Pooled Monitoring Initiative's Restoration Research Award Program

Project Title
Identifying restoration practices and landscape variables that increase native plant establishment and mitigate plant invasion

Lead Entity
Virginia Polytechnic Institute and State University

Partners
MD DNR
NFWF

The Pooled Monitoring Initiative pools resources to support scientists who answer key restoration questions posed by the regulatory and practitioner communities. The research teams then provide the answers back to those who asked the questions for direct application. The goal of the program is to answer these key restoration questions that serve as a barrier to watershed restoration project implementation.

Questions? See cbtrust.org/grants/restoration-research/

Research question(s)

- Why are Streams Susceptible to Invasive Plants?
- What are Common Invaders of Maryland Streams?
- How to Identify Common Invaders?
- How do Invasive Plants Impact Streams?

Project findings

Why are Streams Susceptible to Invasive Plants?

Streams connect wide-ranging areas of a landscape as tributaries meet larger streams which flow into rivers. The plants surrounding streams can drop seeds and other plant material into the water which can then carry the propagules to other locations in the watershed. Streams also experience frequent disturbances, such as flooding, which can draw propagules into the water and deposit them downstream. Especially in urban areas, seeds of invasive plants are often readily available and can easily be dispersed through a watershed. Invasive plants can have competitive advantages over native plants, including a lack of pests, broader environmental tolerances, and heavy seed production. Streams are already more susceptible to invasion than other systems (Schirmel et al. 2015), but stream restoration projects can potentially create even better conditions for invasion. When restoring a stream, existing vegetation is often disturbed and overstory trees may be removed (Figure 1). Disturbances to the soil and increases in light and space availability due to construction/restoration can provide the conditions invasive plants need to establish. Given their competitive advantages over native plants, invasive plants may also outcompete the native species planted on stream restoration projects, leaving them without resources to establish.

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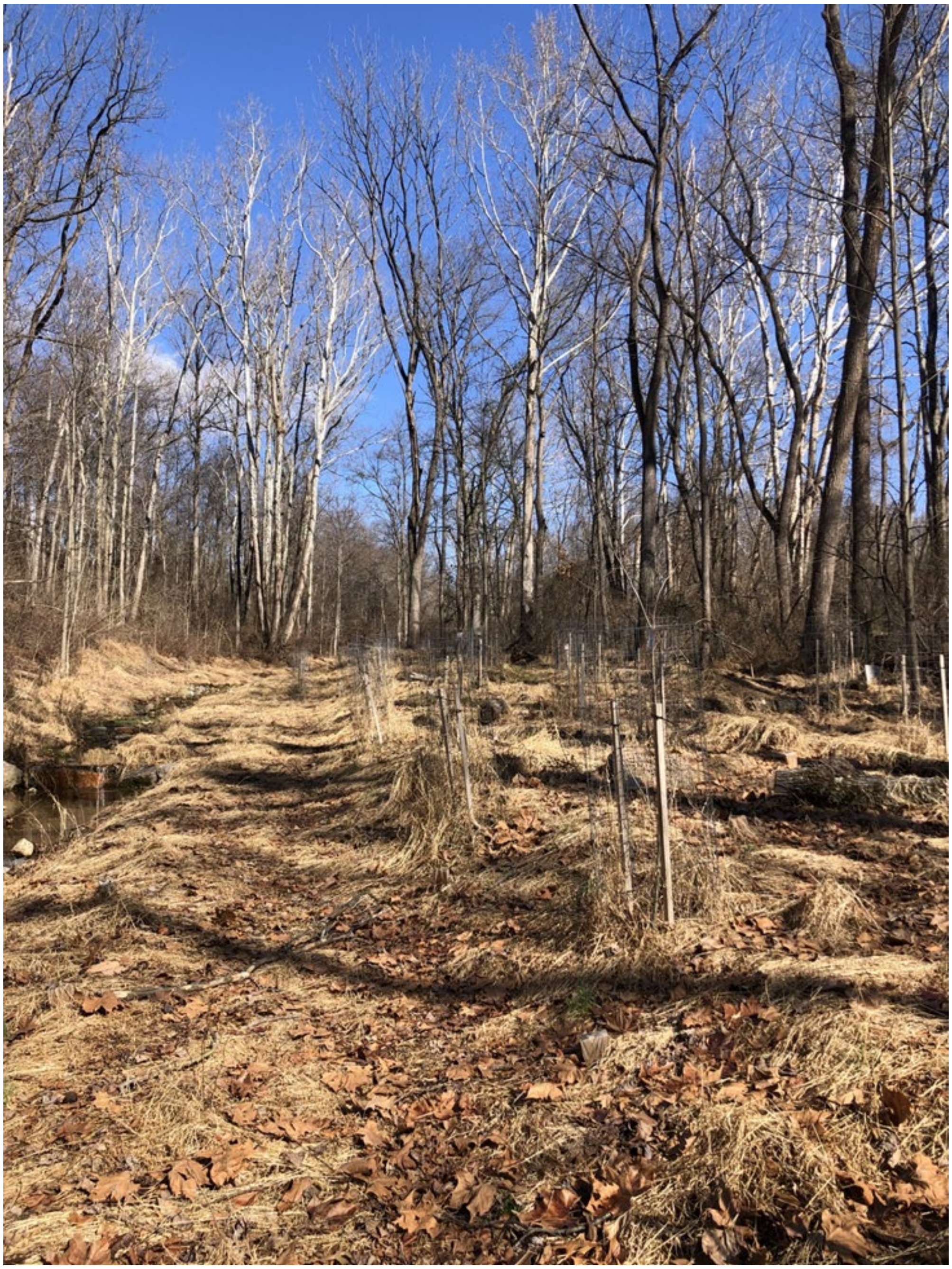
Figure 1. A restored stream in Frederick County, Maryland. Overstory trees have been removed within ~10 m of the stream bank, and the area has been replanted with saplings attached to wooden stakes and surrounded by wire cages to limit white-tailed deer herbivory. The ground is covered with netting. Image by G. N. Ripa.



