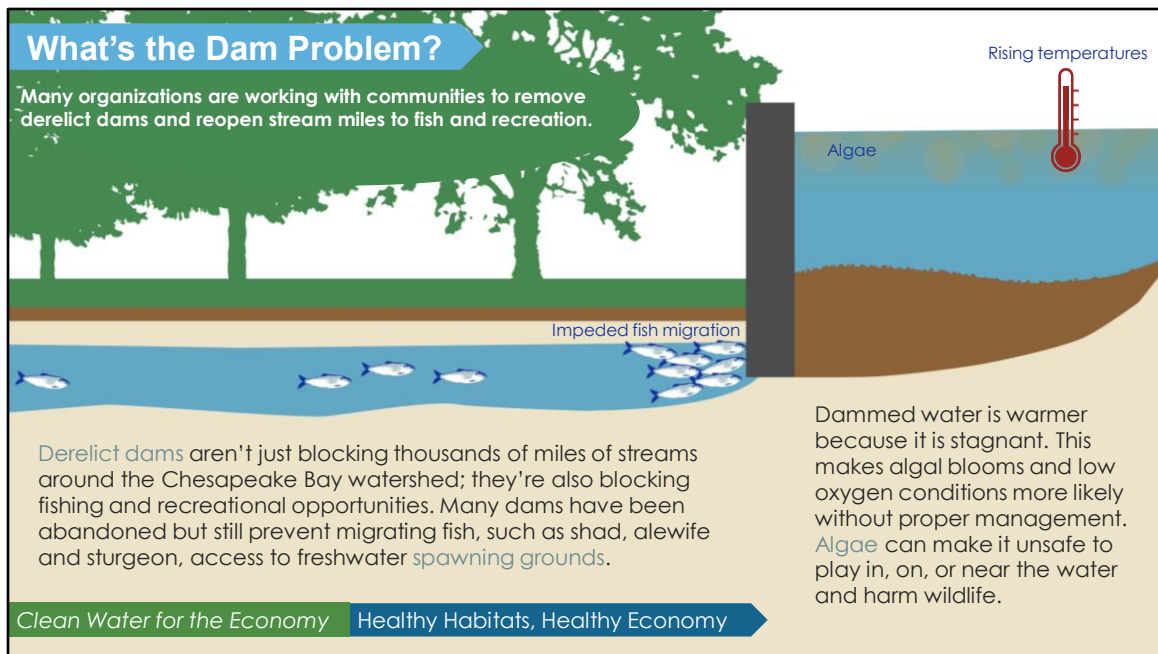
Clean Water for the Economy

Healthy Habitats, Healthy Economy

### References:

<https://www.cbf.org/document-library/cbf-reports/the-economic-benefits-of-cleaning-up-the-chesapeake.pdf>

Photos by W. Parson and S. Droter, Chesapeake Bay Program



[https://www.chesapeakebay.net/documents/22041/2018-2019\\_fish\\_passage\\_management\\_strategy.pdf](https://www.chesapeakebay.net/documents/22041/2018-2019_fish_passage_management_strategy.pdf)

## Fish Passage & Recreation

Case study: Baltimore, MD



In September 2018, Maryland detonated explosives to breach the Bloede Dam on the Patapsco River.

The 111-year-old structure was a safety hazard to visitors to the Patapsco Valley State Park, causing several drownings over the decades.

In 2020, researchers at the Department of Natural Resources found white perch, shad, juvenile striped bass, and river herring upstream of the old dam site. The dam removal gave recreational fishing and other water activities, like canoeing, a chance to thrive.

Maryland's state parks saw **14.9 million** visits in 2019.

Public parks, especially those in urban areas, provide a place to gather, present an opportunity to fish for sustenance and recreation, encourage exercise, and offer many other benefits to all people in the community. See module 5 for more information about public access sites and preserving open spaces like parks.

