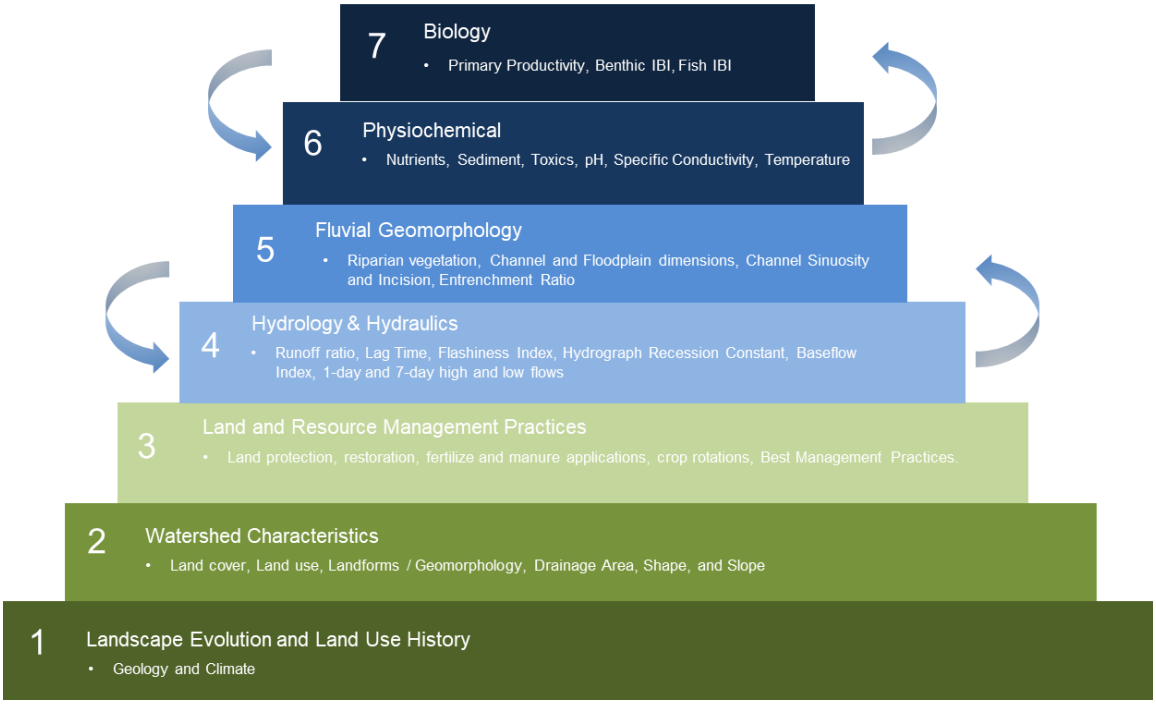
Healthy Watersheds Outcome

Management Strategy

2018–2025, v.5

Watershed-Stream Functional Pyramid



~ adapted from Stream Mechanics

I. Introduction

Healthy watersheds support healthy streams by recharging the groundwater, detaining and retaining water in ponds and wetlands, retaining sediment in floodplains, slowing and cooling rainfall runoff, and supporting aquatic food webs with contributions of organic matter. In combination, these functions serve to maintain stream flow regimes, temperatures, substrates, and water chemistry. Sustaining the condition of healthy watersheds is critical to the health of the Chesapeake Bay and the surrounding region. Healthy watersheds are an insurance policy for the Bay: they provide resilience to the watershed by delivering clean water and critical habitat while we seek to restore areas that have been degraded. Healthy watersheds also provide numerous social and economic benefits to local communities; they are often sources of drinking water and wildlife habitat, help to mitigate the effects of flooding, support a wide range of recreational opportunities, and are more resilient to the effects of invasive species and

climate change. Maintaining healthy watersheds is also a sound long-term investment: protecting them is much less expensive than restoring watershed functions that have become degraded.

Value-added strategies to ensure the long-term maintenance of healthy watersheds by the Chesapeake Bay Program Partners focus on four areas: 1) aligning outcomes, science, data, policies, and management approaches related to healthy waters and watersheds, 2) tracking the status of healthy waters and watersheds, 3) strengthening state and local capacity to maintain healthy waters and watersheds, and 4) strategically informing land conservation decisions to maintain healthy waters and watersheds. Through actions in these areas, collective resources can be applied more efficiently and effectively towards monitoring and maintaining watershed health throughout the Bay basin.

