

**Chesapeake Bay Program | Indicator Analysis and Methods Document**  
*Protected Lands | Updated March 2019 (Data current through early-2019)*

Indicator Title: [Protected Lands](#)

Relevant Outcome(s): [Protected Lands](#)

Relevant Goal(s): [Land Conservation](#)

Location within Framework (i.e., Influencing Factor, Output or Performance):  
[Performance](#)

#### **A. Data Set and Source**

(1) Describe the data set. What parameters are measured? What parameters are obtained by calculation? For what purpose(s) are the data used?

[Acres of permanently protected lands in the Chesapeake Bay watershed.](#)

As currently defined by the Chesapeake Bay Program, “protected lands” means lands permanently protected from development, whether by purchase or donation, through a perpetual conservation or open space easement or fee ownership for their cultural, historical, ecological, or agricultural value. This definition includes non-traditional conservation mechanisms, including transfer of development rights programs that require a conservation easement for the “sending” property and purchase of development rights programs. Lands protected through easements and purchase of development rights typically remain in private ownership.

Protected lands include: county, town, city, state and federal parks; designated open space and recreational land; publicly owned forests, wildlife management areas, natural areas, habitat areas, and wetlands; privately owned working farms or forests with conservation easements; historically important lands, such as protected battlefields, colonial towns and farms; military-owned parks and recreational areas.

Only authoritative data sources were used in the compilation of this data set. The process for creating the dataset is as follows. This dataset was created through a data collection effort where relevant protected lands geospatial data was provided directly from the following State agencies and jurisdictions\*:

- US Geological Survey, Gap Analysis Program (GAP). February 2019. Protected Areas Database of the United States (PADUS), version 2.0 Combined Feature Class (Fee and Easement)
- Maryland Department of Natural Resources
- Maryland Department of Planning

- Delaware Department of Natural Resources and Environmental Control (Division of Fish and Wildlife)
- Freshwater Institute (WV Protected Lands)
- PA Bureau of Farmland Preservation PA Department of Conservation & Natural Resources
- Pennsylvania Land Trust Association (PALTA) – Contracted by PA to maintain land conservation datasets.
- VA Department of Conservation and Recreation
- National Conservation Easement Database
- Previous Chesapeake Bay Protected Lands datasets from (2013, 2015\_16)

\*Note: direct weblinks to publicly available data can be found in the “weblink” attribute in the Shapefile or by requesting it from [rthompson@chesapeakebay.net](mailto:rthompson@chesapeakebay.net)

The Protected Areas Database of the United States, PAD\_US V. 2.0 was also utilized to augment the data provided from the jurisdictions. PAD\_US V 2.0 Designations (DOD) lands were also incorporated for consistency from previous years. This data includes Federal lands as well as National Conservation Easement data. Finally, the 2015\_16 Chesapeake Bay Protected lands dataset was used to assure that any parcels that were previously contained were carried over into the new 2018 dataset. Only 2018 Virginia provided data was used to compile the 2018 dataset for that portion of the watershed. A handful of parcels from the 2015\_16 dataset as well as the National Conservation Easement dataset 2017 were also included in the preliminary 2018 dataset. This is currently under review by VA DCR. The provided datasets were put in PAD\_US format (see appendix 1.) and merged into the new 2018dataset.

The acreage calculations used for determining the progress toward the goal are based on GIS area using the provided polygons, converting those polygons to 5 meter raster grid cells, summarizing by county and converting to acres. For example, a locally owned park in Virginia has a reported value of 671 acres in the attribute field, after converting to 5X5 meter square grid cells, this same area has a total of 1,085,608 cells. A 5X5 meter cell is the equivalent of 25 square meters. Multiplying the cell count by 25 gives a value in square meters.  $108,658 * 25 = 2,716,450$  sq. meters. Dividing by 4046.86 converts sq. meters to acres  $(2,716,450 / 4046.86) = 671$  acres. This procedure was completed at the state scale by ownership type.

Total land area within each of the Chesapeake Bay watershed jurisdictions was calculated using the hydrological unit code (HUC-12) data of the Watershed Boundary Dataset available from USDA-NRCS. This dataset represents the most up to date and refined watershed boundary for the Chesapeake Bay Watershed. The land area was calculated using the Chesapeake Bay Watershed boundary, the State boundaries and the Chesapeake Bay Land Cover Data Series for 2006 leaving out the land cover class 11 representing water. The 30-meter raster cells within the watershed for each state were then summarized and converted to Acres. The total protected land area derived in GIS

was then used to determine the percent of total protected land vs. unprotected land within each jurisdictions portion of the watershed.

(2) List the source(s) of the data set, the custodian of the source data, and the relevant contact at the Chesapeake Bay Program.

- Source: See above description of sources and compilation process.
- Custodian: Renee Thompson, USGS Chesapeake Bay Program Office, [rthompson@chesapeakebay.net](mailto:rthompson@chesapeakebay.net) or by phone at (410)267-5749.
- Chesapeake Bay Program Contact (name, email address, phone number):
  - Jonathan Doherty, National Park Service, [Jonathan\\_Doherty@nps.gov](mailto:Jonathan_Doherty@nps.gov)
  - Renee Thompson, U.S. Geological Survey, [rthomps@chesapeakebay.net](mailto:rthomps@chesapeakebay.net)
  - Andrew Pizzala, Chesapeake Research Consortium, [pizzalaa@chesapeake.org](mailto:pizzalaa@chesapeake.org)

(3) Please provide a link to the location of the data set. Are metadata, data-dictionaries and embedded definitions included?

