

Environmental Assessment for Control of

Phragmites australis

Nanticoke Watershed, Maryland

June 2, 2014

Hurricane Sandy Disaster Relief Funds

DOI Project #CB085

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Portions of this document were transposed directly from the Environmental Assessment of FWS Cooperative Agreement #30181AG097: Control of Phragmites australis in Western Lake Erie Coastal Marshes

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The objective of the proposed project is to improve wetland habitat on the Nanticoke River on the eastern shore of Maryland. Delmarva Resource Conservation and Development Council (DRCD), along with public and private partners, proposes to manage 2,000 acres of invasive *Phragmites australis*. A large-scale approach to phragmites treatment is a critical step toward restoring native wetland plant communities, preserving fish and wildlife, increasing access for recreation, and improving water flow and wetland function along the Nanticoke watershed.

Chemical control will be conducted using aerial and ground herbicide applications. The control work will be conducted by certified contractors specializing in wetland invasive plant management.

The alternatives considered in this Environmental Assessment include biological control, mechanical harvesting, hydrologic manipulation, prescribed fire, and no action. While the first four alternatives can be used somewhat successfully for managing phragmites, research and literature shows that herbicide treatment is the recommended primary control method and the first step toward effective management. No action to control phragmites will cause further degradation of coastal wetland habitats and the native species that inhabit them.

I. AUTHORITY AND PURPOSE

The purpose of this document is to describe the environmental effects of proposed management efforts for *Phragmites australis* in the coastal region of the eastern shore of Maryland along the Nanticoke River. DRCD was granted \$497,000 from U.S. Fish and Wildlife Service (USFWS) to collaborate along with Maryland Department of Natural Resources to manage this invasive plant on approximately 2,000 acres of wetlands within the Nanticoke Watershed. Grant funding for this project was awarded through the Hurricane Sandy Relief Activities Grant.

II. BACKGROUND

A. General Plant information

Phragmites (*Phragmites australis*), also known as common reed, is an invasive plant that has proliferated and degraded marshes in numerous eastern and Midwestern states (Ailstock et al. 2001; MDEQ 2008; Saltonstall 2005). It typically grows in sunny coastal and interior wetlands, lakeshores and margins, riverbanks, roadside ditches, and other low, wet areas, although it can also be found in dry areas.

Although *Phragmites sp.* is native to North America, there is evidence that an introduction of a nonnative genotype has occurred (Saltonstall 2002). Studies indicate that the introduced (European) variation has displaced native types and broadened the historical range of phragmites. The non-native type is not visually distinct from the indigenous, making this a “cryptic invasion” and difficult to fully understand the extent of the invasion.

Phragmites is a tall, coarse perennial grass with stout rhizomes that are deeply embedded in its substrate. The thick stalk (5-15 mm in diameter), which in optimal conditions can reach up to 4.5 meters tall, is leafy throughout, the sheaths overlapping with a large, dense, terminal panicle. The leaves are flat, stiff, 1 to 6 cm wide and up to 60 cm long, tapering to long-attenuate tips. Leaf margins are serrate. The panicle is terminal, plum-like, purplish or silvery, 15 to 50 cm long, with many branches. The flowers have long, silky hairs.

Phragmites spreads by seed and vegetatively through rhizomes (Mal & Narine 2004). Although the plant does produce seeds prodigiously, few are viable and they will not germinate in water depths greater than 5 cm (Marks et al. 1994). This means that phragmites most often spreads via its stout, creeping rhizomes, which can exceed 60 feet in length, grow more than six feet per year, and readily grow into new plants when fragmented (MDEQ 2008). If broken by natural actions such as waves, or human actions such as disking, the rhizomes can quickly take root in new locations. The rhizomes are often cited as one of the predominant reasons for phragmites’ ability to colonize and form large monocultures (see Saltonstall 2005, Mal & Narine 2004, etc.).

B. Distribution and Range

Phragmites occurs in every state in the continental U.S. (USDA PLANTS database). However, the presence and subsequent spread of the nonnative, invasive strand into the Chesapeake Bay appear to be a more recent phenomenon, although it is not known exactly when it initially invaded. The study of phragmites’ expansion and historical distribution are complicated because both native and non-native populations, which are morphologically similar, exist in North America (Saltonstall 2002). Few studies have documented its presence or tracked the invasion process from the early stages to subsequent large-scale, plant-community changes (Lynch & Saltonstall 2002; Wilcox et al. 2003).

However, the current distribution of phragmites has been documented, as have the ecological effects of its expansion. Near-monotypic stands of the non-native phragmites genotype have replaced high quality, complex communities of native plants over thousands of acres of Chesapeake Bay wetlands and coastal areas and this rapid expansion has resulted in adverse ecological impacts on the natural resources of such areas (Ailstock et al. 2001).

C. Invasive Nature and Effects of Phragmites Invasion

The Nanticoke River coastal marshes are among the most biologically significant within the Chesapeake Bay. These wetlands function as critical modifiers of biotic and abiotic materials, and they have been shown to improve water quality, reduce floods, and protect shorelines. Further, the Nanticoke coastal marshes have long been recognized for their significance in providing habitat for a wide variety of flora and fauna, and in particular for migratory birds. These populations are likely a microcosm of what originally habituated the once extensive coastal and marsh systems.

The Chesapeake Bay landscape has suffered much anthropogenic alteration over the last 200 years. Today, most of the region's marshes and wetlands have been drained or replaced by shoreline development or have been further degraded by altered hydrology and sediment deposition patterns. But progress toward restoring coastal marshes throughout the Chesapeake has been significantly undermined by the proliferation of non-native, invasive species. And, even though early detection and prevention is the most cost-effective approach to reduce their effects, some invasive species have become so prolific and damaging that widespread treatment is needed to enhance the Chesapeake's ecosystem health. For Nanticoke River marshes, one of the most ruinous threats is recruitment and propagation of non-native common reed (*Phragmites australis*). This invasive variety of phragmites has become pervasive throughout the Chesapeake Bay.

Phragmites alters the biotic and abiotic environment of wetlands, by excluding native species, reducing plant diversity, and modifying abiotic coastal processes. Consequently, near-monotypic stands of this invasive plant have replaced high-quality, complex communities over thousands of acres in the bay's wetlands and coastal areas. This rapid expansion of a monotypical plant community has resulted in adverse ecological, economic, and social impacts on the natural resources and people of the Chesapeake Bay. Overall, phragmites has degraded the vitality of the bay's marshes, which are some of the most productive and biologically diverse systems in the east. Because phragmites replaces native

vegetation, native sedges, rushes, and cattails are displaced, thereby degrading overall plant species richness and diversity. The loss of native plant diversity further results in the decline of wildlife habitat, including that needed to support migratory bird assemblages and native, resident animal species. By out-competing native wetland plants, phragmites disrupts typical food webs for waterfowl and marsh birds, and the dense monotypic stands of this plant are not used by most of the regional focal species. The destruction of habitat and diversity are additionally compounded and multiplied by the fact that phragmites stands alter the water regime in marsh systems, which causes 'drying' of marsh soils through increased evaporation and trapping of sediments.

Phragmites proliferation carries negative social and economic consequences, too. Chesapeake Bay property values can be reduced because shoreline views are blocked by tall, dense stands. Thick patches of phragmites also reduce access for swimming, boating, fishing, and hunting in nearby coastal areas, and they create potentially serious fire hazards to structures due to the amount of dry biomass during the dormant season.

III. PREFERRED ALTERNATIVES

Given phragmites' profound impact on the Chesapeake Bay, DRCD in conjunction with USFWS and MD DNR, proposes a regional approach to control and management of this invasive species. This effort will build from an existing program, initiated in the last decade by MD DNR and USFWS. Approximately 2,000 acres of phragmites across the Nanticoke watershed has been identified for treatment in late summer 2014. Most properties listed below will require only a few acres of spraying, although some properties will require larger amounts. Owners will be contacted for treatment on their land to obtain permission to treat on-site conditions. Lack of landowner permission may dictate that not all properties will be treated.

Landowner by County and Tract

DORCHESTER (South to North)

- | | | | |
|--|---|--|---|
| <ol style="list-style-type: none"> 1. DNR
TAWES STATE
OFFICE BLDG.
580 TAYLOR AVE-STE
C-4
ANNAPOLIS MD
21401-2352 | <ol style="list-style-type: none"> 2. SAME | <ol style="list-style-type: none"> 3. STATE OF MD
FISH AND WILDLIFE
ADM.
ANNAPOLIS MD 21401 4. SAME 5. BRIAN TWILLEY AND
GREGG JOHNSON
6512 CHEERY WALK | <ol style="list-style-type: none"> 6. RD
HEBRON MD 21830-
2155
HORSEMAN'S
PERFECTION INC
C/O BLAINE T
PHILLIPS |
|--|---|--|---|

