

Specimen Label



Spike[®] 80DF

Specialty Herbicide

®Trademark of Dow AgroSciences LLC

A preemergence and postemergence herbicide for total control of woody plant species, brush and weeds on noncrop areas.

Not for sale, distribution, or use in Nassau and Suffolk Counties in New York State



Spike[®] 80DF will kill trees and shrubs. Carefully read the precautions before using.

Active Ingredient:

tebuthiuron: *N*-[5-(1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl]-*N,N'*-dimethylurea 80.0%

Other Ingredients 20.0%

Total 100.0%

Contains 20 pounds active ingredient per 25 pound bag.

EPA Reg. No. 62719-107

Keep Out of Reach of Children

CAUTION PRECAUCION

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

Precautionary Statements

Hazards to Humans and Domestic Animals

Harmful If Swallowed, Inhaled, Or Absorbed Through The Skin • Causes Eye Irritation

Avoid breathing dust and contact with eyes, skin or clothing. Eye protection, long-sleeved shirt, long pants, shoes and socks, and chemical resistant gloves made of any waterproof material must be worn when handling or applying this product. Wash thoroughly with soap and water after handling. Remove contaminated clothing and wash before reuse.

First Aid

If swallowed: Call a Poison Control Center or doctor immediately for treatment advice. Have a person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a Poison Control Center or doctor. Do not give anything by mouth to an unconscious person.

If on skin or clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a Poison Control Center or doctor for treatment.

If in eyes: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a Poison Control Center or doctor for treatment advice.

If inhaled: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth-to-mouth, if possible. Call a poison control center or doctor for further treatment advice.

Have the product container or label with you when calling a Poison Control Center or doctor or going for treatment. You may also contact 1-800-992-5994 for emergency medical treatment information.

Environmental Hazards

Precaution: Do not use Spike[®] 80DF herbicide in any area where desirable species are in the vicinity of the plants to be controlled. A small amount of Spike 80DF in contact with the roots of desirable trees or other woody species may cause severe injury or death. The roots of such plants may extend far beyond their drip lines.

Do not apply directly to water, to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment washwater or rinsate.

Ground Water Advisory: This product is known to leach through soil into ground water under certain conditions as a result of registered (rangeland and non-crop) uses. Use of this product in areas where soils have rapid to very rapid permeability, particularly where the water table is shallow, may result in ground water contamination.

Use Restrictions for Groundwater Protection

Vulnerable Sites: To minimize any movement of tebuthiuron to subsurface water, do not exceed the application rates specified below on treatment sites where soils have a sand or loamy sand texture throughout the soil profile and **all** of the following characteristics:

1. Rapid to very rapid permeability.
2. Absence of well-defined organic layers or a textural B-horizon (restricting layer of fine-textured soil).
3. The water table of an underlying aquifer[†] is shallow.

The maximum use rates for Spike 80DF in areas described above are:

- **Less than 20 inches annual precipitation:** Do not apply more than 1.25 lb/acre Spike 80DF.
- **Greater than 20 inches annual precipitation:** Do not apply more than 2.5 lb/acre Spike 80DF.

Refer to the Woody Plants Controlled section of this label for plant species controlled at these application rates.

[†] An aquifer is defined as "an underground saturated, permeable, geologic formation capable of producing significant quantities of water to a well or spring." It is the ability of the saturated zone, or portion of that zone, to yield water which makes it an aquifer (American Chemical Society, 1983). Local agricultural agencies can provide further information on the type of soil in your area and the location of shallow ground water aquifers.

Do not apply Spike 80DF in areas where the water table is predominately shallow (5 feet or less), such as marshy or sub irrigated areas, or areas immediately adjacent to streams or lakes which are periodically flooded, unless such use is allowed under a state-approved pesticide management program. **Note:** Also on such areas, woody plants rooted directly in a shallow water table are minimally affected by applications of tebuthiuron and poor woody plant control will result.

Do not apply Spike 80DF where bedrock is continuously exposed or in areas of bedrock overlain by soils that are shallow or discontinuous.

Do not apply Spike 80DF in areas adjacent to sinkholes or depressions lacking external drainage, which occur within areas of karst topography.

Do not apply Spike 80DF to high shrink/swell soils (vertisols) which develop deep cracks upon drying.

Do not apply Spike 80DF within areas identified by state or local authorities as protected groundwater recharge zones.

Notice: Read the entire label. Use only according to label directions. **Before using this product, read Warranty Disclaimer, Inherent Risks of Use and Limitation of Remedies elsewhere on this label. If terms are not acceptable, return at once unopened.**

In case of emergency endangering health or the environment involving this product, call 1-800-992-5994. If you wish to obtain additional product information, visit our web site at www.dowagro.com.

Agricultural Chemical: Do not ship or store with food, feeds, drugs or clothing.

Not For Residential Use

Directions for Use

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Read all Directions for Use carefully before applying.

Do not apply this product through any type of irrigation system.

Storage and Disposal

Do not contaminate water, food, or feed by storage or disposal.

Pesticide Storage: The herbicidal properties of Spike 80DF require caution in handling, storage, and transportation of this product. Store in original container only. In case of leak or spill, contain material and dispose as waste.

