

Chapter 2 – Alternatives Considered

This chapter:

- Describes the alternatives that were considered to address issues and concerns;
- Identifies the design features and mitigation measures that would be implemented to reduce the chance of adverse resource effects; and
- Summarizes the activities and effects of the alternatives in comparative form to clearly display the differences between each alternative and to provide a clear basis for choice among options by the decision maker and the public.

2.1 - Alternatives Considered but Eliminated from Detailed Study

During initial planning and scoping, several potential alternatives to the proposed action were suggested. The following is a summary of the alternatives that contributed to the overall range of alternatives considered, but, for the reasons noted here, were eliminated from detailed study.

2.1.1 - Control NNIS on Private Land Not Adjacent to National Forest Land

Several people expressed interest in collaborating with the Forest to control NNIS on private property that is not adjacent to National Forest land. While such collaboration may be desirable for reducing local NNIS populations, the proper vehicle for such collaboration is a Cooperative Weed Management Area (CWMA) involving landowners, the Forest Service, and other state, federal, and local agencies. The purpose and need focuses on authorizing treatment of infestations; collaborating to achieve control on a broader scale can be pursued independent of this project as staff and funding allow. Elimination of this concept as an alternative does not preclude the Forest from collaborating with the owners of land that is adjacent to treatment sites on National Forest land.

2.1.2 - Collaborate with Adjacent Landowners on Prescribed Fire

One adjacent private landowner expressed a desire to cooperate with the Forest on prescribed fire. While prescribed fire can assist with the control of some NNIS plants, it would be ineffective to pursue as a separate management strategy. Collaboration with adjacent landowners is likely to be desirable where the Forest uses prescribed fire, but such collaboration is best addressed in the context of projects that focus on prescribed fire for silviculture or ecosystem restoration.

2.1.3 - Do Not Plant Species on the West Virginia Division of Natural Resources NNIS List

The purpose and need focuses on treatment of existing infestations rather than planting. The Forest Service already has national, regional, and local policies and management direction in place to prohibit the planting of species determined by the Forest Service to be NNIS.

2.1.4 - Control Non-native Insects

The purpose and need for this project focuses on NNIS plants. The Forest Service, acting through State and Private Forestry and in conjunction with the West Virginia Department of Agriculture, already has programs in place to monitor and control non-native insects.

2.1.5 - Treat Undesirable Native Plant Species

One comment suggested treating aggressive native species such as black locust, striped maple, beech suckers, and ferns in wildlife habitat developments and old timber harvest units across the Forest. The purpose and need for this project is specific to non-native invasive plants. Control of undesirable native species in wildlife habitat developments is best addressed through a separate analysis that covers all aspects of the maintenance of such developments. Control of undesirable native vegetation in timber management units is best addressed at the project level through NEPA documents for timber projects.

2.2 - Alternatives Given Detailed Study

The following section describes the two alternatives that were studied in detail: Alternative 1 (No Action) and Alternative 2 (Proposed Action). Acres or miles identified for activities have been identified from mapping and should be considered estimates.

2.2.1 - Alternative 1 – No Action

The No Action alternative was developed as a baseline for comparison with the action alternative. This alternative provides the decision-maker with a clearer basis for a reasoned choice among the alternatives studied in detail. Under this alternative, additional new management activities would not be implemented to help meet the purpose and need for action described in Chapter 1. This alternative is essentially the “status quo” strategy. It allows current management activities and policies to continue unchanged. For example, the ongoing NNIS prevention and treatment strategies outlined in section 1.4 would continue, but no additional sites would be treated and Forest-wide protocols for future NNIS plant management would not be established. No herbicide use or other forms of NNIS control would occur beyond those control activities that are conducted in conjunction with other projects.

2.2.2 - Alternative 2 – Proposed Action

The proposed action is an integrated, Forest-wide management strategy for NNIS plants. This action consists of two major components: preventing the spread of NNIS plants into new areas, and treating existing infestations. Although components of both prevention and treatment are included in many of the proposed activities, the activities have been categorized below according to the major emphasis.

The proposed action is both programmatic and site-specific. It is programmatic in that it establishes basic protocols for prevention and control of many high-priority species in typical

situations. It is also site-specific in that it identifies a limited set of high-priority sites where specific prevention and control measures would be implemented.

Total eradication of all NNIS is considered impractical due to the widespread nature of some NNIS, the large number of species involved, multiple locations, the difficulty of obtaining a complete inventory, lack of acceptable control methods for certain species and habitats, potential effects on desirable species, the likelihood of reinvasion in disturbed habitats, and the prohibitive amount of labor and money that likely would be required. Therefore, consistent with Forest Plan direction, proposed activities have been prioritized to focus on protection of high-interest ecosystems and resources, and on plant species that pose the greatest risk and for which control efforts have a reasonable chance of succeeding.

Prevention

Trailhead Sanitation

Selected trails and trailheads that provide access to sensitive ecosystems and major backcountry areas would be monitored at least once every three years, especially near parking areas, to detect new NNIS infestations (Map 1, Appendix A). If NNIS with the potential to cause ecosystem disruption or damage to facilities (high-priority NNIS) appear, they would be controlled using one of the treatment methods outlined in the Treatment section below.

Invasion Pathways

Roads that provide potential invasion pathways for high-priority NNIS into sensitive ecosystems would be placed into storage. Road storage involves blocking access to the road, removing culverts, and conducting activities that may be necessary to maintain long-term stability such as constructing water bars and seeding or mulching erosion-prone areas. Cessation of vehicle traffic and maintenance would reduce the likelihood of NNIS plants dispersing along the road corridor. Because the road prisms would remain intact, stored roads could be re-opened if they are needed for future management access. Preventative measures such as equipment cleaning, clean mulch, use of non-invasive plant species, seed testing, and follow-up monitoring would be employed to reduce the risk of introducing or spreading NNIS via the storage activities.

Proposed road storage would involve 10 roads (including four non-system roads) totaling approximately 11.5 miles. The roads would be stored in conjunction with NNIS treatment activities in the Cheat Mountain area (see map for Cheat Mountain area referenced in the Treatment section below). All of the roads proposed for storage are currently shown as gated on the Forest visitor map (i.e., closed to the public), but the gate on one of the roads (Forest Road 27B) recently has remained open year-round. Because the road prisms would remain intact, stored roads could be re-opened if they are needed for future management access.

Treatment

Treatment would focus on NNIS that pose a direct threat to ecosystems and resources of interest. Many of the species proposed for treatment spread aggressively, are shade-tolerant, or both. These species pose particular risks to forested ecosystems or to unique communities such as

limestone glades or wetlands. These species are not proposed for control at every site where they are known to occur; rather, they are proposed for control at sites where they threaten high-value resources or where they are believed to be small emerging infestations that can be eliminated before they get out of hand. Likewise, some NNIS plants that are known to occur on the Forest are not proposed for site-specific control because they are not known to threaten high-value resources or they are so ubiquitous that control is not practical. Programmatic protocols have been developed for many of these in case control of these species becomes a high priority in the future.

The treatment component of the proposed action includes the establishment of programmatic protocols for treatment in typical situations, as well as treatment of specific high-priority sites. At most sites, treatments likely will need to be repeated annually for several years to achieve effective control.

Programmatic Protocols

The following protocols are proposed for typical treatment methods and the typical situations where these methods will be applied:

Foliar Application of Herbicide

Foliar application involves spraying or wiping herbicide on the leaves of NNIS plants. The herbicide generally is diluted in water, and the solution often contains a nonionic surfactant that helps the herbicide penetrate the waxy cuticle of the leaf. The solution may also contain a dye to help the applicator avoid double application. This method can be used for targeted spot applications where NNIS plants are scattered among desirable vegetation. It can also be used to broadcast herbicide over large, continuous NNIS infestations. Because of limitations of the application equipment, applicator safety concerns, and the potential for impacts to non-target vegetation, foliar application typically would be limited to vegetation that is no more than 6 feet tall. For spot applications and applications in areas that are not accessible by vehicle, backpack sprayers would be used. Where very precise spot applications are needed, a wick or glove would be used to wipe herbicide onto the target plants. For large infestations along roads, skid trails, and other areas accessible by vehicle, vehicle-mounted sprayers would be used. Aerial application is not proposed.

