



DoD CHESAPEAKE BAY PROGRAM JOURNAL

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PROTECTING THE CHESAPEAKE BAY FOR MILITARY READINESS, FOR OUR COMMUNITY, FOR FUTURE GENERATIONS

**CLEARED
For Open Publication**

Fort A.P. Hill Participates in Student Outreach Event

By Olivia Mills, Fort A.P. Hill

Jan 06, 2022

The Fort A.P. Hill Environmental and Natural Resources Division (ENRD) joined the Virginia Department of Wildlife Resources and Friends of the Rappahannock on 5-6 October 2021 to educate students on ecosystem conservation during the Caroline County High School’s environmental science field trip. During the two-day event, 125 students gathered at the Hick’s Landing boat ramp along the Rappahannock River to learn about water quality and natural resource conservation.

During the event, the installation’s ENRD personnel hosted a “Wetland Station” where staff explained how to identify wetland ecosystems by analyzing soil profiles, discussed wetland vegetation and hydrology, and communicated the relationship dynamics between wetlands and the Rappahannock River as well as the Chesapeake Bay.

Installation personnel also led a hands-on wetland identification exercise for the students. Staff helped students collect soil profiles using soil augers so they could compare the differences between upland and wetland soils. Students were also guided along the wetland edge and taught how to identify wetland trees, shrubs, and grasses. Following these activities, staff encouraged students to complete a worksheet with wetland identification and Chesapeake Bay questions.

Through education and hands-on experiences, Fort A.P. Hill staff demonstrated to the students the relationship between local wetlands and the larger Rappahannock River and Chesapeake Bay watersheds, supporting the education goal of Executive Order (EO) 13508, Protecting and Restoring the Chesapeake Bay Watershed. This field trip also granted Caroline County High School students the opportunity to learn about wildlife, preservation, and healthy ecosystems through this partnership between Fort A. P. Hill’s ENRD, the Virginia Department of Wildlife Resources, and Friends of the Rappahannock.

The Department of Defense (DoD) Chesapeake Bay Program (CBP) is proud to highlight Fort A.P. Hill and other outreach and stewardship successes at other installations in this Journal issue.



Caroline County High School students visited Hick’s Landing to learn about environmental conservation during a field trip.

IMAGE BY CHRISTOPHER M. HALL, U.S. ARMY.

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Commander’s Corner: Draft Water Quality & Climate Milestones

By Gabrielle Bryson, Brown and Caldwell

Every two years, the DoD CBP is required by the US Environmental Protection Agency (EPA) to develop programmatic and numeric water quality milestones that set short-term, interim goals incrementally moving toward achieving the Chesapeake Bay water quality targets. The draft Fiscal Year (FY) 2022-2023 milestones established by the DoD CBP include a subset of climate-focused metrics (climate milestones) to mitigate climate impacts on best management practice (BMP) performance. Integrating climate-related objectives into the programmatic water quality milestones was catalyzed by initiatives set by the Chesapeake Bay Program Partnership (Partnership), its newly signed Climate Directive, the climate goals in EO 13508 (“Protecting and Restoring the Chesapeake Bay Watershed”), and EO 14008 (“Tackling the Climate Crisis at Home and Abroad”).

In September 2021, the DoD completed its *Climate Adaption Plan (CAP)*¹ in accordance with EO 14008. This plan established a Climate Adaption Strategic Framework for DoD, consisting of four “Climate Adaption Enablers” (enablers) and five “Lines of Effort” (LOEs). The goal of the CAP is to support DoD operations under changing climate conditions, preserve mission readiness, and enhance natural and engineered systems which provide resilience. All of the draft DoD climate milestones were designed to align with these enablers and LOEs. Table 1 outlines the climate-related 2022-2023 programmatic milestones and their connections to the DoD CAP.

