

Threats Template Matrix—Invasive Plants	
1.	<p>Threat: Non-native invasive plants pose threats to native plants, wildlife, and ecological function across the ANF. Invasive plants are a serious impediment to obtaining desirable tree regeneration and can compromise stream health along riparian areas. Large expanses of invasions may also impact recreational opportunities. The most pervasive invasive plants on the ANF include, but are not limited to, glossy buckthorn, multiflora rose and Japanese barberry in forest interiors; Japanese stiltgrass along trails/roadways, rights-of-ways, and other disturbed areas; and Japanese knotweed along streamsides. Additional species of concern in or on properties surrounding the ANF include bush honey suckles, crown vetch, canary reed grass, purple loosestrife, and goat’s rue.</p>
2.	<p>Location: Areas of high concentrations of invasive plants, and particularly glossy buckthorn, multiflora rose, and Japanese knotweed have been mapped (and prioritized ?) by ANF. Glossy buckthorn predominates across thousands of acres of the southeast portion of the forest (including the Marienville district), while multiflora rose predominates on the western portion of the forest. Japanese knotweed is pervasive along the Allegheny River and tributaries on the northern portion of the forest.</p>
3.	<p>Impact or Severity: Non-native invasive plants are notably limiting recruitment of native plants and trees across the ANF. This is highly problematic in areas where gap openings from harvesting or natural disturbance, including mortality from non-native insects and pathogen, are occurring. Non-native invasive shrubs have also been documented to reduce nesting success of many bird species, and berries from non-native species are of lower nutritional value than native plants such as <i>Rubus</i> spp. Much of the riparian areas in the Allegheny River watershed, in and surrounding the ANF, are choked with knotweed and lack any other vegetative cover. Lack of management of non-native invasive plants in the last decade has led to major infestations (over thousands of acres) which will take coordinated effort to control and keep in check. Impacts are also likely to increase where human activity and disturbance will occur in the future.</p>
4.	<p>Desired Outcome: The desired outcome for invasive plant management would be to reduce established populations significantly enough to allow for native herbaceous and woody plants to re-establish and thrive. Complete eradication is unlikely except at very small spatial scales or over a long time-frame. Several strategies should be employed to limit new introductions of non-native invasive in areas where they are not currently found.</p>

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5. Strategies to Achieve the Desired Outcome:

Strategy 1: Herbicide treatments for large-scale infestations: Herbicides are likely to be the most effective treatment method, but can be used in conjunction with mechanical treatments. Generally, shrub species can be treated by foliar herbicide application, or ‘hack and squirt’ for individual stems, or by ‘cut stump’ treatments. For large acreages, foliar application with a mist blower may be most efficient, but directed sprays may be needed in areas where native plants or seedbank is present and should be maintained. Mechanical ‘mowing’ using a brush hog or Gyrotract, followed by herbicide to cut stumps, may also be appropriate on areas amenable to machinery. (See note below about using cut materials for chips if the market develops). Effective treatments for Japanese knotweed includes early season cutting followed by foliar herbicide treatment in late Summer, using herbicides with aquatic labeling. Pre-emergent herbicides are effective for stiltgrass seed bank.

Note: prioritization of treatment areas will be key to controlling invasive plants across the landscape. Areas with only moderate infestations may be easier to control than larger infestations, but require more time to move from site to site and may require more directed spray or individual stem treatment than a broadcast application or mechanical treatment.

When: 2017-2020? Priority treatment areas should be considered in conjunction with harvest operation schedules as well, to time understory vegetation management with promotion of desirable tree regeneration.

Who: ANF/ contract sprayers

Cost: \$150-\$250/ acre?

Strategy 2: Early Detection and Rapid Response: This strategy in combination with monitoring will be most effective in limiting the establishment of small populations of non-native invasive plants in new areas. Some suggestions include requiring natural resource contractors (natural gas and forestry) to monitor and treat roadways, rights of ways, well pads, or log landings, and to include this requirement as part of the contract to leasees. EDRR is a good approach for recreational areas as well to spot treat non-native plants as detected.

When: 2018?

Who: ANF staff, natural resource contractors

Cost:

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<p>Strategy 3: Best Management Practices; Other strategies for limiting the introduction of non-native invasive plants to new areas is to clean equipment (and clothing) when moving from site to site, and using designated native seed mixes for reseeding ROW’s, log landings, well pads, etc. As above, this may be considered a requirement by ANF and written into future contracts with natural resource companies.</p> <p>When: 2018?</p> <p>Who: ANF staff, natural resource contractors</p> <p>Cost:</p>	
<p>Strategy 4: Restoration: Once invasive plants have been controlled to suitable levels (see Additional information needs below), establishment of native plants need to occur rather quickly to prevent re-infestations or establishment of other non-native plants. For example, Japanese stiltgrass commonly invades barren areas where Japanese knotweed was treated and controlled. In forested areas, measures such as deer fencing, vegetation management of native problem plants and appropriate silvicultural methods to promote desirable tree regeneration should be used. In riparian areas and rights of ways, seeding in with native herbaceous seed mixes can be used to quickly establish vegetation.</p> <p>When: Varies site to site, depending on level of control</p> <p>Who: ANF staff, contractors?, possibly volunteer groups</p> <p>Cost: (need cost per pound or per acre of native seed mixes)</p>	
<p>6. Monitoring Strategies:</p> <p>Strategy 1: Utilizing natural resource employees including staff foresters, as well tenders and ROW workers, to monitor areas used for natural resource development or extraction. Develop an easy checklist for top species of concern (this could be combined with monitoring for forest pests such as Hemlock Woolly Adelgid). Might be combined with EDRR if some workers also certified pesticide applicators.</p> <p>When/Frequency: During routine inspections</p> <p>Who: ANF Staff, Well tenders, line workers, and other contractors</p> <p>Cost:</p>	
<p>Strategy 2: Utilizing volunteer groups and organizations for monitoring recreational areas and hiking trails</p> <p>When/Frequency: 2018-2019; 2-3 times through growing season</p> <p>Who: Trail groups, hiking clubs, bird clubs, ATV/bike clubs, and volunteer citizens.</p> <p>Cost:</p>	

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7. **Education and Outreach:** Utilize and work with Allegheny Plateau Invasive Plant Management Area (APIPMA) cooperative for education and training of volunteer network and natural resource workers to ID and map invasive plants on the ANF. APIPMA is currently applying for funding for volunteer training for 2018-2019. Also Consider signage, boot cleaning stations, etc. in recreational areas.
8. **Additional Information Needs:** Complete eradication of invasive plants across the ANF is costly, labor intensive, and likely unachievable. Little research and scientific literature is available (?) to provide guidelines on when non-native invasive plant cover or densities are low enough that native plants may establish and outcompete invasives (though that threshold is likely very, very low). It will be important to understand the most effective timing for promoting native plant establishment (either naturally or by planting) following treatment of invasive species.
9. **Other:** In other parts of the country, trials to incorporate invasive plant control with timber harvesting operations have occurred. This includes mechanically cutting shrubby and woody non-native invasive plants concurrently with overstory tree removals. Understory woody material is piled and chipped on site, and chips transported and used for fuel at nearby plants. This has worked well for privet in the Southeastern United States. This may be a consideration for the future with management of buckthorn and multi-flora rose.