II. Goal, Outcome and Baseline

This management strategy identifies approaches for achieving the following goal and outcome:

Healthy Watersheds Goal

Sustain healthy waters and watersheds recognized for their high quality and/or high ecological value.

Healthy Watersheds Outcome

100 percent of state-identified currently healthy waters and watersheds remain healthy.

Baseline and Current Condition

Maintaining healthy watersheds through planning and conservation to support healthy waters is the natural complement to restoring those that have become degraded. Activities that protect healthy waters and watersheds– including land conservation, local ordinances, anti-degradation policies, and other measures– often cost less and have a higher likelihood of success than restoration activities.

While jurisdictions have different ways of measuring and defining stream and watershed health, the Chesapeake Bay Program's Healthy Watersheds Goal Implementation Team (HWGIT) and Stream Health Workgroup are developing a suite of multiple stream and watershed health metrics that are applicable across all jurisdictions. These metrics enable the integration of watershed and stream health outcomes and a more equitable and effective approach for allocating resources towards sustaining healthy watersheds throughout the 64,000 square-mile Chesapeake Bay basin.

The Healthy Watersheds Outcome has a two-part indicator represented by changes in impervious surfaces coupled with changes in land protection. Left unmitigated, the conversion of forests and farmlands to impervious surfaces can alter stream flow, groundwater recharge, stream temperature, and can be a source of nutrients, sediment, road salts, and other pollutants. Increases in impervious cover are an indicator of potential declining watershed health and impervious surface change has been adopted as one of the main indicators of land conversion for the CBP's Land Use Methods and Metrics Outcome. The conservation of forests, farms, and wetlands preserves the natural pervious properties of watersheds and the proportion of a watershed that is conserved is an indicator of resilience. Increases

in protected lands is the indicator for the Protected Lands Outcome but currently only 62% of available data have sufficient attributes to track change over time.

Current healthy watershed conditions are best described using a combination of data on watershed and stream conditions. The Chesapeake Healthy Watersheds Assessment (CHWA) 2.0 application includes a watershed predictor of stream health that statistically relates watershed conditions as depicted in the 1-meter resolution land use/land cover (LULC) data for the years 2017-2018 to the Chesapeake Benthic Index of Biotic Integrity (BIBI; Figure 1). This analysis represents the best available estimate of stream conditions based on watershed characteristics. These characteristics, depicted by the high-resolution LULC data, will be updated every 4-5 years and the Chesapeake BIBI will be updated every five years (last updated using 2012-2017 data). The Chesapeake BIBI is also used directly to track progress towards the Stream Health Outcome but at a coarser spatial scale compared to the CHWA (Figure 1).