Table 1. Draft DoD CBP 2022-2023 climate milestones and connections to the DoD CAP

Draft DoD CBP Programmatic Climate Milestone	Connections to DoD CAP
Report on Readiness and Environmental Protection Integration (REPI) program and REPI Challenge projects that include climate resilience co-benefits. For reference, the REPI program partners with public and private entities to carry out conservation and natural resource projects that increase climate resilience at installations.	This milestone aligns with the DoD CAP’s “Resilient Built and Natural Infrastructure” LOE3 and its designated “Aligning incentives to reward innovation” enabler. The DoD intends to report on the efforts of defense communities working with private sector partners to enhance management of natural assets that provide water quality and climate resilience co-benefits.
Provide a tally of dollars spent and a list of BMP types implemented that provide climate resilience co-benefits.	This milestone aligns with LOE3. By evaluating DoD funds invested in the implementation and maintenance of built and natural infrastructure that provide climate resilience, DoD can quantify its contributions towards resilience goals and document the wise use of taxpayer dollars to meet multiple installation objectives.
Report on the number and percentage of installations that have updated their Integrated Natural Resource Management Plans (INRMPs) to address climate change.	This milestone aligns with LOE3. Considering how climate will affect existing and future natural and nature-based water quality BMPs provides the foundation for mitigation actions that can ensure sustainment of their function and value over time.
Report on the incorporation of climate resilience themes into existing DoD CBP outreach materials, such as Quarterly Journal articles, fact sheets, and the Annual Progress Report.	Publications and outreach materials on topics related to climate resilience support the DoD CAP’s “Climate literacy” enabler and supports a workforce that is prepared to fully engage in climate resilience activities.
Report on the number and percent of major installations with a DoD Climate Assessment Tool (DCAT) vulnerability assessment.	This milestone aligns with LOE1, “Climate-Informed Decision Making”. A multi-faceted risk assessment of current and future BMPs and locations provides critical information in the planning and design of climate mitigation strategies.
Report on collaborative efforts of significance that enhance resilience. Examples include the Virginia Coastal Resilience Master Planning Framework, Strategic Environmental Research and Development Programs, and the Chesapeake Bay Foundation’s Billion Oysters for the Bay.	This milestone aligns with LOE5, “Enhance Adaptation and Resilience Through Collaboration”, by highlighting efforts that leverage interagency, intergovernmental, and community partnerships to address climate impacts and their effects on BMP performance.

Climate resilience is a shared local, state, and federal priority. Installation Commanding Officers should be aware of DoD initiatives and metrics that demonstrate DoD efforts to comply with Partnership goals while also being able to communicate steps taken to meet DoD EOs and its CAP. REPI, INRMP, BMP, and climate resilience projects can be used to achieve multiple goals related to encroachment, land conservation, natural resources, water quality, and climate resilience priorities. Talk to your environmental staff about projects that can contribute to these milestones and how to prioritize those that meet multiple objectives. For more information about previous Chesapeake Bay restoration federal milestones, visit <https://federalleadership.chesapeakebay.net/>.

¹ Access the DoD CAP at: <https://media.defense.gov/2021/Oct/07/2002869699/-1/-1/0/DEPARTMENT-OF-DEFENSE-CLIMATE-ADAPTATION-PLAN-2.PDF>

Success Story: Stewardship and Resilience Initiatives at Fort Belvoir

By Tomás Nocera, Natural Resource Specialist for Fort Belvoir

The Environmental Division at Fort Belvoir promotes environmental stewardship through public involvement in outreach events each year. This fall, Fort Belvoir partnered with Clean Virginia Waterways for their International Coastal Cleanup and obtained a grant from the National Environmental Education Foundation (NEEF) for National Public Lands Day. These events built on past efforts by restoring a wildflower meadow, cleaning areas along the Chesapeake Bay, and promoting climate change awareness. In addition to public involvement initiatives, the installation is also preparing climate threat mitigation strategies using DoD resources and community engagement.

