



# Homeowner Herbicide Guide

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## Introduction

Herbicides can be a great tool in the battle against non-native invasive plants within your property. Effective and safe use can only be achieved when one is informed with the myriad of strategies, timing, and limitations associated with these herbicides. This guide will help inform you on herbicide use and application.

Herbicides are a type of pesticide, that is a chemical substance used for destroying organisms harmful to valuable plants or animals. In this case we are focusing on the control of plants which is why we increase the specificity of the term to herbicides.

There are hundreds of different herbicide products on the market, all of them utilizing a unique combination of chemicals designed to disrupt internal plant processes. Herbicides fall into many different categories. An **emergent** herbicide will only control existing weeds and will not affect new seeds germinating (sprouting) into new weeds. On the other hand, a **pre-emergent** herbicide will target weeds as they germinate (sprout) from the seeds. Some herbicides can target a specific group of plants. These herbicides are known as **selective**, meaning that they will only kill a certain type of plant like grasses but will not control broadleaves. Conversely, **non-selective** herbicides do not discriminate in the types of plants they control.

Herbicides can also be categorized as **systemic** or **non-systemic**. **Systemic** herbicides are absorbed by the plant and taken into the root system, killing the plant as a whole. **Non-systemic** herbicides, also known as **contact**, only kill the part of the plant they come in contact with. The chemical within an herbicide product that is responsible for killing the plant is known as the **active ingredient**. Some of the common active ingredients and their effects are:

**Glyphosate:** A non-selective herbicide that stops a specific enzyme pathway, needed to make essential plant proteins for plant growth. Specific to plants and some microorganisms.

**Triclopyr:** A selective herbicide that targets broadleaves but does not affect grasses. Affects actively growing plants by mimicking a specific type of plant growth hormone known as an auxin. Plants rapidly take in triclopyr through leaves and roots causing uncontrolled plant growth resulting in plant death.

**2,4-D:** A selective herbicide that targets broadleaves but does not affect most grasses. Works similarly to triclopyr in that it kills plants by causing the cells in the tissues that carry water and nutrients to grow uncontrollably.

These active ingredients are mixed with **adjuvants**, which is any material that is added to an herbicide mixture that facilitates mixing, application, and pesticide efficacy. Adjuvants also allow the applicator to tailor the formulation for their specific application requirements. Adjuvants can include surfactants, dyes, and extenders (amongst many others). Surfactants are one of the most important adjuvants as they facilitate the absorption and movement of herbicide into the plant.

Many of these active ingredients are not known to be toxic to mammals by themselves. Toxicity increases when they are mixed with other ingredients such as surfactants. Some concoctions are known to be more

toxic than others. Some herbicides will contain the same active ingredients but be approved for use in different areas. Roundup and Rodeo contain the same active ingredient but have different formulations that allow Rodeo to be safe for use in wetlands. Never apply a non-wetland approved herbicide over an area that may influence a wetland. That is, any area that holds a significant amount of water, even seasonally, such as ephemeral ponds. Areas that may drain into wet areas should be considered as well. It is also important to review any local, state, or federal regulations when working within or near a wetland.

It is crucial to read and follow the label of any herbicide that you plan to use – the label is the law. The label provides all the important specifics of the herbicides, including the active ingredients, application methods and rates, safety, storage and more. It is important to read the label before buying the product to ensure that you are buying the right tool for the job, using the right herbicide will yield the right results. Additionally, the label will inform the reader on the personal protective equipment (PPE) you must wear when applying that specific herbicide, as well as any information regarding ecological dangers and a list of plants the herbicide targets

**\*This guide only covers chemical control methods. It is important to know about other non-chemical control methods and how they can fit into your invasive plant control regime.**

## Treatment Methods

Herbicides can be applied in a variety of ways with each method exhibiting its own suite of strengths and weaknesses. Please note that these are all chemical methods and do not mention mechanical or biological methods of control.

### Foliar Spray

In this method the herbicide is diluted with water and sometimes diesel fuel (although, many residential products are pre-mixed and ready to go). From here they are sprayed directly onto the leaves of the vegetation to the point of runoff, meaning that every leaf is wetted but not dripping. Foliar spray formulations contain the lowest percentage of active ingredients as they are taken in through a much larger surface area than the other methods. This method should only be used for plants that are below shoulder height. Any higher increases the risk of spray drift. Foliar spray is highly effective when treating large areas as it is efficient on time and cost. On the other hand, this method may lead to the accidental damage of non-target plants from spray drift, and it uses a higher volume of chemical than other treatment methods.

