Proposed Updates for the Chesapeake Riparian Forest Buffer Network website

- Home page
    - What are riparian forest buffers and why are they important?
        - Riparian forest buffers (RFBs) are strips of forest that border waterways. RFBs act as natural filters for rivers, streams, and ultimately the Chesapeake Bay, as they effectively remove pollutants from runoff. Forest buffers are among the most cost-effective practices to improve water quality and to restore a sustainable landscape that supports clean water, native fish and wildlife, and resiliency to climate change. Restoring RFBs is a high priority of the Chesapeake Bay Watershed Agreement, which sets ambitious goals.

            Riparian Forest Buffer Outcome: Restore 900 miles per year of riparian forest buffer and conserve existing buffers until at least 70 percent of riparian areas throughout the watershed are forested.
    - Riparian Forest Buffer Progress in the Chesapeake Bay Watershed
        - Map of RFB acres by county
        - Buffer progress bar chart by year and state (currently on Why forest buffers – but make better)

Bolded text will be the main menu items across the top bar of the home page

- **Why Forest Buffers?** Dropdown menu:
    - Water quality
        - Forest buffers act as natural filters and are often the last line of defense, protecting streams and ultimately the Chesapeake Bay from polluted runoff. Forest buffers protect streams and local drinking water supplies by helping to intercept and process excess nutrients, sediments, and pathogens from entering them. Studies have shown that streams bordered by forest are up to 2-8 times more effective than those with grass borders in processing important substances, like excess nitrogen (Sweeney and others 2004).
        - Resources:
            - Understanding the Science Behind Riparian Forest Buffers: Effects on Water Quality
            - Want clean rivers? Plant trees
            - Sweeney, B. W., Bott, T. L., Jackson, J. K., Kaplan, L. A., Newbold, J. D., Standley, L. J., Hession, W.C. & Horwitz, R. J. (2004). Riparian deforestation, stream narrowing, and loss of stream ecosystem services. *Proceedings of the National Academy of Sciences*, *101*(39), 14132-14137. https://doi.org/10.1073/pnas.0405895101
    - Climate resilience
        - In addition to improving water quality, riparian forest buffers can also help ecosystems and communities adapt to the projected changes in climate. For example, as the temperature warms, planting trees can provide important cooling benefits for people and wildlife. Many aquatic species, like brook trout, require cool water temperatures. As the climate warms throughout the

watershed, planting and maintaining riparian forest buffers to shade streams will help increase available habitat for aquatic species that need cool water.

As forests have higher rates of infiltration and evapotranspiration than other land cover types (Eisenbies and others 2007), increasing forest cover can reduce the amount of stormflow reaching streams and communities. Restoring riparian forests in middle or upper sub-basins can also reduce downstream flooding by desynchronizing the flood peaks coming from different sub-basins (Dixon and others 2016). Strategically restoring forests can therefore help protect communities, infrastructure and ecosystems from the damaging impacts of flooding, which is likely to become more common as the climate changes.

- Resources
  - Bowler, D. E., Mant, R., Orr, H., Hannah, D. M., & Pullin, A. S. (2012). What are the effects of wooded riparian zones on stream temperature?. *Environmental Evidence*, *1*(1), 1-9.
  - Dixon, S. J., Sear, D. A., Odoni, N. A., Sykes, T., & Lane, S. N. (2016). The effects of river restoration on catchment scale flood risk and flood hydrology. *Earth Surface Processes and Landforms*, *41*(7), 997-1008. https://doi.org/10.1002/esp.3919
  - Eisenbies, M. H., Aust, W. M., Burger, J. A., & Adams, M. B. (2007). Forest operations, extreme flooding events, and considerations for hydrologic modeling in the Appalachians—A review. *Forest Ecology and Management*, *242*(2-3), 77-98. https://doi.org/10.1016/j.foreco.2007.01.051
  - Turunen, J., Elbrecht, V., Steinke, D., & Aroviita, J. (2021). Riparian forests can mitigate warming and ecological degradation of agricultural headwater streams. *Freshwater Biology*, *66*(4), 785-798. https://doi.org/10.1111/fwb.13678
  - Wondzell, S. M., Diabat, M., & Haggerty, R. (2019). What matters most: are future stream temperatures more sensitive to changing air temperatures, discharge, or riparian vegetation? *JAWRA Journal of the American Water Resources Association*, *55*(1), 116-132. https://doi.org/10.1111/1752-1688.12707

- Economic benefits
  - Forest buffers can provide important economic benefits for farms, such as improved herd health and valuable assistance for alternate water, fencing and crossing. Forest buffers can enhance property values, prevent erosion and property loss from sloughing banks, regulate base flow of water to streams, and provide woody debris and wider stream channels for reducing downstream flooding.