Clean Water for the Economy Healthy Habitats, Healthy Economy

### References:

<https://dnr.maryland.gov/publiclands/Documents/MPSAnnualReport2019.pdf>

Photo from <https://www.chesapeakebay.net/issues/shad>

## Fish Passage & Recreation

Case study: Fredericksburg, VA



Embrey Dam, located near Fredericksburg, VA, was removed in 2004. Scientists with the US Geological Survey began to see a steady increase in the number of small eels about two years later. They suggested that the removal of the dam is allowing eels to spread into new habitats, and potentially improve their survival.

Paddlers can now float the Rappahannock River to its mouth instead of needing to take their boats out of the water at Fredericksburg, walk them around the dam, and then put them back in the water on the other side. The change in flow also increased fishing opportunities for smallmouth bass, revealed historic canal locks, created Class-2+ rapids, and more recreational opportunities, such as a jumping rock and swimming area.

Clean Water for the Economy

Healthy Habitats, Healthy Economy

### References:

Embry Dam's removal proves to be boon for smaller eels, Karl Blankenship.  
[https://www.bayjournal.com/news/fisheries/embry-dams-removal-proves-to-be-boon-for-smaller-eels/article\\_416538c1-8152-591d-a5ae-31d9b65194d7.html](https://www.bayjournal.com/news/fisheries/embry-dams-removal-proves-to-be-boon-for-smaller-eels/article_416538c1-8152-591d-a5ae-31d9b65194d7.html)  
<https://riverfriends.org/embrey-dam-before-and-after/>

Photo by S. Droter/Chesapeake Bay Program

## Benefits of Wetlands

**Water:** Rain captured by wetlands before entering a creek or river is naturally filtered. Pollutants like sediment and nutrients get trapped, keeping wildlife and humans healthy. The captured water also reduces flooding, protecting your infrastructure.

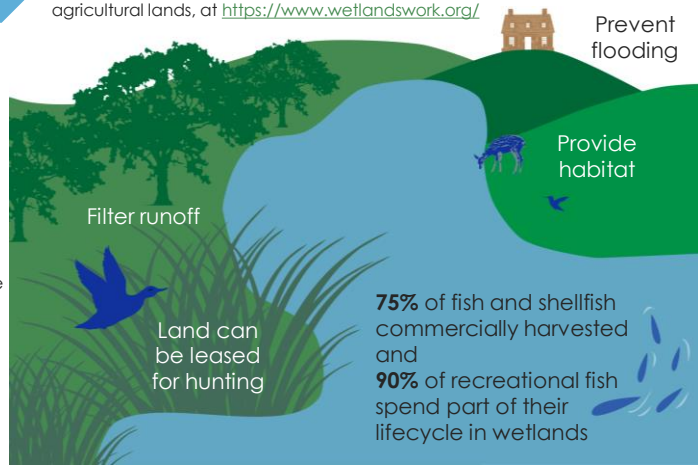
**Wildlife:** Wetlands are compared to rainforests because of the quantity of plants and animals that live there. Wetlands are great places to hunt, fish, watch birds, or take photos.

**Economy:** The environmental services that wetlands provide have economic value. Wetlands also provide financial benefits to landowners who participate in conservation programs or lease their wetlands to hunters.

Delaware may have lost as much as 54 percent of its wetlands since the 1780s. [The most recent study](#) indicates that Delaware lost almost 50 percent more wetland acreage during the span of 1992 to 2007 compared to 1981/2 to 1992.

Climate Connection- As the climate warms, more intense and frequent storms could overwhelm existing stormwater systems, leading to more flooding and erosion. Wetlands could potentially help mitigate these risks.