National Public Lands Day

Wrapped in invasive vines, shrubs, and grasses, an old pollinator meadow and swale had long suffered from neglect. With the help of environmental stewards and volunteers, Conservation Branch staff at Fort Belvoir restored and converted 1,500 square feet of the swale and field into a native pollinator garden and stream meadow with the goal of providing pollinating insects and other wildlife with food, cover, and resources throughout the year. While many seeds and potted plants have just begun their establishment periods, this location has already become popular for wildlife viewing.

International Coastal Cleanup

With twelve miles of shoreline which receive the outflows from three watersheds comprising much of Fairfax County, Fort Belvoir's wetlands unfortunately collect trash from a wide range of upstream sources. To help combat pollution and make our coast cleaner and healthier, Fort Belvoir conducted its Clean the Bay initiative as part of the broader International Coastal Cleanup. In 2021, the installation brought together Department of Public Works Conservation and Child Development Center staff to help remove 20 bags and approximately 200 pounds of trash. Not only do these events serve to encourage people to take care of the places they work and live, but by recording and reporting over 1,000 individual pieces of trash, the data they generate is added to the work of others to document and take action to address the types and sources of litter found in the Chesapeake Bay. These installation events are a powerful tool to engage groups interested in preventing litter, keeping their watersheds healthy, and building a strong stewardship ethic consistent with EO 13508.

Climate Change and Installation Resilience

Recent climate change initiatives within the Army have allowed Fort Belvoir to utilize the Army Climate Assessment Tool to identify the installation's greatest



Volunteers help collect trash from Fort Belvoir's wetlands during the installation's Clean the Bay Day initiative.

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climate hazards or threats. With this information, the Environmental Division is adapting the installation’s INRMP to focus on mitigation efforts, which improve resilience when possible, and to share this information at public events, including meetings with the Fairfax County, Virginia Board of Supervisors. These objectives have been accomplished by:

- Gradually outlining climate vulnerabilities
- Assessing risks to target natural resources, such as threatened and endangered species and wetland habitats
- Developing written documents for resilience measures that address the installation’s greatest exposures (i.e., drought, heat, sea level rise) with reference to the Climate Adaptation for DoD Natural Resource Managers guide².

Furthermore, Fort Belvoir’s Environmental Division Chief is now an active participant with Resilient Fairfax, a local community group pushing to advance resilience among local and federal governments and private entities. Fort Belvoir is also working with the Northern Virginia Regional Commission with assistance from Office of Local Defense Community Cooperation grants to plan projects that help both the local community and the installation meet government-directed energy saving actions, mitigate flooding, and reduce shoreline erosion. These initiatives prioritize requirements related to tackling climate change and improve Fort Belvoir and the surrounding community’s resilience.

Looking Forward

Fort Belvoir is taking positive steps to restore the Chesapeake Bay through efforts dedicated to monitoring its tributaries and wetlands for waste, and pushing for a cleaner, healthier, and more resilient installation. The installation’s leadership values outreach and environmental stewardship and will continue to act on these core values by looking for ways to incorporate new BMPs, install green roofs, and find sources of cleaner energy.

Success Story: NNSY Participates in National Public Lands Day

Adapted from a Defense Visual Information Distribution Service (DVIDS) article by Jason Scarborough, NNSY

On 25 September 2021 NNSY’s Natural Resources Program office and volunteers participated in NEEF’s National Public Lands Day by planting native trees at the Craddock Little League Fields. Established in 1994 and held annually, National Public Lands Day is the nation’s largest single-day volunteer event for public lands. This was NNSY’s first year participating in this program, and the installation’s Natural Resource Program was recognized for their commitment to the workforce, their community, and the environment with the NEEF’s National Public Lands Day DoD Award. Tree planting efforts, like this one, promote environmental stewardship, improve air quality, store and reduce excess carbon, stabilize soils, provide shade, and increase native biodiversity.

More information about National Public Lands Day and NNSY’s involvement is available from DVIDS at:

<https://www.dvidshub.net/news/408418/nnsy-demonstrates-environmental-stewardship-commemoration-national-public-lands-day>.