- | | | |
|--|--|---|
| 100 W 10TH ST STE
1010
WILMINGTON DE
19801-6606 | 1731 HOBAN RD NW
WASHINGTON DC
20007-2036 | PO BOX 86
VIENNA MD 21869-
0087 |
| 7. WESTON FARMS LLC
28107 BEAVER DAM
BRANCH RD
LAUREL DE 19956-
2543 | 17. SAME | 27. LAYTON FARM LLC
1 COURT LN UNIT 102
CAMBRIDGE MD
21613-1884 |
| 8. SAME | 18. SAME | 28. VEINNA POWER LLC
C/O TAX
DEPARTMENT
211 CARNEGIE CTR
PRINCETON NJ
08540-6213 |
| 9. ATLANTIC INN LLC
11 VENETIAN DR
REHOBOTH BEACH
DE 19971-1937 | 19. SAME | 29. DELMARVA POWER
AND LIGHT CO
PO BOX 231
WILMINGTON DE
19899-2313 |
| 10. WILLIAM LARMORE
1 COURT LN UNIT
102
CAMBRIDGE MD
21613-1884 | 20. SALEHI SIAMAK &
KAREN SALEHI
3891 ELLIOTT
ISLAND RD
VIENNA MD 21869-
1126 | 30. JOHNSON CARLA F
JOHNSON FLETCHER
DARBY
101 TALBOT BLVD
CHESTERTOWN MD
21620 |
| 11. HENRY FARM LLC
1 COURT LN UNIT 102
CAMBRIDGE MD
21613-1884 | 21. RIVER FARMS
C/O G STEELE
PHILLIPS
3901 ELLIOTT ISLAND
RD
VIENNA MD 21869-
9629 | 31. MARGARET WEBB
C/O RAY NICHOLAS
4823 VIENNA
RHODESDALE RD
VIENNA MD 21869 |
| 12. HARRY REID
5037 REID RD
VIENNA MD 21869-
1615 | 22. OUTTEN WILLIAM F
JR & DEBORAH L
AND WILLIAM F III
4310 ELLIOTT ISLAND
RD
VIENNA MD 21869-
1574 | 32. C/O US FISH &
WILDLIFE SER
300 WESTGATE
CENTER DR
HADLEY MA 01035-
9589 |
| 13. SELLERS REGINALD
SR L/E &
EMMA JEAN L/E THEN
TO ET AL
4763 RHODESDALE
VIENNA RD
VIENNA MD 21869-
1657 | 23. EDWIN LEWIS
PO BOX 8
VIENNA MD 21869-
0000 | 33. CHARLES PHILLIPS
C/O ROBERT
PHILLIPS
38133 N SPRING HILL
RD
DELMAR DE 19940-
3114 |
| 14. ELLEN TINGLE
32026 OLD OCEAN
CITY RD
PARSONSBURG MD
21849-2000 | 24. DEAN ROBERT LEE
JR ETAL
DEAN STEPHEN
PAUL
106 STOCKTON LN
ARNOLD MD 21012-
0000 | |
| 15. WALDO HANSEN
3344 CHESTNUT AVE
BALTIMORE MD
21211-2622 | 25. ROBERT CREIGHTON
4862 RHODESDALE
VIENNA RD
VIENNA MD 21869-
1658 | |
| 16. SAVANNAH LAKE
LODGE INC | 26. THE
COMMISSIONERS OF
VIENNA | |

Dorchester Addition:

95. MULLAN THOMAS F III REVOCABLETRUST
2330 W JOPPA RD STE 210
LUTHERVILLE MD 21093-4630

WICOMICO (North to South)

34. DWIGHT GRAHAM

- 23363 CAPITOLA RD
TYASKIN MD 21865-
2036
35. BOONE REBECCA B
DONOFRIO HARRIETT
B TRUSTEES RTA
PO BOX 1496
HOMER AK 99603-
1496
36. DNR
37. DELMARVA POWER
AND LIGHT
2530 N SALISBURY
BLVD
PO BOX 1739
SALISBURY MD
21802-
38. SHA
39. DELMARVA POWER
WI-004 08- 09
P.O.BOX 231
WILMINGTON DE
19899-0231
40. THE NATURE
CONSERVANCY
5410 GROSVENOR
LANE
SUITE 100
BETHESDA MD 20814
41. WRIGHT CHARLES
MASTERS IV
WRIGHT LYNN
MICHELLE
8910 OLD RAILROAD
AVE
PO BOX 303
HEBRON MD 21830-
42. BYRON RICHARDSON
23501 MARSH RD
MARDELA SPRINGS
MD 21837-2051
43. RICHARDSON STEVE
RICHARDSON
STUART J/T
23501 MARSH RD
MARDELA SPRINGS
MD 21837-2051
44. CUT 'EM ALL JACK
HUNT CLUB LLC
PO BOX 1
BETHEL DE 19931-
0001
45. EDITH SHORT
- 23719 OCEAN GTWY
MARDELA SPRINGS
MD 21837-2101
46. C/O ANITA L
CORBETT
23821 OCEAN GTWY
MARDELA SPRINGS
MD 21837-2102
47. COLLINS JOSEPH L &
AUTUMN L
WINTERBOTTOM
COLLINS T/E
23550 TAYLORS TRL
MARDELA SPRINGS
MD 21837-2457
48. ROY CALLOWAY
C/O MARY L
WHITTINGTON
14 HUME CT
BALTIMORE MD
21204-1819
49. ROSE CAREY
31958 DOWNING RD
DELMAR MD 21875-
2215
50. POORMANS GUN
CLUB PARTNERSHIP
C/O SPENCER
WALLER
PO BOX 89
QUANTICO MD 21856-
0089
51. LOUISE SEHMAN
13054 SAINT
PATRICKS CT
HIGHLAND MD 20777-
9515
52. WILGUS EDWARD Q
QUILLIN BARTLEY T
23985 OCEAN GTWY
MARDELA SPRINGS
MD 21837-
53. PERDUE FARMS LLC
31149 OLD OCEAN
CITY RD
SALISBURY MD
21804-
54. JAMESON REAL
ESTATE LLC
PO BOX 340
HEBRON MD 21830-
0340
55. THOMAS LYNN B SR
TRUSTEE 2/3 &
RUTH SNIDER 1/3 INT
5533 SHARPTOWN
RD
RHODESDALE MD
21659-1311
56. MARION CHAMBERS
3178 JAMAICA POINT
RD
TRAPPE MD 21673-
1673
57. EDWIN LEWIS
PO BOX 8
VIENNA MD 21869-
58. PHILIP L WELLS
FAMILY LIMITED
PART
7570 CHERRY WALK
RD
HEBRON MD 21830-
2164
59. ASHCRAFT STEPHEN
W &
JAMES G BROWN T/C
925 W ISABELLA ST
SALISBURY MD
21801-4033
60. DELGROSSO
MICHAEL J
LAKEY STEPHEN
15024 SANDPIPER RD
MILTON DE 19968-
61. BARTOSHESKY
ROBERT S
D'ALONZO WILLIAM F
30566 PADDINGTON
CT
SALISBURY MD
21804-2548
62. ROBERT ATKINSON
10400 SHARPTOWN
RD
MARDELA SPRINGS
MD 21837-
63. JEP LLC
PO BOX 2111
SALISBURY MD
21802-2111
64. HARCUM ANNE
MARIE
7810 ATHOL RD
HEBRON MD 21830-
2150

65. DNR
C/O LAND &
PROPERTY MGMT.E-
3
580 TAYLOR AVE
TAWES BUILDING
ANNAPOLIS MD
21401-2352
66. MALVIN MINTON
27120 WOODSIDE DR
SALISBURY MD
21801-1730
67. IDEWATER
SPORTSMAN ASSOC
C/O FREDERICK
FEARS JR
30866 WARD RD
SALISBURY MD
21804-
68. WESSELS MICHAEL J
&
JB LONG II TM
FISHER & RL LAWS
T/C
PO BOX 259
SALISBURY MD
21803-0259
69. HORNER
CASSANDRA L
TRUSTEE
113 FALCON LN
WILMINGTON DE
19808-1937
70. ROYAL OAK ROAD
LLC
PO BOX 259
SALISBURY MD
21803-0259
71. THOMAS FISHER
27823 PEMBERTON
DR
SALISBURY MD
21801-2420
72. KARAMIAN RAFFI N
14 WINDWHISPER LN
ANNAPOLIS MD
21403-3473
73. SANDY HILL FAMILY
CAMP INC
5752 SANDY HILL RD
QUANTICO MD 21856-
2103
74. HORNER
CASSANDRA L &
H LOUIS HORNER JR
J/T
30687 FOXCHASE DR
SALISBURY MD
21804-2540
75. HULL VIOLET ETAL
C/O MADONNA P
JOHNSON
PO BOX 4291
SALISBURY MD
21803-4291
76. KARAMIAN TANYA F
5394 LANKFORD RD
QUANTICO MD 21856-
2038
77. KARAMIAN NARBIK A
KARAMIAN DOLORES
J
5394 LANKFORD RD
QUANTICO MD 21856-
2038
78. RUSSELL COOPER
6241 WESTBURY DR
SALISBURY MD
21801-1679
79. DENISOF GERALD A
21864 WETIPQUIN RD
QUANTICO MD 21856-
2115
80. DARRYL WILLING
PO BOX 194
QUANTICO MD 21856-
0194
81. MICHAEL KROPP
1613 CYNTHIA CT
JARRETTSVILLE MD
21084-1508
82. EDWARD
MONTEFERRARIO
180 LINCOLN AVE
WEST MILFORD NJ
07480-4732
83. REIGLE FRANKLIN P
SR
18911 CENTRAL AVE
UPPER MARLBORO
MD 20774-8724
84. JAMES INSLEY
4740 HATCROWN
POINT DR
TYASKIN MD 21865-
2087
85. CURT WATKINS
4307 STURBRIDGE
DR
SALISBURY MD
21804-1950
86. DAVID DAYTON
20915 CEDAR HILL
PKY
PO BOX 42
BIVALVE MD 21814-
0042
87. FOWLKES JENNIE
LEE W ETAL
7308 BRIGHTSIDE RD
BALTIMORE MD
21212-1011
88. SHACKELFORD IDA
LEE DARBY
C/O IDA LEE DARBY S
WOOTTEN
1920 N PANTOPS DR
CHARLOTESVILLE VA
22911-
89. C/O LORA
MATTHEWS
2925 SUMMIT AVE
BALTIMORE MD
21234-1715
90. TERRY DUTTON
20762 NANTICOKE RD
BIVALVE MD 21814-
2017
91. ZABKOWSKI BEN J &
LINDA J H
20730 NANTICOKE RD
PO BOX 140
NANTICOKE MD
21840-0140
92. WICOMICO COUNTY
DEPT OF PARKS &
RECREATION
P O BOX 429
SALISBURY MD
21803-0429
93. JOHN JACOB C/O
PATRICIA W PEPPER
PO BOX 80
NANTICOKE MD
21840-0080

The largest properties listed above are mapped in Appendix B. The area encompassed with this project, is approximately 2,000 acres when shown over the full breadth of the Nanticoke watershed.