The dataset is stored on a Microsoft staff “Onedrive” site and can be accessed by emailing Renee Thompson at [rthompson@chesapeakebay.net](mailto:rthompson@chesapeakebay.net) or John Wolf [jwolf@chesapeakebay.net](mailto:jwolf@chesapeakebay.net). Basic metadata for the 2018 dataset is available.

## B. Temporal Considerations

(4) Data collection date(s): USGS Chesapeake Bay Program Office Staff undertook the data collection effort in mid-2018 for GIS files of protected lands through early March 2019.

(5) Planned update frequency (e.g., annual, biannual, etc.):

- Source Data: Bi-annual
- Indicator: Bi-annual

The primary rationale for this is to provide sufficient time for land protection partners to implement consistent data standards based on the PAD\_US format as well as allow time for parcels to be digitized and put into GIS format.

Note: Chesapeake Bay Program staff is working with partners to develop a web portal through LandScope to provide protected lands data as it becomes available.

(6) Date (month and year) next data set is expected to be available for reporting:  
Late 2020 to early 2021 or sooner if the indicator improvement project goes well.

## C. Spatial Considerations

(7) What is the ideal level of spatial aggregation (e.g., watershed-wide, river basin, state, county, hydrologic unit code)?

Generally the data is at a 1:24,000 scale. Spatial aggregation is acceptable at any scale and tools are being developed for the LandScope Chesapeake website to facilitate this process.

(8) Is there geographic (GIS) data associated with this data set? If so, indicate its format (e.g., point, line polygon). Polygon (5m raster grid with ownership is also available for acreage calculations, see Renee Thompson for instructions).

(9) Are there geographic areas that are missing data? If so, list the areas.

Members of the land conservation planning team within the Chesapeake Bay Program suspect that some data from smaller county and local governments as well as some smaller land trust and conservation easement data may be missing. In addition, it is thought that some agricultural easements that were funded in whole or in part by Natural Resource Conservation Funds may also be underrepresented in this dataset. Finally, there are two datasets one in VA and a Delaware DOT with open space roadside areas that may also be missing. The magnitude of these gaps in terms of acreage is unknown. We are working with contacts and partners to identify sources of missing data and incorporate them when possible.

(10) Please submit any appropriate examples of how this information has been mapped or otherwise portrayed geographically in the past.

- [http://www.chesapeakebay.net/maps/map/protected\\_lands\\_2006](http://www.chesapeakebay.net/maps/map/protected_lands_2006)
- [https://www.chesapeakebay.net/what/maps/protected\\_lands\\_2011](https://www.chesapeakebay.net/what/maps/protected_lands_2011)
- [https://www.chesapeakebay.net/what/maps/protected\\_lands\\_2013](https://www.chesapeakebay.net/what/maps/protected_lands_2013)
- <https://www.chesapeakeprogress.com/conserved-lands/protected-lands>

#### **D. Communicating the Data**

(11) What is the goal, target, threshold or expected outcome for this indicator? How was it established?

As called for in the 2014 Chesapeake Bay Watershed Agreement, the goal for protected lands is that by 2025, partners will protect an additional two million acres of lands throughout the watershed—currently identified as high-conservation priorities at the federal, state or local level—including 225,000 acres of wetlands and 695,000 acres of forest land of highest value for maintaining water quality. This goal is consistent with the similarly worded goal called for in the “Strategy for Protecting and Restoring the Chesapeake Bay Watershed.”

(12) What is the current status in relation to the goal, target, threshold or expected outcome?

Since the 2010 baseline, 1,358,456 acres of protected lands have been recorded, or 67.92% of the 2,000,000 acres goal of protected lands. (See 16 for caveat related to comparison of acreage values between reporting years).

(13) Has a new goal, target, threshold or expected outcome been established since the last reporting period? Why? No.

(14) Has the methodology of data collection or analysis changed since the last reporting period? How? Why?

Methodology of Data Collection did not change since the last recording year in 2011 but differs from recording efforts prior to 2011.

Regional tracking of permanently protected lands in the Chesapeake Bay watershed has been carried out since 2000. This was originally stimulated by the goal of protecting twenty percent of the Bay watershed in Pennsylvania, Maryland, Virginia and the District of Columbia, set through the Chesapeake 2000 Agreement. Reporting and tracking toward this goal was performed through a tabular spreadsheet based on acreage totals reported to the Chesapeake Bay Program on an annual basis. There are a lot of conflicting polygon boundaries for public lands in DC. The data originally came from the city, PAD\_US as well as National Capitol Planning and Parks dataset. In addition, there are “multi-part” polygons were multiple properties, sometimes over a large area are represented in one record in the dataset....so it may overlap with other dataset and be duplicative but can't be deleted because another part would then be lost. Analysts investigated this issue a bit with my master polygon this time and deleted and cleaned up some boundaries, being careful not to delete anything. Because of this data cleanup of overlapping and redundant polygons the values for DC change slightly even though no new data was collected. With the latest effort in early 2019, additional discrepancies between DC provided data, and PAD\_US V 2.0 were uncovered. There is a need to work with this jurisdiction to clean up their parcel boundaries and ownership information to ensure a more accurate reporting for this indicator. In addition, it is the analysts understanding that there are some small parks that are being created and preserved in the city under a partnership with Casey Trees. Staff is unclear on whether these new parks are included in the data provided from the city data download page.