Cut Surface Application of Herbicide

Cut surface application of herbicide is used to control NNIS trees, shrubs, and vines. Several cuts are made in the outer bark, and an herbicide solution is squirted onto the exposed cambium (inner bark). Alternatively, the plant can be cut down and the herbicide solution applied to the stump. The herbicide generally is diluted in water, although the solution usually is several times more concentrated than solutions used for foliar applications. This precisely targeted application method has very low potential for runoff or impacts to non-target plants.

Basal Spray Application of Herbicide

Basal spray is similar to cut surface in that the herbicide is applied directly to the lower stem of NNIS trees, shrubs, and vines. However, basal spray differs by applying the herbicide solution to the outer bark, without making any cuts. Therefore, basal spray applications are less labor

intensive than cut surface applications. The herbicide generally is diluted in an oil solution to allow it to penetrate the bark.

Hand Pulling

Very small infestations of weak-rooted NNIS plants can be controlled through pulling the plants up by hand. This method is useful for herbaceous and small woody NNIS that are interspersed with high-value non-target plants such as threatened, endangered, or sensitive species. However, it is slow and labor intensive and therefore not practical for large infestations.

Mowing

Mowing can be useful for preventing seed production and exhausting root reserves in annuals, biennials, or short-lived perennials. It can be accomplished using tractors, brush hogs, mowing machines, scythes, or string trimmers. Mowing is sometimes used in lieu of herbicides where soil or water quality concerns exist. However, it is not useful for many NNIS species, and it must be timed precisely to cut the plants just before seed production. Mowing also can affect non-target plants that are interspersed with the NNIS. Care must be taken to avoid spreading viable plant parts via mowing equipment.

Grubbing

In situations where herbicide use is undesirable and mowing and hand pulling are not effective, NNIS plants may be dug out by the roots using hand tools such as grubbers, weed wrenches, and shovels. Although grubbing avoids the use of herbicide, it causes soil disturbance and can have physical impacts on non-target species. It does not provide effective control for species that are capable of regenerating from small pieces of plant material left in the soil.

Biological Control

Of the variety of high-priority NNIS plants in need of control on the Forest, only the knapweeds are known to be susceptible to effective and commercially available biological control agents. Several species of seed-head feeding and root-boring flies, moths, and beetles may be used to control knapweeds. These biological control agents eat only knapweeds and do not pose a risk to non-target plants or animals. If biological control agents become available for other species, these agents may be used after they have passed standard U.S. Department of Agriculture screening.

Prescribed Fire

Prescribed fire can exert a controlling effect on some NNIS plants, notably garlic mustard. While prescribed fire alone is unlikely to achieve effective control, on large infestations it may be used in conjunction with other methods to reduce the extent of herbicide applications. Prescribed fire would only be applied in fire adapted or highly altered ecosystems.

Typical Control Situations

We anticipate that most NNIS control needs on the Forest will fall into one of the following situations:

Forest Roads – Many infestations occur along Forest roads because of their function as dispersal vectors. Most NNIS in this situation are low growing due to recurrent maintenance; therefore,

foliar application of herbicide would be the most common control method. Vehicle mounted sprayers likely will be used for many infestations, although a backpack sprayer may be used for isolated spot spraying. Carefully timed mowing may be used to control seed production in widespread annuals such as Japanese stiltgrass.

State Roads and Highways – Some infestations occur where state roads and highways traverse National Forest land. Control activities would be similar to those along Forest roads, but coordination with the West Virginia Division of Highways would be necessary.

General Forest Areas – Many high-priority NNIS have penetrated into natural habitats via old skid routes, trails, or overland seed dispersal. Any of the control methods outlined above may be used on these infestations, depending on the species to be controlled and the presence of other resource concerns.

Near Streams or Other Bodies of Water – A Forest-wide effort to control high-priority NNIS that threaten high value ecosystems cannot avoid control efforts near water bodies. Control methods that do not use herbicides would be used whenever possible. However, in many cases, non-herbicide methods could not be expected to provide effective, practical control. Where herbicides must be used within stream channel buffers as defined by the Forest Plan, or within 100 feet of other water bodies, only herbicides registered for aquatic use would be used. Where herbicides must be applied to emergent vegetation, only wick or glove applicators would be used.

Near Rare Plant Occurrences – NNIS plants may need to be controlled to protect occurrences of threatened, endangered, and sensitive plants from aggressive competition. However, the control methods also have the potential to affect rare plants inadvertently. Control methods that do not use herbicides would be used whenever possible. However, non-herbicide methods may not be effective or practical in some cases. Where herbicides must be used within 100 feet of known occurrences, only spot application methods would be used. Care would also be used to minimize the non-target effects of hand and mechanical control methods (trampling, soil disturbance, or cutting).

Future Treatment Activities

Although the proposed action identifies many specific sites across the Forest for treatment, it is likely that more high-priority treatment sites will be discovered. Therefore, the proposed action provides for the treatment of these additional sites after a review of the condition of any resources that may be affected. At a minimum, this review would involve wildlife, aquatics, botany, TES species, silviculture, recreation, and cultural resources. Treatment activities must involve situations similar to those programmatic and site-specific situations already analyzed, and any resource effects must be within the scale and scope of effects already analyzed. Line officer review and approval would be required prior to treatment. New herbicides and treatment methods would not be used without appropriate additional NEPA analysis and documentation. Table 2.1 summarizes proposed treatment protocols for NNIS plant species that may need to be treated on the Forest in the foreseeable future.

Table 2.1. NNIS Plants that May Be Treated on the Monongahela National Forest and Potential Treatment Methods