    In addition to the direct economic benefits, realizing our RFB goals at scale will not only require knowledgeable foresters, but leagues of restoration workers in both rural and urban areas that can help with project planning, implementation,

and maintenance. By supporting local businesses and entrepreneurs while generating jobs, forest buffer restoration can grow local restoration economies.

- Resources:
  - Buffer$: A Conservation Buffer Economic Analysis Tool
  - Non-timber Forest Product Calculator
  - Why add edible and floral plants to riparian forest buffers?
  - Green Cities: Good Health- Local Economics
  - BenDor, T., Lester, T. W., Livengood, A., Davis, A., & Yonavjak, L. (2015). Estimating the size and impact of the ecological restoration economy. *PloS one*, *10*(6), e0128339. https://doi.org/10.1371/journal.pone.0128339

- Recreation and human health
  - Forest buffers enhance recreational opportunities, including fishing, bird watching, hunting, hiking, and exploration with children and grandchildren. Numerous studies show significant human health benefits from recreating in forests or looking at trees, including increased immune system function, lower blood pressure, lower stress, improved mood, increased ability to focus, accelerated recovery from surgery or illness, increased energy level, and improved sleep.
  - Resources:
    - Immerse Yourself in a Forest for Better Health
    - Green Cities: Good Health

- Habitat
  - Forest buffers also restore the natural in-stream conditions of temperature, oxygen, and food (algae, leaf litter) and stabilize and widen stream channels. The widening of channels creates more habitat and a better-functioning, healthier ecosystem per unit length of streambed. Forest buffers help increase the diversity and abundance of fish food – i.e, aquatic macroinvertebrates or "macros" – both directly by shedding leaves into streams for macros to feed upon, and indirectly by providing optimum light and temperature conditions for growing the preferred algae of macros. Streamside forests also create cooler, clearer, wider, more stable streams favored by native species of fish like brook trout while providing important habitat for birds, like wood ducks.
  - Resources
    - Riparian Buffers for Wildlife
    - Understanding the Science Behind Riparian Forest Buffers: Effects on Plant and Animal Communities
    - Working Trees for Wildlife
    - Pollinator-friendly plant list
    - Agroforestry: Pollinators
    - Fish Need Leaves
    - Sustaining America's Aquatic Biodiversity – What is Aquatic Biodiversity, why is it important?
    - Riparian Habitat: Birding in Riparian Zones

- **Fund your buffer**
    - Maintain the Funding a Forest Buffer Program page as is
- **Plant your buffer** – Dropdown menu
    - Working with Partners
        - Transfer all material from Working with Partners tab
    - Technical Assistance
        - Maintain original text on the Technical Assistance page
        - Resources
            - USDA Conservation Technical Assistance Program
            - Landowner Guide to Buffer Success
            - Forest Landowners Guide to Tree Planting Success
    - Design and plant your buffer
        - Scientific studies show that 100 feet of streamside forest will adequately protect the physical, chemical, and biological characteristics of most streams (Sweeney and Newbold 2014). However, narrower buffers are also beneficial for improving water quality.

          Many landowners are happy growing a forest next to their stream for clean water and habitat. But with extra planning, landowners could harvest products from their forest buffer. These multi-functional buffers may not be eligible for some of the federal programs that have been outlined under the Funding section, but they may appeal to landowners for other reasons.

