

## Request for Proposals (RFP)

### Project Title: Contractor Support in the Development of Landscape Characterization and Monitoring in the Chesapeake Bay Watershed

Issued by: Chesapeake Conservancy

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Proposal Due Date: July 9, 2024

Point of Contact: Emily Beach

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#### 1. INTRODUCTION AND BACKGROUND

Chesapeake Conservancy (“The Conservancy”) is a 501(c) (3) organization based in Annapolis, MD. The mission of The Conservancy is “to conserve and restore the natural and cultural resources of the Chesapeake Bay watershed for the enjoyment, education, and inspiration of this and future generations. We serve as a catalyst for change, advancing strong public and private partnerships, developing and using new technology, and empowering environmental stewardship.”

Chesapeake Conservancy’s Conservation Innovation Center (CIC) was established in 2013 to use cutting-edge technology to empower data-driven conservation and restoration. The Conservancy’s CIC is preparing a response to the US Environmental Agency’s (EPA) Notice of Funding Opportunity (NOFO) [EPA-R3-CBP-24-01 titled “Landscape Characterization and Monitoring in the Chesapeake Bay Watershed.”](#) If funded, the Conservancy will secure a five year agreement with the US EPA to provide geospatial support to the Chesapeake Bay Program (CBP).

The CBP was founded in 1983 to guide the restoration of the Chesapeake Bay and its watershed and is a partnership of federal, state and local agencies; academic institutions and non- governmental organizations. It is guided by the [2014 Chesapeake Bay Watershed Agreement](#), which lays out 10 goals to advance the restoration and protection of the Bay watershed. Progress towards the CBP goals are facilitated by six Goal Implementation Teams (GITs): [Sustainable Fisheries](#), [Water Quality](#), [Fostering Chesapeake Stewardship](#), [Habitat](#), [Maintain Healthy Watersheds](#), and [Enhance Partnering, Leadership and Management](#); including workgroups and action teams, such as the [Land Use Workgroup](#) (LUWG).

The CBP is interested in identifying ways to coordinate work to develop decision support systems that integrate needs, data and priorities across the program’s multiple goals. The next step in this process is updated high resolution land use land cover data, enhanced river corridor data, and landscape metrics and communication products associated with these data to facilitate their application to CBP outcomes and the CBP’s Phase 7 suite of modeling tools.

Applicants can provide proposals for all activities or only portions.

## 2. DESCRIPTION OF SERVICES REQUESTED:

Applicants may apply for any or all of the activities or components within specific enumerated activities. Be sure to specify in your proposal and detailed budget which subtasks you are including in your proposed scope of work.

The selected contractor(s) will provide support for the following activities.

### **Activity 1: High-Resolution Land Cover Characterization and Monitoring**

This Activity seeks to support the CBP with a database of consistent land cover and change data to support land use/land cover characterization and other monitoring efforts. Previously, EPA has invested in the production of 1-meter land cover data for 2013/14, 2017/18, and 2021/22, as well as change products between those time periods for the entire Chesapeake watershed region. Additionally, they have made investments in similar land cover products for all of EPA Region 3 for 2021/22. These data were developed using object-based detection methods on NAIP imagery, combined with LiDAR-derived elevation data (i.e. DEMs and DSMs) and other ancillary data (e.g. local planimetrics).

To support consistent, scalable, and repeatable methods for updating land cover data across time, CIC and CBP would like to shift towards an AI-driven methodology for classifying land cover and detecting land cover change. These methods should use deep-learning architectures that can ingest multiple remote sensing datasets, and take advantage of the two-dimensional context of these data. In support of this effort, CIC is seeking contractual support for the following elements:

1. Developing automated routines for the production of high spatial-resolution land cover datasets for the Chesapeake Bay region for the years 2025/26, and retrospective updates for datasets representing 2013/14, 2017/18, and 2021/22.
  - a. These data should include at minimum the following nine classes, but may include additional classes: water, barren, herbaceous, shrubland, tree canopy, roads, structures, other impervious surfaces, and tree canopy over impervious. Definitions for these classes should align with current CBP 1-meter land cover data, or will require approval from LUWG for changes to these definitions.
  - b. These data should be developed with a 1-meter or sub-meter spatial resolution, based on NAIP imagery from USDA. Other imagery sources may be considered, if the contractor has strong reasoning for utilizing a different product. Classification decisions should be supplemented with information from best available LiDAR derived elevation products (i.e. Digital Elevation Models and Digital Surface Models), ortho-imagery, and other ancillary layers (e.g. local planimetric data).
  - c. These data should cover a geographic range that includes the entire Chesapeake Bay region. To date, this has included 205 counties/independent cities that are within, intersecting, or adjacent to the Chesapeake Bay watershed (CBW). This range is required for any proposals.
    - i. The CIC is interested in proposals that include an additional estimate for expanding coverage to additional counties in Pennsylvania, Virginia, and West Virginia. This expansion ensures comprehensive coverage of the EPA Region 3 geography, in addition to the Chesapeake Bay Watershed geography.
  - d. These data should be provided in cloud-optimized formats to allow for ease of use in cloud-based processing environments. The contractor will be expected to coordinate with CIC and the CBPO Data Center to ensure transferability.
  - e. The final data package should include the final land cover classification raster and imagery segmentation aligned with the classification that can be used as input for land use/land cover

- data production. This data should be developed in collaboration with CIC staff to ensure usability for work described in Activity 3 of the original EPA NOFO.
2. Performing manual inspection and correction of high spatial-resolution land cover datasets for the Chesapeake Bay region for the years 2025/26, and retrospective updates for datasets representing 2013/14, 2017/18, and 2021/22.
    - a. This may include corrections identified by the contractor, corrections asked for by the CIC during QAQC checks, or due to feedback from stakeholders.
  3. Developing and performing a state- and class-stratified accuracy assessment of land cover data for 2025/26, including an accuracy assessment report documenting the findings.
    - a. The aforementioned data should have class accuracies for tree canopy and total impervious cover that equal or exceed 95%, and other individual class accuracies that equal or exceed 85%.
  4. Supporting the development of land cover change data from 2021/22 to 2025/26 with consistent bias compared to land cover changes mapped for 2013/14 to 2017/18 to 2021/22.
    - a. CIC intends to lead method development for identifying land cover change, in coordination with efforts listed in Activity 2 and 3 of the original EPA NOFO. The contractor will be expected to assist with the generation of change training data using the provided land cover products. This will include a quality assurance process guiding generation of these training data from areas of high land cover classification confidence.
  5. Performing a state-and class-stratified accuracy assessment of land cover change from 2021/22 to 2025/26 for all change class combinations composing up to 95% of observed change
    - a. CIC intends to develop the methods for the accuracy assessment, but anticipated needing reviewers to support the data assessment.
  6. Supporting the development and implementation of a comprehensive Quality Assurance and Quality Control (QAQC) process that outlines procedures, standards, and criteria for data development to assure accuracy, consistency, completeness, and reliability of the land cover data products.
    - a. This will include workflows for identifying, documenting, and in some cases resolving discrepancies, anomalies, or errors within the land cover data. It will also include workflows for re-verifying any corrections applied to previously produced land cover data.
  7. Providing comprehensive written components for project documentation and progress reporting.
    - a. Will include a written report on final methodology and areas for improvement.

### ***Activity 1: High-Resolution Land Cover Characterization and Monitoring: Anticipated Deliverables***

- Land cover raster data for 4 time periods (GeoTIFF)
- Land cover segmentation data for 4 time periods (GeoJSON, FGDB, etc.)
- Accuracy Assessment for 2025/26 land cover data (Word Document)
- Accuracy Assessment for land cover change from 2021/22-2025/26 (Word Document, review points, scoring data table)
- Final report outlining methodologies, areas for improvement and other final reporting requirements and up to 10 semi-annual progress reports (Word Document)

### **Activity 2: Hyper-Temporal Spectral Indices**

This Activity seeks to support CBP with a database of hyper-temporal spectral indices (esp. vegetative and moisture related information) and change analyses that can be used to enhance other land characterization and monitoring efforts. In support of this effort, CIC is seeking contractual support for the following elements:

1. Develop and perform routines for generating a spatially- and temporally-referenced database of

analysis-ready hyper-temporal spectral indices.