### Cut-stump

This method involves the cutting of the invasive plant completely at its base (the closer to the ground the better) using a cutting tool (lopper, chainsaw, hand saw). Herbicide is then sprayed or painted onto the exposed cut stump. Plants will begin to start sealing the wound as soon as it is cut. Due to this, absorption rates will decrease dramatically as time passes. For maximum effectiveness, apply herbicide to the stump as soon as it is cut, ideally within 15 minutes. This method is best when trying to minimize the amount of herbicide applied to an area. However, this method can be time consuming.

When using this method to cut vines around a tree, try your best to limit the amount of herbicide that gets on the non-target tree. A little herbicide on the bark will not harm the tree but soaking it may weaken it.

### Hack and Squirt

In this method, an axe or hatchet is used to make a series of cuts into the trunk or stem of a plant, deep enough to reach the sapwood tissue inside the trunk. Immediately after making the cuts the treatment is made by “squirting” herbicide into these slots. Cuts should point at a downward 45-degree angle to prevent the herbicide from draining out of the cut. It is important to not girdle the tree or shrub, that is create a connected ring of cuts around the circumference of the trunk that will cut off the flow of nutrients ultimately responsible for transporting the herbicide to the rest of the plant. This method is highly effective in reducing the amount of herbicide used and exhibits a low risk to non-target plants. However, this method creates stands of dead trees, or “snags” which may or may not match up to the homeowner’s goals. Additionally, this method can only be used on woody plants such as shrubs or trees, on stems larger than 1 inch in diameter.

### Basal Bark

For this method, an oil soluble herbicide is mixed with an oil carrier such as diesel fuel or basal oil. Then used to spray the full circumference of the invasive plant’s trunk or stem, starting at the base to 40 cm or 16 inches up the trunk. This method is only used for woody plants such as shrubs, trees, or large vines. The oil-based solution penetrates the bark and is transported throughout, killing the plant. This method may lose significant effectiveness on plants with very thick bark. This is another good option to reduce the amount of herbicide used and to reduce damage to non-target plants. Similar to hack and squirt, this method leaves dead standing vegetation that may need to be cleared in the future. Note that stands can provide good habitat for wildlife but may create a hazard for humans as the trunk begins to break down.

### Granule

The granule method applies small granules or pellets to the soil that contain the active ingredient to prevent pre-emergent growth of weeds within an area for an extended period of time. To apply, the applicator blankets an area with the granules and waters it in. Sometimes the granules will need to be worked into the soil. This method works well for those that may want to maintain an already planted area or to aid in preparation for a future planting. When buying granule products, it is important to read the label and make sure that the herbicide is rated to not affect already established plants. Dust is similar to granules but is finely ground and combined with an inert carrier. These products are not common and can pose an inhalation hazard.

### Soil Drench

The soil drench method applies a diluted herbicide mix directly into the soil to target the roots of the target plant. Small stemmed plants can be treated by applying the mixture at the base of the stem while bigger stemmed plants such as trees may require a trench to be dug out by the base of the trunk and drench be poured into that trench. This method is highly targeted and can reduce the risk of treating non-target plants based on the scenario. Areas that contain tightly packed plants may be inhabited by the roots of multiple plants, increasing the risk of damage to non-target plants. The effects of this method may take longer than foliar spraying due to the slower absorption process.

## Considerations

There are a number of factors to consider when applying an herbicide. It is critical to always adhere to herbicide label instructions, remember THE LABEL IS THE LAW. There can be implications when the label instructions are not followed, or if the following factors are not considered.

### Personal Protective Equipment

Personal Protective Equipment or PPE is one of the most important aspects of herbicide application. It ensures the safety of the applicator and those around them. Herbicide labels will always provide minimum PPE requirements when mixing and applying the product. The general goal of PPE is to provide a barrier between the applicator and the chemical. Keeping this in mind, only wearing some but not all required PPE may expose the applicator to unnecessary risk. PPE is only effective when all parts are worn in conjunction with each other.

**Rubber Gloves:** Glove materials can vary in their protective abilities. It is important to pay careful attention to the glove types specified on the herbicide label. Chemical resistant gloves can come in many different forms, made from materials like nitrile, neoprene, and butyl rubber. Oftentimes, the herbicide label will list examples of suitable glove types.

**Clothing:** A long sleeved shirt and pants will protect the applicator's limbs and body from accidental spillage and sprays. Shorts and short sleeved shirts will not offer enough protection.

**Footwear:** At a minimum, closed toe shoes are to be worn. If available, rubber boots are a better option as they will not absorb chemical and are easy to clean.

**Eye Protection:** Eye protection should always be worn when mixing or applying herbicide. At a minimum, eyeglasses or sunglasses can be worn if on hand. Heavier protection can include shielded safety glasses, goggles, a face shield, or a full-face respirator. Applicators that wear glasses can wear goggles or eye-glass conscious safety glasses.