          Ideally, the buffer along a stream whether urban or rural, should be contiguous. Achieving such uniformity can be even more challenging in developed areas, and there is the additional challenge of potentially heavy use by people. A typical stream in a developed area goes through a city or residential area where there may be only narrow bands of land available for planting. Any buffer width will be beneficial, but more water quality improvement can be had if the buffer is at least 35 feet wide. Visit the Chesapeake Tree Canopy Network for tools, best practices, and resources for establishing, maintaining, and protecting riparian forest buffers in developed areas.
        - Resources
            - Conservation Buffers: Design Guidelines for Buffers, Corridors and Greenways
            - Chesapeake Bay Riparian Handbook: A Guide for Establishing and Maintaining Riparian Forest Buffers
            - Maryland DNR: the 3-Zone Buffer System
            - Maryland DNR Riparian Forest Buffer Design and Maintenance Handbook
            - Pennsylvania DEP Buffer Planning and Restoration
            - Streamside forest buffer width needed to protect stream water quality, habitat, and organisms: a literature review

- Why add edible and floral plants to riparian forest buffers?
- Sweeney, B. W., & Newbold, J. D. (2014). Streamside forest buffer width needed to protect stream water quality, habitat, and organisms: a literature review. *JAWRA Journal of the American Water Resources Association*, *50*(3), 560-584. http://dx.doi.org/10.1111/jawr.12203

- Reporting and crediting new buffers
  - The Chesapeake Assessment and Scenario Tool (CAST) is the Chesapeake Bay Program watershed model that can be used by decision-makers at the federal, state and local levels to determine how best to restore and protect local waterways, and ultimately, the Chesapeake Bay. The CAST website has extensive information about the reporting , crediting and verification of Best Management Practices (BMPs), including Riparian Forest Buffers.

    Reporting
    Each year, the Chesapeake Bay Program tracks progress toward the goals and outcomes in the Chesapeake Bay Agreement (see Chesapeake Progress). For riparian forest buffers (RFB), the reporting cycle is July 1- June 30. The acres that are directly reported are the best indicator of progress on RFB. As of December 2010, all BMP information submitted to the Chesapeake Bay Program Office must be in a format compatible with the National Environmental Information Exchange Network (NEIEN) protocols that dictate the use of BMP-specific fields and units.

    Water Quality Crediting
    All new RFBs incrementally reduce total nitrogen, phosphorus, and suspended sediment and are important to reaching the Chesapeake Bay Total Maximum Daily Load (TMDL). An expert panel report established the water quality credit for RFBs. As with all other BMPs, the RFB credit is registered in the CAST which simulates the watershed, the river flows, and associated transport and fate of nutrients and sediment that cause water quality degradation. In addition to receiving credit for the land use conversion, RFBs also earn an additional "upland efficiency" credit for reductions in the amount of nutrients delivered from upland acres. More information about BMP crediting is available in Section 6 of the CAST model documentation.

    Verification
    All Best Management Practices have a credit duration in the Chesapeake Bay model. To continue to receive credit after the credit duration expires, the practice must be verified to ensure it is still there and operating correctly. The Chesapeake Bay Program has developed a watershed-wide BMP verification framework and the forestry workgroup has developed more specific verification guidance for forestry BMPs, including forest buffers.
  - Success stories- Maintain as is

- **Maintain your buffer**

    - Prior to planting, site planning and preparation is necessary. After planting, good maintenance means greater tree survival. Grazing by deer and livestock can be a common problem for newly-planted trees as is competition by undesirable plants. A combination of mowing, herbicide and tree tubes are often essential to establish hardwood plantings in the mid-Atlantic region. Three to five years of follow-up care may be necessary.
    - Buffer maintenance resources
        - Chesapeake Bay Riparian Handbook: A Guide for Establishing and Maintaining Riparian Forest Buffers
        - Stroud Water Research Center Webinar on Buffer Maintenance
        - Maryland DNR Riparian Forest Buffer Design and Maintenance Handbook
- **Resource library**

  See Rebecca's Resource Library spreadsheet. Propose to organize resources into the following categories (with drop-down menus for each)
    - Status of the Chesapeake Bay Watershed
    - Buffer Overview Resources
    - Buffer Implementation and Maintenance Resources
    - Recent Research (within the past 15 years)
    - Historic Research (older than 15 years)
    - CREP Program
    - Conducting Outreach
    - Specific Benefits Highlights
    - Additional BMPs
    - Native Plants
    - Invasive Plants