Research and literature shows that herbicide treatment is the recommended primary control method and the first step toward effective phragmites management (Marks et al. 1994). Roughly 80 percent of phragmites' biomass is underground as rhizomes. And because it spreads primarily by rhizomes, digging, tilling, and pulling phragmites can expedite its spread. Landscape fabric has been used by some to smother patches of phragmites; however, such plots are then not able to support the growth of other plants. Also, the roots of phragmites may spread outside of the covered areas.

Hence, the primary control method will be aerial systemic herbicide (glyphosate) and LI 700 (a surfactant) application although some treatment will take place with contracted amphibious equipment, and follow-up applications will be conducted via ATV and/or backpack application (e.g., Cowie et al. 1992; Ailstock et al. 2001; Rickey & Anderson 2004).

No technique used alone can fully control phragmites, and reinvasion is likely to occur if management is not maintained. For greatest efficacy, control should begin in the first season in which phragmites is found, but, where the plant already exists in large well-established stands, multiple treatments using a combination of methods are required (see review in Marks et al. 1994). These may include such techniques as prescribed fire, mechanical treatment (e.g., mowing and raking), and water level manipulations. The scope of this project incorporates herbicide application only, as follows:

- (1) initial herbicide application (summer/fall of 2014)
- (2) spot-treatment of sites where phragmites re-growth occurs (summer/fall 2015)

The broad-spectrum herbicide, glyphosate (which is commercially available as Rodeo[®], among others), is known to control phragmites. This herbicide is approved by the USEPA for wetland use. Given historic results the employment of glyphosate is preferred for this application.

IV. ALTERNATIVES TO THE PROPOSED ACTION

Research and literature shows that herbicide treatment is the recommended primary control method and the first step toward effective phragmites management (Marks et al. 1994). Roughly 80 percent of phragmites' biomass is underground as rhizomes. And because it spreads primarily by rhizomes,

digging, tilling, and pulling phragmites can expedite its spread.

Alternatives for the control of this nuisance aquatic vegetation include:

A. Biological Control

Biological control is rarely a practical option for controlling phragmites because those organisms known to feed on this plant (moth larvae, aphids, leaf miners, gall midges, rodents, and birds) cause only incidental damage, with a few rare exceptions. Regarding control with microorganisms and invertebrates, Cornell University researchers have tested over 150 different fungi, pathogens, and insects and have found only four wasp species that might control phragmites (see on-line review at phragmites.org). Testing of their effectiveness is still ongoing, however, so practical implementation of phragmites via invertebrate bio-control is not feasible currently.

Some breeding waterbirds and wetland mammals do use phragmites as a food supply, although this grazing is neither reliable nor pervasive enough for adequate control. American coots, for instance, consume young shoots in the immediate area of their nests. Considerable damage to phragmites shoots occurs locally by such species as muskrats and nutria, but like coot grazing, this is not an activity under the manager's control.

Controlled grazing has little effect on shoot density, but rhizomes that are repeatedly trampled will bear few shoots and recover slowly when grazing has ceased. If phragmites stands are grazed for two years or more, vigor is reduced considerably. Because the amount of grazing required to reduce these stands would be detrimental to desirable plant species as well, grazing is not a recommended control measure.

B. Mechanical Harvesting

Physical removal and mechanical control of phragmites stands may include tilling, discing, and mowing. Such cutting and/or harvesting can be quite beneficial, particularly where stand vegetation is dense and composed of a limited number of species, and immediate results are needed. However, these control methods can be very expensive, and, at least when harvesting, a need for a disposal site can be prohibitive, too. Since phragmites reproduces mostly via rhizomes, most of these methods will actually help spread the plant in treatment areas, so it should not be considered as primary control resource. Although difficult, mechanical treatments are possible on sites that are flooded or consistently moist. A

rotary ditch digger can be used in flooded areas to chop through rhizome-packed substrates and till over existing plants. On drier sites, bulldozers, brush-cutters, discs, rototillers, mowers, crushers, and plows can be practical. Unfortunately, most of these methods also tend to break up and spread rhizome fragments across a site, thereby helping propagate the plant in the future. Dredging may be effective in some situations, but potential effects on wetlands and aesthetic considerations will limit its use. Even though it has been eliminated as a primary treatment method, mechanical manipulation is considered a helpful resource before conducting herbicide application, since mowing, brush-cutting, tilling, etc., can create openings in dense stands, thereby increasing the efficacy of herbicide (see Mal & Narine 2004, among others).

C. Hydrologic Manipulation

Water-level manipulation, where it can be used, can be a useful tool for controlling phragmites. Flooding will not alter established stands, but if water levels greater than 12 inches (30 cm) are maintained, colonies will not expand. At these depths, runners are unable to anchor and will float to the surface. Seedlings are easily killed by raising water levels, but timing of water-level manipulations must be carefully determined to be effective and to avoid conflicts with other management objectives. Draining water from established stands often reduces plant vigor and allows more desirable species to compete, but drying may require several years to degrade a stand. On many wetland areas, however, drainage is neither practical nor desirable. The structures needed to drain wetlands (and then recharge, post-treatment) are expensive to build and are often not feasible. Landowners may also have objections to the alteration of their property or changes in current hydrologic flows. This method has been eliminated due to cost considerations, and its limited applicability.

D. Prescribed Fire

Fire used alone as a control measure has variable results depending on intensity of the burn, but is generally most effective in late summer. Generally, winter burning affords no control and often increases densities of spring crops unless a late spring freeze kills new buds. Spring burning without other control treatments is ineffective because the original stand is simply replaced with a more vigorous growth. In fact, burning in spring removes all dead stems and litter and scorches buds, stimulating multiple buds to develop and emerge. Early to midsummer burns are also ineffective because regrowth still replaces the original stand.

Burning phragmites late in the growing season reduces stand vigor temporarily because few replacement buds are available. Furthermore, reserve energy is in the rhizomes by then and cannot be used for winter bud production. Unfortunately, though, summer burns can have dire impacts on populations of nesting birds, herpetofauna, Lepidoptera, etc. The limited efficacy and the temporal concerns associated with prescribed fire, along with the logistical challenges of implementation in wetlands (i.e., hydrology), renders this control method undesirable as a main control.

E. No Action

No action to control phragmites will cause further degradation of coastal wetland habitats and the native species that inhabit them. Due to lack of treatment over the last decades, near-monotypic stands of this invasive plant have replaced high-quality, complex communities over thousands of acres in bay wetlands and coastal areas. This rapid expansion of a monotypical plant community has resulted in adverse ecological, economic, and social impacts on the natural resources and people of the Chesapeake Bay. Overall, phragmites has degraded the vitality of Chesapeake Bay marshes, which are some of the most productive and biologically diverse systems in the eastern United States. Because phragmites replaces native vegetation, native sedges, rushes, and cattails are displaced, thereby degrading overall plant species richness and diversity. The loss of native plant diversity further results in the decline of wildlife habitat, including that needed to support migratory bird assemblages and native, resident animal species.

V. FEDERALLY-LISTED THREATENED, ENDANGERED, PROPOSED, AND CANDIDATE SPECIES

No federally-listed threatened, endangered, proposed, and candidate plant or animal species are known to reside within the phragmites stands scheduled for treatment. Because treatment areas are generally monocultural stands of phragmites, the likelihood of listed plant species being negatively impacted is small. The likelihood of any detrimental effects to threatened or endangered animals is remote due to the properties of the herbicide proposed for this application (see the following section).

A list of threatened, endangered, proposed, and candidate species under the jurisdiction of the U.S. Department of the Interior, Fish and Wildlife Service for the Maryland coastal counties of Wicomico and Dorchester is included in Appendix A.

VI. ENVIRONMENTAL IMPACTS

A Material data safety sheet is included within the appendices; however, the following is a syntheses (from TNC's Weed Control Methods Handbook, Tu et al. 2001), which briefly describes the environmental toxicity of glyphosate, the active herbicide within the brand name Rodeo®. In short, the chemical is of low toxicity to animal communities, although care must be taken if a surfactant is used. The surfactant to be used is LI 700, a soy-based chemical that is not bioaccumulative or acutely toxic in at distributional levels (Solomon 2003).

Glyphosate is of relatively low toxicity to birds and mammals (Evans & Batty 1986). The LD50 of glyphosate for rats is 5,600 mg/kg and for bobwhite quail, >4,640 mg/kg. EPA's Reregistration Eligibility Decision states that blood and pancreatic effects and weight gain were noted during subchronic feeding studies with rats and mice (EPA 1993). Other studies show developmental and reproductive impacts to animals given the highest dose.