Pesticide Disposal: Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

Nonrefillable rigid containers 5 gallons or less:

Container Reuse: Nonrefillable container. Do not reuse or refill this container. Offer for recycling if available.

Triple rinse or pressure rinse container (or equivalent) promptly after emptying. **Triple rinse** as follows: Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container 1/4 full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. **Pressure rinse** as follows: Empty the remaining contents into application equipment or a mix tank and continue to drain for 10 seconds after the flow begins to drip. Hold container upside down over application equipment or mix tank and continue to drain for 10 seconds after the flow begins to drip. Hold container upside down over application equipment or mix tank or collect rinsate for later use or disposal. Insert pressure rinsing nozzle in the side of the container, and rinse at about 40 psi for at least 30 seconds. Drain for 10 seconds after the flow begins to drip.

Nonrefillable nonrigid containers:

Container Reuse: Nonrefillable container. Do not reuse or refill this container. Offer for recycling if available.

Refillable rigid containers larger than 5 gal:

Container Reuse: Refillable container. Refill this container with pesticide only. Do not reuse this container for any other purpose. Cleaning the container before final disposal is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller. To clean the container before final disposal, empty the remaining contents from this container into application equipment or a mix tank. Fill the container about 10% full with water and, if possible, spray all sides while adding water. If practical, agitate vigorously or recirculate water with the pump for two minutes. Pour or pump rinsate into application equipment or rinsate collection system. Repeat this rinsing procedure two more times.

Storage and Disposal (Cont.)

Nonrefillable rigid containers larger than 5 gal:

Container Reuse: Nonrefillable container. Do not reuse or refill this container. Offer for recycling if available.

Triple rinse or pressure rinse container (or equivalent) promptly after emptying. **Triple rinse** as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container 1/4 full with water. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times.

Turn the container over onto its other end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Repeat this procedure two more times.

Pressure rinse as follows: Empty the remaining contents into application equipment or a mix tank and continue to drain for 10 seconds after the flow begins to drip. Hold container upside down over application equipment or mix tank and continue to drain for 10 seconds after the flow begins to drip. Hold container upside down over application equipment or mix tank or collect rinsate for later use or disposal. Insert pressure rinsing nozzle in the side of the container, and rinse at about 40 psi for at least 30 seconds. Drain for 10 seconds after the flow begins to drip.

General Information

Spike 80DF is a surface applied, soil-active product intended for total vegetation control in non-cropland. Applied as a broadcast treatment, Spike 80DF is generally non-selective to (will control) annual grasses, annual and perennial broadleaves and broadleaf woody plants. Perennial warm-season grasses are generally tolerant to Spike 80DF, but may exhibit injury during the season following application. Cool season perennial grasses are not tolerant to broadcast applications of this product except at rates less than 0.5 lb active ingredient. Applied as a banded treatment, Spike 80DF may be used to control woody plants in non-cropland sites. With banded treatments, effects on herbaceous vegetation are confined mainly to the treated band, but may last more than one growing season. Dormant season application and keeping the treated band as narrow as possible is recommended to minimize herbicidal effects on perennial grasses and to lessen effects on other herbaceous plants.

Treatments become effective after sufficient rainfall has occurred to move the active ingredient in Spike 80DF into the root zone. Herbicidal symptoms appear most rapidly when applied just before seasonal rainfall. Susceptible herbaceous plants exhibit leaf chlorosis followed by browning before the plant dies. Woody plants exhibit leaf chlorosis and browning followed by defoliation. Woody plants may undergo several defoliation cycles, usually following significant rainfall before death occurs. Time required to achieve control of woody vegetation depends on susceptibility of target species, rainfall and soil conditions and may vary from a single growing season to several years. Lack of rainfall will delay herbicidal activity and lengthen the time required for control.

For best woody plant control results with Spike 80DF, do not disturb intact plants by practices such as wood cutting, chaining, or burning for two years after application. Resprouting or survival of woody plants is more likely to occur if plants are disturbed before complete control occurs.

Use Precautions and Restrictions

Read the entire label *before* using Spike 80DF to determine if this product is suitable for the desired purpose.

Not for sale, distribution, or use in Nassau and Suffolk Counties in New York State

This product is not registered in the state of Florida.

Spike 80DF is an extremely active herbicide which will kill trees, shrubs, and other forms of desirable vegetation having roots extending into the treated area. Feeder roots of many species of desirable vegetation extend many feet beyond the drip line of the branches, and a very small amount of Spike 80DF in contact with one feeder root of a tree, shrub, or other desirable vegetation may cause serious injury or death to the entire plant.

Recommended Treatment Setback: Do not apply Spike 80DF in the vicinity of desirable plants. Exposure of even a small part of a plant root system to Spike 80DF may cause severe plant injury or death. Plant roots usually occupy an area much larger than the aerial portion of the plant. Treatment setback distance should be 2 times the height or width of adjacent non-target vegetation, whichever is greater. For example, if adjacent non-target vegetation is 25 feet tall, the treatment setback should be 50 feet.