*The Strategy for Protecting and Restoring the Chesapeake Bay*, prepared in response to Executive Order 13508, set a goal of protecting an additional 2 million acres of high priority conservation lands watershed-wide (including portions of Delaware, New York and West Virginia) by 2025. This goal was carried forward as part of the recently signed 2014 Chesapeake Bay Watershed Agreement.

The expansion to watershed-wide tracking, advances in geospatial data, and a broad regional commitment among many partners to land conservation data sharing through LandScope Chesapeake called for an improved approach to assembling land protection

tracking data. As such, the Chesapeake Bay Program has transitioned to tracking protected lands in a GIS environment.

Unlike pure tabular data, land protection information associated with a GIS database better serves the needs of multiple users and objectives. It allows visualizing protected lands on the landscape and assessing progress relative to various conservation goals, such as protecting targeted ecological areas, wildlife corridors, forested shorelines, etc.

NOTE: A more technical and complete description of the new Protected Lands Indicator tracking methods and future path forward are included in Section G of this document.

(15) What is the long-term data trend (since the start of data collection)?

Cumulatively, 9,158,456 acres of land have been permanently protected in the Chesapeake Bay watershed through 2018 with the addition of PAD\_US v 2.0 in early 2019. This figure includes permanent protection for:

- 108,522 acres of land in Delaware (24% of DE land within the watershed)
- 10,292 acres of land in the District of Columbia (26% of DC land within the watershed)
- 1,773,792 acres of land in Maryland (30.32% of MD land within the watershed)
- 327,281 acres of land in New York (8% of NY land within the watershed)
- 3,550,179 acres of land in Pennsylvania (25% of PA land within the watershed)
- 2,987,078 acres of land in Virginia (22% of VA land within the watershed)
- 401,312 acres of land in West Virginia (18% of WV land within the watershed)

\*note: While new data was not obtained for DC from the city for 2018 some corrections and clean up was performed on polygons within DC to reduce duplication and overlap. New data from PAD\_US v 2.0 further complicated this effort. The slight change in value is a result of that process.

(16) What change(s) does the most recent data show compared to the last reporting period? To what do you attribute the change? Is this actual cause or educated speculation?

Compared to the previous data call in 2015\_16 there was an increase in overall acreage recorded. Since 2015\_16, 353,879 more acres of protected lands have been reported. However, some of these acres may not have been conserved since the last data call in 2015\_16, but may have just recently been reported. For this reason and the opportunistic nature of conservation, this increase may or may not be indicative of a trend of increasing land conservation between the two data collection years.

The difference between these data collection efforts (2013,2015\_16 and 2018) is the result of four factors: (a) the addition of previously protected (prior to 2013) but newly digitized parcels to GIS databases; (b) the addition of parcels newly protected since the last collection effort; and (c) newly available data sources that were not previously

known to researchers, for example Maryland Department of Planning data layers related to transfer and purchase of development rights programs; (d) corrected or refined data related to property ownership or boundary changes. Unfortunately, on a watershed-wide basis it is not yet feasible to determine the extent of a particular factor because state and other protected lands databases have not consistently included the date of protection (aka “date established”) for each parcel. It is worth noting that there was an improvement during the 2013 data collection round and again in 2015\_16 related to the “date established” data field, however, this field is only populated in a small number of the total protected lands records, in most cases it is blank. It is the intention of Bay Program staff to continue to work with data providers to assure the date the parcel was protected is a data attribute that is included in the future, from this point forward. It is also worth noting that the ownership information related to who owns a property has also shown some variation from year to year. It may be that property ownership changed hands or was corrected between one data year and another. Some variation in the direct owner numbers between years has been observed, however the general trend in overall acreage has continued to increase with each data collection year.

Educated speculation – Please note, there are flaws in the direct comparison of 2008, 2011, 2013, and 2015\_16 data (described above). Comparing data from one year to the next indicates a general increase in the number of acres of land protected in the Chesapeake Bay watershed, not a specific increase.

Based on the opportunistic nature of land conservation, fluctuations in funding for land acquisitions, and the trends of land conservation from the past decade, variation between the numbers of additional acres permanently protected each year is anticipated.

(17) What is the key story told by this indicator?

The population in the Chesapeake Bay watershed continues to grow. By 2020, it’s expected that more than 18 million people will live in the region. The supporting development and land conversion that this growth implies rank among the top stressors to the Bay’s ecosystem and a major threat to its restoration and protection. One strategy to combat loss of high value lands is to permanently protect them from development, while incenting and encouraging development in more suitable areas.

Towards that end, this indicator reports the acres of permanently protected lands within the Chesapeake Bay watershed. Since the 2010 baseline, there has been an increase in acres recorded. However, based on the opportunistic nature of land conservation, fluctuations in funding for land acquisitions, and the trends of land conservation from the past decade, variation between the numbers of additional acres permanently protected each year is anticipated.