Newton et al. (1984) examined glyphosate residues in the viscera of herbivores following helicopter application of glyphosate to a forest in Oregon and found residue levels comparable to those found in litter and ground cover (<1.7 mg/kg). These residue levels declined over time and were undetectable after day 55 (Newton et al. 1984). Although carnivores and omnivores exhibited much higher viscera residue levels (5.08 mg/kg maximum), Newton et al. (1984) concluded that carnivores were at lower risk than herbivores due to the lower relative visceral weights and a proportionally lower level of food intake.

Batt et al. (1980) found no effect on chicken egg hatchability or time to hatch when an egg was submerged in a solution of 5% glyphosate. Sullivan and Sullivan (1979) found that black-tailed deer showed no aversion to treated foliage and consumption of contaminated forage did not reduce total food intake. Significant impacts to bird and mammal populations due to large-scale habitat alterations following treatment of forest clearcuts with glyphosate have been reported (Morrison & Meslow 1984; Santillo et al. 1989a, b; MacKinnon & Freedman 1993).

Glyphosate itself is of moderate toxicity to fish. The 96-hour LC50 of technical grade glyphosate for bluegill sunfish and rainbow trout are 120 mg/L and 86 mg/L, respectively. Fish exposed to 5 mg/L of glyphosate for two weeks were found to have gill damage and liver damage was observed at glyphosate

concentrations of 10 mg/L (Neskovic et al. 1996). The technical grade of glyphosate is of moderate toxicity to aquatic species, and the toxicity of different glyphosate formulations can vary considerably. For example, Touchdown 4-LC® and Bronco® have low LC50s for aquatic species (<13 mg/L), and are not registered for aquatic use. On the other hand, Rodeo® has relatively high LC50s (>900 mg/L) for aquatic species and is permitted for use in aquatic systems. The surfactant in Roundup® formulations is toxic to fish; however, Rodeo has no surfactant, and is registered for aquatic use.

The surfactant X-77 Spreader®, which is often used in conjunction with Rodeo®, is approximately 100 times more toxic to aquatic invertebrates than Rodeo® alone (Henry et al. 1994). The surfactant MONO818 is included in Roundup® formulations because it aids the breakdown of surface tension on leaf surfaces, but it may also interfere with cutaneous respiration in frogs and gill respiration in tadpoles (Tyler 1997 a,b). In addition, MONO818 is highly toxic to fish (Folmar et al. 1979; Servizi et al. 1987). The LC50 of MONO818 is 2-3 mg/L for sockeye, rainbow, and coho fry (Folmar et al. 1979; Servizi et al. 1987;

Tyler 1997 a,b). The LC50 of Roundup® for bluegill sunfish and rainbow trout is only slightly higher at 6-14 mg/L and 8-26 mg/L, respectively. Similarly for *Daphnia*, the 96-hour LC50 of glyphosate alone is 962 mg/L, but the LC50 of Roundup® drops to 25.5 mg/L (Servizi et al. 1987). Roundup® is therefore not registered for use in aquatic systems.

Despite these toxicity levels, Hildebrand et al. (1980) found that Roundup® treatments at concentrations up to 220 kg/ha did not significantly affect the survival of *Daphnia magna* or its food base of diatoms under laboratory conditions. In addition, Simenstad et al. (1996) found no significant differences between benthic communities of algae and invertebrates on untreated mudflats and mudflats treated with Rodeo® and X-77 Spreader®. It appears that under most conditions, rapid dissipation from aquatic environments of even the most toxic glyphosate formulations prevents build-up of herbicide concentrations that would be lethal to most aquatic species.

The surfactant to be used to improve the efficacy of the herbicide will be LI 700. Analysis measured at distributional levels of LI 700 suggest that ecological effects are not expected (Solomon 2003). According to the attached Material Safety Data Sheet, LI 700 exhibits low acute toxicity to rats through oral, inhalation, and dermal routes. Oral and dermal LD50's for rats exposed to LI 700 were both >5,000 mg/kg and the inhalation LC50 in rats was >6.04 mg/L.

Acute 96-hour LC50s for rainbow trout and bluegill sunfish exposed to LI 700 were 130 mg/L and 210 mg/L, respectively. The acute 48-hour *Daphnia magna* LC50 was 170 mg/L. The acute exposure no effect levels for rainbow trout, bluegill sunfish, and *Daphnia magna* were <100 mg/L, 100 mg/L, and 100mg/L, respectively. The manufacturer-recommended application rate for LI 700 is 5L of LI 700 for every 1,000 L of spray mixture of glyphosate and water.

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Appendix A. USFWS Listed Species That Occur in Maryland

- E Amphipod, Hay's Spring Entire (*Stygobromus hayi*)
- E Bat, Indiana Entire (*Myotis sodalis*)
- E Darter, Maryland Entire (*Etheostoma sellare*)
- T Sea turtle, green except where endangered (*Chelonia mydas*)
- E Sea turtle, hawksbill Entire (*Eretmochelys imbricata*)
- E Sea turtle, Kemp's ridley Entire (*Lepidochelys kempii*)
- E Sea turtle, leatherback Entire (*Dermochelys coriacea*)
- E Squirrel, Delmarva Peninsula fox Entire, except Sussex Co., DE (*Sciurus niger cinereus*)
- E Sturgeon, shortnose Entire (*Acipenser brevirostrum*)
- T Tiger beetle, Northeastern beach Entire (*Cicindela dorsalis dorsalis*)
- T Tiger beetle, Puritan Entire (*Cicindela puritana*)
- T Turtle, bog (=Muhlenberg) northern (*Clemmys muhlenbergii*)
- E Wedgemussel, dwarf Entire (*Alasmidonta heterodon*)
- E Whale, finback Entire (*Balaenoptera physalus*)
- E Whale, humpback Entire (*Megaptera novaeangliae*)
- E Whale, North Atlantic Right Entire (*Eubalaena glacialis*)

Animal species listed in this state that do not occur in this state (4 species)

Status Species

E Beetle, American burying Entire (*Nicrophorus americanus*)

T Plover, piping except Great Lakes watershed (*Charadrius melodus*)

E Puma (=cougar), eastern Entire (*Puma (=Felis) concolor cougar*)

E Wolf, gray U.S.A.: All of AL, AR, CA, CO, CT, DE, FL, GA, KS, KY, LA, MA, MD, ME, MO, MS, NC, NE, NH, NJ, NV, NY, OK, PA, RI, SC, TN, VA, VT and WV; those portions of AZ, NM, and TX not included in an experimental population; and portions of IA, IN, IL, ND, OH, OR, SD, UT, and WA. Mexico. (*Canis lupus*)

Summary of Plant listings

Plant species listed in this state and that occur in this state (6 species)

Status Species

E Bulrush, Northeastern (*Scirpus ancistrochaetus*)

E Dropwort, Canby's (*Oxypolis canbyi*)

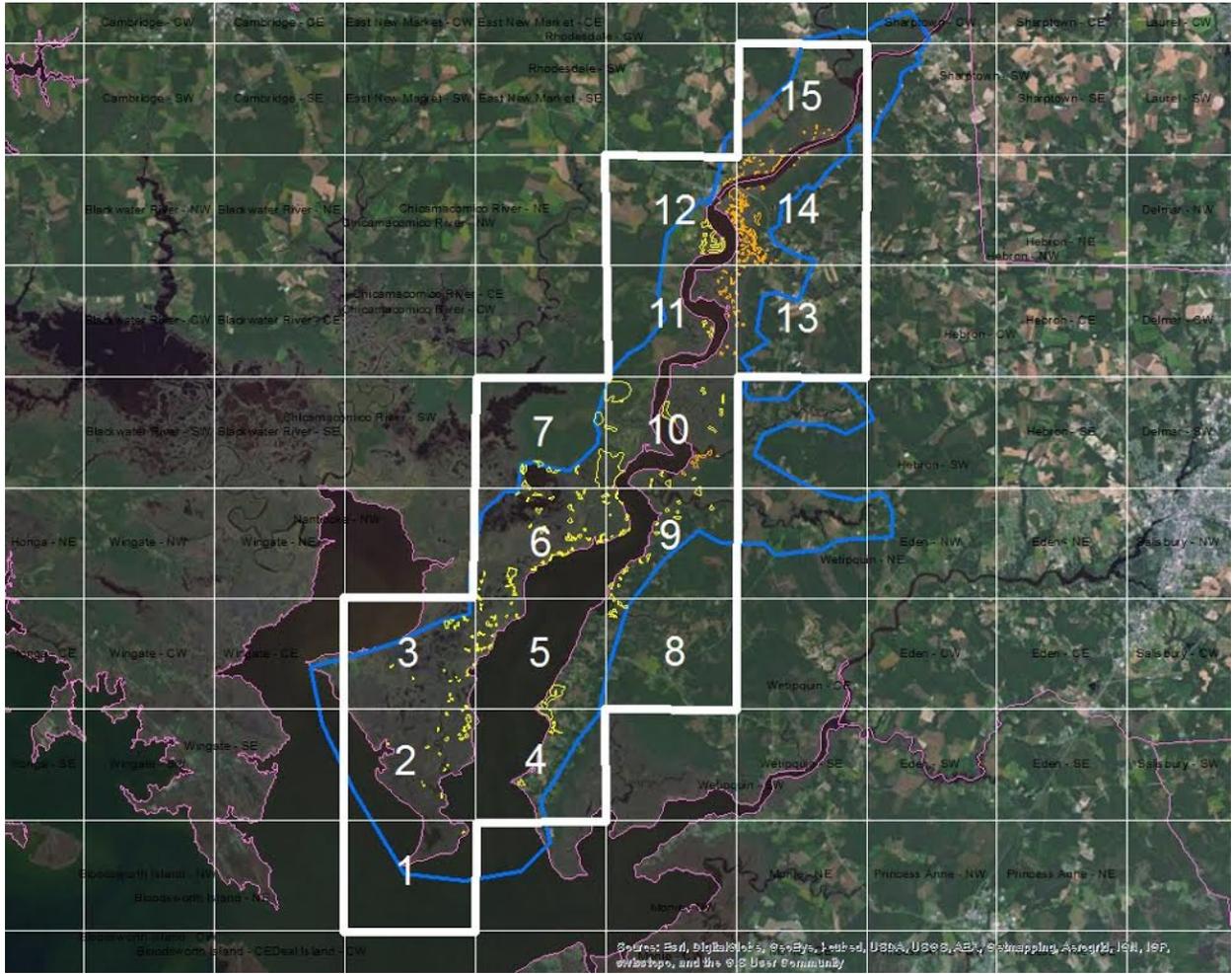
E Gerardia, sandplain (*Agalinis acuta*)