Common Name	Scientific Name	Possible Treatment Methods	Possible Herbicides
Norway maple	<i>Acer platanoides</i>	Basal spray, cut surface, foliar spray, grubbing	Triclopyr, glyphosate, metsulfuron methyl
Bishop's goutweed	<i>Aegopodium podagraria</i>	Foliar spray, grubbing, mowing	Glyphosate, triclopyr
Giant bentgrass	<i>Agrostis gigantea</i>	Foliar spray, grubbing	Glyphosate, sethoxydim
Tree of heaven	<i>Ailanthus altissima</i>	Basal spray, cut surface, foliar spray, grubbing	Triclopyr, glyphosate, metsulfuron methyl
Chocolate vine	<i>Akebia quinata</i>	Foliar spray, grubbing	Glyphosate, triclopyr
Garlic mustard	<i>Alliaria petiolata</i>	Foliar spray, hand pull, fire	Glyphosate, triclopyr
Porcelain berry	<i>Ampelopsis brevipedunculata</i>	Basal spray, cut surface, foliar spray, grubbing, hand pull	Glyphosate, triclopyr
Sweet vernal grass	<i>Anthoxanthum odoratum</i>	Foliar spray, grubbing, hand pull	Glyphosate, sethoxydim
Lesser burdock	<i>Arctium minus</i>	Foliar spray, mowing, grubbing, hand pull	Glyphosate, clopyralid, triclopyr
Common wormwood	<i>Artemisia vulgaris</i>	Foliar spray, mowing	Clopyralid, glyphosate
Small carpgrass	<i>Arthraxon hispidus</i>	Foliar spray, mowing, hand pull	Sethoxydim, imazapic, glyphosate
Giant reed	<i>Arundo donax</i>	Foliar spray, cut surface	Glyphosate
Yellow rocket	<i>Barbarea vulgaris</i>	Hand pull, grubbing, foliar spray, mowing	Glyphosate, triclopyr
Non-native barberries	<i>Berberis thunbergii</i> , <i>Berberis vulgaris</i>	Basal spray, cut surface, foliar spray, grubbing, hand pull	Triclopyr, glyphosate
Field brome	<i>Bromus arvensis</i>	Foliar spray, hand pull, mowing	Glyphosate, sethoxydim, imazapic
Meadow brome	<i>Bromus commutatus</i>	Foliar spray, hand pull, mowing	Glyphosate, sethoxydim, imazapic
Smooth brome	<i>Bromus inermis</i> var. <i>inermis</i>	Foliar spray, hand pull	Glyphosate, sethoxydim, imazapic
Rye brome	<i>Bromus secalinus</i>	Foliar spray, hand pull, mowing	Glyphosate, sethoxydim, imazapic
Barren brome	<i>Bromus sterilis</i>	Foliar spray, hand pull, mowing	Glyphosate, sethoxydim, imazapic
Cheatgrass	<i>Bromus tectorum</i>	Foliar spray, hand pull, mowing	Glyphosate, sethoxydim, imazapic
Flowering rush	<i>Butomus umbellatus</i>	Cutting, grubbing, foliar spray and foliar application (wick/glove)	Glyphosate
Plumeless thistle	<i>Carduus acanthoides</i>	Foliar spray, mowing, grubbing	Metsulfuron methyl, clopyralid, glyphosate, triclopyr
Curled thistle	<i>Carduus crispus</i>	Foliar spray, mowing, grubbing	Metsulfuron methyl, clopyralid, glyphosate, triclopyr
Musk thistle	<i>Carduus nutans</i>	Foliar spray, mowing, grubbing	Metsulfuron methyl, clopyralid, glyphosate, triclopyr
Oriental bittersweet	<i>Celastrus orbiculatus</i>	Cut surface, basal spray, foliar spray, grubbing, hand pull	Triclopyr, glyphosate
Brown knapweed	<i>Centaurea jacea</i>	Foliar spray, biological control, hand pull	Triclopyr, glyphosate, clopyralid, picloram

Common Name	Scientific Name	Possible Treatment Methods	Possible Herbicides
Tyrol knapweed	<i>Centaurea nigrescens</i>	Hand pull, foliar spray, biological control	Triclopyr, glyphosate, clopyralid, picloram
Meadow knapweed	<i>Centaurea pratensis</i>	Foliar spray, biological control, hand pull	Triclopyr, glyphosate, clopyralid, picloram
Spotted knapweed	<i>Centaurea stoebe</i>	Hand pull, foliar spray, biological control	Triclopyr, glyphosate, clopyralid, picloram
Celandine	<i>Chelidonium majus var. majus</i>	Foliar spray, hand pull, grubbing	Triclopyr, glyphosate
Chicory	<i>Cichorium intybus</i>	Foliar spray, hand pull, grubbing	Triclopyr, glyphosate
Canada thistle	<i>Cirsium arvense</i>	Foliar spray	Clopyralid, glyphosate, imazapic
Bull thistle	<i>Cirsium vulgare</i>	Foliar spray, mowing, grubbing	Clopyralid, glyphosate, triclopyr, metsulfuron methyl
Poison hemlock	<i>Conium maculatum</i>	Foliar spray, mowing, grubbing, hand pull	Glyphosate
Field bindweed	<i>Convolvulus arvensis</i>	Foliar spray, grubbing, hand pull	Glyphosate
Crown vetch	<i>Coronilla varia</i>	Foliar spray, mowing, grubbing	Triclopyr, glyphosate, clopyralid, metsulfuron methyl
Gypsy-flower	<i>Cynoglossum officinale</i>	Foliar spray, mowing, hand pulling,	Metsulfuron methyl, picloram
Queen Anne's lace	<i>Daucus carota</i>	Foliar spray, mowing, hand pulling	Triclopyr, glyphosate
Chinese yam	<i>Dioscorea oppositifolia</i>	Foliar spray, grubbing, mowing	Glyphosate, triclopyr
Fuller's Teasel	<i>Dipsacus fullonum</i>	Foliar spray, grubbing	Metsulfuron methyl, glyphosate
Cut-leaved teasel	<i>Dipsacus laciniatus</i>	Foliar spray, grubbing	Metsulfuron methyl, glyphosate
Common teasel	<i>Dipsacus sylvestris</i>	Foliar spray, grubbing	Metsulfuron methyl, glyphosate
Indian-strawberry	<i>Duchesnea indica</i>	Foliar spray, hand pulling	Triclopyr, clopyralid
Viper's bugloss	<i>Echium vulgare</i>	Hand pull, foliar spray	Glyphosate, clopyralid
Russian olive	<i>Eleagnus angustifolia</i>	Basal spray, cut surface, foliar spray, grubbing, hand pull	Triclopyr, glyphosate, metsulfuron methyl
Autumn olive	<i>Eleagnus umbellata</i>	Basal spray, cut surface, foliar spray, grubbing, hand pull	Triclopyr, glyphosate, metsulfuron methyl
Quackgrass	<i>Elymus repens</i>	Foliar spray	Sethoxydim, glyphosate
Burningbush	<i>Euonymus alata</i>	Basal spray, cut surface, foliar spray, grubbing, hand pull	Triclopyr, glyphosate, imazapyr
Winter creeper	<i>Euonymus fortunei</i>	Foliar spray, cut surface, grubbing, hand pull	Triclopyr, glyphosate
Leafy spurge	<i>Euphorbia esula</i>	Foliar spray	Glyphosate, picloram, imazapic
Japanese knotweed	<i>Polygonum cuspidatum</i>	Foliar spray	Triclopyr, glyphosate, imazapyr
Glossy buckthorn	<i>Rhamnus frangula</i>	Basal spray, cut surface, foliar spray, grubbing, hand pull	Glyphosate, triclopyr
False baby's breath	<i>Galium mollugo</i>	Foliar spray	Triclopyr, glyphosate
Ground ivy	<i>Glechoma hederacea</i>	Foliar spray, grubbing, hand pull	Glyphosate, triclopyr
English ivy	<i>Hedera helix</i>	Foliar spray, cut surface, hand pull	Triclopyr, glyphosate
Giant hogweed	<i>Heraclium mantegazzianum</i>	Foliar spray	Glyphosate, triclopyr
Dame's rocket	<i>Hesperis matronalis</i>	Foliar spray, hand pull, grubbing	Glyphosate, triclopyr