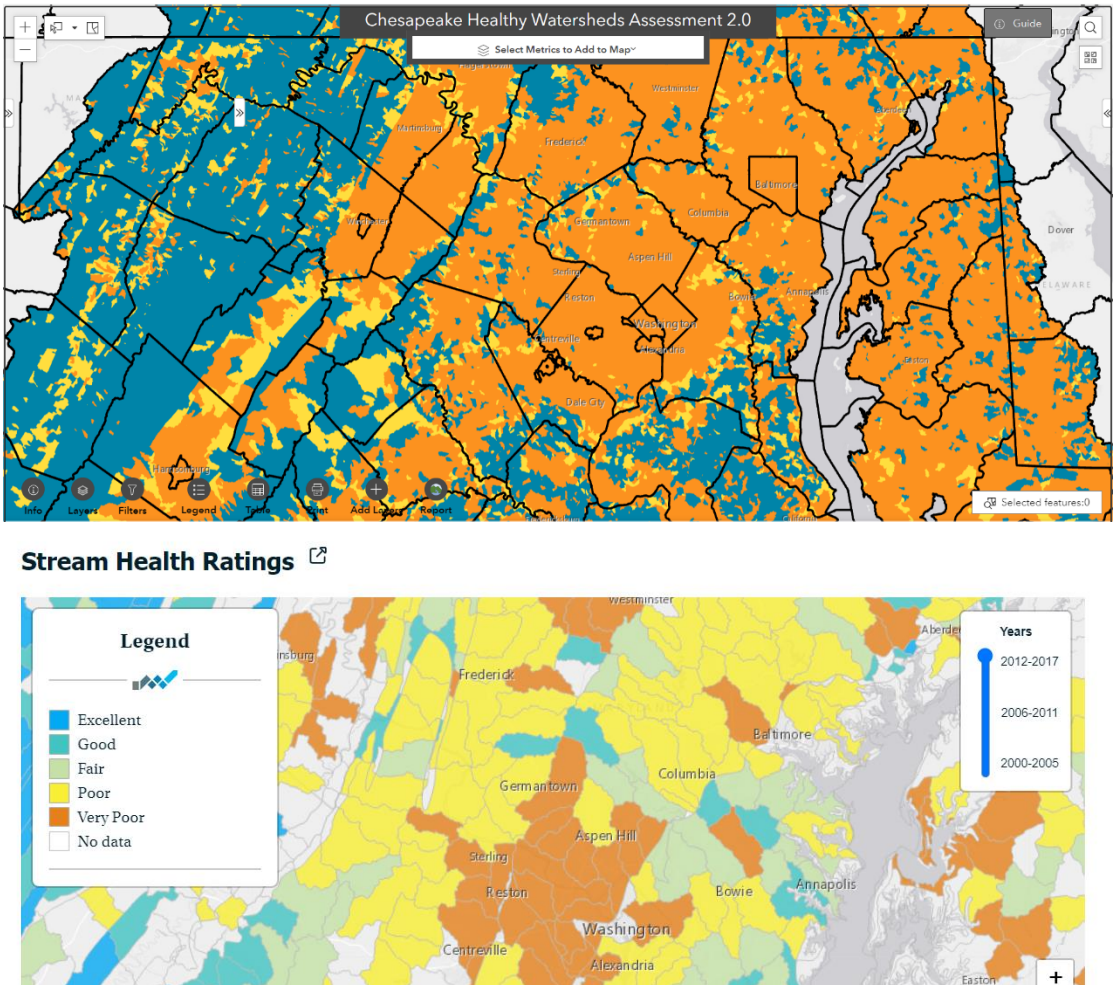


Figure 1. The Chesapeake Healthy Watersheds Assessment 2.0 (top) application showing good condition catchments in blue, fair condition in yellow, and poor condition in orange based primarily on land use/land cover conditions. The Stream Health Indicator (bottom) shows the health of larger watersheds (HUC12's) based on at least three stream reaches sampled for instream benthic macroinvertebrate assemblages.

III. Participating Partners

All members of the Healthy Watersheds Goal Implementation Team (HWGIT) are cooperating to achieve healthy watershed goals. Each has their own unique policies, procedures, programs, and tools to meet their goals. Unlike individual state programs, the HWGIT is focused on integrating information throughout the Bay watershed to develop common metrics for assessing, tracking, and reporting on watershed conditions. In addition, the HWGIT supports science to better understand the relationships between watershed conditions and stream health and supports land conservation and land use planning activities to maintain the health of watersheds. Increasingly, this work will be done in close coordination with other CBP workgroups including the Stream Health Workgroup, Protected Lands Workgroup, Forestry Workgroup, Wetlands Workgroup, Land Use Workgroup, Climate Resiliency Workgroup, Local Leadership Workgroup, and Public Access Workgroup.