Y DANIEL DeANGELIS, NNSY.

Volunteers gather for NNSY’s National Public Lands Day.

² Access the Climate Adaption for DoD Natural Resource Managers guide at: <https://toolkit.climate.gov/tool/climate-adaptation-dod-natural-resource-managers#:~:text=Climate%20Adaptation%20for%20DoD%20Natural%20Resource%20Managers%20was,prepare%20for%20and%20reduce%20climate-related%20vulnerabilities%20and%20risks>



Incorporating Climate Resilience in Stormwater Design

By Gabrielle Bryson, Brown and Caldwell

The impacts of climate change in the Chesapeake Bay watershed include increasing tidal flooding, rising groundwater tables, greater recurrence and severity of rainstorms, and longer, more intense heat waves. These changing conditions are not reflected in many current design standards for stormwater infrastructure and BMPs, which were developed using historical precipitation data. Therefore, existing infrastructure and BMPs may be at a higher risk of reduced performance or failure affecting DoD operations and mission under future climate conditions. For many common stormwater BMPs, failure may also result in loss of Chesapeake Bay total maximum daily load (TMDL) credit and affect municipal separate storm sewer system (MS4) permit compliance.

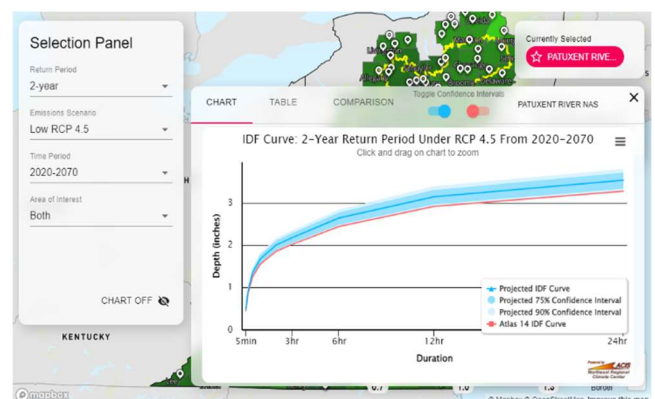
The Partnership's Urban Stormwater and Climate Resilience Workgroups (Workgroups) held a joint meeting on 18-19 October 2021, which included discussion on climate change impacts. This article will review some principles and resources for climate resilient planning presented at the meeting that can be applied at DoD installations. Recommendations include using revised design standards, building multiple layers of defense into the stormwater system, and integrating natural system projects into a comprehensive stormwater management approach. These strategies also align with the September 2021 DoD Climate Adaption Plan (linked in the footnote on page 2).

Updating Design Standards through Intensity-Duration-Frequency (IDF) Curves³

In 2021, the Mid-Atlantic Regional Integrated Sciences and Assessments (MARISA) team released an online Projected IDF Curve Data Tool for the Chesapeake Bay watershed and Virginia (access the tool at <https://midatlantic-idf.rcc-acis.org/>), which provides change factors that can be applied to historical Atlas 14 IDF curves at the county level and projected IDF curves for select U.S. Geological Survey (USGS) stations. Using these change factors or projected IDF curves in stormwater infrastructure and BMP design increases a BMP's ability to withstand future climate conditions since these values are based on climate projections that account for future precipitation conditions.

At each USGS station, the tool provides projections for different Representative Concentration Pathways (RCPs)⁴, along with the 75% and 90% confidence intervals of the tool's median IDF curve to demonstrate the potential variability in precipitation projections. Selecting the median curve values may not protect your design from worse-than-expected future conditions, but selecting the highest value within the 90% confidence interval is not always economically feasible or realistic. Determining which IDF values to use should be a function of local conditions (e.g., impervious surface cover and proximity to the coast) and a risk assessment (e.g., what needs to be protected and the relative vulnerability). Some regional entities, like the Hampton Roads Planning District Commission (HRPDC), have developed additional guidance (such as curve multipliers) for local practitioners on how to use data from the tool (see callout box on the right).