Common Name	Scientific Name	Possible Treatment Methods	Possible Herbicides
Meadow hawkweed	<i>Hieracium caespitosum</i>	Foliar spray, grubbing	Glyphosate, triclopyr, clopyralid
Field hawkweed	<i>Hieracium pretense</i>	Foliar spray, grubbing	Glyphosate, triclopyr, clopyralid
Velvet grass	<i>Holcus lanatus</i>	Foliar spray, grubbing, hand pull	Sethoxydim, glyphosate
Japanese hop	<i>Humulus japonicus</i>	Foliar spray, hand pull	Glyphosate
Common St. John's wort	<i>Hypericum perforatum</i>	Foliar spray	Metsulfuron, picloram, glyphosate
Hairy cat's ear	<i>Hypochaeris radicata</i>	Foliar spray, grubbing	Clopyralid, glyphosate
Cogon grass	<i>Imperata cylindrica</i>	Foliar spray	Glyphosate, imazapyr
Yellow iris	<i>Iris pseudacorus</i>	Foliar spray and foliar application (wick/glove)	Glyphosate
Korean bushclover	<i>Kummerowia stipulacea</i>	Foliar spray, hand pull, mowing	Triclopyr, glyphosate
Japanese clover	<i>Kummerowia striata</i>	Foliar spray, hand pull, mowing	Triclopyr, glyphosate
Japanese bushclover	<i>Lespedeza bicolor</i>	Foliar spray, mowing	Triclopyr, glyphosate, clopyralid, metsulfuron methyl
Sericea lespedeza	<i>Lespedeza cuneata</i>	Foliar spray, mowing	Triclopyr, glyphosate, clopyralid, metsulfuron methyl
Ox-eye daisy	<i>Leucanthemum vulgare</i>	Foliar spray, grubbing, hand pull	Imazapyr, picloram, clopyralid
Exotic privets	<i>Ligustrum vulgare</i> , <i>L. sinense</i> , <i>L. japonica</i> , <i>L. obtusifolium</i>	Cut surface, basal spray, foliar spray, grubbing, hand pull	Glyphosate, triclopyr, metsulfuron methyl
Butter-and-eggs	<i>Linaria vulgaris</i>	Foliar spray, hand pull	Glyphosate, picloram
Perennial ryegrass	<i>Lolium perenne ssp. multiflorum</i>	Foliar spray, grubbing	Sethoxydim, glyphosate
Japanese honeysuckle	<i>Lonicera japonica</i>	Foliar spray	Glyphosate, metsulfuron methyl
Exotic bush honeysuckles	<i>Lonicera maackii</i> , <i>L. tatarica</i> , <i>L. morrowii</i> , <i>L. x. bella</i> , other shrubby <i>Lonicera</i>	Basal spray, cut surface, foliar spray, grubbing, hand pull	Glyphosate, metsulfuron methyl
Bird's foot trefoil	<i>Lotus corniculatus</i>	Foliar spray, grubbing	Clopyralid, glyphosate, triclopyr
Moneywort	<i>Lysimachia nummularia</i>	Foliar spray, hand pull	Glyphosate, triclopyr
Purple loosestrife	<i>Lythrum salicaria</i>	Foliar spray, grubbing, hand pull	Glyphosate, triclopyr
White sweet clover	<i>Melilotus alba</i>	Foliar spray, hand pull, mowing	Imazapyr, picloram, metsulfuron methyl, glyphosate
Yellow sweet clover	<i>Melilotus officinalis</i>	Foliar spray, hand pull, mowing	Imazapyr, picloram, metsulfuron methyl, glyphosate
Japanese stiltgrass	<i>Microstegium vimineum</i>	Foliar spray, hand pull, mow	Imazapic, sethoxydim, glyphosate
Chinese silvergrass	<i>Miscanthus sinensis</i>	Foliar spray	Glyphosate, imazapyr
Grape hyacinth	<i>Muscari botryoides</i>	Foliar spray, grubbing	Glyphosate, triclopyr
Star of Bethlehem	<i>Ornithogallum umbellatum</i>	Grubbing, hand pull	
Drooping star of Bethlehem	<i>Ornithogalum nutans</i>	Grubbing, hand pull	
Wild parsnip	<i>Pastinaca sativa</i>	Foliar spray, grubbing, mowing	Glyphosate, triclopyr

Common Name	Scientific Name	Possible Treatment Methods	Possible Herbicides
Princess tree	<i>Paulownia tomentosa</i>	Basal spray, cut surface, foliar spray, grubbing, hand pull	Glyphosate, triclopyr, imazapyr
Beefsteak plant	<i>Perilla frutescens</i>	Foliar spray, hand pull, grubbing	Glyphosate, triclopyr
Reed canary grass	<i>Phalaris arundinacea</i>	Foliar spray	Glyphosate, sethoxydim
Japanese corktree	<i>Phellodendron japonicum</i>	Basal spray, cut surface, foliar spray, grubbing, hand pull	Glyphosate, triclopyr
Common reed	<i>Phragmites australis</i>	Foliar spray, mowing	Glyphosate
Canada bluegrass	<i>Poa compressa</i>	Foliar spray	Glyphosate
Kentucky bluegrass	<i>Poa pratensis</i>	Foliar spray	Glyphosate
Rough bluegrass	<i>Poa trivialis</i>	Foliar spray	Glyphosate
Oriental lady's thumb	<i>Polygonum caespitosum</i> <i>var. longisetum</i>	Foliar spray, grubbing, hand pulling, mowing	Glyphosate
Mile-a-minute vine	<i>Polygonum perfoliatum</i>	Foliar spray	Triclopyr, glyphosate, imazapyr
Sachaline	<i>Polygonum sachalinense</i>	Foliar spray	Triclopyr, glyphosate, imazapyr
Kudzu	<i>Pueraria montana</i> <i>var. lobata</i>	Foliar spray	Glyphosate, triclopyr, metsulfuron methyl, picloram
Lesser celandine	<i>Ranunculus ficaria</i>	Foliar spray, grubbing, hand pull	Glyphosate
Creeping buttercup	<i>Ranunculus repens</i>	Foliar spray, grubbing, hand pull	Glyphosate
Common buckthorn	<i>Rhamnus cathartica</i>	Basal spray, cut surface, foliar spray, grubbing, hand pull	Glyphosate, triclopyr
Jetbead	<i>Rhodotypos scandens</i>	Basal spray, cut surface, foliar spray, grubbing	Glyphosate, triclopyr
Creeping yellow cress	<i>Rorippa sylvestris</i>	Foliar spray, grubbing	Triclopyr
Multiflora rose	<i>Rosa multiflora</i>	Basal spray, cut surface, foliar spray, grubbing, hand pull	Glyphosate, triclopyr, imazapyr, metsulfuron methyl
Wineberry	<i>Rubus phoenicolasius</i>	Foliar spray, grubbing	Glyphosate, triclopyr, metsulfuron methyl
Tall fescue	<i>Schedonorus phoenix</i>	Foliar spray, grubbing	Glyphosate, imazapyr, imazapic
Meadow fescue	<i>Schedonorus pratensis</i>	Foliar spray, grubbing	Glyphosate, imazapyr, imazapic
Stringy stonecrop	<i>Sedum sarmentosum</i>	Foliar spray, hand pull, grubbing	Glyphosate, triclopyr
Johnsongrass	<i>Sorghum halapense</i>	Foliar spray, hand pull, grubbing	Glyphosate, sethoxydim
Japanese spiraea	<i>Spiraea japonica</i>	Basal spray, cut surface, foliar spray, grubbing, hand pull	Glyphosate, triclopyr
Common chickweed	<i>Stellaria media</i>	Foliar spray, hand pull, grubbing	Glyphosate, triclopyr
Colt's foot	<i>Tussilago farfara</i>	Foliar spray, hand pull, grubbing	Glyphosate, triclopyr
Great mullein	<i>Verbascum thapsus</i>	Foliar spray, hand pull	Glyphosate, triclopyr, metsulfuron methyl
Bigleaf periwinkle	<i>Vinca major</i>	Foliar spray, hand pull, grubbing	Glyphosate, triclopyr, picloram
Common periwinkle	<i>Vinca minor</i>	Foliar spray, hand pull, grubbing	Glyphosate, triclopyr, picloram

Site-Specific Treatments

In keeping with the needs outlined above, the proposed treatments of existing infestations focus on those that threaten botanical areas, candidate research natural areas, National Natural Landmarks, TES species habitat, landscape-scale ecological reserves, tree regeneration, and roads and facilities. The treatment maps show the existing infestations that are proposed for treatment (see Appendix A). Treatments of continuous infestations would total approximately 134 acres; spot treatments would be conducted across another 4,960 acres (see Appendix B). A discussion of focus areas for treatment follows.

Parsons Area

Treatment is proposed at four sites in the northern Cheat District in Tucker County (Map 2). Two sites involve several small, isolated patches of garlic mustard. Although other invasive plants in the vicinity are widespread and likely would not be practical to control, these small patches of garlic mustard might still be eliminated fairly easily, thereby preventing more widespread infestations later. In addition, one of these garlic mustard patches is near a population of the federally-listed endangered running buffalo clover, so control is desirable to reduce the potential for future impacts. The other two sites involve small, emerging infestations of oriental bittersweet and common privet at the Horseshoe YMCA camp and the Cheat District warehouse.