- Alliance for the Chesapeake Bay
    - CBPO Local Government Advisory Committee
- Chesapeake Bay Commission
- Chesapeake Bay Foundation
- Delaware Department of Natural Resources and Environmental Control
- District of Columbia Department of Energy and Environment
- Land Trust Alliance
- Maryland Department of Planning
- Maryland Department of Natural Resources
- National Oceanic and Atmospheric Administration (NOAA)
    - Climate Resiliency Workgroup
- New York Department of Environmental Conservation
- Pennsylvania Department of Environmental Protection
- U.S. Environmental Protection Agency (EPA)
    - Office of Wetlands, Oceans and Watersheds
    - Mid-Atlantic Region 3
    - Chesapeake Bay Program Office (CBPO)
- U.S. Fish and Wildlife Service (USFWS)
- U.S. Forest Service (USFS) Chesapeake Bay Office
- U.S. Geological Survey (USGS)
    - Eastern Ecological Science Center
    - Lower Mississippi-Gulf Water Science Center
- Virginia Department of Conservation and Recreation
- West Virginia Department of Environmental Protection

Local Engagement

While state, federal, and regional partners can provide funding, data, science, and tools to support healthy watersheds protection, most land protection and land use planning efforts occur at the local level by municipal governments, watershed associations, nonprofits, and private sector entities. These organizations often partner with local, state, and federal agencies, and typically provide a sustained

level of real-world focus for localized efforts to protect healthy waters and watersheds. Local governments also can protect sources of drinking water and preserve lands valued highly by the public as nature preserves, parks, greenways, recreational areas, and wildlife habitat. Local tools for healthy watershed protection include planning (comprehensive, park and recreation, transportation, economic development, water resources, etc.); regulating (zoning, sub-division and tree planting ordinances, stormwater utilities and mitigation requirements); and protecting (land acquisitions and easements).

Providing actionable data, science, and tools to local organizations is a challenge because to be effective, information needs to be provided by trusted sources to the right people, at the right time, and in the right format. What's considered "right" may vary state to state and locality to locality. Therefore, it's imperative that information networks are developed and designed to reflect the unique organizational relationships that exist across each major jurisdictions in the Bay watershed.

IV. Factors Influencing Success

1. Scientific and Technical Understanding:

a. Information relating watershed conditions to stream health

Better understanding of the relationships between watershed conditions and the multiple dimensions of stream health is necessary to minimize and mitigate changes in the watershed that adversely impact streams. There's a large body of science on the role of impervious surfaces and urban development impacting stream health but there's also significant variability in physiographic conditions, land use histories, and management practices that complicate simplistic threshold-based relationships. Outstanding scientific questions include:

- How does land use/land cover configuration and history moderate the impacts of development on stream health?
- How do surficial drainage patterns moderate the impacts of development on stream health?
- How does the age of development and land use histories impact the resilience and restoration potential of streams?
- Within watersheds, which lands are most important to protect to maintain healthy waters?

b. Human and Natural Factors

A wide range of natural and human factors influence the attainment of the healthy watersheds' protection goal, though many "natural" factors may have human primary/secondary causes. For example, air quality and air deposition, climate change, and invasive species are all associated with past and current human activities. Some factors are best addressed at regional and programmatic levels and may take decades before the benefits of those actions are manifest (e.g., reducing greenhouse gas emissions). In contrast, changes in land use that adversely impact streams are best addressed locally. The benefits from land protection and land use planning can be

realized in the short term if they prevent the conversion of sensitive environments to development or if they provide new recreational opportunities to the public.

2. Dissemination of Scientific Information, Data and tools

In assessing the range of factors influencing our ability to meet this goal, land use change---specifically the amount, type, and way in which land use change occurs---is the single biggest factor impacting healthy watersheds that is within our collective ability to manage. Local governments, planning district commissions and watershed organizations are often the key players in healthy watershed protection because of their role in local land use decisions. Ensuring that officials making land use decisions and those organizations and entities influencing their decisions have the best information on healthy watersheds is essential to achieve this goal. Our collective work should, include development of information needs described above; enhancement of scientific, technical, and policy tools; and a process for educating, engaging, and involving local communities in healthy watershed protection.