E Harperella (*Ptilimnium nodosum*)

T Joint-vetch, Sensitive (*Aeschynomene virginica*)

T Pink, swamp (*Helonias bullata*)

Appendix B. Map of Focal Area



Map shows Nanticoke River broken into 15 quadrants with Phragmites identified for application

MATERIAL SAFETY DATA SHEET



Emergency Phone: 800-992-5994
Dow AgroSciences LLC
Indianapolis, IN 46268

RODEO* HERBICIDE

Effective Date: 3/23/04
Product Code: 84825
MSDS: 006694

1. PRODUCT AND COMPANY IDENTIFICATION:

PRODUCT: Rodeo* Herbicide

COMPANY IDENTIFICATION:

Dow AgroSciences LLC
9330 Zionsville Road
Indianapolis, IN 46268-1189

EXTINGUISHING MEDIA: Foam, CO₂, Dry Chemical

FIRE AND EXPLOSION HAZARDS: Foam fire extinguishing system is preferred because uncontrolled water can spread possible contamination. Toxic irritating gases may be formed under fire conditions.

FIRE-FIGHTING EQUIPMENT: Use positive-pressure, self-contained breathing apparatus and full protective equipment.

2. COMPOSITION/INFORMATION ON INGREDIENTS:

Glyphosate IPA:	CAS # 038641-94-0	53.8%
N-(phosphono-methyl) glycine, Isopropylamine Salt		
Balance, Total		46.2%

6. ACCIDENTAL RELEASE MEASURES:

ACTION TO TAKE FOR SPILLS: Absorb small spills with an inert absorbent material such as Hazorb, Zorbball, sand, or dirt. Report large spills to Dow AgroSciences on 800-992-5994.

3. HAZARDOUS IDENTIFICATIONS:

EMERGENCY OVERVIEW

Clear, pale yellow liquid. May cause eye irritation. Slightly toxic to aquatic organisms.

EMERGENCY PHONE NUMBER: 800-992-5994

7. HANDLING AND STORAGE:

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: Keep out of reach of children. Do not swallow. Avoid contact with eyes, skin, and clothing. Avoid breathing vapors and spray mist. Handle concentrate in ventilated area. Wash thoroughly with soap and water after handling and before eating, chewing gum, using tobacco, using the toilet or smoking. Keep away from food, feedstuffs, and water supplies. Store in original container with the lid tightly closed. Store above 10°F (-12°C) to keep from crystallizing.

4. FIRST AID:

EYE: Flush eyes thoroughly with water for several minutes. Remove contact lenses after initial 1-2 minutes and continue flushing for several additional minutes. If effects occur, consult a physician, preferably an ophthalmologist.

SKIN: Wash skin with plenty of water.

INGESTION: No emergency medical treatment necessary.

INHALATION: Remove person to fresh air; if effects occur, consult a physician.

NOTE TO PHYSICIAN: No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION:

These precautions are suggested for conditions where the potential for exposure exists. Emergency conditions may require additional precautions.

EXPOSURE GUIDELINES: None established

ENGINEERING CONTROLS: Good general ventilation should be sufficient for most conditions. Local exhaust ventilation may be necessary for some operations.

5. FIRE FIGHTING MEASURES:

FLASH POINT: >214°F (>101°C)

METHOD USED: Setflash

FLAMMABLE LIMITS:

LFL: Not applicable

UFL: Not applicable

RECOMMENDATIONS FOR MANUFACTURING, COMMERCIAL BLENDING, AND PACKAGING WORKERS:

EYE/FACE PROTECTION: Use safety glasses.

SKIN PROTECTION: No precautions other than clean body-covering clothing should be needed.

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MATERIAL SAFETY DATA SHEET



RODEO* HERBICIDE

Emergency Phone: 800-992-5994
Dow AgroSciences LLC
Indianapolis, IN 46268

Effective Date: 3/23/04
Product Code: 84825
MSDS: 006694

RESPIRATORY PROTECTION: For most conditions, no respiratory protection should be needed; however, if discomfort is experienced, use a NIOSH approved air-purifying respirator.

APPLICATIONS AND ALL OTHER HANDLERS: Please refer to the product label for personal protective clothing and equipment.

9. PHYSICAL AND CHEMICAL PROPERTIES:

APPEARANCE: Clear, pale yellow liquid
DENSITY: 10.0 - 10.5 lbs/gal
pH: 4.8 - 5.0
ODOR: None
SOLUBILITY IN WATER: Miscible
SPECIFIC GRAVITY: 1.21 gm/L
FREEZING POINT: -7°F - -10°F (-21°C - -25°C)

10. STABILITY AND REACTIVITY:

STABILITY: (CONDITIONS TO AVOID) Stable under normal storage conditions.

INCOMPATIBILITY: (SPECIFIC MATERIALS TO AVOID) Galvanized or unlined steel (except stainless steel) containers or spray tanks may produce hydrogen gas which may form a highly combustible gas mixture.

HAZARDOUS DECOMPOSITION PRODUCTS: None known.

HAZARDOUS POLYMERIZATION: Not known to occur.

11. TOXICOLOGICAL INFORMATION:

EYE: May cause slight temporary eye irritation. Corneal injury is unlikely.

SKIN: Essentially non-irritating to skin. Prolonged skin contact is unlikely to result in absorption of harmful amounts. The LD₅₀ for skin absorption in rabbits is >5000 mg/kg. Did not cause allergic skin reactions when tested in guinea pigs.

INGESTION: Very low toxicity if swallowed. Harmful effects not anticipated from swallowing small amounts. The oral LD₅₀ for rats is >5000 mg/kg.

INHALATION: Brief exposure (minutes) is not likely to cause adverse effects. The aerosol LC₅₀ for rats is >6.37 mg/L for 4 hours.

SYSTEMIC (OTHER TARGET ORGAN) EFFECTS: For a similar material, glyphosate, in animals, effects have been reported on the following organ: liver.

CANCER INFORMATION: A similar material, glyphosate, did not cause cancer in laboratory animals.

TERATOLOGY (BIRTH DEFECTS): For glyphosate IPA, available data are inadequate for evaluation of potential to cause birth defects.

REPRODUCTIVE EFFECTS: For glyphosate IPA, available data are inadequate to determine effects on reproduction.

MUTAGENICITY: For a similar material, glyphosate, in-vitro and animal genetic toxicity studies were negative.

12. ECOLOGICAL INFORMATION:

ENVIRONMENTAL DATA:

ECOTOXICOLOGY:

Material is practically non-toxic to aquatic organisms on an acute basis (LC₅₀ or EC₅₀ is >100 mg/L in most sensitive species tested).

Acute LC₅₀ for rainbow trout (*Oncorhynchus mykiss*) is >2500 mg/L.

Acute immobilization EC₅₀ in water flea (*Daphnia magna*) is 918 mg/L.

Material is practically non-toxic to birds on an acute basis (LD₅₀ is >2000 mg/kg).

Acute oral LD₅₀ in bobwhite (*Colinus virginianus*) is >2000 mg/kg.

The LC₅₀ in earthworm *Eisenia foetida* is >1000 mg/kg. Acute contact LD₅₀ in honey bee (*Apis mellifera*) is >100 µg/bee.

Acute oral LD₅₀ in honey bee (*Apis mellifera*) is >100 µg/bee.

Growth inhibition EC₅₀ in green alga (*Selenastrum capricornutum*) is 127 mg/L.

Growth inhibition EC₅₀ in duckweed (*Lemna sp.*) is 24.4 mg/L.

13. DISPOSAL CONSIDERATIONS:

DISPOSAL METHOD: If wastes and/or containers cannot be disposed of according to the product label directions, disposal of this material must be in accordance with your local or area regulatory authorities.

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MATERIAL SAFETY DATA SHEET



RODEO* HERBICIDE

Emergency Phone: 800-992-5994
Dow AgroSciences LLC
Indianapolis, IN 46268

Effective Date: 3/23/04
Product Code: 84825
MSDS: 006694

This information presented below only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations.

If the material as supplied becomes a waste, follow all applicable regional, national and local laws and regulations.

14. TRANSPORT INFORMATION:

U.S. DEPARTMENT OF TRANSPORTATION (DOT) INFORMATION:

For all package sizes and modes of transportation:
This material is not regulated for transport.

15. REGULATORY INFORMATION:

NOTICE: The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state or provincial, and local laws. The following specific information is made for the purpose of complying with numerous federal, state or provincial, and local laws and regulations.