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What are Common Invaders of Maryland Streams?

There are many species of invasive plants present in Maryland; however, some are better at invading riparian areas than others (Figure 2). Common invaders of Maryland streams include Japanese stiltgrass, multiflora rose, Japanese honeysuckle, and porcelain-berry. Oriental bittersweet, ground ivy, common mugwort, English ivy, reed canary grass, wineberry, Japanese barberry, and privets (e.g., border privet, Chinese privet) are also commonly observed along Maryland's streams. There are many other invasive plants that have become established in Maryland's watersheds, for more information on invaders and how to identify them, see Plant Invaders of Mid-Atlantic Natural Areas (Other Resources).

Figure 2. Several invasive species on a restored stream in Maryland, including Japanese stiltgrass, wineberry, garlic mustard, and mile-a-minute. Image by G. N. Ripa.

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How to Identify Common Invaders?

Japanese stiltgrass (*Microstegium vimineum*) is an annual invasive grass known to dominate forest understories in much of the eastern United States by displacing native plants. Japanese stiltgrass leaves are approximately 3" long and often have a silvery-*midrib*. Leaves are arranged *alternately* along the stem. Japanese stiltgrass does not have an extensive root system and usually can be pulled out of the ground easily. Many individuals of Japanese stiltgrass are often found growing together, forming a dense carpet along the ground.