Consulting precipitation data from the tool can be useful during the BMP planning stages. If installations would like to use data from this tool for BMP design calculations, they should also consult with their subject matter experts to evaluate asset risks and determine the appropriate RCP and associated precipitation values to use.



The Projected IDF Curve Data Tool values for St. Mary's County, MD.

IDF Curve Multipliers for the Localities in Hampton Roads, Virginia

As part of their effort to establish stormwater design standards that account for climate change, HRPDC is developing IDF curve multipliers with data from the Projected IDF Curve Data Tool for each locality in the Hampton Roads region. HRPDC used impervious cover as a proxy for each locality's ability to absorb rainfall, as well as precipitation data from the tool, to define the multipliers.

These multipliers are incorporated in HRPDC's draft proposed design standards. If approved, installations in the region can apply these multipliers to the historical Atlas 14 IDF curves. The multipliers are included in Ben McFarlane's presentation from the Workgroup meeting (https://www.chesapeakebay.net/channel_files/42054/2021-10-19_hrpdc_resilient_design_guidelines.pdf).

SCREENSHOT FROM THE MARISA'S PROJECTED IDF CURVE DATA TOOL

³ This section utilizes information presented by Michelle Miro and Ben MacFarlane during the Workgroups meeting.

⁴ RCPs represent the predicted climate conditions resulting from different carbon emission scenarios.



Incorporating Climate Principles in BMP Selection⁵

Addressing climate impacts can be accomplished through more than just adjusting rainfall (hydrologic) design parameters for BMPs and other stormwater infrastructure. Installations can also increase the storage capacity of individual structures and integrate redundancy into the installation's stormwater system to minimize or prevent stormwater bypass or overflow. Creating redundancy is accomplished by selecting the right combination of interventions to provide multiple layers of protection in the event that one element fails. The following are examples of how climate resilience principles can be incorporated into existing BMP selection and stormwater practices.

Install structures or BMPs for stormwater infiltration, detention, and storage. BMPs that store stormwater, especially in flood-prone areas, increase the installation's retention and infiltration capacity, potentially reducing the frequency and severity of flooding at the site. Examples include bioretention cells, tree planting, constructed wetlands, dry ponds, and vegetated swales. These BMPs also provide some water quality improvement with climate-resilient vegetated practices reducing pollutant loads most significantly.

Protect flood-prone or low elevation areas. Coastal regions, floodplains, and low-lying areas have a higher flood risk. To protect these vulnerable areas, especially when mission-critical facilities are present, installations must first identify at-risk locations. Installations can identify the locations of BMPs most at risk of tidal or stormwater flooding using DoD tools such as the DCAT or the Flood Inundation Storm Hazard (a.k.a. FISH) tool. A fact sheet on these climate tools is available on DENIX (<https://authoring.denix.osd.mil/chesapeake/dod-cbp-chesapeake-bay-action-team-cbat/training-and-guidance-documents/fact-sheets/>). Depending on the level of the flood risk, green infrastructure or traditional grey infrastructure improvements may be needed to intercept or divert stormwater from the area.

Establish routine practices to keep stormwater inlets and structures clear of debris and functioning. Regular maintenance and cleaning of catch basins, storm drains, and ditches prevent blockages that could restrict stormwater flow and lead to flooding. Keeping trash, landscaping debris, and other materials out of the stormwater system also improves the water quality of receiving waters. Hosting stewardship events, such as Clean the Base Day, can encourage clean-up efforts and community engagement at installations. Installations can also receive TMDL credit through practices such as storm drain cleaning and street sweeping. Routine maintenance of stormwater BMPs is important to ensure continued performance, TMDL credit, and MS4 permit compliance (if applicable).