An Arboriculturist (tree expert) should be consulted to help you to determine if the area of proposed application is free of all roots of desirable vegetation. The effect of Spike 80DF on desirable vegetation may be irreversible and its presence in the soil may prevent growth of other desirable vegetation for some years after application.

Do not use Spike 80DF on areas such as walks, driveways, streets, lawns, patios, tennis courts, swimming pools, cemeteries, or other landscaped areas, or under asphalt or concrete pavement where future landscaping is planned. Do not apply on field crops. Do not apply on any area into which the roots of field crops or other desirable vegetation may extend. **Roots of trees, shrubs, and other desirable vegetation may extend far beyond the drip line of the plant's branches.**

Avoid non-target drift or product movement. Do not apply when winds are gusty or under any other condition which will allow drift or product movement. Do not apply to areas where soil movement by water erosion and/or natural or mechanical means is likely. Avoid treatment of areas susceptible to wind erosion such as single grain sands or disturbed soils that are loose and powdery dry. Under these conditions, treatment should be delayed until the soil surface has been stabilized by rainfall or irrigation. Before treatment of sandy soils in areas subject to wind erosion, the soil surface should first be stabilized with gravel mulch or other means of preventing physical movement of surface soil. Drift or any form of product movement from treated areas may cause damage to any vegetation to which treatment is not intended.

Do not apply Spike 80DF to interior ditchbanks (areas which slope toward the drainage). Do not apply to ditches used to transport irrigation or potable water.

Thoroughly clean all traces of Spike 80DF from application equipment after use. **Do not empty residues cleaned from application equipment on areas where they may come in contact with the roots of desirable vegetation or the water source for such vegetation.**

Spike 80DF may injure or suppress certain herbaceous vegetation in the treated area. Therefore, do not apply where such injury cannot be tolerated. Do not apply broadcast applications of Spike 80DF where forage or maintenance of a grass cover is desired. Injury to most herbaceous perennials is reduced if Spike 80DF is applied when this vegetation is dormant.

Grazing Haying Restrictions

If the treated area is to be used for haying, do not apply more than 5 pounds per acre of Spike 80DF, and do not apply the product more than once a year. There are no grazing restrictions following application of Spike 80DF at labeled rates.

Haying Restriction: In areas receiving band or individual plant treatments of 5 pounds per acre or less of Spike 80DF, grass may be cut for hay one year after application.

Frequency of Application and Maximum Use Rates

Vegetation Control by Ground Broadcast or Banded Application:

- The maximum use rate and frequency of application is 1.25 to 2.5 lb of Spike 80DF (1 to 2 lb a.i.) per acre once every three years for vulnerable sites where soils are sandy and depth to water table is shallow. (Refer to Environmental Hazards section under Use Restrictions for Ground Water Protection.)
- For all other areas, the maximum use rate and frequency of application is up to 5 lb of Spike 80DF (4 lb a.i.) per acre once every three years; and no more than two treatments totaling 7.5 lb of Spike 80DF (6 lb a.i.) per acre in any 6 year period.

Total Vegetation Control and Maintenance of Bare Ground by Ground Broadcast Only: The maximum use rate and frequency of application is up to 5 lb of Spike 80DF (4 lb a.i.) per acre applied only once per year; however, no more than 7.5 lb of Spike 80DF (6 lb a.i.) per acre may be applied in any 3 year period.

Spot Treatments (Hand-held Equipment): May be applied at rates up to 7.5 lb of Spike 80DF (6 lb a.i.) per acre when needed.

Rotation of Treated Areas to Plants other than Forage Grasses

It is intended that Spike 80DF be applied only to rangeland, permanent pastures and non-cropland areas that will not be rotated to crop production, or other use involving planting or transplanting of herbaceous or woody plants susceptible to tebuthiuron. Do not rotate areas treated with this product to any seeded crop, planted or transplanted plant species other than forage grasses until an adequately sensitive field bioassay demonstrates that the level of tebuthiuron present in the soil will not adversely affect such plantings.

Field Bioassay Instructions: In areas where tebuthiuron was previously applied, plant test rows of the intended rotational crop or plant species across the original direction of application in a manner to sample variability in field conditions such as soil texture, soil organic matter, soil pH, or drainage. The field bioassay can be initiated one or more years following application of this product to rangeland, permanent pastures or non-crop areas. Observe the test planting for symptoms of herbicidal activity, such as poor stand (failure to establish) chlorosis (yellowing), and necrosis (dead leaves or shoots), or stunting (reduced growth). Observation of the test planting for an entire use season is recommended to evaluate the full range of conditions that may give rise to herbicidal symptoms. If herbicidal symptoms do not occur, the test crop or plant species can be grown. Practices that may hasten the degradation of tebuthiuron are establishment of perennial warm season grasses which are effective in the removal and metabolism of soil residues and supplemental irrigation.

Mixing Directions

Thorough mixing and continuous agitation are important to ensure uniform application. Fill the spray tank half-full of water. Start agitation and continue agitation during entire mixing and spraying operation. Add the required amount of Spike 80DF and allow it to mix thoroughly while completing the spray tank filling. If additional product is a liquid, add slowly while filling remainder of tank with water.