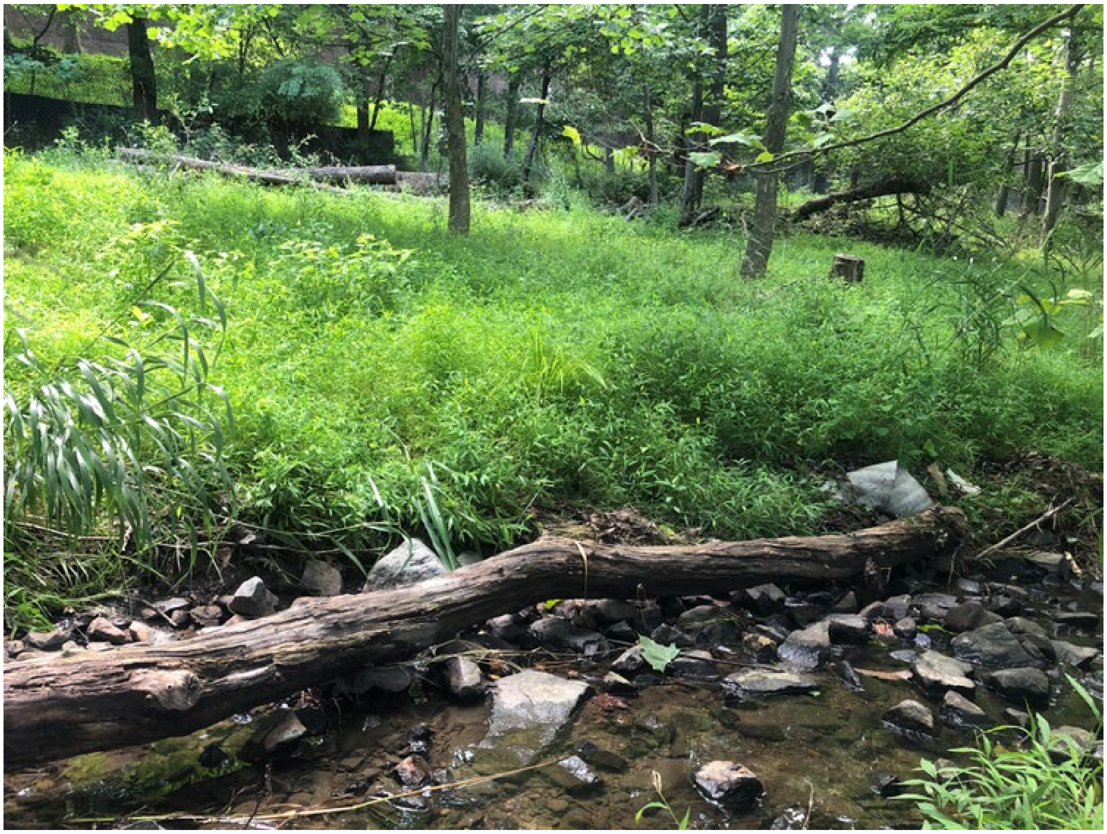

Figure 3. A riparian forest understory dominated by Japanese stiltgrass (*Microstegium vimineum*). Image by G. N. Ripa.

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Multiflora rose (*Rosa multiflora*) is a shrub species that can grow vines that climb on surrounding vegetation and form dense thickets. Multiflora rose has an alternate leaf arrangement with groups of between 5 and 11 leaflets. Sharp *prickles* are present on the light green or reddish stems. Flowers are usually white and have 5 petals that are somewhat heart-shaped with yellow *stamens* in the middle. Fruits of multiflora rose are red and are often present on stems from summer through winter.

Figure 4. A streambank heavily invaded by multiflora rose (*Rosa multiflora*). Image by G. N. Ripa.

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Japanese honeysuckle (*Lonicera japonica*) is a climbing vine that can strangle native vegetation. Leaves are *oppositely* arranged on brownish stems and often oval-shaped, though some younger leaves may be *lobed*. Japanese honeysuckle flowers are tubular and initially white or cream and turn yellow. Fruits are present in the fall and turn from green to black when ripe.