3. Management and Actions

a. Monitoring cumulative effects

Achieving this outcome will not happen through any one mechanism or stakeholder. Rather, multiple actions are needed from a diversity of entities to ensure healthy watershed protection. Actions can include regulatory and non-regulatory programs at the State and Federal level, ranging from basic anti-degradation and permit program safeguards to land and easement purchases to educational programs. While there are many excellent examples of healthy watershed protection initiatives in the Chesapeake Bay region, these actions often occur in isolation. It is important to understand the collective and cumulative impact of our management strategies at sustaining healthy watersheds. For this reason, among others, the CBP is monitoring land use change throughout the watershed at 1-meter resolution every 4-5 years and monitoring land protection efforts at shorter time intervals.

b. Federal, State and Local Regulatory Authorities

State and federal actors can greatly affect the protection of a healthy watershed through permitting and grants. The Clean Water Act includes permitting and programs for wetlands (§404), stormwater and other point source discharges (§402), non-point sources of pollution (§319), and antidegradation (§303). Other legislation such as the National Environmental Policy Act and Energy Policy Act authorizes federal and state review and/or permitting of activities such as drilling, natural gas extraction and conveyance, pipelines, compressor stations, highways, reservoirs, and other federally permitted projects. State antidegradation policies are particularly relevant to this outcome because they have already identified waters whose quality exceeds fishable/swimmable standards (Tier 2) and outstanding natural resource waters (Tier 3). States have protections in place to ensure that Tier 2 and Tier 3 waters are not significantly degraded but these programs alone may not always be sufficient sustain healthy waters. For example, high quality (i.e., Tier 2) waters can be degraded if the sponsors of a new or expanded activity (e.g., wastewater treatment plant, new development) can demonstrate 1) they have considered and ruled out possible

alternatives, and 2) the project represents an important economic or social development. Allowable degradation cannot result in a loss of waterbody use(s), but can be significant, nonetheless.

V. Current Efforts and Gaps

1. Monitoring: stream health, watershed health, and land protection

a. Stream Health

All states and some localities have some level of physical, chemical, and biological monitoring data with which to assess stream health but not all streams are monitored nor had their quality assessed. Moreover, most streams that are monitored, particularly for biological data, are done so infrequently. Addressing these issues and synthesizing the disparate data for multiple aspects of stream health is the role of the CBP's Stream Health Workgroup.

The bulk of activity regarding the collection and use of stream condition information has been used to characterize impaired streams, rather than to identify, characterize, and protect healthy waters. There is a lack of resources for repeated or periodic field assessments of stream health to ensure we are maintaining existing healthy waters.

b. Watersheds Health

Each state has their own unique definition of healthy watersheds and programs to monitor them (see state definitions below). The disparate definitions and monitoring programs make it difficult to assess watershed and stream health conditions uniformly throughout the watershed. The CBP Partners are monitoring land use/land cover and change consistently across all jurisdictions every 4-5 years with 1-meter resolution imagery. This program has funding to continue through 2029. Through the CHWA 2.0 application, a process has been developed to relate changes in watershed conditions to predict changes in stream condition. While helpful, this application only indicates where land use conditions are indicative of potential stream degradation, other sources of degradation such as acid mine drainage and toxics are not considered. A more holistic and uniform approach for assessing and predicting stream health based on watershed conditions and other data is needed.

c. Land Protection

The CBP began collecting spatial land protection data in early 2010's. These data were provided by state agencies, land trusts, and other organizations tracking land protection efforts. As of 2024, the data are more complete then in the past but only 62% of the records (by area- 7.14 million acres) have valid "date-of-establishment" field values. For the remaining 38% of the records (2.97 million acres), we don't know when they were protected! For the 62% valid records, 764,000 acres were protected after 2010. The outstanding records (2.97 million acres) represent an area four times larger than the area for which we have valid records. For this reason, the CBP's progress towards land protection goals is uncertain. Most protected lands lacking a valid date field are owned by Federal or State agencies and are predominantly in Maryland, Virginia, West Virginia, and New York. To

track changes in land protection within healthy watersheds with some level of confidence, a date-of-establishment field is needed for at least 90% of all records.

2. **Local Awareness**
   Currently, the status and importance of healthy watersheds are not being conveyed to local government decision makers and other organizations and entities consistently across all Chesapeake Bay jurisdictions. As a result, local land use planners and managers may not be aware of resources available to them to help protected those watersheds. Information needs to be disseminated effectively to those engaged in planning and protection activities at the local level.