Otter Creek Area

The Otter Creek Wilderness and surrounding lands comprise one of the major ecological reserves on the Forest. Preventing major NNIS impacts in these reserves is a key goal of this project. Control activities are proposed at five sites near this reserve (Map 3). None of the sites is within the Wilderness, although one site is very close to the boundary.

Stuart Recreational Area is a heavily used developed recreation site along the Shaver's Fork River southwest of the Otter Creek Wilderness. The floodplain of the river is heavily invaded by Japanese stiltgrass. Although the bulk of the infestation is considered beyond practical control, two small outlier patches along a trail in the adjacent upland forest are proposed for control. This control is intended to check the spread of stiltgrass from the floodplain into adjacent unaffected forest. Also, a small garlic mustard infestation near the recreation site parking lot would be controlled to prevent further spread through the forest.

Along the road to Bickle Knob, an old pasture and disturbed woodland adjacent to the Coberly Sods grazing allotment has been overrun by a large infestation of garlic mustard. This infestation threatens the surrounding forest, which currently has high herbaceous species diversity due to the presence of limestone outcrops. The infestation also could eventually threaten the nearby Bickle Slope Botanical Area. Intensive control efforts are proposed on the 6-acre core of the infestation, and scattered spot control is proposed on up to 102 additional acres.

Two small patches of Japanese stiltgrass have been reported from the Shaver's Mountain Spruce/Hemlock Botanical Area and National Natural Landmark, which is located along the eastern boundary of Otter Creek Wilderness. The stiltgrass patches are located just outside the wilderness boundary. Eradication should still be possible for these small patches, which would halt further infestation of the Botanical Area and prevent spread into the adjacent wilderness.

Near the northeast corner of Otter Creek Wilderness, a patch of garlic mustard has been reported at the State Road 26 ford on the Shaver's Fork River. Although Japanese stiltgrass in this area is believed to be beyond practical control, the garlic mustard may still be controllable.

Unauthorized all-terrain vehicle use is believed to be the source of the garlic mustard. Therefore, in addition to garlic mustard control, a rock or wooden ATV barrier is proposed at this location. Garlic mustard has been reported from a wetland restoration site at the U.S. Highway 33 bridge over Glady Fork. This small patch would be controlled to prevent loss of ecological function of the restored wetland and to prevent spread to the adjacent forest.

Reed canary grass has infested several wildlife openings in the Lower Glady Fork area. To restore the wildlife habitat value of these openings, reed canary grass would be controlled in the openings and along several miles of nearby roadside.

Dolly Sods Area

Forest Roads 75 and 19 through the Dolly Sods Scenic Area host several NNIS plants that are characteristic of disturbed roadsides. Most of these species do not pose an imminent threat to the intact ecosystems adjacent to the road. However, two species could pose a threat and therefore are proposed for control (Map 4). Garlic mustard has been reported along the road shoulder adjacent to the Fisher Spring Run Bog Botanical Area/National Natural Landmark/Candidate Research Natural Area. This small patch is proposed for control to prevent it from spreading into the adjacent forested ecosystems. Reed canary grass has been reported in scattered patches along the roads. To prevent reed canary grass from invading the many high-quality wetland communities in the Scenic Area and adjacent Dolly Sods Wilderness, spot control of reed canary grass is proposed along an estimated 8.8 miles of Forest Roads 75 and 19.

Smoke Hole Area

The Smoke Hole Canyon along the South Branch of the Potomac River contains many rare limestone glades and barrens. These communities provide habitat for several sensitive plant species. Because these communities have a fairly open tree canopy, they are vulnerable to shade-intolerant NNIS that normally would not cause ecosystem disruption in more heavily forested areas. Control activities are proposed at three sites to protect glade, barren, and limestone forest communities and the rare plant species associated with these communities (Map 5). Because several NNIS plant species are widespread throughout the canyon, complete control is not practical. Therefore, control activities would be more of a "holding action" that would have to be repeated at regular intervals in the future.

Control of Japanese stiltgrass is proposed in the moist coves in and around the Blue Rock Geological Area. Control activities here would protect stands of northern white cedar with a very diverse herbaceous layer, as well as occurrences of several rare plant species in adjacent glade habitats. Across the river to the west of Blue Rock, control of Japanese stiltgrass and viper's bugloss is proposed to protect a glade woodland community that harbors several rare plant species.

On the crest of Cave Mountain east of the Big Bend Campground, a high-quality complex of glades and barrens harbors several sensitive and rare plant species. These communities are threatened by viper's bugloss and spotted knapweed. NNIS infestations in this community may

be partly due to seed transport and trampling of native plants by recreational users, vehicles, and cattle, most of which appear to be accessing the site from adjacent private land. Therefore, control activities would be supplemented by efforts to control access by cattle and visitors.

In addition to the three glade/barren control sites, several old regeneration units in the southern part of the Smoke Hole canyon near Eagle Rock are being impacted by NNIS. Tree of heaven, and in some cases autumn olive and bush honeysuckles, are competing with the native tree and shrub species. Therefore, control of these three NNIS is proposed to release the desirable vegetation from competition.

Seneca Creek Vicinity

The Seneca Creek backcountry and associated buffer lands comprise another of the major ecological reserves on the Forest. Garlic mustard has become established at several locations around the periphery of this area, and control activities are proposed at three sites (Map 6). The largest control effort in this area involves an infestation associated with reclamation efforts at a former surface mine near Brushy Run, on the eastern slopes of Spruce Mountain. This control effort will need to be designed carefully because of the presence of the federally-listed endangered running buffalo clover at this site. Other garlic mustard control efforts are planned for Forest Road 112 east of Spruce Knob and the Gatewood group camp near Spruce Knob Lake.

Laurel Fork Vicinity

A few known locations of NNIS are proposed for treatment near the Laurel Fork Wildernesses, although none of the locations are within the wilderness boundaries (Map 7). Treatment is proposed for a small patch of garlic mustard along the Middle Mountain Road adjacent to Laurel Fork North, as well as for another small patch along a road at the south end of Laurel Fork South. Approximately 1 mile east of Laurel Fork South, treatment is proposed for an infestation of meadow knapweed that is overtaking a range allotment.

East Fork Greenbrier/Burner Mountain Area – The National Forest portion of Blister Swamp is infested with yellow iris. This species could threaten ongoing ecosystem restoration efforts on adjacent private land, as well as planned future restoration efforts on National Forest land. Therefore, control of the infestation on National Forest land is proposed.

Control is proposed for garlic mustard, Japanese stiltgrass, and bush honeysuckle that threaten the periphery of the large ecological reserve formed by the East Fork Greenbrier backcountry. Further west, control is proposed for a large complex of wildlife openings on Burner Mountain that have been overrun by reed canary grass. Control efforts also are proposed on the network of roads that connect these openings (Map 8).

Cheat Mountain/Shaver's Mountain Vicinity – One of the largest complexes of proposed treatment is located in and around the spruce restoration areas north of Highway 250 on Cheat and Shaver's Mountains (Map 9). Most of the treatment would target reed canary grass that potentially threatens the unique high-elevation wetlands along small tributaries to the Shaver's Fork River. Although treatment of reed canary grass is not proposed in the wetlands, which are still largely intact, treatment is proposed along many miles of roads and many wildlife openings. This proposed treatment should eliminate or greatly reduce the seed reservoir and thereby reduce

the chance of reed canary grass invading the wetlands in the event of a disturbance.