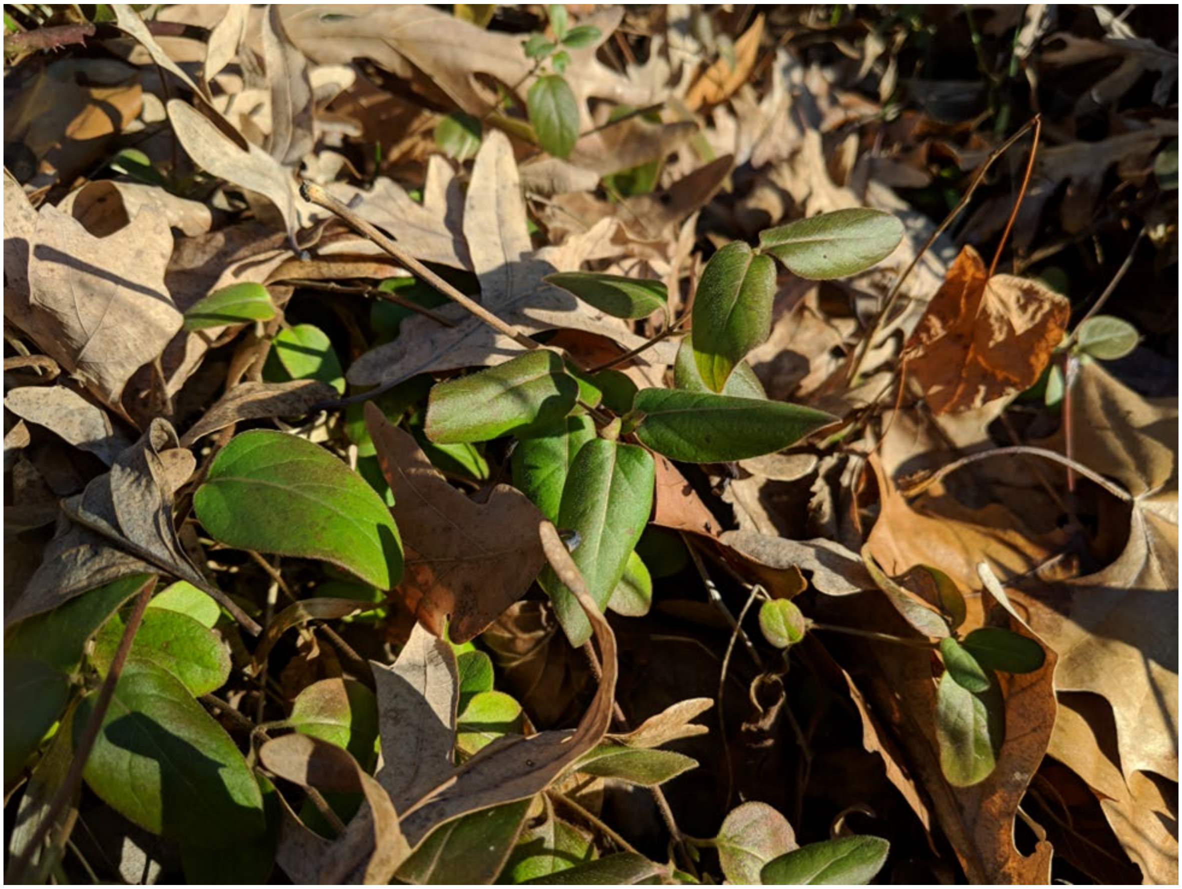

Figure 5. Japanese honeysuckle (Lonicera japonica) peeking through leaf litter. Image by J. L. Reid.

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Porcelain-berry (*Ampelopsis glandulosa var. brevipedunculata*) is a member of the grape family with climbing vines. Leaves are alternately arranged, shiny green above, and usually have 3-5 lobes. Young stems can be green or brown with *lenticels* and become woodier with age. Flowers are green and often hard to notice, typically present from June through August. Porcelain-berry fruits in September and October with bright and noticeable drupes, beginning as light blue then changing to green and ultimately dark blue. Porcelain-berry vines can grow in thick tangles, overtaking existing vegetation and ultimately killing it.