3. **Vulnerability**
   Healthy watersheds can be adversely impacted by residential, commercial, transportation, and other construction activities; energy resource development; water withdrawals; dams and other barriers; agricultural runoff, and other nonpoint sources of pollution. Vulnerability assessments that capture various risks to healthy watersheds and characterize them quantitatively and/or qualitatively can help managers prioritize areas according to risk and better target resources. The U.S. Geological Survey (USGS) has developed and maintains a Chesapeake Bay Land Change Model to forecast changes in urban land use throughout the watershed. This model should be expanded to simulate other major types of future change occurring in the watershed, such as utility-scale solar fields and timber harvests, to better represent vulnerabilities to land use change.

4. **Strategic conservation and planning**
   Maintaining healthy watersheds requires strategic actions to conserve lands within those watersheds, land use planning to minimize land conversion, and permitting to minimize the adverse impacts from unavoidable land conversion. Targeting conservation efforts may require new funding sources, conditions on existing funding sources, and capacity building for conservation organizations active in healthy watersheds. Similarly, informational support for local planners operating in healthy watersheds may be needed to better communicate the benefits of maintaining watershed functions and stream health.

State Definitions of Healthy Watersheds

The following are descriptions of jurisdictions' healthy waters and watersheds definitions.

Delaware: All of Delaware's tributaries to the Chesapeake Bay are impaired by nitrogen, phosphorus, and/or bacteria. Although they do not specifically define "healthy watersheds," being impaired is an indication that the watershed is not healthy. Delaware promulgated TMDL regulations for all these tributaries long before the Bay TMDL and will not consider them to be unimpaired until they meet Delaware's Surface Water Quality Standards and no longer cause downstream impacts to the Chesapeake Bay.

District of Columbia: Washington, D.C. is primarily urbanized and therefore has not identified currently healthy watersheds. However, the District Department of the Environment (DDOE) has several laws and programs that focus on improving watershed

health. These laws and programs include storm water management, sediment and erosion control, and water quality regulations; incentive programs promoting the installation of best management practices; a RiverSmart Homes program; incentives for the installation of green roofs on buildings; and Bay-friendly tree planting events.

Maryland: Anti-degradation Tier II catchments will be used for Maryland's healthy watersheds data layer. This includes non-tidal watersheds under regulatory anti-degradation protection that exceed minimum applicable water quality criteria and standards. Currently, Tier II streams are identified according to fish and benthic indices of biotic integrity. Tier II streams are grouped into catchments and those with current Assimilative Capacity, or the natural capacity of a water body to dilute and absorb pollutants and prevent harmful effects, are included in the Tier II catchments for what the state considers to be healthy watersheds.

New York: The Waterbody Inventory/Priority Waterbodies List (WI/PWL) is an inventory of the state's surface water quality. The category of "No Known Impact" represents "segments where monitoring data and information indicate that there are no use restrictions or other water quality impacts/issues" and is being used to determine New York's healthy waters and watersheds.

Pennsylvania: Designated or existing uses classified as Exceptional Value or High Quality are used as the basis for identifying Pennsylvania's healthy waters and watersheds.

High Quality Water
Chemistry meets water quality criteria at least 99 percent of the time for dissolved oxygen, iron, dissolved copper, temperature, dissolved nickel, dissolved cadmium, ammonia nitrogen, dissolved zinc, pH, dissolved arsenic, dissolved lead, and aluminum.

Biology – qualifiers for

1. Biological assessment – supports high quality aquatic community using peer reviewed biological assessment procedures (e.g., surface water is compared to reference stream or watershed and receives a benthic macroinvertebrate score of at least 83 percent)
2. Class A wild trout stream

Exceptional Value Water
Meets requirements of High-Quality Water and…

- Is located in a National Wildlife Refuge
- Is located in a designated State Park or State Forest natural area, National Natural Landmark, federal or state wild river, federal wilderness area or national recreational area
- Is an outstanding national, state, regional or local resource water
- Is a surface water of exceptional recreational significance

- Achieves a benthic score of at least 92 percent compared to reference conditions
- Is a wilderness trout stream
- Is a surface water of exceptional ecological significance

Virginia: The Interactive Stream Assessment Resource (INSTAR) designates Virginia's ecologically healthiest watersheds. The goal of INSTAR is to develop a complementary, synoptic, and geospatial database for fish and macroinvertebrate community composition and abundance at stream locations throughout the state, including larger (fourth order or greater) non-wadable streams and rivers.