**Respirator and Headgear:** Herbicide labels will specify if a respirator and/or headgear is required. When picking out the respirator, ensure that it is approved by National Institute for Occupational Safety and Health (NIOSH). Proper headgear does not include baseball hats or any other casual headgear, it will always refer to chemical resistant hats or hoods.

### Weather

Before scheduling a treatment, it is imperative to familiarize oneself with local weather predictions as this will dictate treatment efficacy. Herbicide should never be applied when temperatures are above 85 degrees Fahrenheit. Application during this time may cause the herbicide to volatilize, transitioning from liquid to gas. This is problematic for the effectiveness of the treatment and detrimental for the applicator as it becomes easy to breath-in the herbicide. Volatilized herbicide drift can damage non-target plants, including overhead trees, or even plants on a neighboring property. Avoid applications when temperatures are below 40 degrees Fahrenheit as this will decrease effectiveness. You will see the best results between 60-85 degrees Fahrenheit.

Applications such as foliar spraying should only be done on a calm day when winds are at a minimum. High winds during an application will cause spray to blow over into non-target areas such as native plants or the applicator. Additionally, windy days present an increased risk to applicators working near trees as limbs may snap and fall during this time.

Treatment should be postponed if rain is forecasted within 12 hours of the treatment. Many herbicides have a rainfast period (necessary length of a rain-free period following a herbicide application) much shorter than 12 hours. However, this is a good rule to follow as this period changes with environmental conditions and will account for any forecast miscalculations. Rains will cause herbicide runoff, washing the herbicide away from the target area and potentially having detrimental effects on non-target species. Treatment should not be done immediately after a rain as the moisture on the vegetation can dilute the herbicide, reducing its effectiveness.

It is important to note that general weather patterns can influence herbicide absorption and directly impact efficacy. Foliar spraying on cool cloudy days can reduce herbicide efficacy compared to foliar spraying on warm sunny days. This is due to the reduced photosynthetic activity on days with lower temperature and light levels. Similarly, plants that are experiencing drought conditions tend to drastically reduce metabolic activity in an effort to survive stressful conditions. Treatment during this period of time will not be effective.

### Non-target plants

Herbicide applications always risk damaging non-target plants. This risk can be mitigated by choosing selective herbicides or changing the application method or timing to avoid causing harm to beneficial natives. Wrongful identification of target species can contribute to this as well. Make sure you are informed on the key field marks of your target species.

### Timing

The effectiveness of some applications will vary throughout the year. Many woody plants such as vines, shrubs, and trees exhibit a general changing flow of energy and nutrients, seasonally. During the spring, plants bring all energy reserves stored in the roots and transfer them above ground, fueling the emerging flowers and leaves. Herbicide applications are not very effective during this time as the herbicide has a low chance of moving into the roots. In the summer, the flow begins to trickle downward and applications can become more effective. This downward flow reaches an apex during the fall when the plant is preparing for its winter dormancy; transporting large amounts of its growing season production down to the roots. Evergreen and semi-evergreen invasive plants will extend this period closer to the winter. Oftentimes winter is the best time to treat these plants, as dormant natives will not be affected from overspray and are easily distinguishable.

The effectiveness of all the methods will vary as seasons progress. Foliar spraying will be the most effective treatment during late summer to early fall (before leaf fall). At this time plants will be leafed out and transporting a large percentage of their energy reserves down to the roots. Cut-stump is effective during these times, but may treat a smaller area during the same period of time when compared to foliar spraying. During late fall and winter, many plants will have lost their foliage, leaving the applicator to consider different control methods. Hack and squirt can be applied anytime during the year, although it is advisable to curtail

treatment during intense upward sap flow (generally between the months of March and early June). Basal bark treatment can be applied anytime during the year. These methods are quicker than cut-stump but may create more work for the applicator in the future in the form of standing snags.

### Proximity to Wetlands and Slope

Noting the treatment area's proximity to wetlands will inform the user if a wetland approved herbicide is needed. If this is not available to the user then herbicide application will not be possible, and a mechanical control method may need to be utilized. In New Jersey, invasive plant management (both chemical and mechanical) in or near wetlands require permits and a specialized license to complete this work. Be sure to check all local, state, and federal regulations as they related to wetland prior to beginning this work.

Noting land slope is important when accounting for the potential herbicide run off. The importance of this factor will depend on the proximity to sensitive areas such as wetlands and type of application method used. For example, foliar spraying (applying through a spray on the leaves) a non-wetland approved herbicide over a slope that drains into a pond would be irresponsible and illegal. In this instance switching to a wetland approved herbicide would be ideal. If possible, switching over to an application method that requires less herbicide such as cut-stump can be another great option.