In addition to reed canary grass, treatment is proposed for bush honeysuckles, Japanese barberry, garlic mustard, and Japanese stiltgrass that threaten botanical areas, limestone forests, and other high value ecosystems. These treatments would include control of bush honeysuckles in the Blister Run Botanical Area, as well as garlic mustard control in the Gaudineer Scenic Area.

Ramshorn/Shock Run Area, East of Dunmore

The ridge line east of Dunmore contains the Ramshorn and Shock Run project areas, where the Forest is investing effort and money in prescribed fire projects for oak ecosystem restoration. Both of these project areas face a severe threat from large garlic mustard infestations. The Ramshorn project area also contains smaller infestations of Japanese stiltgrass and common privet. While the prescribed fire proposed for these areas may help control garlic mustard and privet, the fire projects alone are unlikely to achieve the degree of control necessary to protect the resource management investments. Therefore, specific control efforts are proposed as part of this project (Map 10).

Buzzard Ridge Area

The Buzzard Ridge area in the headwaters of the Elk River is not a major ecological reserve and does not contain especially high value ecosystems. However, emerging infestations of garlic mustard in this area may still be controllable. To prevent these infestations from spreading across the larger landscape, control treatments are proposed (Map 11).

Highland Scenic Highway Area

The Highland Scenic Highway runs along the eastern edge of the largest ecological reserve on the Forest, which is formed by the Cranberry Wilderness and other nearby backcountry areas. Numerous invasive species grow along the shoulders of the highway. Maintaining the roadsides through mowing is difficult due to the presence of guardrails in many areas. Therefore, herbicide use is proposed to control invasive plants along the road shoulder (Map 12).

Also in the scenic highway area, several small garlic mustard infestations occur near the Tea Creek Campground and the Day Run Campground. These infestations would be controlled to prevent them from spreading throughout the ecological reserve (Map 12).

Cranberry Area

The upper portions of the Cranberry and Williams River watersheds contain the Cranberry Glades, which is the largest and highest quality high-elevation wetland ecosystem on the Forest. This area also lies within the ecological reserve formed by the Cranberry Wilderness and adjacent backcountry areas. These high-quality ecological resources are threatened by infestations of garlic mustard, reed canary grass, and crown vetch. Control of these threats is proposed (Map 13).

In addition to the ecological threats, the dam at Summit Lake may be threatened by infestations of bush honeysuckles and autumn olive. These shrubs create problems for maintenance of the dam, which must be kept free of woody vegetation to prevent piping of water along root channels. The boat ramp area at Summit Lake contains a small infestation of yellow iris that

may still be controllable, thereby preventing spread to the rest of the lake and other nearby aquatic habitats (Map 13).

Middle Mountain Near Rimel

The Middle Mountain backcountry is the only major (over 10,000 acres) ecological reserve in the southeastern part of the Forest. The Forest is implementing oak ecosystem restoration along the northern edge of this backcountry area. Ecosystems in this area are threatened by garlic mustard and tree of heaven, which are proposed for control (Map 14).

Anthony Creek Area

The southeastern part of the Forest contains several rare shale barren communities, some of which are designated as botanical areas. One of these, Whites Draft, is potentially threatened by invasive plants along its boundary. Control of these plants is proposed to prevent degradation of the botanical areas. In addition, control of garlic mustard at the Blue Bend Recreation Area is proposed to prevent the infestation from spreading throughout the local area (Map 15).

2.3 - Monitoring Applicable to Alternative 2

Table 2.2 describes monitoring that would occur under implementation of the Proposed Action, Alternative 2.

Table 2.2 - Monitoring Applicable to Alternative 2

Resource	Monitoring Description	Who's Responsible for Monitoring?
NNIS – Control Sites	Treatment sites should be monitored annually, and follow-up treatments applied as needed, until sites have been free of the target species for three consecutive years, or until the Responsible Official determines that effective control is not possible.	Botany
NNIS – Trailhead Sanitation Sites	Trailhead sanitation sites should be monitored at least once every three years for the presence of high priority NNIS plants.	Botany/Recreation
Threatened and Endangered Plants	Where TES plants are known to occur within 100 feet of treatment sites, monitor the TES species for effects of treatment annually during each treatment year and for three years following the last treatment.	Botany
Sensitive Wildlife – Northern Flying Squirrel	Any herbicide treatment sites with known northern flying squirrel occurrences, as well as a subset of any such sites within mapped suitable habitat but not near known occurrences, will be monitored following herbicide application for possible impacts to northern flying squirrels.	Wildlife/Botany

2.4 - Design Features and Implementation Strategies Applicable to Alternative 2

All alternatives have been designed to meet applicable state and federal laws and regulations, Forest Service policy and directives, and Forest Plan standards and guidelines. The implementation practices or features shown in Table 2.3 would be used with the specified activities, if selected, to help meet Forest Plan direction. This table gives additional detail on how to implement Forest Plan direction, especially when Forest Plan direction is general, or a specific method of implementation is recommended to ensure the desired results.

Table 2.3 - Design Features and Implementation Strategies Applicable to Alternative 2

Resource and Concern	Forest Plan Direction	Implementation Practice or Feature
<p>Native plants/NNIS Seeding may be needed for soil stabilization and reestablishment of desirable vegetation in wildlife openings. Such seeding is an opportunity to enhance habitat value by using native plants.</p>	<p>VE06, p. II-18</p>	<p>All seeding for soil stabilization, wildlife openings, etc. should use a site-appropriate mix of native grasses and/or forbs. A cover/nurse crop should be included in the mix to insure adequate soil stabilization while the native grasses and forbs become established. The cover/nurse crop does not have to be native as long as it is not invasive.</p>
<p>NNIS Seed mixtures could be contaminated with noxious weeds.</p>	<p>VE20 through VE24, pp. II-19 through II-20</p>	<p>Ideally, all seed mixtures used for soil stabilization, wildlife openings, etc. should be certified weed-free. However, there is a good possibility that certified seed will not be available. In this case the seed vendor’s test results for noxious weed content should accompany the seed shipment and should demonstrate that the seed is substantially free from noxious weed seeds.</p>
<p>NNIS Soiled construction equipment and vehicles may introduce NNIS plants.</p>	<p>VE20 through VE24, pp. II-19 through II-20</p>	<p>Before entering National Forest land, all construction equipment, spray vehicles, tractors, plows, disks, etc. must be free of all soil, seeds, vegetative matter, or other debris that could contain or hold seeds. Equipment and vehicles that are used in infested areas must be cleaned to the same standard before being moved to any other area of National Forest land. Vehicle and equipment cleaning should be conducted in a manner that 1) does not spread invasive plants to un-infested areas, and 2) does not contaminate soil and water with oil, grease, or other contaminants.</p>
<p>TES Plants NNIS control activities could adversely affect TES plants in or near treatment sites.</p>	<p>VE13, p. II-19; TE71, p. II-27; TE76 and TE77, p. II-28</p>	<p>Prior to the beginning of treatment activities, known locations of threatened, endangered, and sensitive (TES) plants within treatment areas should be marked with brightly colored flagging or other highly visible markers. All persons conducting control activities should be made aware of these locations, should be given basic instruction in identifying the TES species that are present, and should be instructed to avoid impacting TES plants through spray drift, digging, mowing, trampling, etc. to the maximum extent practical. To minimize the potential for poaching of TES plants in sites that are near trails or open roads, markers should be removed upon the completion of each annual iteration of control treatments.</p>