Material must be kept in suspension at all times by continuous agitation. If bypass (hydraulic) agitation is used, the return flow should terminate at the bottom of the mixing tank to minimize foaming. Check the sprayer frequently before and during use to insure proper calibration and uniform application.

A master shut-off switch for the entire spraying system and nozzle check valves are recommended on commercial spray equipment.

If hand held or back pack type sprayers are used, determine the amount of water and chemical necessary to cover uniformly the area to be treated. Shake vigorously after filling and periodically during application to maintain product in suspension.

Application Methods

Broadcast Application

Apply Spike 80DF in a spray volume of 5 or more-gallons of water per acre by ground. Apply before or during the period of active growth of plants to be controlled. Initial control is enhanced by rainfall.

In areas of low annual rainfall (less than 15 inches per year) Spike 80DF should be applied prior to the time of year when the predominant portion of that rainfall occurs. A minimum of 1 to 1 1/2 inches of rainfall is required to activate Spike 80DF and place it in the zone of weed seed germination.

Other products registered for use on the site to be treated may be applied in tank mix combination with Spike 80DF to provide broader spectrum weed control or provide initial top kill of existing vegetation. Consult the manufacturer's label for additional weeds controlled, directions for use, cautions and limitations before use. See detailed information for tank mixing in the General Information section of this label.

Banded Application (Ground Application Only)

Banded applications of Spike 80DF allow for woody plant control and preservation of grasses and other desirable herbaceous vegetation in non-cropland areas (such as utility, railroad, and pipeline rights-of-way and fencerows). In banded applications, the rate per acre is equivalent to the broadcast rate, but the herbicide is concentrated into individual herbicide bands spaced 4 to 10 feet apart. Banded applications may be made using a spray volume of 5 or more gallons per acre. Actual herbicide bands should be kept as narrow as possible during application to minimize potential injury or loss of herbaceous vegetation. In areas such as brush-infested fencerows, a single band may be applied. Control is dependent upon root systems intercepting the herbicide in soil beneath treated bands.

Band spacing should be selected based on the size of the woody plants in the area to be treated and the amount of injury or loss of herbaceous vegetation that can be tolerated. Where control of young or seedling woody plants is desired, bands should be spaced closer together. This will achieve maximum exposure to their limited root systems. Where larger more mature woody plants are to be controlled, bands should be spaced at the wider end of the recommended spacing range.

In addition to allowing adequate exposure of the more extensive root systems of these larger woody species for control, use of the wider spacings will further reduce injury or loss of herbaceous vegetation within the treated band.

Within the treated band nearly all vegetation, woody and herbaceous, will be killed. Some herbaceous vegetation close to the treated band with roots extending into it may be severely injured or killed. However, since root systems of herbaceous plants are less extensive most plants outside the treated band are unaffected.

When banded applications are made in an area where straight stream nozzles are positioned more than 5 feet above the soil surface or where woody plant foliage is dense, breakup of individual nozzle streams may occur. If conditions do not permit delivery of intact nozzle streams to the soil surface, efficacy may be reduced and injury of herbaceous vegetation will increase. For this reason, application in the dormant season when there is minimum foliage present is recommended. To avoid breakup of individual nozzle streams by interfering vegetation, applicators may also employ mechanical means to position spray nozzles close to the soil surface such as protected drop nozzles or nozzles mounted at the end of weighted bars which maintain constant contact the soil surface.

Fencerow Applications: For fencerow applications, a single spray band will cover a fencerow 4 to 10 feet wide. Use a rate appropriate to control the most difficult species to control in the fencerow. Use a straight stream nozzle and direct the nozzle stream at the soil surface in the center of the fencerow. For fencerows wider than 10 feet, separate bands may be applied on either side of the fencerow.

Rate example: Assuming the desired rate of Spike 80DF is 5 pounds per acre and the fencerow is 10 feet wide, a one 5-pound bag of Spike 80DF will treat 4356[†] linear feet of fencerow. Determine the delivery rate for the nozzle at the desired spray pressure and the walking speed of the applicator. If the length of the area to be treated is 4356 ft long and the walking speed is 3 mph (264 ft/minute) it would take 16.5 minutes to walk the length of the treatment area. If the delivery rate of the nozzle is 0.6 gallons per minute, the treatment would require approximately 10 gallons (0.6 gallon per minute X 16.5 minute = 10 gallons) of spray solution.

[†] 1 acre = 43560 sq ft (43560 sq ft ÷ 10 ft = 4356 ft)

Individual Plant Treatment

ATTENTION: Do not use this treatment method in any area where there are desirable species in close proximity plants to be eliminated. A small amount of Spike 80DF in contact with the roots of desirable trees or other woody species may cause severe injury or death. See Use Precautions and Restrictions section for precautions for avoiding damage to non-target plants.

Spike 80DF may be applied in high or low volumes of water for selective control of individual woody plants. Recommended rates will vary depending upon site conditions, with the higher rates needed for difficult to control species, large plants, heavier soils, fall applications and cut brush. Refer to Factors in Herbicidal Response of Woody Plants section for further information.