Find wetlands funding opportunities, especially for agricultural lands, at <https://www.wetlandswork.org/>



Clean Water for the Economy

Healthy Habitats, Healthy Economy

<https://www.epa.gov/wetlands/why-are-wetlands-important>

## Sustainable Commercial Fisheries

Healthy watersheds and habitats support the Bay region's thriving seafood harvests, including:



**\$90.6**  
million



**\$51.0**  
million



**\$31.7**  
million



**\$27.7**  
million



**\$12.0**  
million

value of  
commercial  
landings in 2019

In addition to these consumer favorites, healthy watersheds also support forage fish, like bay anchovies and silversides, that many larger fish and other animals rely on for food. Healthy fisheries are essential for:



tourism



outdoor recreation



restaurants

### Health and Safety

Pollution, especially bacteria, can make eating seafood and playing near waterways unsafe. In order to keep tourism, outdoor recreation, and restaurants thriving, keep local habitats healthy.

### Climate Connections

Our fisheries are at risk due to rising water temperatures. See [NOAA's species vulnerability index](#) and a [recent report on climate impacts to recreational fishing](#) for more info.

Clean Water for the Economy

Healthy Habitats, Healthy Economy

### References:

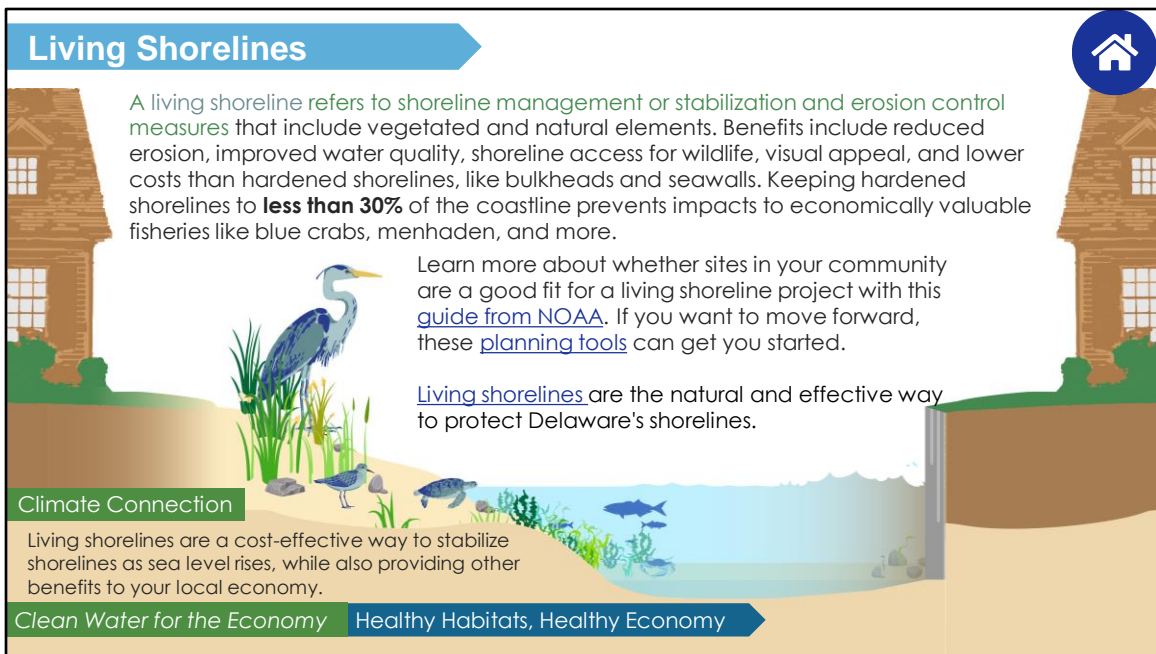
Commercial landings data for the Bay states:

<https://foss.nmfs.noaa.gov/apexfoss/f?p=215:200:23317386457633::NO::>

NOAA Species Vulnerability Index: <https://www.st.nmfs.noaa.gov/data-and-tools/northeast-fish-and-shellfish-climate-vulnerability/index>

American Fly Fishing Trade Association, Recommendations to Improve the Health and Sustainability of America's Marine Fisheries Report:

<https://afttafisheriesfund.org/new-index-1>



## Living Shorelines

A living shoreline refers to shoreline management or stabilization and erosion control measures that include vegetated and natural elements. Benefits include reduced erosion, improved water quality, shoreline access for wildlife, visual appeal, and lower costs than hardened shorelines, like bulkheads and seawalls. Keeping hardened shorelines to **less than 30%** of the coastline prevents impacts to economically valuable fisheries like blue crabs, menhaden, and more.

