

# Forest Vegetation Management: A Matrix of Options

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Forest understory vegetation complexes that interfere with management objectives can consist of native and nonnative species ranging from annual herbs to long-lived woody species. Each species presents different challenges if they have reached a threshold that warrants a management response to restore and maintain habitat, ecological function, productive potential, and other values commonly associated with woodlands.

In 2016, a team of foresters from Cornell Cooperative Extension started a 3-year National Institute of Food and Agriculture (NIFA)-funded project known as Forest Vegetation Management (FVM) to evaluate and develop recommendations for forest managers in the northeastern United States. An outcome of those efforts is shown in the Table 1 matrix. The matrix allows managers to rapidly assess options for similar types of shade-tolerant plants<sup>2</sup>, then focus on methods likely to yield desirable results for each context.

Every plant has at least one control method. No single method works well across all types of plants or for all configurations of ownership and management. Consequently, developing a sound strategy starts with identifying ownership objectives and constraints with the targeted vegetation types (Table 2) then selecting one or more appropriate methods (i.e., those rated as a 1 or 2, as defined in Table 3) from the matrix.

Detailed guidance for each method is captured in Table 4. The guidance was developed into an extension bulletin of the same name (available at <https://bit.ly/2ZuHB4r-FVM-Matrix>) and on the Cornell Cooperative Extension forestry extension website at [www.ForestConnect.info](http://www.ForestConnect.info). This information was compiled primarily through two methods: the results of applied research projects on aspects of forest vegetation management conducted mainly at the Cornell University Arnot Teaching and Research Forest, and interviews with forestry professionals that were part of the FVM project.

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<sup>2</sup> Local regulations may restrict some options.

**Table 1.—Matrix FVM options. For the description of vegetation growth form, see Table 2. For the description of number codes, see Table 3. For the description of treatments (chemical, mechanical, etc.), see Table 4.**

| Vegetation Growth Form     | Chemical                         |                              | Mechanical                        |                     |                                    | Integrated                             | Biological                     |
|----------------------------|----------------------------------|------------------------------|-----------------------------------|---------------------|------------------------------------|----------------------------------------|--------------------------------|
|                            | Foliar (broadcast or individual) | Basal/injection (individual) | Mow/cut (broadcast or individual) | Girdle (individual) | Excavate (broadcast or individual) | Cut-stump, cut-surface, or cut-stubble | Silvopasture/ livestock impact |
| Herbaceous, short-lived    | 2                                | 3                            | 2                                 | 3                   | 3                                  | 3                                      | 2                              |
| Low herbaceous, perennial  | 1                                | 3                            | 2                                 | 3                   | 3                                  | 2/3                                    | 2                              |
| Tall herbaceous, perennial | 1/2                              | 3                            | 2                                 | 3                   | 3                                  | 2                                      | 2                              |
| Vines, annual              | 1                                | 3                            | 2                                 | 3                   | 3                                  | 3                                      | 2                              |
| Vines, perennial           | 2                                | 3                            | 2                                 | 3                   | 3                                  | 1                                      | 2                              |
| Canes                      | 1                                | 3                            | 1                                 | 3                   | 2                                  | 1                                      | 2                              |
| Shrubs                     | 2                                | 2                            | 1                                 | 2                   | 1                                  | 1                                      | 2/3                            |
| Trees                      | 2/3                              | 1                            | 1                                 | 1                   | 2                                  | 1                                      | 2/3                            |

**Table 2.—Examples of vegetation growth form in the FVM matrix**

| Plant Type                 | Example                                                          |
|----------------------------|------------------------------------------------------------------|
| Herbaceous, short-lived    | Stiltgrass, garlic mustard                                       |
| Low herbaceous, perennial  | Ferns, grasses                                                   |
| Tall herbaceous, perennial | Knotweed, swallow wort                                           |
| Vines, annual              | Mile-a-minute                                                    |
| Vines, perennial           | Grape, bittersweet, poison ivy                                   |
| Canes                      | Rubus, multiflora rose                                           |
| Shrubs (<10 inches)        | Barberry, autumn olive, honeysuckle, privet, euonymus, buckthorn |
| Trees (>10 inches)         | Beech, carpinus, ostrya, striped maple, tree-of-heaven           |

**Table 3.—FVM matrix codes**

| Code | Description                                                                                                                                                                                                                            |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Good results<br>While correct protocol is important, control of the target is high and generally robust in effectiveness.                                                                                                              |
| 2    | Mixed results<br>These treatments can be applied successfully, but attention to protocols is important. Without this attention, success is unlikely.                                                                                   |
| 3    | Impractical to implement or insufficient results<br>There is limited research or experience for this treatment, or—while the treatment is theoretically possible—it is unlikely to succeed due to logistical or practical constraints. |

**Table 4.—Explanations for predicted outcomes**

|                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Chemical—foliar</b>             | Selective, nonselective, and pre-emergent herbicides for labeled use can be partially effective when applied under the right conditions. Factors limiting effectiveness in forest applications include: access; coverage; plant conditions like growth phase and drought stress; resistance features, both genetic and morphological; meteorological conditions; and skilled application. Broadcast herbicide treatments are usually more effective for short-term control—such as to temporarily reduce understory interference to establish or release regeneration—and are most effective when coupled with other control strategies. |
| <b>Chemical—basal or injection</b> | Basal spray and injection are impractical treatment methods for most types of interfering vegetation, larger woody stems that are readily accessible. Basal treatment formulations will be most effective on thin-barked species like beech. Systemic herbicides labeled for injection will yield the best results when wood is not frozen and the proper dosage is used according to the product label.                                                                                                                                                                                                                                 |
| <b>Mechanical—mow or cut</b>       | Severing stems by cutting either with simple tools or specialized machines provides instant gratification, but usually short-lived results. Most example plants are capable of vigorously resprouting. Intensive and continued mowing would be necessary to exhaust root reserves to mortality for most species. Nonetheless, judicious mowing can increase the viability of more durable methods from the chemical and biological categories.                                                                                                                                                                                           |
| <b>Mechanical—girdle</b>           | Girdling is impractical except for larger-diameter woody stems that are unlikely to sucker or coppice. The cambium tissue beneath the bark must be fully severed and some species can take several years to die.                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Mechanical—excavate</b>         | Plants and most roots are removed using heavy equipment. This is effective for species that will not propagate from root fragments. However, the significant soil disturbance associated with excavation will often stimulate the soil seed bank and potentially give rise to other noxious plant problems.                                                                                                                                                                                                                                                                                                                              |
| <b>Integrated</b>                  | Mechanical cutting followed by immediate chemical treatment of the fresh stumps can enhance the effectiveness of control for plants where the cut surface is sufficiently large to absorb the labeled herbicide treatment.                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Biological—silvopasturing</b>   | Managed livestock impacts such as defoliation, girdling, browsing, and trampling are used to limit the growth of undesirable plant species while fostering the growth of desirable ones. Silvopasture establishment usually requires some combination of initial treatments from other vegetation management options to reduce vegetation height and density before livestock can be effective. Targeted livestock impacts through intensive rotational grazing will gradually shift understory vegetation to a more stable complex resistant to invading plants.                                                                        |

The content of this paper reflects the views of the author(s), who are responsible for the facts and accuracy of the information presented herein.

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