U.S. REGULATIONS

SARA 313 INFORMATION: To the best of our knowledge, this product contains no chemical subject to SARA Title III Section 313 supplier notification requirements.

SARA HAZARD CATEGORY: This product has been reviewed according to the EPA "Hazard Categories" promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

Not to have met any hazard category

TOXIC SUBSTANCES CONTROL ACT (TSCA): All ingredients are on the TSCA inventory or are not required to be listed on the TSCA inventory.

STATE RIGHT-TO-KNOW: This product is not known to contain any substances subject to the disclosure requirements of

New Jersey
Pennsylvania

OSHA HAZARD COMMUNICATION STANDARD: This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILITY ACT (CERCLA, or SUPERFUND): To the best of our knowledge, this product contains no chemical subject to reporting under CERCLA.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) RATINGS:

CATEGORY	RATING
Health	1
Flammability	1
Reactivity	0

16. OTHER INFORMATION:

MSDS STATUS: Revised Sections: 3,4,11,12,13,14 & 15
Reference: DR-0361-8028
Replaces MSDS Dated: 1/12/00
Document Code: D03-148-002
Replaces Document Code: D03-148-001

The Information Herein Is Given In Good Faith, But No Warranty, Express Or Implied, Is Made. Consult Dow AgroSciences For Further Information.

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Appendix F. Specimen Label for Rodeo® Herbicide

Specimen Label



Rodeo®

Herbicide

For control of annual and perennial weeds and woody plants in forests, non-crop sites, and in and around aquatic sites; also for use in wildlife habitat areas, for perennial grass release, and grass growth suppression and grazed areas on these sites.

Avoid contact of herbicide with foliage, green stems, exposed non-woody roots or fruit of crops, desirable plants and trees, because severe injury or destruction may result.

Active Ingredient(s):

glyphosate [†] N-(phosphonomethyl)glycine, isopropylamine salt	53.8%
Other Ingredients	46.2%
Total Ingredients	100.0%

[†] Contains 5.4 pounds per gallon glyphosate, isopropylamine salt (4 pounds per gallon glyphosate acid).

EPA Reg. No. 62719-324

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 Inhaled

Avoid breathing spray mist. Remove contaminated clothing and wash before reuse. Wash thoroughly with soap and water after handling.

Personal Protective Equipment (PPE)

Applicators and other handlers must wear:

- Long-sleeved shirt and long pants
- Shoes plus socks.

Follow manufacturer's instructions for cleaning/maintaining PPE (Personal Protective Equipment). If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

Engineering Controls

When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240 (d) (4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

User Safety Recommendations

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.

First Aid

If inhaled: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably 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

Do not contaminate water when cleaning equipment or disposing of equipment washwaters. Treatment of aquatic weeds can result in oxygen depletion or loss due to decomposition of dead plants. This oxygen loss can cause fish suffocation.

In case of leak or spill, soak up and remove to a landfill.

Physical or Chemical Hazards

Spray solutions of this product should be mixed, stored and applied using only stainless steel, aluminum, fiberglass, plastic or plastic-lined steel containers.

Do not mix, store or apply this product or spray solutions of this product in galvanized steel or unlined steel (except stainless steel) containers or spray tanks. This product or spray solutions of this product react with such containers and tanks to produce hydrogen gas, which may form a highly combustible gas mixture. This gas mixture could flash or explode, causing serious personal injury, if ignited by open flame, spark, welder's torch, lighted cigarette or other ignition source.

Notice: Read the entire label. Use only according to label directions. **Before using this product, read Terms and Conditions of Use, Warranty Disclaimer, Inherent Risks of Use, and Limitation of Remedies elsewhere on this label. If terms are unacceptable, 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.

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.

This is an end-use product. Dow AgroSciences does not intend and has not registered it for reformulation. See individual container label for repackaging limitations.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your state or tribe, consult the agency responsible for pesticide regulation.

Agricultural Use Requirements

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE), and restricted entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 4 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

- Coveralls
- Chemical-resistant gloves made of any waterproof material
- Shoes plus socks

Non-Agricultural Use Requirements

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard for agricultural pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries or greenhouses.

Keep people and pets off treated areas until spray solution has dried.

Storage and Disposal

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

Pesticide Storage: Store above 10°F (-12°C) to keep product from crystallizing. Crystals will settle to the bottom. If allowed to crystallize, place in a warm room 68°F (20°C) for several days to redissolve and roll or shake container or recirculate in mini-bulk containers to mix well before using.

Pesticide Disposal: Wastes resulting from use of this product that cannot be used or chemically reprocessed should be disposed of in a landfill approved for pesticide disposal or in accordance with applicable Federal, state or local procedures.

Nonrefillable 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 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.

Refillable containers larger than 5 gallons:

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.

Nonrefillable containers larger than 5 gallons:

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 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
(How this product works)

This product is a water-soluble liquid, which mixes readily with water and nonionic surfactant to be applied as a foliar spray for the control or destruction of many herbaceous and woody plants. This product is intended for control of annual and perennial weeds and woody plants in forests, pine straw plantations, non-crop sites such as utility rights-of-way, and in and around aquatic sites; also for use in wildlife habitat areas, for perennial grass release, and grass growth suppression and grazed areas on these sites.

The active ingredient in this product moves through the plant from the point of foliage contact to and into the root system. Visible effects on most annual weeds occur within 2 to 4 days, 7 days or more on most perennial weeds, and 30 days or more on most woody plants. Extremely cool or cloudy weather following treatment may slow the activity of this product and delay visual effects of control. Visible effects include gradual wilting and yellowing of the plant which advances to complete browning of above-ground growth and deterioration of underground plant parts.

Unless otherwise directed on this label, delay application until vegetation has emerged and reached the stages described for control of such vegetation under the "Weeds Controlled" section of this label.

Unemerged plants arising from unattached underground rhizomes or root stocks of perennials or brush will not be affected by the spray and will continue to grow. For this reason best control of most perennial weeds or brush is obtained when treatment is made at late growth stages approaching maturity.

Always use the higher rate of this product and surfactant within the recommended range when vegetation is heavy or dense, when treating dense multi-canopied sites or woody vegetation or difficult-to-control herbaceous or woody plants.

Do not treat weeds, brush or trees under poor growing conditions such as drought stress, disease or insect damage, as reduced control may result. Reduced control of target vegetation may also occur if foliage is heavily covered with dust at the time of treatment.

Reduced control may result when applications are made to woody plants or weeds following site disturbance or plant top growth removal from grazing, mowing, logging or mechanical brush control. For best results, delay treatment of such areas until resprouting and foliar growth has restored the target vegetation to the recommended stage of growth for optimum herbicide exposure and control.

Rainfall or irrigation occurring within 6 hours after application may reduce effectiveness. Heavy rainfall or irrigation within 2 hours after application may wash the product off the foliage and a repeat treatment may be required.

This product does not provide residual weed control. For subsequent residual weed control, follow a label-approved herbicide program. Read and carefully observe the cautionary statements and all other information appearing on the labels of all herbicides used.

Note: The maximum rates stated throughout this product's labeling apply to this product combined with the use of all other herbicides containing glyphosate or sulfosate as the active ingredient, whether applied as mixtures or separately. Calculate the application rates and ensure that the total use of this and other glyphosate or sulfosate containing products does not exceed the maximum use rates.

Grazing Restrictions: This product may be used to treat undesirable vegetation in utility rights-of-way that pass through pastures, rangeland, and forestry sites that are being grazed. For tank mix applications, comply with all restrictions appearing on the tank mix product label.

Except for lactating dairy animals there are no grazing restrictions following the labeled applications of this product.

- For lactating dairy animals there are no grazing restrictions for the following labeled applications of this product:
 - ▶ Where the spray can be directed onto undesirable woody brush and trees, such as in handgun spray-to-wet or low volume directed spray treatments.
 - ▶ For tree injection of frill applications and for cut stump treatments
- For broadcast applications, observe the following restrictions for lactating dairy animals:
 - ▶ For application rates of greater than 4.5 but not to exceed 7.5 quarts per acre, no more than 15 percent of the available grazing area may be treated.
 - ▶ For application rates that do not exceed 4.5 quarts per acre, no more than 25 percent of the available grazing area may be treated.
- These restrictions do not apply to pastures, rangeland or forestry sites outside of utility rights-of-way.

NOTE: Use of this product in any manner not consistent with this label may result in injury to persons, animals or crops, or other unintended consequences. When not in use, keep container closed to prevent spills and contamination.

Buyer and all users are responsible for all loss or damage in connection with the use or handling of mixtures of this product or other materials that are not expressly recommended in this label. Mixing this product with herbicides or other materials not recommended in this label may result in reduced performance.

ATTENTION: Avoid drift. Extreme care must be used when applying this product to prevent injury to desirable plants and crops.

Do not allow the herbicide solution to mist, drip, drift or splash onto desirable vegetation since minute quantities of this product can cause severe damage or destruction to the crop, plants or other areas on which treatment was not intended. The likelihood of plant or crop injury occurring from the use of this product is greatest when winds are gusty or in excess of 5 miles per hour or when other conditions, including lesser wind velocities, will allow spray drift to occur. When spraying, avoid combinations of pressure and nozzle type that will result in splatter or fine particles (mist) which are likely to drift. **Avoid applying at excessive speed or pressure.**

Spray Drift Management

Avoiding spray drift at the application site is the responsibility of the applicator. The interaction of many equipment-and-weather-related factors determine the potential for spray drift. The applicator and the grower 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 to agricultural field crops. These requirements do not apply to forestry applications, public health uses or to applications using dry formulations.