Restoring and conserving natural systems. Practices such as stream, shoreline, and wetland restoration, riparian buffer creation, and land conservation also add to an installation's climate resilience. Restoring, rehabilitating, or conserving natural systems can buffer installations from the impacts of climate change, provide numerous co-benefits for habitat and wildlife, and improve water quality. Natural resources projects may be eligible for TMDL credit, may help meet MS4 permit requirements, can contribute to the goals of the installation's INRMP, and can help DoD meet other goals and objectives outlined in EO 13508, EO 14008, and other Chesapeake Bay restoration commitments.

Takeaways for DoD Installations

Incorporating existing and projected climate threats into BMP planning and design guidelines is an ongoing effort in many states, regions, and organizations. These decisions must balance the levels of risk, protection, and cost acceptable to their stakeholders. In the Chesapeake Bay watershed, some tools and resources are starting to emerge to adjust BMP design parameters to account for climate change. In addition, some localities are already preparing for climate threats by designing stormwater systems that integrate redundancy, increase infiltration and storage capacity, and utilize natural resource BMPs, and by maintaining these structures to sustain performance. Installations are encouraged to consider these resources and examples as they contemplate how to enhance climate resilience in their areas of responsibility while jurisdiction, Service, and DoD Climate Adaptation Plans evolve.

For More Information

Presentations and resources from the Joint Urban Stormwater and Climate Resiliency Workgroup Conference Call on October 18-19, 2021, can be found online at:

- 1: https://www.chesapeakebay.net/what/event/climate_resiliency_workgroup_crwg_october_2021_meeting
- 2: https://www.chesapeakebay.net/what/event/urban_stormwater_workgroup_conference_call_october_2021

⁵ This section utilizes information presented by Alan Cohn, Tom Schueler, and David Wood during the Workgroups meeting.



Chesapeake Bay Action Team Updates

By Caitlin Humiston, Brown and Caldwell

Members of the CBAT convened for their quarterly meeting on 28 October 2021. Participants reviewed ongoing Chesapeake Bay-related service and installation projects and activities and listened to two presentations.

Presentation 1: 2020 DoD TMDL Progress Evaluation and 2025 DoD Implementation Plan: Takeaways for Installations

Stephanie MacDurmon, with Brown and Caldwell, provided an overview of the outcomes of the 2020 DoD Chesapeake Bay Progress Evaluation emphasizing conclusions and suggested actions for installation staff. The purpose of the presentation was to provide installations with a snapshot of DoD progress through state fiscal year (SY) 2020, planned effort through 2025, and the additional level of effort needed to achieve 2025 jurisdictional Federal Planning Goals (FPGs).

Ms. MacDurmon discussed DoD progress within jurisdictions in relation to its SY2020-2021 Numeric Two-Year Water Quality Milestones, as these targets provide a short-term assessment of the remaining efforts for DoD to achieve its 2025 FPGs. In almost all jurisdictions, more than 50% of necessary load reductions for SY2020 and SY2021 remain and the gaps for total nitrogen (TN) are larger than the gaps for total phosphorus (TP). Accordingly, installations should prioritize BMPs that deliver efficient TN reductions, as well as the inspection and maintenance of existing BMPs to sustain performance and maximize credit for pollution reduction.

Ms. MacDurmon compared the 2025 Implementation Plan scenario results and the 2025 FPGs for each jurisdiction. All installations will require additional BMP implementation efforts to achieve collective jurisdictional TN and/or TP FPGs, in addition to maintaining their existing BMPs and implementing all of their reported planned BMPs.

The DoD land area reported by the Partnership includes U.S. Army Corps of Engineers (USACE) land and overestimates DoD load reduction requirements. The DoD CBP will continue to work with USACE and the Partnership to consider how to address this issue.