Resource and Concern	Forest Plan Direction	Implementation Practice or Feature
<p>TES Plants NNIS control activities could adversely affect TES plants in or near treatment sites.</p>	<p>VE13, p. II-19; TE71, p. II-27; TE76 and TE77, p. II-28</p>	<p>Do not conduct indiscriminate broadcast foliar spraying within 100 feet of known locations of threatened, endangered, or sensitive plants. If practical, hand pulling, grubbing, and mowing are the preferred control methods within this buffer. If herbicides must be used within the buffer, precisely targeted spot applications should be used. To the extent practical, applications should be made during the dormant season for the threatened, endangered, or sensitive species.</p>
<p>TES Plants Butternut, which is a sensitive species, looks superficially similar to tree of heaven. Butternuts could be inadvertently killed by tree of heaven control efforts if species identification is not confirmed.</p>	<p>VE13, p. II-19</p>	<p>Avoid cutting and applying herbicide to butternuts. Due to similarity of appearance to butternut, species identification of tree of heaven to be controlled must be confirmed by checking the leaf margin (entire vs. toothed), glands at leaf bases, or presence of samaras.</p>
<p>TES Plants The sensitive species Allegheny onion occurs at the Ramshorn treatment site. This plant could be harmed by poorly timed applications of non-selective herbicides.</p>	<p>VE13, p. II-19</p>	<p>Where herbicide treatments are conducted within 100 feet of known occurrences of Allegheny onion, apply herbicides only during the dormant season for Allegheny onion. Use only broadleaf-specific herbicides.</p>
<p>Recreation Resources Visitors may be exposed to herbicides and may be inconvenienced by area closures.</p>	<p>VE35 and VE37, p. II-20</p>	<p>In popular recreation sites, avoid treatment during heavy recreation use days such as weekends and holidays. When treatment is to occur in such areas, notify the public in advance through such means as newspapers, the Forest web site, and postings at recreation sites and trailheads.</p>
<p>Threatened and Endangered Wildlife Indiana bats may be roosting in trees targeted by NNIS treatments</p>	<p>TE26, TE27, TE31</p>	<p>Treatment methods for the tree of heaven and other NNIS trees over 5 inches dbh will be limited to basal spray or “hack and squirt” herbicide application to avoid loss of potential maternity or other roost trees (i.e., no trees over 5 inches dbh will be cut). In addition, no foliar spray will be used on trees over 5 inches dbh or 6 feet tall to avoid the potential for direct spray of herbicide on roosting bats.</p>
<p>Threatened and Endangered Wildlife Cheat Mountain salamanders could be harmed by ground or vegetation disturbance</p>	<p>TE58 and TE59</p>	<p>In known or high potential Cheat Mountain salamander habitat, survey for this species prior to implementing any ground or vegetation disturbance. Any ground or vegetation disturbance in occupied habitat and a 300-foot buffer around occupied habitat must not adversely affect Cheat Mountain salamanders.</p>
<p>Threatened and Endangered Wildlife Cheat Mountain salamanders could be harmed by contact with or ingestion of herbicides</p>	<p>TE59</p>	<p>In areas with known presence of Cheat Mountain salamanders, limit foliar herbicide application to hand application using a wick, wand/swiper, or glove applicator. Only aquatic-registered herbicides will be used in these areas. Avoid all mechanical treatment and herbicide application within 5 meters of observed Cheat Mountain salamanders or their eggs. Any herbicide application in known Cheat Mountain salamander habitat during April through October will be limited to the heat-of-the-day hours (9 am to 4 pm) when the salamanders are less likely to be active.</p>

Resource and Concern	Forest Plan Direction	Implementation Practice or Feature
<i>Sensitive Wildlife</i> Ground-nesting sensitive birds may be harmed or killed by mowing or ground disturbance during the nesting season.	WF13	In areas with known occurrences of ground- or low cover-nesting sensitive birds, limit mowing and grubbing to the period August 15 through March 15.
<i>Sensitive Wildlife</i> Ground-nesting sensitive birds may be harmed by herbicide application during the nesting season	WF13	Flag known nest locations of sensitive ground- or low cover-nesting birds and avoid herbicide application within 50 meters during the nesting season.
<i>Sensitive Wildlife</i> Northern flying squirrels could be harmed by herbicide application in their habitat	WF13	Should distressed flying squirrels be found in the vicinity of herbicide treatment sites within 30 days following treatment, herbicide treatments will cease in known and mapped northern flying squirrel habitat pending further investigation of the potential causes. Herbicide treatments will not resume until protective measures are in place.
<i>Sensitive Wildlife</i> Southern water shrews could be harmed by herbicide application in their habitat	WF13	In the Blister Run Botanical Area, application of glyphosate will be limited to cut surface, weed wand/swiper, wick, or glove methods rather than foliar spray or basal spray.
<i>Sensitive Wildlife</i> Allegheny woodrat, eastern small-footed myotis, timber rattlesnake, and green salamander could be harmed by herbicide application in their rocky habitats	WF13	Where treatment sites include rocky outcrops, talus slopes, caves, ledges, or similar habitats, surveys will be conducted within 100 meters of these features. If sensitive animals are found, treatments within 50 meters of these features will be limited to hand pulling and mowing with a string trimmer.

2.5 – Mitigation Measures Applicable to Alternative 2

The mitigation measures shown in Table 2.4 would be used with the specified actions to help reduce or eliminate potential negative impacts and to help meet Forest Plan direction.

Table 2.4 - Mitigation Measures Applicable to Alternative 2

Resource and Concern	Mitigation Measure	Effectiveness Information & Reference
<i>NNIS</i> Hay used for mulch can introduce NNIS plants.	Because a local source for weed-free mulch is not yet available, use clean straw, coconut fiber matting, synthetic material, or other low-risk material instead of hay mulch.	Forest Plan: VE20, p. II-19. Straw comes from intensively managed grain fields, which often are subject to herbicide applications and therefore are less likely to contain NNIS than hay fields. Coconut fiber and synthetic materials do not come from fields and thus have a low likelihood of containing NNIS.

Resource and Concern	Mitigation Measure	Effectiveness Information & Reference
<p>Human Health and Safety Prolonged use of triclopyr could expose workers to unsafe doses of this herbicide.</p>	<ul style="list-style-type: none"> No worker is allowed to apply or handle triclopyr for more than 7 hours in any one day. No worker is allowed to apply or handle triclopyr for more than 14 consecutive days. If a worker has been applying or handling triclopyr for 14 consecutive days on this project or any other job prior to working on this project, the worker must refrain from working with triclopyr for 7 consecutive days prior to beginning or resuming such work on this project. 	<p>Durkin 2003b; risk assessment worksheets contained in the project file. Exposure scenarios that produced unacceptable hazard quotients involved 8-hour work days for 90 days. Exposure scenarios involving shorter work days did not produce unacceptable hazard quotients.</p>
<p>Human Health and Safety Forest visitors could be exposed to unsafe doses of herbicides through consumption of contaminated vegetation or contact with treated vegetation</p>	<p>Where foliar herbicide applications are conducted near areas that are accessible to the general public, such as roads, trails, trailheads, recreational sites, administrative sites, etc., the treatment areas shall be closed to the public during treatment. Treated areas shall be signed to warn of the herbicide application, and shall remain signed until the treated vegetation dies or defoliates, or until enough time has passed for the herbicide to degrade to nontoxic levels. Any edible berries or other fruit that are contacted by the herbicide shall be removed from the site.</p>	<p>Risk assessment worksheets contained in the project file for clopyralid, glyphosate, imazapic, picloram, sethoxydim, and triclopyr. Exposure scenarios involving consumption or contact of contaminated vegetation would be unlikely to occur with the mitigation measure in place.</p>
<p>Aquatic Resources Some herbicides are toxic to aquatic life</p>	<p>Where treatment is necessary within stream channel buffers identified in the Forest Plan or within 100 feet of other water bodies, springs, or seeps, use herbicides registered for aquatic use or non-herbicide control methods.</p>	<p>Risk assessments identified potential hazards from use of non-aquatic formulations of glyphosate and triclopyr. Study authors recommended using the aquatic formulations of these herbicides for treatments near water (Durkin 2003a, Durkin 2003b)</p>
<p>Soil and Water Certain weather conditions may cause drift, runoff, or leaching of herbicides into groundwater or surface water</p>	<p>Spraying operations shall not occur when any of the following conditions exist:</p> <ul style="list-style-type: none"> Rain, fog, or dew causes moisture to drip from the foliage, or Precipitation is anticipated within six hours at the spray area. 	<p>Rain occurring within six hours of application can wash off much of foliar-applied glyphosate (Sundaram 1991).</p>
<p>Soil and Water Underground aquifers in areas with karst (limestone) surficial geology are vulnerable to contamination from herbicide spills</p>	<p>Mix and transfer chemicals on non-karst soils.</p>	<p>This measure will eliminate the potential for a spill on karst topography.</p>