1. The distance of the outer most nozzles on the boom must not exceed 3/4 the length of the wingspan or rotor.
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 Information**:

Importance of 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 Inversion section of this label).

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-Use the lower spray pressures recommended for the nozzle. Higher pressure reduces droplet size and does not improve canopy penetration. 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 backwards, parallel to the airstream will produce larger droplets than other orientations. Significant deflection from the 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 larger droplets than other nozzle types.

Boom Length-For some use patterns, reducing the effective boom length to less than 3/4 of the wingspan or rotor length may further reduce drift without reducing swath width.

Application-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 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 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 smoke from a ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a connected cloud (under low wind conditions) indicates an inversion, while smoke that moves upwards and rapidly dissipates indicates good vertical air mixing.

Sensitive Areas: The pesticide should only be applied when the potential for drift to adjacent sensitive areas (e.g., residential areas, bodies of water, known habitat for threatened or endangered species, non-target crops) is minimal (e.g., when wind is blowing away from the sensitive areas).

Mixing And Application Instructions

Apply these spray solutions in properly maintained and calibrated equipment capable of delivering desired volumes. Hand-gun applications should be properly directed to avoid spraying desirable plants. Note: reduced results may occur if water containing soil is used, such as water from ponds and unlined ditches.

Mixing

This product mixes readily with water. Mix spray solutions of this product as follows:

1. Fill the mixing or spray tank with the required amount of water while adding the required amount of this product (see "Directions for Use" and "Weeds Controlled" sections of this label).
2. Near the end of the filling process, add the required surfactant and mix well. Remove hose from tank immediately after filling to avoid siphoning back into the water source.

Note: If tank mixing with Garlon® 3A herbicide, ensure that Garlon 3A is well mixed with at least 75 percent of the total spray volume before adding this product to the spray tank to avoid incompatibility.

During mixing and application, foaming of the spray solution may occur. To prevent or minimize foam, avoid the use of mechanical agitators, place the filling hose below the surface of the spray solution (only during filling), terminate by-pass and return lines at the bottom of the tank, and, if needed, use an approved anti-foam or defoaming agent.

Keep by-pass line on or near bottom of tank to minimize foaming. Screen size in nozzle or line strainers should be no finer than 50 mesh. Carefully select correct nozzle to avoid spraying a fine mist. For best results with conventional ground application equipment, use flat fan nozzles. Check for even distribution of spray droplets.

IMPORTANT: When using this product, unless otherwise specified, mix with a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient. For conifer release (pine release) use only surfactants that are approved for conifer release, and specified on the surfactant label as safe for use in conifer release (pine release). Always read and follow the manufacturer's surfactant label recommendations for best results.

Colorants or marking dyes approved for use with herbicides may be added to spray mixtures of this product. Colorants or dyes used in spray solutions of this product may reduce performance, especially at lower rates or dilutions. Use colorants or dyes according to the manufacturer's label recommendations.

Clean sprayer and parts immediately after using this product by thoroughly flushing with water and dispose of rinsate according to labeled use or disposal instructions.

Carefully observe all cautionary statements and other information appearing in the surfactant label.

Application Equipment And Techniques

ATTENTION: AVOID DRIFT. EXTREME CARE MUST BE EXERCISED WHEN APPLYING THIS PRODUCT TO PREVENT INJURY TO DESIRABLE PLANTS AND CROPS.

Do not allow the herbicide solution to mist, drip, drift, or splash onto desirable vegetation since minute quantities of this product can cause severe damage or destruction to crops, plants, or other areas on which the treatment was not intended. The likelihood of plant or crop injury occurring from the use of this product is greatest when winds are gusty or in excess of 5 miles per hour or when other conditions, including lesser wind velocities, will allow spray drift to occur. When spraying, avoid combinations of pressure and nozzle type that will result in splatter or fine particles (mist) which are likely to drift. **AVOID APPLYING AT EXCESSIVE SPEED OR PRESSURE.**

Note: Use of this product in a manner not consistent with this label may result in injury to persons, animals, or crops, or other unintended consequences. When not in use, keep container closed to prevent spills and contamination.

Aerial Equipment

For aerial application of this product in California, refer to Federal supplemental label for this product entitled "For Aerial Application in California Only". In California, aerial application may be made in aquatic sites and noncrop areas, including aquatic sites present in noncrop areas that are part of the intended treatment.

For control of weed or brush species listed in this label using aerial application equipment: For aerial broadcast application, unless otherwise specified, apply the rates of this product and surfactant recommended for broadcast application in a spray volume of 3 to 20 gallons of water per acre. See the "Weeds Controlled" section of this label for labeled annual and herbaceous weeds and woody plants and broadcast rate recommendations. Aerial applications of this product may only be made as specifically recommended in this label.

AVOID DRIFT. Do not apply during inversion conditions, when winds are gusty or under any other condition which will allow drift. Drift may cause damage to any vegetation contacted to which treatment is not intended. To prevent injury to adjacent desirable vegetation, appropriate buffer zones must be maintained.

Coarse sprays are less likely to drift; therefore, do not use nozzles or nozzle configurations which dispense spray as fine spray droplets. Do not angle nozzles forward into the airstream and do not increase spray volume by increasing nozzle pressure.

Drift control additives may be used. When a drift control additive is used, read and carefully observe the cautionary statements and all other information appearing in the additive label. The use of a drift control agent for conifer and herbaceous release applications may result in conifer injury and is not recommended.

Ensure uniform application. To avoid streaked, uneven or overlapped application, use appropriate marking devices.

Thoroughly wash aircraft, especially landing gear, after each day of spraying to remove residues of this product accumulated during spraying or from spills. **Prolonged exposure of this product to uncoated steel surfaces may result in corrosion and possible failure of the part. Landing gear are most susceptible.** The maintenance of an organic coating (paint) which meets aerospace specification MIL-C-38413 may prevent corrosion.

Ground Broadcast Equipment

For control of weed or brush species listed in this label using conventional boom equipment: For ground broadcast application, unless otherwise specified, apply the rates of this product and surfactant recommended for broadcast application in a spray volume of 3 to 30 gallons of water per acre. See the "Weeds Controlled" section of this label for labeled annual and herbaceous weeds and woody plants and broadcast rate recommendations. As density of vegetation increases, spray volume should be increased within the recommended range to ensure complete coverage. Carefully select correct nozzle to avoid spraying a fine mist. For best results with ground application equipment, use flat fan nozzles. Check for even distribution of spray droplets.

Forestry and Utility Rights-of-Way Sites: This product is recommended for broadcast applications using suitable ground equipment in forestry sites, utility sites, and utility rights-of-way. Apply the recommended rates of this product and surfactant in a spray volume of 10 to 60 gallons per acre. Check for even distribution of spray droplets.

**Hand-Held and High-Volume Equipment
(Use Coarse Sprays Only)**

For control of weeds listed in this label using knapsack sprayers or high-volume spraying equipment utilizing handguns or other suitable nozzle arrangements:

High volume sprays: Prepare a 3/4 to 2 percent solution of this product in water, add a nonionic surfactant and apply to foliage of vegetation to be controlled. For specific rates of application and instructions for control of various annual and perennial weeds, see the "Weeds Controlled" section in this label.

Applications should be made on a spray-to-wet basis. Spray coverage should be uniform and complete. Do not spray to point of runoff.

Low volume directed sprays: This product may be used as a 5 to 10 percent solution in low-volume directed sprays for spot treatment of trees and brush. This treatment method is most effective in areas where there is a low density of undesirable trees or brush. If a straight stream nozzle is used, start the application at the top of the targeted vegetation and spray from top to bottom in a lateral zig-zag motion. Ensure that at least 50 percent of the leaves are contacted by the spray solution. For flat fan and cone nozzles and with hand-directed mist blowers, mist the application over the foliage of the targeted vegetation. Small, open-branched trees need only be treated from one side. If the foliage is thick or there are multiple root sprouts, applications must be made from several sides to ensure adequate spray coverage.

Prepare the desired volume of spray solution by mixing the amount of this product in water, shown in the following table:

Spray Solution

Desired Volume	Amount of this product							
	3/4%	1%	1 1/4%	1 1/2%	2%	5%	8%	10%
1 gal	1 fl oz	1 1/3 fl oz	1 2/3 fl oz	2 fl oz	2 2/3 fl oz	6 1/2 fl oz	10 1/4 fl oz	12 3/4 fl oz
25 gal	1 1/2 pt	1 qt	1 1/4 qt	1 1/2 qt	2 qt	5 qt	2 gal	2.5 gal
100 gal	3 qt	1 gal	1 1/4 gal	1 1/2 gal	2 gal	5 gal	8 gal	10 gal

2 tablespoons = 1 fluid ounce

For use in knapsack sprayers, it is suggested that the recommended amount of this product be mixed with water in a larger container. Fill the knapsack sprayer with the mixed solution and add the correct amount of surfactant.

Selective Equipment

This product may be applied through shielded sprayers or wiper application equipment. This equipment may be used to selectively control undesirable vegetation without harming desirable vegetation.

Shielded sprayers direct the herbicide solution onto weeds while shielding desirable vegetation from the spray solution. Any recommended rate or tank mixture of this product may be used employing this equipment.

Wiper applicators physically wipe product directly onto undesirable vegetation. Care should be taken to avoid wiping desirable vegetation. Use a 33 to 100 percent solution of this product, diluted in water for wiper applications. Use a 33 percent solution for wick or gravity feed systems. Higher concentrations may be used in pressurized systems that are capable of handling thicker solutions. Addition of a nonionic surfactant at a rate of 10 percent by volume of total herbicide solution is recommended.