For high volume applications, mix 1 one pound of Spike 80DF in enough water to make 10 gallons of solution. Apply 10 ounces of material to the soil per every 2 to 4 inches of stem diameter.

For low volume applications, mix 1 pound of Spike 80DF in enough water to make 1 gallon of solution. Apply 1 ounce of material to the soil per very 2 to 4 inches of stem diameter.

When treating large stems, apply the multiple treatments (spots or bands) in even spacing around the stem.

Two types of equipment are suggested for applying Spike 80DF using banded or individual plant treatment methods, the Solo Model 425 back pack sprayer (or equivalent) for both banding and individual plant treatment and the Spot Gun for individual plant treatment.

The Solo sprayer is prepared for spraying by adding the pre-slurried contents of a 4 pound bag of Spike 80DF and water to the tank. Fill to capacity with additional water and shake vigorously. Equip the Solo sprayer with a 0003-SS straight stream nozzle and the Solo pressure regulator with the green (10 psi) pressure limiting spring. To band Spike 80DF at 5 pounds per acre, walk at 3 mph (264 feet per minute) with the Solo on continuously and space the bands 5 feet apart. Adjust the rate and walking speed according to the brush species and conditions encountered. For individual plant treatment with the Solo, apply a 1.5 second shot for every 1 to 2 inches of stem diameter at the base of unwanted woody plants.

The Spot Gun is prepared for individual plant treatment by mixing 2 pounds of Spike 80DF in sufficient water to obtain 1 gallon of spray solution. Set the Spot Gun to deliver 8 milliliters of this solution for every 1 to 2 inches of stem diameter at the base of the unwanted woody plants. For application on steep slopes or other sensitive areas, the Spot Gun can be equipped with a soil probe to inject the Spike 80DF solution beneath the soil surface. Placement at a soil depth of 2 to 4 inches will eliminate any surface movement and reduce injury to herbaceous vegetation.

At the prescribed rates, a 4 pound bag of Spike 80DF will treat approximately 950 stems 1 to 2 inches in diameter. Because of its non-volatile nature and low potential for drift, this Spike application technique can be used for treating unwanted woody plants on non-cropland areas adjacent to sensitive crops (See Precautions and Restrictions section). Use of a colored marker or dye in spray mixtures will aid in inspection of the completed work.

Aerial Application

Aerial application of Spike 80DF on rights-of-way is limited to helicopter only.

Apply in 5 or more gallons per acre when using aerial application equipment. Because Spike 80DF is a soil active herbicide, maximum soil deposition is desirable. This may be achieved by application of extremely large droplets. Large straight stream nozzles, minimum nozzle pressure and spray thickening agents may be used to achieve the maximum possible droplet size and minimize the potential for drift. Foliar deposition from large droplets is also more likely to be washed from foliage to the soil surface during initial rainfall events.

Precautions for Avoid Spray Drift: Avoid spray drift at the application site. The interaction of many equipment-and-weather-related factors determine the potential for spray drift. Users are responsible for considering all these factors when making decisions.

The following drift management requirements must be followed to avoid off-target drift movement from aerial applications:

1. The distance of the outer most operating nozzles on the boom must not exceed 90% of the wingspan or rotor width.
2. Nozzles must always point backward parallel with the air stream and never be pointed downwards more than 45 degrees.

Where states have more stringent regulations, they should be observed.

The applicator should be familiar with and take into account the information covered in the following Aerial Drift Reduction Advisory. [This information is advisory in nature and does not supersede mandatory label requirements.]

Aerial Drift Reduction Advisory

Information On Droplet Size: The most effective way to reduce drift potential is to apply large droplets. The best drift management strategy is to apply the largest droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential, but will not prevent drift if applications are made improperly, or under unfavorable environmental conditions (see Wind, Temperature and Humidity, and Temperature Inversions).

Controlling Droplet Size:

- **Volume** - Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated flows produce larger droplets.
- **Pressure** - Do not exceed the nozzle manufacturer's recommended pressures. For many nozzle types lower pressure produces larger droplets. When higher flow rates are needed, use higher flow rate nozzles instead of increasing pressure.
- **Number of Nozzles** - Use the minimum number of nozzles that provide uniform coverage.
- **Nozzle Orientation** - Orienting nozzles so that the spray is released parallel to the airstream produced larger droplets than other orientations and is the recommended practice. Significant deflection from horizontal will reduce droplet size and increase drift potential.
- **Nozzle Type** - Use a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles. Solid stream nozzles oriented straight back produce the largest droplets and the lowest drift.

Boom Length: For some use patterns, reducing the effective boom length to less than 90% of the wingspan or rotor length may further reduce drift without reducing swath width.

Application Height: Applications should not be made at a height greater than 10 feet above the top of the largest plants unless a greater height is required for aircraft safety. Making applications at the lowest height that is safe reduces exposure of droplets to evaporation and wind.

Swath Adjustment: When applications are made with a crosswind, the swath will be displaced downwind. Therefore, on the up and downwind edges of the field, the applicator must compensate for this displacement by adjusting the path of the aircraft upwind. Swath adjustment distance should increase, with increasing drift potential (higher wind, smaller drops, etc.).