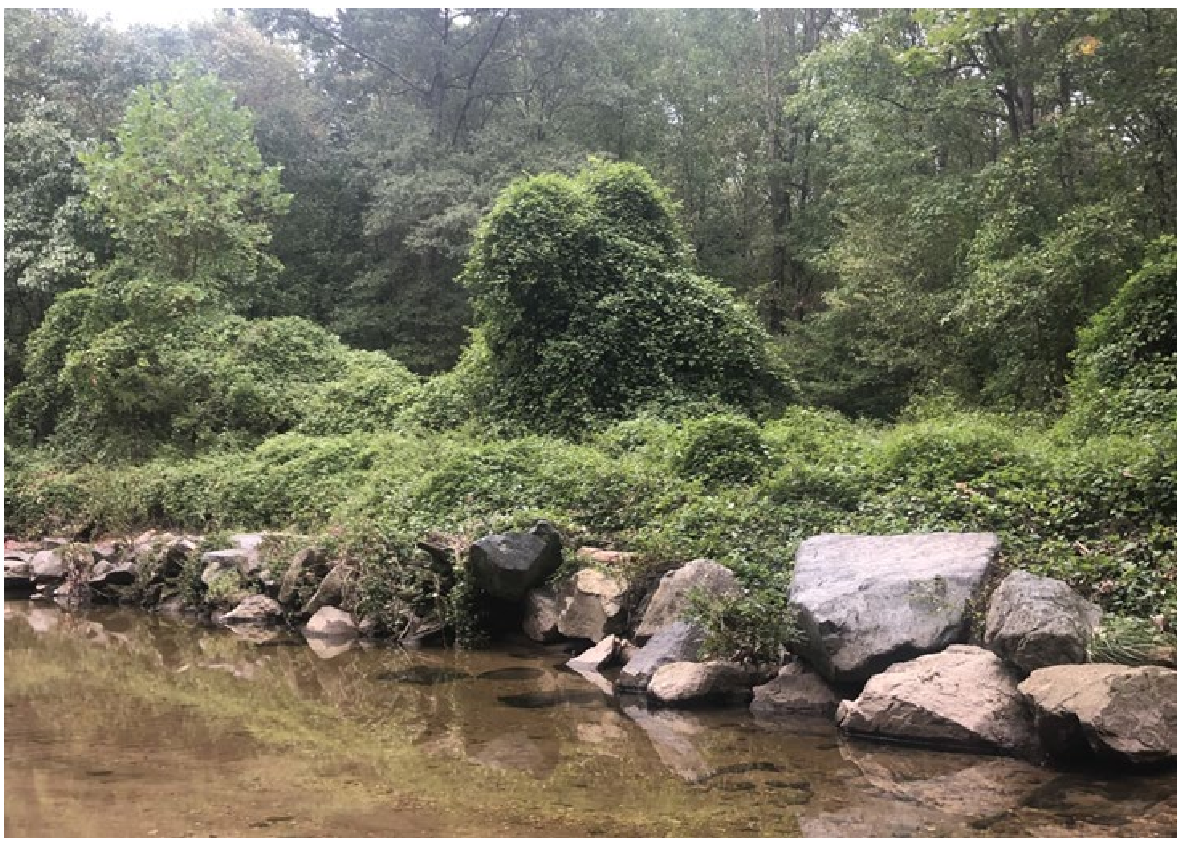

Figure 6. Porcelain-berry (*Ampelopsis glandulosa var. brevipedunculata*) blanketing a restored streambank. Image by G. N. Ripa.

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How do Invasive Plants Impact Streams?

Invasive plants have been shown to have various impacts on stream systems. Organic matter inputs from riparian vegetation into streams are important for nutrient cycling through the system, the rate of decomposition for plant material, and aquatic species presence and abundance and invasive plant material can negatively impact these processes (Robertson and Coll 2019).

Changes in organic matter inputs due to differences in the composition of invasive plant material compared to native plant material can influence various species, from macroinvertebrates to fish, through food web dynamics. Invasive plants can also impact stream systems through terrestrial processes. For example, Japanese knotweed, a known invader of Maryland streams, may cause streambank erosion due to loss of native root structure holding soil in place (Colleran et al. 2020). Japanese knotweed has also been shown to lose more water through its leaves than native vegetation, thus reducing total water flow in the streams and rivers it invades (Galster and Vanderklein 2023).

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Why does this study matter?

In general, plants are also important habitat components and provide food or shelter for many native animals that utilize riparian corridors including insects, birds, and mammals. In many cases, insects have coevolved with specific native plant species and when invasive plants limit the abundance of these native plant species, insects can experience population declines (Tallamy et al. 2021). The detrimental effects of invasive plants on insects can be felt by species higher up on the food chain, such as birds, evidenced by declines in Carolina chickadee reproductive success when there are more non-native plants (Narango et al. 2018). In this way, invasive plants can impact not only the structure and function of the stream itself but also create cascading impacts for a suite of species that rely on stream ecosystems.

For more information:

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