- a. The exact list of indices to be generated will be determined in the first six months of the project. The potential list of indices includes, but is not limited to: NDVI, NDMI, Tasseled Cap Wetness, and Radar Backscatter. Additional suggestions for indices welcome.
  - b. These indices should be derived from Landsat, Sentinel 1 & 2, and upcoming NISAR imagery, though other imagery recommendations are welcome.
  - c. These indices should be generated for imagery from the years 1985-2028 and be computed for monthly, bimonthly, seasonal, and annual periods.
  - d. Output data should be filtered to reduce “noise” across space and time to prepare the data for further change analyses and use within other projects. The algorithms for detecting and filtering these data should be developed using open-source methods and will be shared with CBPO staff.
  - e. Output data should be cloud-optimized and will be transferable as needed with guidance from the CBPO Data Center and Land Data Team.
  - f. Workflows developed for producing this database should include code for updating the database as new imagery becomes available, developed and documented with the intention of sharing with CBPO staff for use within cloud-based computing environments.
2. Collaborate on the development of algorithms to quantify spatial/temporal trends and detect changes in spectral indices over time (e.g., code base, environment files, documentation).
    - a. The contractor and CIC will each develop algorithms for detecting changes in indices time series corresponding to shifts in land use and environmental conditions. The contractor will coordinate with CIC to discuss methods and delegate approaches to be developed by each party.
    - b. The contractor and CIC will each develop algorithms for characterizing temporal trends in indices time series that can be used to classify land use histories. The contractor will coordinate with CIC to discuss methods and delegate approaches to be developed by each party.
  3. Supporting the development and implementation of a comprehensive Quality Assurance and Quality Control (QAQC) process that outlines procedures, standards, and criteria for data development to assure accuracy, consistency, completeness, and reliability of the indices database.
  4. Providing comprehensive written components for project documentation and progress reporting.
    - a. Will include a written report on final methodology and areas for improvement.

### ***Activity 2: Hyper-Temporal Spectral Indices: Anticipated Deliverables***

- Cloud-optimized database of raster datasets including computed monthly, bimonthly, seasonal, and annual spectral indices (e.g., NDVI, NDMI, and others) (GeoPackage, COG, STAC, .netCDF, etc.)
- Code and associated documentation for producing, updating, and filtering spectral indices (GitHub repository with cleanly commented source code, and YAML, text, or docker configuration files)
- Code and associated documentation for detecting changes in and quantifying spatial/temporal trends within spectral indices (GitHub repository with cleanly commented source code, and YAML, text, or docker configuration files)
- Final report outlining methodologies, areas for improvement and other final reporting requirements and up to 10 semi-annual progress reports (Word Document)

### **Activity 3: High-Resolution Land Use Characterization, Monitoring, and BMP Verification**

This Activity seeks to provide support to CBP by characterizing land use/land cover (LULC), assessing change over time, and using this information to support land management and monitoring. An element of this work is to support the monitoring of ongoing management strategies, especially structural and land cover-related best management practices, such as detection ponds, manure storage areas, grass buffers, forest buffers, cover crops, conservation tillage, and stream restoration. Leveraging machine learning and manual interpretation on high-resolution imagery, LiDAR, and other ancillary data to identify where practices exist on the landscape

supports not just monitoring efforts, but also provides valuable feedback for new implementation planning.

In support of this effort, CIC is seeking contractual support for the following elements:

1. Collaborate on the development/implementation of methods for identifying the presence/absence of structural and/or land cover Best Management Practices (BMPs).
  - a. CIC would like proposals for specific BMPs that a contractor is interested in mapping or supporting the development of methodologies for. Please itemize each BMP separately if considering more than one.
2. Support the development and implementation of a comprehensive Quality Assurance and Quality Control (QAQC) process that outlines procedures, standards, and criteria for data development to assure accuracy, consistency, completeness, and reliability of BMP data.
3. Providing comprehensive written components for project documentation and progress reporting.
  - a. Will include a written report on final methodology and areas for improvement.

**Activity 3: High-Resolution Land Use Characterization, Monitoring, and BMP Verification: Anticipated Deliverables**

- Spatial footprints of BMP implementation (GeoJSON, FGDB, etc.)
- Code and associated documentation for producing BMP implementation data (GitHub repository with cleanly commented source code, and YAML, text, or docker configuration files)
- Final report outlining methodologies, areas for improvement and other final reporting requirements and up to 10 semi-annual progress reports (Word Document)

**3. ESTIMATED BUDGET**

The Conservancy expects to have a role in each activity, in addition to the project roles listed above. Use the complete description of each activity and estimated funding breakdowns provided by EPA in the original NOFO as a guide when determining your budget needs compared to the full project budget.