### Wildlife

Although many herbicides were formulated to only target biological processes unique to plants, many ecological effects are still not well known. A responsible applicator will always try to apply the least amount of herbicide needed for effective treatment. The use of the right herbicide for the land type will ensure minimal disruption of ecological processes. For example, limiting treatment during periods when wildlife may be nesting .

### Storage

Always store your herbicide in a dry and climate protected area, but away from children and others. Places like a shed, garage, or storage totes are perfect. Try to avoid storing recently mixed herbicide (a concentrate mixed with surfactant) in a spray bottle or tank for long periods of time. Instead, only mix the amount needed, working in batches if necessary. From the moment the concentrates are mixed, the active ingredients will begin to breakdown. Resulting in a less effective or completely ineffective mix. The best practice to implement is to mix what you need and utilize all of it. Additionally, sitting herbicide will gradually break down the equipment it is stored in.

## Herbicide Types

Herbicides come in a variety of forms, created for the myriad of scenarios and varying skill level of the applicator.

### Ready to Use

Ready to use or ready to spray herbicides are the most accessible form of herbicide available to the homeowner as they do not require any additional preparatory steps from purchase to application. These types of herbicide come pre-mixed with all the necessary ingredients, combining active ingredients with the

other necessary components such as water, oil, and/or surfactants needed for a successful mix. Generally, we recommend the landowner buy these forms of herbicide as they can simplify the process. Because these solutions are pre-mixed for a specific application method, they cannot be used for other methods such as cut-stump which require a higher percentage of active ingredients in the mix.

### Concentrate

Another type of herbicide on the market is the concentrated formula. Concentrates will provide the applicator with a mix of active ingredients and will have to be further diluted for the applicator's needs. This provides the applicator with a much more flexible product that can be stretched for use with foliar or cut-stump formulations. Pay special attention to the label of these concentrates as some will be specifically designed for forbs and/or grasses. These types of concentrates may be applied to woody species but only through a stronger dose of foliar spray. Other concentrates that are often marketed as "brush killers" can be used as both foliar spray when diluted and cut-stump without dilution. This flexibility adds complexity as the user will need to tailor the mix to their specific needs. Additionally, these concentrates may require the purchase of equipment like pump-up tank sprayers or similar equipment.

### Granule

The granule form herbicide is a pre-emergent herbicide used to prevent weed seeds from germinating. This herbicide does not kill plants that have already germinated. This method is a good option when maintaining an established bed or when trying to prepare a future bed for planting. The application of this method is straightforward, simply requiring the applicator to lightly blanket the soil with the granules and water in it. While this method is easily accessible, it is narrow in its treatment focus, in that it can only treat weeds before they emerge.

**\*Please remember to only use the herbicide in accordance to its label instructions.**

## Species-specific recommendations

The species below are known as New Jersey's main culprits. These species represent a unique set of treatment challenges due to their growth strategies.

### Vines

Species under this group include English ivy, kudzu, mile-a-minute, porcelain berry, sweet autumn clematis, oriental bittersweet, and Chinese wisteria. These species are best controlled by foliar spray or cut-stump, depending on the situation. Low lying vines under shoulder height that carpet large areas are best controlled by foliar spraying late-summer to early spring. Vines that are climbing up trees can be cut-stumped by their base and left to break down well into the winter. Old vines of large size can be efficiently treated by cut stumping as well.

### Woody Species

Species under this group include privet, bush honeysuckle, multiflora rose, and tree of heaven. This group of species can be treated with a variety of methods. Foliar spraying can be done when plants are under shoulder height. Cut stumping is a great option for when woody species start to get large and foliar spraying is no

longer feasible. Larger stumps will offer a greater surface area for absorption. Basal bark and hack-n-squirt are good alternatives as well.

### Broadleaves

Species under this group include garlic mustard, Asiatic dayflower, mugwort, creeping Charlie, and lesser celandine. This group of plants is best treated with foliar spray. When possible, treat these plants before they bloom to prevent seeding, which lengthens the amount of treatments needed for complete eradication. Young sprouts will generally improve the absorption rate as many species lack their waxy coverings in this stage.

### Grasses

Species under this group include weeping love grass, phragmites, bamboo, and Japanese stilt grass. This is a group of plants that can be difficult to control as they have an exceptionally strong and extensive root system. Depending on the height of the species this group is best controlled by foliar spray and cut-stump. Low lying and less hardy grasses such as weeping love grass and stilt grass can be treated with a consistent foliar spray schedule. Tall and exceptionally hardy grasses like phragmites or bamboo will demand an aggressive strategy. Due to the height of phragmites and bamboo, the applicator may have to implement mechanical control practices such as mowing to reduce the height and initiate new growth. From here, the applicator can foliar spray the new growth.

**\*For more species specific recommendations please visit <https://www.fohvos.info/invasive-species-strike-team/info-center/> under eradication and species list with control recommendations.**