Wind: Drift potential is lowest between wind speeds of 2-10 mph. However, many factors, including droplet size and equipment type determine drift potential at any given speed. Application should be avoided below 2 mph due to variable wind direction and high inversion potential. NOTE: Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect spray drift.

Temperature and Humidity: When making applications in low relative humidity, set up equipment to produce larger droplets to compensate for evaporation. Droplet evaporation is most severe when conditions are both hot and dry.

Temperature Inversions: Applications should not occur during a local, low level temperature inversion because drift potential is high. Temperature inversions restrict vertical air mixing, which causes small suspended droplets to remain in a concentrated cloud. This cloud can move in unpredictable directions due to the light variable winds common during inversions. Temperature inversions are characterized by increasing temperatures with altitude and are common on nights with limited cloud cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of the smoke from a ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a concentrated cloud (under low wind conditions) indicates an inversion, while smoke that moves upward and rapidly dissipates indicates good vertical air mixing.

Factors in Herbicidal Response of Woody Plants

Spike 80DF has little or no foliar activity, but when applied to the soil is readily absorbed by the plant roots along with soil moisture. Effects will not become apparent until there is sufficient rainfall to move the herbicide into the root zone. The time required to achieve control is dependent on soil type, amount and timing of rainfall, and rooting depth of target species. Some species may go through several defoliations and refoliations over a period of approximately two to three years before dying.

Soil Texture, Soil Depth, and Organic Matter

Poor control or erratic results are likely to occur if banded treatments are applied to soils containing more than 5% organic matter or more than 30% clay. Do not apply to "blackland" or other heavy clay soils that crack extensively upon drying. Other deep, medium, and fine-textured soils supporting deep-rooted woody plant species require higher rates within recommended rate ranges for consistent control. Woody plants growing in shallow, coarse, or rocky soils with low organic matter are normally more susceptible due to increased soil availability of the herbicide and shallow rooting depth. Application rates at the low end of the rate range may be used under these conditions.

Woody Plant Size and Density

The height and density of woody vegetation is a reliable indicator of soil conditions. Woody vegetation is generally taller and denser where soils are deep and/or of medium to fine texture and where soil moisture conditions are more favorable. Higher rates in the recommended rate range are required on such sites. Woody vegetation will be smaller and less dense on sites with coarse, shallow, or rocky soils with less favorable soil moisture conditions. Lower rates in the recommended rate range may be used on such sites. Where a high level of woody plant control is required and application rates cannot be adjusted for changes in soils, plant size, or density, apply Spike 80DF at a rate sufficient to control the tallest and most dense woody vegetation in the treatment area.

Application Timing

Spike 80DF may be applied anytime except when the soil is frozen or is saturated with moisture. For optimum results, applications should be made prior to the resumption of active seasonal growth in the spring or before expected seasonal rainfall. In areas receiving greater than 25 inches of annual rainfall, late summer and fall applications may require a higher application rate in the indicated rate range to achieve consistent control.

Banded application of Spike 80DF is recommended for control of brush regrowth after dozing or shredding, provided the regrowth has reached an average height of five feet or more prior to application. Spike 80DF works best when there is an abundance of active leaf area to stimulate soil moisture and herbicide uptake during the season following application. Taller regrowth will tend to respond with faster and more consistent brush control.

Spike 80DF may cause temporary herbicidal symptoms to appear on perennial grasses. Dormant season application is recommended to minimize herbicidal effects on desirable forage grasses.

Effect of Shallow Groundwater on Woody Plant Control

Do not apply Spike 80DF to areas where the water table is predominately shallow (5 feet or less), such as marshy or sub irrigated areas, or areas immediately adjacent to streams or lakes which are periodically flooded. On such sites, where roots extend directly to a shallow water table, woody plants are minimally affected by applications of tebuthiuron and poor control will result.

Note: Refer to Environmental Hazards section under Use Restrictions for Ground Water Protection for other rate limitations on "vulnerable" sites.

Non-Cropland Total Vegetation Control

Spike 80DF may be used for preemergence and postemergence total vegetation control in such non-cropland areas as: airport runways, utility substations and rights-of-way, road shoulders where no vegetation is desired, under asphalt and concrete pavements where no future landscaping is planned, at the base of highway guardrails, sign posts and markers, at the base of transmission towers and poles, around industrial buildings, lumberyards, railroad yards, firebreaks, and fencerows.

Note: Refer to General Information section for limitations on maximum use rates, frequency of application and total application rates allowed during a given period of time. Refer to Environmental Hazards section under Use Restrictions for Ground Water Protection for other rate limitations on "vulnerable" sites.