Although millions of acres of land have been protected in the Chesapeake Bay watershed, land continues to be being developed. Between 1990 and 2007, impervious surfaces (associated with growth in single-family houses) increased by an estimated 34 percent while the Bay watershed population increased by only 18 percent. This increase in impervious cover indicates that our personal footprint on the landscape is growing.

Land in the watershed is a finite and fragile resource, and what happens on land has an enormous impact on local waterways. Population growth and development have increased the need to preserve natural places such as forests, parks, refuges and other permanently protected lands which provide habitat for animals and filter pollution before it reaches the Bay and its tributaries. They also allow for the preservation of the cultural, historic, recreational and working lands that have informed the unique heritage and identity of people living in the Chesapeake region for centuries.

Conserving important places relies heavily on public support. Reporting on the status of land protection within the Bay watershed can help generate that support and provides transparency related to these efforts. In addition to providing an important public update, reporting on this indicator directly shows progress towards achieving the [Strategy for Protecting and Restoring the Chesapeake Bay Watershed](#) (issued under Executive Order 13508) outcome to “protect an additional two million acres of lands throughout the watershed currently identified as high conservation priorities at the federal, state or local level by 2025, including 695,000 acres of forest land of highest value for maintaining water quality.”

This outcome was carried forward in the signing of the 2014 [Chesapeake Bay Watershed Agreement](#) where signatories agreed to a new land protection outcome to further build upon the successful Chesapeake 2000 goal: *“By 2025, protect an additional two million acres of lands throughout the watershed—currently identified as high conservation priorities at the federal, state or local level—including 225,000 acres of wetlands and 695,000 acres of forest land of highest value for maintaining water quality. (2010 baseline year)”*

## **E. Adaptive Management**

(18) What factors influence progress toward the goal, target, threshold or expected outcome?

See response above for a discussion of regional trends affecting progress towards land conservation such as population growth, growth in impervious surfaces, and public support. Management and leveraging of diverse funding pools, integration and coordination of conservation data, and the capacity level of conservation land trusts also influence progress towards this outcome. The associated [Management Strategy](#) for this Outcome discusses these and other factors in more detail.

(19) What are the current gaps in existing management efforts?

The associated Management Strategy for this Outcome details current efforts and gaps in the following areas:

- Improving the Quality, Quantity and Accessibility of Conservation Priority Data
- Aligning Land Conservation Priorities with Funding Opportunities
- Building the Land Conservation Community
- Developing the Capacity and Tools for Restoring, Protecting and Managing Landscapes
- Expanding Federal, State and Local Funding and Incentives for Conservation
- Increasing Public Support for Land Conservation
- Advancing Youth Engagement and Citizen Stewardship

In addition, jurisdictions and partners need sufficient funding and capacity to implement PAD\_US standards as well as aggregate progress into a single dataset for their state.

(20) What are the current overlaps in existing management efforts?

This effort is highly collaborative across the Watershed through the Chesapeake Conservation Partnership and cascading down to the states, local governments and the multitude of land trusts and other non-profits. While this multi layered effort can always be improved, there are no significant overlaps.

(21) According to the management strategy written for the outcome associated with this indicator, how will we (a) assess our performance in making progress toward the goal, target, threshold or expected outcome, and (b) ensure the adaptive management of our work?

(a) Monitoring progress on items detailed in biennial work plans will provide insight into what the land protection data tells us about past and future land protection efforts. Other measurement and assessment tools that can also inform progress include:

- An annual progress report for the general public articulating best practices and leveraging successes.
- Partner and public surveys to measure changes in awareness, constituency-building and support of land conservation.
- Tracking of public and private funding for land conservation to monitor changes in funding levels over time.

(b) Additional functionality may be added to LandScope Chesapeake or another platform to provide data analysis and identify trends and priority areas. Annual Chesapeake Conservation Partnership gatherings provide a venue for reviewing progress towards this goal, sharing drivers for and obstacles to conservation, and assessing and addressing changes in management direction. The Steering Committee's regular meetings enable progress to be adapted as needed. Regular communications, workgroup meetings, and annual reporting will also provide additional information and opportunities for adaptive management.

## F. Analysis and Interpretation

*Please provide appropriate references and location(s) of documentation if hard to find.*

- (22) What method is used to transform raw data into the information presented in this indicator? Please cite methods and/or modeling programs. [N/A](#)
- (23) Is the method used to transform raw data into the information presented in this indicator accepted as scientifically sound? If not, what are its limitations? [N/A](#)
- (24) How well does the indicator represent the environmental condition being assessed? [See answers to questions 9, 12 and 16 of this document.](#)
- (25) Are there established reference points, thresholds, ranges or values for this indicator that unambiguously reflect the desired state of the environment? [N/A](#)
- (26) How far can the data be extrapolated? Have appropriate statistical methods been used to generalize or portray data beyond the time or spatial locations where measurements were made (e.g., statistical survey inference, no generalization is possible)? [N/A](#)

## G. Quality

*Please provide appropriate references and location(s) of documentation if hard to find.*

- (27) Were the data collected and processed according to a U.S. Environmental Protection Agency-approved Quality Assurance Project Plan? If so, please provide a link to the QAPP and indicate when the plan was last reviewed and approved. **If not, please complete questions 28-30. No.**
- (28) *If applicable:* Are the sampling, analytical and data processing procedures accepted as scientifically and technically valid? [N/A](#)
- (29) *If applicable:* What documentation describes the sampling and analytical procedures used?  
[Please contact Renee Thompson at rthompson@chesapeakebay.net](mailto:rthompson@chesapeakebay.net) for complete metadata and documentation of compiled datasets.
- (30) *If applicable:* To what extent are procedures for quality assurance and quality control of the data documented and accessible? [N/A](#)
- (31) Are descriptions of the study design clear, complete and sufficient to enable the study to be reproduced? [N/A](#)