Learn more about whether sites in your community are a good fit for a living shoreline project with this [guide from NOAA](#). If you want to move forward, these [planning tools](#) can get you started.

[Living shorelines](#) are the natural and effective way to protect Delaware's shorelines.

**Climate Connection**  
Living shorelines are a cost-effective way to stabilize shorelines as sea level rises, while also providing other benefits to your local economy.

**Clean Water for the Economy**   **Healthy Habitats, Healthy Economy**

### References:

[https://cbtrust.org/wp-content/uploads/15765\\_Threshold-effects-of-altered-shorelines-and-other-stressors\\_Final.pdf](https://cbtrust.org/wp-content/uploads/15765_Threshold-effects-of-altered-shorelines-and-other-stressors_Final.pdf)



### References:

[https://www.vims.edu/research/units/centerspartners/map/aquaculture/docs\\_aqua/mrr-2019-8.pdf](https://www.vims.edu/research/units/centerspartners/map/aquaculture/docs_aqua/mrr-2019-8.pdf)

<https://www.cbf.org/document-library/non-cbf-documents/analysis-of-the-economic-benefits-of-the-maryland-shellfish-aquaculture-industry-full-report.pdf>

Photos by W. Parson/Chesapeake Bay Program

## What You Can Do

Visit the [Delaware Department of Natural Resources and Environmental Control website](#)



**Reduce impervious surfaces in your jurisdiction** to limit pollutants entering your local waterways and protect local water quality. Use these EPA resources to get started:

- [The Green Infrastructure Municipal Handbook](#)
- [Enhancing Sustainable Communities With Green Infrastructure](#)
- [Local Water Policy Innovation: A Road Map for Community Based Stormwater Solutions](#)



**Look for opportunities to conserve and protect habitat** to maintain ecosystem functions, including water quality protections, versus trying to replace those roles with engineered infrastructure. See module 5 and the [Chesapeake Bay Trust toolkit](#).



**Lead your community** to achieve environmental and local government goals by exploring technical and funding resources, like grants from the [National Fish and Wildlife Foundation](#), [EPA](#), and your state.



**Share this information with others** to create an even stronger, more resilient community.

## To Learn More

Visit the [Delaware Department of Natural Resources and Environmental Control website](#)



- EPA's [Economic Benefits of Wetlands](#)
  - Explore a short PDF about how wetlands contribute to your local economy
- EPA's [The Economic Benefits of Protecting Healthy Watersheds](#)
  - Learn about the monetary values of ecosystem services
- Prince George's County's [The Economic Values of Nature](#)
  - Read through a real example of a county that has quantified the benefits of their trees
- Chesapeake Bay Foundation's [The Economic Benefits of Cleaning Up the Chesapeake](#)
  - Learn about the value of benefits gained by having clean water

## Glossary

Visit the [Delaware Department of Natural Resources and Environmental Control website](#)



- [Interpretive Outdoor Experiences](#)

Outdoor exploration guided by a person with the goal of educating and engaging

- [Derelict Dams](#)

Dams that were created for a past purpose that are now obsolete, abandoned, and dangerous

- [Algae](#)

Simple aquatic plants that can be single-celled or grow in clumps or slimy mats

- [Spawning Grounds](#)

The location where animals, such as fish, go to lay eggs

- [Impervious Surfaces](#)

Paved or hardened surfaces that do not allow water to pass through (e.g., roads, rooftops, sidewalks, pools, patios, and parking lots)