Resource and Concern	Mitigation Measure	Effectiveness Information & Reference
<p>Soil and Water Wet soils with thick organic horizons at the surface (histosols or histic epipedons) are dependent on sphagnum mosses and other wetland vegetation for proper functioning. Broad-spectrum herbicides could kill this vegetation.</p>	<p>Where NNIS control is conducted on histosols or soil with a histic epipedon, use non-herbicide methods, precisely targeted spot applications of herbicide, or selective herbicides that do not affect mosses.</p>	<p>This measure would avoid exposing the sphagnum mosses to lethal herbicide doses.</p>
<p>Soil and Water Picloram has a high potential for runoff and can be persistent in the environment. Use of picloram in or near karst soils or near irrigation sources could lead to water contamination.</p>	<p>Do not use picloram on the Cunningham Knob range allotment or any other site in or adjacent to karst soils. Do not use picloram near irrigation water sources or within 100 feet of any water body. Substitute metsulfuron methyl, clopyralid, or non-herbicide methods.</p>	<p>This measure will eliminate the potential for picloram to contaminate karst features or surface waters (Dr. Chandran Rakesh, WVU Extension Specialist, personal communication).</p>
<p>Soil Soil exposed by fire lines may present a risk of erosion</p>	<p>Water-bar dozer lines as directed in the Fire Erosion prevention handbook. Water-bar hand lines on steep slopes. Seed and mulch all soils that are disturbed into the mineral horizon. Apply lime and fertilizer as needed or indicated by soil testing.</p>	<p>West Virginia BMPs for timber harvesting</p>
<p>Soil Prescribed fires in areas with concentrated slash may burn hot enough to damage the soil</p>	<p>Where prescribed fire is applied, disperse any slash piles or protect them by constructing fire lines around them.</p>	<p>Erickson and White 2008; Shock Run Monitoring Report – USDA Forest Service 2006</p>
<p>Threatened and Endangered Wildlife Indiana bats could be harmed by loss of roost trees and direct contact with herbicides</p>	<p>No trees greater than 5 inches dbh will be cut. Foliar spraying will not be used on trees or shrubs greater than 5 inches dbh or greater than 6 feet tall. Herbicide treatment of trees greater than 5 inches dbh or greater than 6 feet tall will be limited to basal spray or cut surface methods that do not involve felling the tree.</p>	<p>Trees greater than 5 inches dbh are considered potential Indiana bat roost trees (USFWS 2006).</p>
<p>Wildlife Large mammals and large birds could be harmed by ingesting vegetation treated with triclopyr</p>	<p>Do not use triclopyr for foliar treatments in wildlife openings, fields, or other open habitats frequented by game species (preferred herbicides in these areas are metsulfuron methyl or imazapyr).</p>	<p>Risk assessment worksheets for triclopyr identified possible chronic toxicity for long-term consumption of large quantities of treated vegetation (see worksheets in project file). Exposure scenarios involving long-term consumption of large amounts of contaminated vegetation would be unlikely to occur with the mitigation measure in place.</p>

2.6 - Comparison of Activities by Alternative

Table 2.5 summarizes the activities that may be implemented under each alternative.

Table 2.5 - Summary Comparison of Activities Proposed, by Alternative

Activity	Alt. 1 - No Action	Alt. 2 - Proposed Action
Trailhead monitoring/sanitation, number of sites	0	61
Miles of road storage	0	11.5
Establishment of programmatic treatment protocols	No	Yes
Site-specific treatment of existing infestations, acres	0	5,094

¹ Figures provided in this table are approximations.

An explanation of each alternative’s consistency with the Forest Plan is provided in the “Forest Plan Consistency” sections in Chapter 3. Implementing the action alternative would not require an amendment to the Forest Plan. If the action alternative is selected, any contracts or work plans used to complete the work would contain terms and conditions that would help implement design features and mitigation requirements such as those listed in Tables 2.3 and 2.4, or imposed by statute, regulation, or Executive Order.

2.7 - Comparison of Environmental Effects by Alternative

Table 2.6 summarizes how the alternatives differ in regards to their achievement of project objectives (Chapter 1), their response to the issue (Chapter 1), and resource impacts (Chapter 3).

Table 2.6 - Summary Comparison of Environmental Effects, by Alternative

Project Objectives	Alternative 1 - No Action	Alternative 2 - Proposed Action
Reduce risk of NNIS introduction	Existing prevention activities	Existing prevention activities plus trailhead sanitation and storage of high risk roads
Control NNIS plants that threaten high-interest ecosystems	Minimal ongoing activity (hand pulling garlic mustard at Gaudineer Scenic Area)	Targeted control of 50 infestations that threaten botanical areas, scenic areas, candidate research natural areas, landscape-scale ecological reserves, or TES species habitat.
Eliminate emerging infestations	Only to the extent such emerging infestations occur within timber harvest or range allotment project boundaries	Control of 31 high-priority infestations that are less than 1 acre in size
Control NNIS plants that cause problems for resource management	None	Control of 23 infestations that threaten wildlife habitat development, ecosystem restoration efforts, tree regeneration, and roads/facilities

Issue	Alternative 1 - No Action	Alternative 2 - Proposed Action
<p>Reduce the impacts to Forest resources from NNIS:</p> <ul style="list-style-type: none"> • Acres of potential NNIS treatment • Treatment protocols established • NNIS preventive measures proposed 	<ul style="list-style-type: none"> • 1,078 acres of control as part of other projects • No treatment protocols established • Continuation of preventative measures listed in Section 1.4 	<ul style="list-style-type: none"> • 6,172 acres of cumulative control for this project and other projects combined • Establishment of treatment protocols as outlined in Section 2.2.2 • Continuation of preventative measures listed in Section 1.4; trailhead sanitation strategy; storage of 11.5 miles of road
Potential Impacts	Alternative 1 - No Action	Alternative 2 - Proposed Action
Beneficial effects to threatened and endangered plants and animals	None	Potential long-term benefits to two populations of running buffalo clover. Potential long-term benefits to one population of Cheat Mountain salamander
Adverse effects to threatened and endangered plants and animals	None	Potential short-term loss of individual plants in two populations of running buffalo clover
Possible long-term beneficial effects to sensitive plants	None	Ten species
Possible short-term adverse effects to sensitive plants	None	Four species
Likely short-term adverse effects to sensitive plants	None	One species
Effects to aquatic resources	None	None, barring accidental spills
Effects to human health and safety	None	None, provided mitigation measures are followed
Effects to soil productivity	Potential reduction in productivity due to continued spread of NNIS plants	Reductions mitigated on 5,094 acres of treatment areas
Soil disturbance	None	Minor amounts of disturbance due to hand pulling, grubbing, and prescribed fire
Accumulation of herbicides in soil and groundwater	None	None provided design criteria and mitigation measures are followed
Scenic resources	Some degradation of scenic quality due to spread of NNIS plants	Mitigation of scenic quality degradation; temporary browning or burning of vegetation in treatment areas
Recreation impacts	Expansion of invasive plant thickets that could impede foot travel	Control of selected invasive plant thickets; temporary closures of some trails, roads, and facilities during treatment
Cultural heritage impacts	None	None provided any future ground-disturbing activities are preceded by archaeological surveys