- (32) Were the sampling, analytical and data processing procedures performed consistently throughout the data record? [See tracking land protection section in Appendix 2.](#)
- (33) If data sets from two or more sources have been merged, are the sampling designs, methods and results comparable? If not, what are the limitations? [See Appendix 3: State Protected Lands “Proposed” Data Standards and Best Practices, in this document.](#)
- (34) Are levels of uncertainty available for the indicator and/or the underlying data set? If so, do the uncertainty and variability impact the conclusions drawn from the data or the utility of the indicator? [N/A \(See responses to questions 12 and 16 of this document for a description of the limitations of interpreting the data set.\)](#)
- (35) For chemical data reporting: How are data below the MDL reported (i.e., reported as 0, censored, or as < MDL)? If parameter substitutions are made (e.g., using orthophosphate instead of total phosphorus), how are data normalized? How does this impact the indicator? [N/A](#)
- (36) Are there noteworthy limitations or gaps in the data record? [N/A](#)

#### **H. Additional Information (*Optional*)**

- (37) Please provide any further information you believe is necessary to aid in communication and prevent any potential misrepresentation of this indicator.

### **Appendix 1: Chesapeake 2000 Protected Lands Tracking Efforts**

The Chesapeake 2000 Agreement established a goal to “permanently preserve from development 20 percent of the total watershed acreage in Maryland, Pennsylvania, Virginia and the District of Columbia, or 6.8 million acres, by 2010.” This goal was achieved and surpassed in 2007, though tracking towards continued through 2010. Tabular data collected for tracking between 2000 and 2010 indicated that 7,247,427 cumulative acres of land were permanently protected.

Regional tracking of permanently protected lands towards the Chesapeake 2000 Agreement goal was conducted from 2000 to 2010 through a tabular data call process. The expansion to watershed-wide tracking, advances in geospatial data, and a broad regional commitment among many partners to land conservation data sharing through LandScope Chesapeake called for an improved approach to assembling land protection tracking data. As such, the Chesapeake Bay Program has transitioned to tracking protected lands in a GIS environment.

Unlike pure tabular data, land protection information associated with a GIS database better serves the needs of multiple users and objectives. It allows visualizing protected lands on the landscape and assessing progress relative to various conservation goals, such as protecting targeted ecological areas, wildlife corridors, forested shorelines, etc. Methods for data collection and analysis between past and current protected lands tracking efforts are significantly different. As such, the tabular results of Chesapeake 2000 tracking are not directly comparable with those of current GIS tracking efforts. The indicator information is provided to maintain a record historic tracking data where data was collected in a tabular format by acreage directly from the Jurisdictions. Currently this indicator is compiled in a geospatial format from jurisdictions and is calculated on their behalf by Chesapeake Bay Program Staff.

## **Appendix 2: Protected Lands Tracking and Reporting in the Chesapeake Bay Watershed**

### **Background:**

Regional tracking of permanently protected lands in the Chesapeake Bay watershed has been carried out since 2000. This was originally stimulated by the goal of protecting twenty percent of the Bay watershed in Pennsylvania, Maryland, Virginia and the District of Columbia, set through the Chesapeake 2000 Agreement. Reporting and tracking toward this goal was performed through a tabular spreadsheet based on acreage totals reported to the Chesapeake Bay Program on an annual basis.

*The Strategy for Protecting and Restoring the Chesapeake Bay*, prepared in response to Executive Order 13508, set a goal of protecting an additional 2 million acres of high priority conservation lands watershed-wide (including portions of Delaware, New York and West Virginia) by 2025.

More recently the 2014 *Chesapeake Bay Watershed Agreement* set the Protected Lands Outcome that “by 2025, protect an additional two million acres of lands throughout the watershed—currently identified as high-conservation priorities at the federal, state or local level—including 225,000 acres of wetlands and 695,000 acres of forest land of highest value for maintaining water quality.”

The expansion to watershed-wide tracking, advances in geospatial data, and a broad regional commitment among many partners to land conservation data sharing through LandScope Chesapeake call for an improved approach to assembling land protection tracking data.

### **Tracking Land Protection – Moving from Tabular to Geospatial (GIS) format:**

Unlike pure tabular data, land protection information associated with a GIS database better serves the needs of multiple users and objectives. It allows visualizing protected lands on the landscape and assessing progress relative to various conservation goals, such as protecting targeted ecological areas, wildlife corridors, forested shorelines, etc.

In 2008 USGS staff at Chesapeake Bay Program Office undertook a data collection effort to track protected lands in the Chesapeake Bay Watershed in a geospatial environment. At the time, the data were the most recent and best available. Data were collected directly from authoritative sources, including Chesapeake Bay Program partners, State and Federal agencies and national non-governmental organizations such as The Nature Conservancy. The initial effort was challenging due to lack of geospatial data and decentralized GIS systems. In addition, many of the properties overlapped with other properties in the dataset, making it difficult to avoid double counting of parcels. A topology tool was run in GIS to identify overlapping areas and assign them to one parcel or the other to address this issue. Acres reported in the attribute information in the collected datasets were in some cases slightly different than the GIS calculated acres due to the editing process. The resulting dataset constituted the first comprehensive GIS layer of protected lands for the entire Chesapeake Bay watershed; it indicated a total of approximately 7.6 million protected acres in the watershed, this new method was built upon to create the 2010 baseline value of 7.8 million acres.