Activity	Estimated Funding Per Year	Total Estimated Funding for Five Years
Activity 1: High-Resolution Land Cover Characterization and Monitoring	\$500,000	\$2,500,000
Activity 2: Hyper-Temporal Spectral Indices	\$100,000	\$500,000
Activity 3: High-Resolution Land Use Characterization, Monitoring, and BMP verification	\$500,000	\$2,500,000
Activity 4: Stream Corridor Characterization	\$200,000	\$1,000,000
<b>TOTAL</b>	<b>\$1,300,000</b>	<b>\$6,500,000</b>

#### 4. PROPOSAL REQUIREMENTS:

Proposals should include the following sections:

- a) Executive Summary:
  - Overview of the contractor's qualifications and understanding of the project.
- b) Technical Approach:
  - Detailed methodology for data collection, analysis, and tool development.
  - Description of the statistical modeling approach.
  - Outline of the project management plan, including timelines and milestones.
  - Description and example of previous coded workflows that have been packaged for sharing/transfer (e.g. Git repositories with clean, commented code and documentation).
- c) Qualifications and Experience:
  - Relevant experience in ecological modeling, remote sensing, and GIS.
  - Examples of similar projects completed.
- d) Personnel:
  - Key personnel who will be involved in the project, including their qualifications and roles.
- e) Budget:
  - Detailed budget breakdown, including labor, materials, and other direct costs for each year over the entire 5-year project lifecycle aligned with work effort.
  - Justification for each budget item.
  - Please provide the budget numbers in a separate PDF at the time of submission to serve as the sealed bid.
- f) References:
  - Contact information for at least three references from similar projects.
- g) Disclose any subcontractors who would be used in the completion of the contract.
- h) Certify that the applicant and any subcontractors included in the bid, that neither it nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this Contract by any federal department or agency.
- i) There is a preference for goods and services that are energy efficient, conserve natural resources, and/or protect the environment.

#### 5. EVALUATION CRITERIA:

Proposals will be evaluated based on the following criteria:

- Technical approach and methodology (40%)
- Contractor's qualifications and experience (30%)
- Project management plan and timelines (20%)
- Budget and cost-effectiveness (10%)

#### 6. SUBMISSION INSTRUCTIONS:

Proposals must be submitted electronically with costs provided in a separate file, in PDF format to [ebeach@chesapeakeconservancy.org](mailto:ebeach@chesapeakeconservancy.org) by July 9, 2024, 4:59 PM ET. Late submissions will not be considered.

#### 7. QUESTIONS AND CLARIFICATIONS:

Questions regarding this RFP should be submitted in writing to [ebeach@chesapeakeconservancy.org](mailto:ebeach@chesapeakeconservancy.org) by June 28, 2024. Responses will be provided to all interested parties.

#### 8. CONTRACT AWARD:

Chesapeake Conservancy reserves the right to award the contract to the most qualified contractor based on the evaluation criteria. The award decision will be made by July 15, 2024. The anticipated start date for the project is

October 1, 2024 and will not exceed five years.

#### **9. CONTRACT TERMS AND CONDITIONS:**

This will be a federal funded agreement and as such certain requirements will flow to the contractors. Below is a list of key requirements that will be included in the contract.

- The contract shall contain a provision, as applicable, to comply with all regulations under the Clean Air Act (42 U.S.C. § 7401 et seq.) and the Federal Water Pollution Control Act (Clean Water Act) (33U.S.C. § 1251 et seq.), and Executive Order 11738, Providing for Administration of the Clean Air Act and the Federal Water Pollution Control Act With Respect to Federal Contracts, Grants, or Loans.
- The contract shall contain a provision complying with the Byrd Anti-lobbying Act. The contractor must certify that no lobbying has been done with federal funds and disclose any lobbying activities engaged in with non-federal funds.
- Compliance with certification requirements under 15 CFR Part 28, "New Restrictions on Lobbying." Each bidder under this Contract or subcontract is generally prohibited from using federal funds for lobbying the Executive or Legislative Branches of the Federal Government in connection with this EDA Award. The contractors and subcontractors will be required to continue certification each calendar quarter.