The DoD CBP has developed a new strategy to divide the remaining load gap among individual installations. This new method estimates a load reduction contribution based on the installations' total developed area and area treated. The strategy is more customizable than the previous Fill Gap strategy because installations can implement BMP types that fit their needs. Ms. MacDurmon emphasized the importance of correct reporting of land cover data in the P&I datacall and BMP information in the BMP datacall, as the installation-specific reduction contributions produced from this new strategy are based on this data.

Ms. MacDurmon ended her presentation with a request for Virginia installations that received an email from the Virginia Department of Environmental Quality BMP Warehouse regarding expired or expiring BMPs. Installations may need to update BMP records in the Warehouse or their database if they determine that the identified BMPs still exist and they are at risk of losing credit.

Presentation 2: DoD's Draft Final 2022-2023 Water Quality Programmatic Milestones

Kevin Du Bois, DoD CBP Coordinator, provided an overview of DoD's draft final Programmatic Water Quality Milestones for 2022-2023, including climate-related milestones to address impacts to BMP performance. Some Programmatic Water Quality Two-Year Milestones align with the LOEs from the recently released DoD CAP. Mr. Du Bois emphasized that the metrics for milestone reporting would be extracted from the existing datacall structure requiring no additional effort by installation staff. The DoD CBP will use information collected in the annual datacalls to report on these milestones. Mr. Du Bois provided the draft final milestones to Service Leads and the DoD Climate Action Team for comment and review. The DoD CBP will submit the final milestones to the EPA by 15 January 2022.

DoD Chesapeake Bay Program Updates

- The Virginia Institute of Marine Science will offer free one-day tidal wetland training for installation staff in 2022. A poll will be sent out to select potential training dates within the 17-19 or 24-26 May 2022 timeframe.
- A presentation on natural resource and climate co-benefits of stormwater BMPs will be part of a future CBAT meeting.
- Installations are welcome to submit success stories or article ideas for the Spring 2022 Journal.
- The DoD has obtained agreement with EPA and Pennsylvania Department of Environmental Protection on a final DoD FPG.

The next CBAT meeting is scheduled for 27 January 2022.



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✓ Check it Out

DoD released its signed *Climate Adaption Plan* on 1 September 2021. This document establishes a Climate Adaptation Strategic Framework with methodologies and actions to ensure DoD's continued operation and to enhance natural assets under changing climate conditions. The plan is available at: https://media.defense.gov/2021/Oct/07/2002869699/1/1/0/DEPARTMENT_OF_DEFENSE_CLIMATE_ADAPTATION_PLAN.PDF

Urban Trees and Stormwater Management Webinar: Quantifying Impacts, Maximizing Benefits. U.S. Forest Service webinar recognizing the role of trees in controlling urban stormwater runoff, recorded on 13 October 2021. Access slides and webinar podcast at: https://www.fs.fed.us/research/urban_webinars/urban_trees_stormwater_management.php

Finding EPA Resilience Resources with the Environmental Resilience Tools Wizard Webinar. This EPA webinar, recorded on 1st December 2021, discusses how to use the Wizard to filter EPA resilience tools based on the user's needs. Access the recording at: https://www.epa.gov/research/states/epa_tools_and_resources_training_webinar_series

Nitrogen in the Chesapeake Bay Watershed – A Century of Change, 1950-2050. This USGS report provides a long term perspective of nitrogen loading from historical data since 1950 and projected trends through 2050. An overview of this report is available at https://www.usgs.gov/centers/cba/science/greatest_opportunities_future_nitrogen_reductions_chesapeake_bay_watershed_are?qt=science_center_objects_0#qt=science_center_objects

You can also access the full report at <https://pubs.er.usgs.gov/publication/cir1486>

Advances in Stormwater Monitoring and the Development of BMPs for Treatment webinar. Strategic Environmental Research and Development Program and Environmental Security Technology Certification Program webinar on improved methodology for laboratory toxicity testing associated with rapid flow engineered filter media to treat stormwater runoff, recorded on 21st October 2021. Access the webinar recording at: https://serdp.estcp.org/Tools_and_Training/Webinar_Series/10_21_2021

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