With advances in GIS and many new datasets becoming available, and to support implementation of LandScope Chesapeake, the USGS undertook another data collection effort between December of 2011 and July 2012. The data collected were in most cases current as of the end of 2011. Some new sources of data became available including national level datasets such as the Protected Areas Database of the United States (PAD\_US) as well as the National Conservation Easement Database (NCED). Using these national datasets, a foundation layer of protected lands was formed; however researchers recognized that the national level datasets were missing information. Protected Lands data were then collected from each state agency as well as from various non-governmental organizations and regional land conservation agencies. The topology editing was again used to identify and correct overlapping areas to enable a more accurate counting of total acres. In addition, USGS staff worked with the 27 individual datasets to put them into the standard PAD\_US format with recommended attributes in an effort to standardize protected lands GIS data. (More information on this is available at [http://gapanalysis.usgs.gov/wp-content/uploads/2013/10/PADUS\\_Standards\\_Oct2013\\_USGSreview.pdf](http://gapanalysis.usgs.gov/wp-content/uploads/2013/10/PADUS_Standards_Oct2013_USGSreview.pdf). While there are most likely some protected properties that are not accounted for in this dataset (such as smaller local land trusts which may not report their protected lands to the NCED or state agencies), researchers are confident that this is the most accurate and comprehensive dataset available for tracking protected lands in the Chesapeake Bay Watershed.

This more expansive data collection effort showed an increase of approximately 400,000 acres over the 2008 collection effort, bringing the cumulative total to approximately 8 million acres of protected lands within the Chesapeake Bay Watershed. The difference between the two data collection efforts (2008 and 2011-12) is the result of two factors: (a) the addition of previously protected (prior to 2008) but newly digitized parcels to GIS databases; and (b) the addition of parcels newly protected since the last collection effort. Unfortunately, on a watershed-wide basis it is not yet feasible to determine the extent of either factor because state and other protected lands databases have not consistently included the date of protection (aka “date established”) for each parcel.

The 2014 data collection effort attempted to streamline the collection and data processing process by working directly with data providers to provide GIS data with required attributes and in a standardized format. Unfortunately, due to lack of resources at the state level, only some of the data was provided according to the requested PAD\_US format. Staff worked to put all data into the same PAD\_US format and created one complete Chesapeake Bay Protected Lands shapefile for 2013. In an effort to ease data processing burdens on Bay Program staff, the actual GIS acres reported for this indicator is based on a conversion of parcel polygons to 5 meter grid (raster cells). This allows staff to add grid cells by ownership type and convert to acres, which saves a great deal of staff time because overlapping and potential duplicate records are eliminated in the polygon to raster conversion in GIS.

Tracking progress towards a conservation goal requires the ability to measure acres protected from one interval to the next. State and local protected lands databases are continuously updated to capture previously protected but unreported parcels. Including a date of protection in attribute data for each protected parcel – as outlined below under “Procedures for Moving Forward in Future Years” – will enable distinguishing between previously protected and newly protected parcels in the future.

It is worth noting that moving from a tabular reporting system to a GIS based system and the availability of more accurate geospatial data in 2011 compared to 2010 introduces some potential inconsistencies with prior tracking methods. These might include the following:

- Parcels’ reported acreages may be different than those calculated in GIS by the CBPO. A data provider may have a property that was not drawn to scale on the map, the acreage may have been estimated in the field rather than measured directly from parcel tax maps, or the original map projection of the data may have differed from that used by the CBPO. As a result, the CBPO GIS calculated acres may be slightly larger or smaller than what was originally reported or is actually on the ground.

- There are some cases where a small land trust or local government has simply either not digitized their protected parcels or not incorporated the data into any state or national layers; these would not be reflected in this dataset.
- Once all of the digital property boundaries were aggregated at the state level and put into one spatial dataset, there were a large number of overlapping areas. In order to gain an accurate count, boundaries had to be edited to remove overlapping areas. In most cases the overlapping areas were assigned to one of the two parcels resulting in differences between the reported acres and the calculated GIS acres.
- All acreage values reported in the CBPO protected lands dataset were derived in a GIS and may not reflect the same areas as measured in the field. In general, however, the CBPO dataset acreages are very close to those reported by the states.
- With the 2011/2012 data collection effort a new Chesapeake Bay Watershed boundary was developed from the 12-digit subwatershed polygons as released by Natural Resources Conservation Service. Hydrological Unit (HUC-12), this more refined watershed boundary is more detailed than the previous version used; as a result the total land area in each state has been slightly adjusted.
- One may notice that the total federally protected lands actually went down between prior assessments and the 2011/2012 data collection effort. This is due to the fact that in 2011 researchers were careful to only include lands that were protected from development and serve some sort of biological, ecological, or cultural resource function. Federal areas that were removed include some federal building footprints, reservoirs (water), or other development intensive properties that were not appropriate for a protected lands dataset. Researchers are in the process of creating/updating a federal facilities dataset to better keep track of all federal lands and of refining the criteria used to distinguish federal lands that also constitute “protected” lands. This distinction was not made in the 2008 effort, for example.