INSTAR, and the extensive aquatic resources database on which it runs, supports a wide variety of stream assessment, management, and conservation activities aimed at restoring and protecting aquatic living resources throughout the Commonwealth. Once identified as "healthy", these stream reaches are integrated into the Virginia Department of Conservation and Recreation, Natural Heritage Program Data Explorer, and represented as Stream Conservation Units (SCUs). Data are shared with land trusts, local government; planning districts and other state and federal agencies to guide land use, land management and conservation decisions.

West Virginia: West Virginia does not have a "healthy watersheds" program or definition. West Virginia's anti-degradation rule can be applied to help define this category of streams. West Virginia's Tier 3 waters are known as "outstanding national resource waters." These include waters in Federal Wilderness Areas, specifically designated federal waters, and high-quality waters or naturally reproducing trout streams in state parks, national parks, and national forests.

VI. Management Approaches

Management Approach #1: Align outcomes, science, data, policies, and management approaches related to healthy waters and watersheds

- Expand the scope of the healthy watersheds outcome to include all healthy waters and their watersheds based on a holistic accounting of stream and watershed conditions.
- Convene joint workgroup meetings to identify shared goals, strategies, and information sources including the workgroups focused on stream health, protected lands, forestry, land use, climate resiliency, wetlands, brook trout, and public access.
- Convene joint GIT meetings to identify shared conservation, public access, and habitat goals and strategies.
- Develop a better understanding of the relationship between watershed and stream conditions.
- Develop substantive near-term actions that directly support diversity, equity, inclusion, and justice.

Management Approach #2: Track the status of healthy waters and watersheds

- Track changes in stream and watershed conditions every 4-5 years using a common spatial scale and combination of metrics and sampling techniques.
- Populate a "date of establishment" field for 90% of all protected lands records in each jurisdiction.
- Update the CHWA 2.0 application when additional high-resolution LULC data are available.
- Update the CHWA 2.0 vulnerability assessment informed by high-res LULC, sea-level rise data, and hyper-temporal spectral indices from satellite data.

Management Approach #3: Strengthen state and local capacity to maintain healthy waters and watersheds

- Prototype an approach to assess local land protection and planning capacity to maintain stream and watershed health while working with regional conservation partnerships.
- Leverage the value-added capabilities of the Chesapeake Bay Partnership to improve local capacity to plan for green infrastructure and to protect and maintain stream and watershed health.
- Disseminate information on Healthy Watersheds Consortium (HWC) and other grant opportunities. Build capacity for watershed protection within CBP using the HWC approach.

Management Approach #4: Strategically inform land conservation decisions to maintain healthy waters and watersheds

- Provide information on stream and watershed health to elected officials, land use planning staff, state agencies, local governments, and conservation organizations.
- Encourage conservation in healthy watersheds by altering the incentive structure affecting land conservation decisions.
- Provide data and information relevant to proposed legislation impacting the management and protection of healthy waters and watersheds.
- Explore how the CHWA can be used in conjunction with conservation targeting tools to inform conservation priorities.

VII. Monitoring Progress

Tracking progress towards this outcome requires monitoring changes in land use/land cover and monitoring land protection efforts both spatially and temporally. High-resolution (1-meter) land use/land cover data will be updated every 4-5 years and the protected lands dataset will be updated every 1-2 years once the date-of-establishment field is more fully attributed in the outstanding 38% of records.

VIII. Assessing Progress

Progress will be assessed by monitoring the amount of land conversion to development and land protection occurring within healthy watersheds.

IX. Adaptively Manage

While the outcome for this goal is specific to state-identified healthy watersheds, variability in how states define healthy watersheds has created challenges in assessing watershed health and tracking progress towards meeting the outcome and goal. Therefore, starting this 2024-2026 round, the HWGIT will continue to work towards common methods across all jurisdictions for defining watershed health and tracking progress.

X. Biennial Workplan

Biennial workplans for each management strategy were developed for the 2016-2017, 2018-2019, 2020-2021, 2022-2023, and 2024-2025 timelines, respectively.