For total vegetation control in areas **not treated the previous season** with Spike 80DF or other residual herbicides, apply Spike 80DF prior to or just after emergence of plants as follows:

At 5 pounds per acre, Spike 80DF will control the following:

alfalfa	hemlock, poison
aster, heath	henbit
aster, white heath	honeysuckle, Japanese
barley, little	horseweed
bedstraw	knawweed
bluegrass, annual	kochia
bluegrass, Kentucky	lambsquarters
bouncingbet	lupine
bromegrass, downy	medic, black
bromegrass, ripgut	morningglory
bromegrass, smooth	mullein, common
broomsedge	nightshade, silverleaf
buffelgrass	oat, wild
burclover	panicum, Texas
buttercup, smallflower	pepperweed, Virginia
camphorweed	pigweed
carrot, wild	plantain, buckhorn
catsear, spotted	puncturevine
cheat	ragweed, giant
chickweed	raspberry, red
clover, red	ryegrass, Italian
cocklebur	sedge, annual
creeper, Virginia	shepherdspurse
crowfootgrass	sida, prickly
dock, curly	sowthistle, annual
dogfennel	spikeweed
fescue	spurge
fescue, rattail	spurge, spotted
fiddleneck, coast	starthistle, yellow
filaree	strawberry
filaree, redstem	sunflower, common
fleabane, annual	telegraphplant
foxtail	Timothy
gaillardia, rosering	trumpetcreeper
geranium, Carolina	velvetgrass
goldenrod	vetch
grape	witchgrass
gumweed	

For the **maintenance of total vegetation control** in non-cropland areas **east of the Rocky Mountains** which were treated the previous season with Spike 80DF or other residual herbicides, apply Spike 80DF prior to or just after emergence of plants as follows (some of the species listed may show erratic control depending on the time between application and weed germination):

At 3 pounds per acre, Spike 80DF will control the following:

goldenrod	spurge
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At 2 pounds per acre, Spike 80DF will control the following:

bluegrass, annual	parsnip, wild
bluegrass, Kentucky	pepperweed
carrot, wild	pigweed
chickweed, common	ragweed, common
croton	smartweed, Pennsylvania
fleabane, annual	sweetclover
horseweed	thistle, Canada
mullein	woodsorrel, yellow
panicum, fall	

In areas of rainfall greater than 25 inches per year, the 3 pounds per acre maintenance rate should be used for all weed species listed above.

For the **maintenance of total vegetation control** in non-cropland areas **west of the Rocky Mountains** which were treated the previous season with Spike 80DF or other residual herbicides, apply Spike 80DF prior to or just after emergence of plants as follows (some of the species listed may show erratic control depending on the time between application and weed germination):

At 1.5 pounds per acre, Spike 80DF will control the following:

bassia, fivehook	pigweed
cheat	plantain
cudweed	ryegrass, annual
foxtail	saltbush
lettuce, prickly	shepherdspurse
oat, wild	witchgrass
oxtongue, bristly	

At 2 pounds per acre, Spike 80DF will control the following:

buttercup	mustard
canarygrass, reed	ragweed, western
knapweed, Russian	starthistle, yellow
knotweed	telegraphplant
mallow	

At 3 pounds per acre, Spike 80DF will control the following:

barley	sida, alkali
gumweed	smartweed, swamp
puncturevine	

In areas of rainfall greater than 25 inches per year, the 3 pounds per acre maintenance rate should be used for all weed species listed above.

**Non-Cropland
Control of Woody Plants and Vines**

For the control of woody plants and vines, the following rates of Spike 80DF are recommended. These rates can vary depending upon soil type, rainfall, time of application, and size/density of the woody plants.

Spike 80DF applied at the rate of 1.25 pounds per acre will control the following species:

Common Name	Scientific Name
burweed	<i>Haplopappus tenuisectus</i>
creosotebush	<i>Larrea tridentata</i>
wait-a-minute-bush	<i>Mimosa biuncifera</i>

In addition to those species controlled at 1.25 lb per acre, the following species will be controlled at the rate of 2.5 pounds per acre:

Common Name	Scientific Name
blueberry	<i>Vaccinium</i> spp.
buckbrush	<i>Symphoricarpos orbicalatus</i>
ceniza (Texas silverleaf)	<i>Leucophyllum frutescens</i>
cherry, bitter	<i>Prunus emarginata</i>
elm, American	<i>Ulmus americana</i>
hackberry, western	<i>Celtis occidentalis</i>
huckleberry	<i>Gaylussacia</i> spp.
locust, black	<i>Robinia pseudoacacia</i>
mulberry, red	<i>Morus rubra</i>
pine	<i>Pinus</i> spp.
pine, western white	<i>Pinus monticola</i>
rose, multiflora	<i>Rosa multiflora</i>
sage, purple	<i>Salvia leucophylla</i>
sagebrush, big	<i>Artemisia tridentata</i>
sumac, smooth	<i>Rhus glabra</i>
thornapple, desert	<i>Datura discolor</i>
tree-of-heaven	<i>Ailanthus altissima</i>
whitebrush	<i>Aloysia lycioides</i>
wolfberry, berlandier	<i>Lycium berlandieri</i>

In addition to those species controlled at 2.5 lb per acre, the following species will be controlled at the rate of 3.75 pounds per acre:

Common Name	Scientific Name
alder, speckled	<i>Alnus rugosa</i>
birch, gray	<i>Betula populifolia</i>
cottonwood, eastern	<i>Populus deltoides</i>
elm, winged	<i>Ulmus alata</i>
fir, balsam	<i>Abies balsamea</i>
granjeno	<i>Celtis pallid</i>
hardhack	<i>Spiraea tomentosa</i>
huisache	<i>Acacia farnesiana</i>
condalia, lotebush	<i>Condalia obtusifolia</i>
maple, sugar	<i>Acer saccharum</i>
oak, blackjack	<i>Quercus marilandica</i>
oak, blue	<i>Quercus douglasii</i>
oak, post	<i>Quercus stellat</i>
poplar, balsam	<i>Populus balsamifera</i>
spruce, white	<i>Picea glauca</i>
tamarack	<i>Larix laricina</i>
willow	<i>Salix</i> spp.
yaupon	<i>Ilex vomitoria</i>
yaupon, desert	<i>Schaefferia cuneifolia</i>

In addition to those species controlled at 3.75 lb per acre, the following species will be controlled at the rate of 5 pounds per acre:

Common Name	Scientific Name
acacia, blackbrush	<i>Acacia rigidula</i>
acacia, catclaw	<i>Acacia greggii</i>
acacia, twisted	<i>Acacia tortuosa</i>
alder, red	<i>Alnus rubra</i>
aspen, bigtooth	<i>Populus grandidentata</i>
beech, American	<i>Fagus grandifolia</i>
blackberry, allegheny	<i>Rubus allegheniensis</i>
boxelder	<i>Acer negundo</i>
chamise	<i>Adenostoma fasciculatum</i>
chokecherry, common	<i>Prunus virginiana</i>
colubrina, Texas	<i>Colubrina texensis</i>
condalia, bluewood	<i>Condalia obovata</i>
creeper, Virginia	<i>Parthenocissus quinquefolia</i>
dogwood, roughleaf	<i>Cornus drummondii</i>
douglasfir	<i>Pseudotsuga menziesii</i>
guajillo	<i>Acacia berlandieri</i>
guayacan	<i>Portleria angustifolia</i>
hawthorn	<i>Crataegus</i> spp.
hickory, black	<i>Carya texana</i>
hickory, pignut	<i>Carya glabra</i>
hickory, shagbark	<i>Carya ovata</i>
kidneywood, Texas	<i>Eysenhardtia texana</i>
kudzu	<i>Pueraria lobata</i>
leatherstem	<i>Jatropha dioica</i>
maples	<i>Acer</i> spp.
mountain-mahogany (birchleaf)	<i>Cetocarpus betuloides</i>
oak, California scrub	<i>Quercus dumosa</i>
oak, live	<i>Quercus virginiana</i>
oak, pin	<i>Quercus palustris</i>
oak, red	<i>Quercus rubra</i>

oak, white
 pine, Australian
 pines
 salvia, shrubby blue
 sumac, staghorn
 sweetgum
 trumpetcreeper

Quercus alba
Casuarina spp.
Pinus spp.
Salvia ballotaeflora
Rhus typhina
Liquidambar stryaciflua
Campsis radicans

Individual (Spot) Application

Spike 80DF may be applied, using hand-held equipment at up to 7.5 pounds per acre, to the following species by individual (spot) application only:

Common Name	Scientific Name
ash, green	<i>Fraxinus pennsylvanica</i>
ash, white	<i>Fraxinus americana</i>
blackberry, evergreen	<i>Rubus laciniatus</i>
ceanothus, wedgeleaf	<i>Ceanothus cuneatus</i>
chaparral, whitethorn	<i>Ceanothus leucodermis</i>
cherry, black	<i>Prunus serotina</i>
dogwood, flowering	<i>Cornus florida</i>
elm, Chinese	<i>Ulmus parvifolia</i>
elm, slippery	<i>Ulmus rubra</i>
greenbrier, common	<i>Smilax rotundifolia</i>
groundsel tree	<i>Baccharis</i> spp.
hawthorn, cockspur	<i>Crataegus crus-galli</i>
lantana	<i>Lantana camara</i>
manzanita, greenleaf	<i>Arctostaphylos patula</i>
maple, bigleaf	<i>Acer macrophyllum</i>
maple, Norway	<i>Acer platanoides</i>
maple, silver	<i>Acer saccharium</i>
maple, vine	<i>Acer circinatum</i>
melaleuca	<i>Maleuca quinquevernia</i>
oak, white	<i>Quercus alba</i>
peppertree, Brazilian	<i>Schinus terebinthifolius</i>
pine, Australian	<i>Casuarina</i> spp.
pine, jack	<i>Pinus banksiana</i>
pine, red	<i>Pinus resinosa</i>
pine, shortleaf	<i>Pinus echinata</i>
pine, Virginia	<i>Pinus virginiana</i>
privet	<i>Ligustrum</i> spp.
raspberry, black	<i>Rubus occidentalis</i>
redcedar, eastern	<i>Juniperus virginiana</i>
Russianolive	<i>Elaeagnus angustifolia</i>
salal	<i>Gaultheria shallon</i>
sumac, laurel	<i>Rhus laurina</i>
sycamore, American	<i>Platanus occidentalis</i>
tallow tree	<i>Sapium sebiferum</i>
tuliptree	<i>Liriodendron, tulipifera</i>

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Revisions:

1. Updated Storage and Disposal