### **Procedures for Moving forward in Future Years:**

The next formal reporting relative to watershed-wide land protection goals is proposed for 2020,. This provides a roughly two year window from the 2018 effort.

In future years, it is anticipated that the LandScope Chesapeake web-based map platform will ideally replace a separate reporting process. However, in order to make the transition more seamless, partners will need to work together to standardize and clean up the datasets that will be feeding into the LandScope Chesapeake platform. NatureServe and the Chesapeake Bay Program are using the PAD\_US format as the

standard, with the addition of two attributes to standard requirements (a “Date Established” and whether or not the property is accessible to the public). More information on the PAD\_US format is available at [http://gapanalysis.usgs.gov/wp-content/uploads/2013/10/PADUS\\_Standards\\_Oct2013\\_USGSreview.pdf](http://gapanalysis.usgs.gov/wp-content/uploads/2013/10/PADUS_Standards_Oct2013_USGSreview.pdf). See the “Providing Data for LandScope” document for additional details on data standards, clean up instructions, and best practices.

## Appendix 3: State Protected Lands “Proposed” Data Standards and Best Practices

June 21, 2018

### Essential Protected Lands Data Standards and Best Practices Chesapeake Bay Program and Chesapeake Conservation Partnership

This document outlines best practices for developing and maintaining geospatial data related to protected lands. An accurate Chesapeake Bay watershed protected lands geospatial dataset is essential for tracking progress toward multiple Chesapeake Bay Watershed Agreement goals. It is also crucial for ensuring state and local governments and non-governmental organizations have accurate annual land protection data on which to base projections included in Bay TMDL Watershed Implementation Plans.

#### Background:

Since 2010 and every two years after, US Geological Survey staff in the Chesapeake Bay Program have undertaken a comprehensive data collection and aggregation process to create one complete GIS based dataset representing all of the permanently protected lands in the Chesapeake Bay watershed. Due to the multiplicity of entities actively protecting land this is no small undertaking. Data is aggregated from multiple Federal, State, and non-governmental organizations and the attribute tables are standardized to have consistent fields. More recent updates rely heavily on the Protected Areas Database (PAD\_US) and National Conservation Easement (NECD) databases and their advances in the coordination and standardization of protected areas and easement property datasets. However, the Chesapeake Bay Program still relies on obtaining data directly from jurisdictions and other authoritative data sources to supplement national datasets and ensure the most accurate and timely Chesapeake watershed dataset.

This document clarifies standards and best practices for data managers to improve geospatial data and facilitate comparison and aggregation of data from multiple sources. To reduce duplication of efforts, the Chesapeake Bay Program has *generally* adopted the PAD\_US standards that seek to define a common protocol for sharing authoritative protected areas data between agencies and organizations. This will ultimately result in a comprehensive and accurate dataset of protected areas for the United States to meet multiple needs at a variety of scales.

Recent developments have made the importance of accurate tracking even more evident. The Chesapeake Bay Program has moved toward crediting conservation and planning in the Bay TMDL.<sup>1</sup> To properly “account” for land conservation in the Bay TMDL context,

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<sup>1</sup> Land conservation can improve water quality by:

it is imperative that incoming geospatial land conservation data contain key attributes. Of particular importance: data must contain a **“Date of Protection”** field specifying the date the property was legally protected through fee acquisition or conservation easement. This allows CBP modelers and partners to determine an annual rate of land conservation that can be used to forecast the offset of future growth and development and thereby the pollution reduction of associated conserved lands. Further, it helps ensure the most accurate tracking of progress toward land protection goals.

### MINIMUM Required Chesapeake Bay Watershed Protected Lands Data

#### Attributes:

A list of the minimum required data attributes for each property included in GIS datasets within the Chesapeake Bay watershed follows. All fields are **required**. This represents a subset of the broader set of PAD\_US attributes. Completion of all recommended PAD\_US attributes is beneficial, but the list below represents the minimum standards for the Chesapeake Bay watershed. Additional details, examples and guidance on PAD\_US can be found at [PAD\\_US metadata](#) and in the [PAD\\_US Standards and Methods Manual](#).

**Category:** General category for the protection mechanism associated with the protected property.

<i>Code</i>	<i>Description</i>
Fee	The most common way real estate is owned.
Easement	A conservation easement creates a legally enforceable land preservation agreement between a landowner and government agency or qualified land protection organization (i.e. land trust).
Other	Other types of protection include mixed protection, leases, agreements or those over marine waters.
Unknown	There is a good degree of certainty the parcel is protected but the exact mechanism is unknown.

**Owner Type:** General land owner type *of the fee property interest*, standardized for the US.

<i>Code</i>	<i>Description</i>	<i>Comments</i>
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1. Using permanently protected lands as the most reliable substrate for installing, monitoring, and maintaining Best Management Practices (BMPs) (e.g., planting trees in the riparian zone);
2. Reducing the future conversion of land to more polluting land uses e.g., placing an easement on land that would otherwise be developed.
3. Soliciting restoration investments on conserved lands that are strategically located to intercept pollutants before they enter streams and waterways (e.g., precision conservation).

FED	Federal	Fee interest owned by federal agency.
TRIB	American Indian Lands	Fee interest owned by tribal government.
STAT	State	Fee interest owned by state agency.
DIST	Regional Agency Special District	Fee interest owned by regional agency or water district not bound by a specific jurisdiction.
LOC	Local Government	Fee interest owned by city, township or county agency.
NGO	Non-Governmental Organization	Fee interest owned by non-governmental organization such as land trust, conservancy etc.
PVT	Private	Fee interest privately held by individual or corporation; e.g. privately owned lands conserved through an easement held by another entity like a state or NGO.
JNT	Joint	Fee interest held by more than one type.
UNK	Unknown	Unknown owner.

**Owner Name:** Owner *of the fee interest* of the property, standardized for the nation.

<i>Code</i>	<i>Description</i>	<i>Code</i>	<i>Description</i>
0110	Bureau of Land Management (BLM)	0380	State Department of Transportation
0115	Bureau of Ocean Energy Management (BOEM)	0385	State Department of Mental Health
0125	Fish and Wildlife Service (FWS)	0390	State Department of Agriculture
0130	Forest Service (USFS)	0395	Other State Land
0135	Department of Defense (DOD)	0410	Regional Agency Land
0140	Department of Energy (DOE)	0420	Regional Water Districts
0145	National Park Service (NPS)	0510	City Land
0150	Natural Resources Conservation Service (NRCS)	0520	County Land
0155	Agricultural Research Service (ARS)	0610	Audubon Society
0160	Bureau of Indian Affairs (BIA)	0620	Land Trust
0165	National Oceanic and Atmospheric Administration (NOAA)	0630	The Nature Conservancy (TNC)
0170	Other Federal Land	0640	Ducks Unlimited
0220	Native American Land	0650	Private University
0310	State Park & Recreation	0655	Private Corporation

0315	State Department of Conservation	0660	Private Non-Profit
0320	State Land Board	0710	Private Landowner
0325	State Department of Environment	0720	Private Institution
0330	State Fish and Wildlife	0800	Joint Ownership
0335	State University	0810	Other Ownership
0340	State Department of Natural Resources	0910	Unknown
0360	State Coastal Reserve		
0365	State Natural Heritage Program		
0370	State Cultural Affairs		
0375	State Historical Society		

**Local Owner:** The *actual name of the owner of the fee interest* (spelled out, not abbreviated) to complement the standardized 'Owner Name' above. For example, if "State Fish and Wildlife" is the standardized 'Owner Name' "Pennsylvania Fish & Game Commission" would be a possible "Local Owner" name. Note: it is not necessary to identify the actual owner name for privately held properties; just use "Privately owned".

**Easement Holder Type:** Where the 'Category' of protection code (above) is listed as "Easement", this field must specify the type of holder of the easement, standardized as follow.

<i>Code</i>	<i>Description</i>	<i>Comments</i>
FED	Federal	Easement held by federal agency.
TRIB	American Indian Lands	Easement held by tribal government.
STAT	State	Easement held by state agency.
DIST	Regional Agency Special District	Easement held by regional agency or water district not bound by a specific jurisdiction.
LOC	Local Government	Easement held by city, township or county agency.
NGO	Non-Governmental Organization	Easement held by non-governmental organization such as land trust, conservancy etc.
PVT	Private	Easement privately held by individual or corporation (unlikely)
JNT	Joint	Easement held by more than one type.
UNK	Unknown	Unknown owner.

**Easement Holder:** Where the 'Category' of protection code (above) is listed as "Easement", this field must indicate the *actual name of the holder of the conservation easement* (spelled out, not abbreviated). For example, Virginia Outdoors Foundation, Eastern Shore Land Conservancy, etc.

**Unit Name:** The name of the land management unit or protected area standardized to Proper Case with acronyms spelled out (e.g. Shenandoah National Park not NP). This means the management unit with which the property is affiliated or managed. For example: Tuckahoe State Park, Bald Eagle State Forest, Pyfer Nature Preserve. Note: some private lands under conservation easement may not be associated with any formally named land management unit.

**State Name:** Name of state spelled out in Proper Case.

**Aggregator source:** Organization, aggregated database name and contact name credited with data aggregation. Attributed in the format 'organization name\_filenameYearPublished.filetype' (e.g. TNC\_SecuredAreas2008.shp).

**GIS Source:** The original source of GIS spatial and attribute information the aggregator obtained (e.g. WYG&F\_whmas08.shp) for each record. Preferably, this should reference the authoritative data provided by the land manager. Files names should match original source data to facilitate future updates.

**GIS Source Date:** The date (yyyy/mm/dd) GIS data was obtained by the data source for aggregation. If month or day is unknown, use 00. This date represents the best available data the GIS source has to support management and decision making at the time.

**GIS Acres:** Acres calculated for each polygon converted from the Shape\_Area Field.

**Date of Protection:** The year (yyyy) the property was legally protected via fee acquisition or enactment of a conservation easement.

**Source Protected Area ID:** A unique identifier available from the aggregator's data that differentiates each parcel within a protected area (or the protected area if parcel are unavailable).

**Access:** Accessibility of the property to the public, standardized

<i>Code</i>	<i>Description</i>
OA	Open Access
RA	Restricted Access
XA	Closed
UK	Unknown