Weeds Controlled

Annual Weeds

Apply to actively growing annual grasses and broadleaf weeds.

Allow at least 3 days after application before disturbing treated vegetation. After this period the weeds may be mowed, tilled or burned. See "Directions for Use," "General Information" and "Mixing and Application Instructions" for labeled uses and specific application instructions.

Broadcast Application Rates: For weeds less than 6 inches tall, use 1 1/2 pints of this product per acre plus a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient. If weeds are greater than 6 inches tall, use 2 1/2 pints of this product per acre plus a non-ionic surfactant containing 80% or greater active ingredient.

Hand-Held, High-Volume Application Rates: Use a 3/4 percent solution of this product in water plus a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient. Apply to foliage of vegetation to be controlled.

When applied as directed, this product plus a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient will control the following annual weeds:

Common Name	Scientific Name
Balsamapple ¹	<i>Momordica charantia</i>
Barley	<i>Hordeum vulgare</i>
Barnyardgrass	<i>Echinochloa crus-galli</i>
Bassia, fivehook	<i>Bassia hyssopifolia</i>
Bluegrass, annual	<i>Poa annua</i>
Bluegrass, bulbous	<i>Poa bulbosa</i>
Brome	<i>Bromus spp.</i>
Buttercup	<i>Ranunculus spp.</i>
Cheat	<i>Bromus secalinus</i>
Chickweed, mouseear	<i>Cerastium vulgatum</i>
Cocklebur	<i>Xanthium strumarium</i>
Corn, volunteer	<i>Zea mays</i>
Crabgrass	<i>Digitaria spp.</i>
Dwarfandelion	<i>Krigia cespitosa</i>
Falseflax, smallseed	<i>Camelina microcarpa</i>
Fiddleneck	<i>Amsinckia spp.</i>
Flaxleaf fleabane	<i>Coryza bonariensis</i>
Fleabane	<i>Erigeron spp.</i>
Foxtail	<i>Setaria spp.</i>
Foxtail, Carolina	<i>Alopecurus carolinianus</i>
Groundsel, common	<i>Senecio vulgaris</i>
Horseweed/Marestail	<i>Coryza canadensis</i>
Kochia	<i>Kochia scoparia</i>
Lambsquarters, common	<i>Chenopodium album</i>
Lettuce, prickly	<i>Lactuca scariola</i>
Morningglory	<i>Ipomoea spp.</i>
Mustard, blue	<i>Chorispora tenella</i>
Mustard, tansy	<i>Descurainia pinnata</i>
Mustard, tumble	<i>Sisymbrium altissimum</i>
Mustard, wild	<i>Sinapis arvensis</i>
Oats, wild	<i>Avena fatua</i>
Panicum	<i>Panicum spp.</i>
Pennycress, field	<i>Thlaspi arvense</i>
Pigweed, redroot	<i>Amaranthus retroflexus</i>
Pigweed, smooth	<i>Amaranthus hybridus</i>
Ragweed, common	<i>Ambrosia artemisiifolia</i>
Ragweed, giant	<i>Ambrosia trifida</i>
Rocket, London	<i>Sisymbrium inio</i>
Rye	<i>Secale cereale</i>
Ryegrass, Italian ^{**}	<i>Lolium multiflorum</i>
Sandbur, field	<i>Cenchrus spp.</i>
Shattercane	<i>Sorghum bicolor</i>
Shepherd's-purse	<i>Capsella bursa-pastoris</i>
Signalgrass, broadleaf	<i>Brachiaria platyphylla</i>
Smartweed, Pennsylvania	<i>Polygonum pensylvanicum</i>
Sowthistle, annual	<i>Sonchus oleraceus</i>
Spanishneedles ^{**}	<i>Bidens bipinnata</i>
Stinkgrass	<i>Eragrostis ciliaris</i>
Sunflower	<i>Helianthus annuus</i>
Thistle, Russian	<i>Salsola kali</i>
Spurry, umbrella	<i>Holosteum umbellatum</i>
Velvetleaf	<i>Abutilon theophrasti</i>
Wheat	<i>Triticum aestivum</i>
Witchgrass	<i>Panicum capillare</i>

¹ Apply with hand-held equipment only.

^{**} Apply 3 pints of this product per acre.

Annual weeds will generally continue to germinate from seed throughout the growing season. Repeat treatments will be necessary to control later germinating weeds.

Perennial Weeds

Apply this product to control most vigorously growing perennial weeds. Unless otherwise directed, apply when target plants are actively growing and most have reached early head or early bud stage of growth. Unless otherwise directed, allow at least 7 days after application before disturbing vegetation.

NOTE: If weeds have been mowed or tilled, do not treat until regrowth has reached the recommended stages. Fall treatments must be applied before a killing frost.

Repeat treatments may be necessary to control weeds regenerating from underground parts or seed.

Specific Weed Control Recommendations: For perennial weeds, apply the recommended rate plus a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient. Use of this product without surfactant will result in reduced herbicide performance. Refer to the "Mixing and Application Instructions" section of this label and the surfactant manufacturer label for more information.

When applied as directed, this product plus a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient will control the following perennial weeds: (Numbers in parentheses "(-)" following common name of a listed weed species refer to "Specific Perennial Weed Control Recommendations" for that weed which follow the species listing.)

Common Name	Scientific Name
Allalfa (31)	<i>Medicago sativa</i>
Alligatorweed ¹ (1)	<i>Alternanthera philoxeroides</i>
Anise/Fennel (31)	<i>Foeniculum vulgare</i>
Artichoke, Jerusalem (31)	<i>Helianthus tuberosus</i>
Bahiagrass (31)	<i>Paspalum notatum</i>
Bermudagrass (2)	<i>Cynodon dactylon</i>
Bindweed, field (3)	<i>Convolvulus arvensis</i>
Bluegrass, Kentucky (12)	<i>Poa pratensis</i>
Blueweed, Texas (3)	<i>Helianthus ciliaris</i>
Brackenfern (4)	<i>Pteridium spp.</i>
Bromegrass, smooth (12)	<i>Bromus inermis</i>
Canarygrass, reed (12)	<i>Phalaris arundinacea</i>
Cattail (5)	<i>Typha spp.</i>
Clover, red (31)	<i>Trifolium pratense</i>
Clover, white (31)	<i>Trifolium repens</i>
Cogongrass (6)	<i>Imperata cylindrica</i>
Cordgrass (7)	<i>Spartina spp.</i>
Cutgrass, giant ¹ (8)	<i>Zizaniopsis miliacea</i>
Dallisgrass (31)	<i>Paspalum dilatatum</i>
Dandelion (31)	<i>Taraxacum officinale</i>
Dock, curly (31)	<i>Rumex crispus</i>
Dogbane, hemp (9)	<i>Apocynum cannabinum</i>
Fescue (31)	<i>Festuca spp.</i>
Fescue, tall (10)	<i>Festuca arundinacea</i>
Guineagrass (11)	<i>Panicum maximum</i>
Hemlock, poison (31)	<i>Conium maculatum</i>
Horsenettle (31)	<i>Solanum carolinense</i>
Horseradish (9)	<i>Armoracia rusticana</i>
Ice Plant (22)	<i>Mesembryanthemum crystallinum</i>
Johnsongrass (12)	<i>Sorghum halepense</i>
Kikuyugrass (21)	<i>Pennisetum clandestinum</i>

Common Name	Scientific Name
Knapweed (9)	<i>Centaurea repens</i>
Lantana (13)	<i>Lantana camara</i>
Lespedeza, common (31)	<i>Lespedeza striata</i>
Lespedeza, sericea (31)	<i>Lespedeza cuneata</i>
Loosestrife, purple (14)	<i>Lythrum salicaria</i>
Lotus, American (15)	<i>Nelumbo lutea</i>
Maidencane (16)	<i>Panicum hematomon</i>
Milkweed (17)	<i>Asclepias</i> spp.
Muhly, wirestem (21)	<i>Muhlenbergia frondosa</i>
Mullein, common (31)	<i>Verbascum thapsus</i>
Napiergrass (31)	<i>Pennisetum purpureum</i>
Nightshade, silverleaf (3)	<i>Solanum elaeagnifolium</i>
Nutsedge, purple (18)	<i>Cyperus rotundus</i>
Nutsedge, yellow (18)	<i>Cyperus esculentus</i>
Orchardgrass (12)	<i>Dactylis glomerata</i>
Pampasgrass (19)	<i>Cortaderia jubata</i>
Paragrass (16)	<i>Bracharia mutica</i>
Phragmites [†] (20)	<i>Phragmites</i> spp.
Quackgrass (21)	<i>Agropyron repens</i>
Reed, giant (22)	<i>Arundo donax</i>
Ryegrass, perennial (12)	<i>Lolium perenne</i>
Smartweed, swamp (31)	<i>Polygonum coccineum</i>
Spatterdock (23)	<i>Nuphar luteum</i>
Starthistle, yellow (31)	<i>Centaurea solstitialis</i>
Sweet potato, wild [†] (24)	<i>Ipomoea pandurata</i>
Thistle, artichoke (25)	<i>Cynara cardunculus</i>
Thistle, Canada (25)	<i>Cirsium arvense</i>
Timothy (12)	<i>Phleum pratense</i>
Torpedgrass [†] (26)	<i>Panicum repens</i>
Tules, common (27)	<i>Scirpus acutus</i>
Vaseygrass (31)	<i>Paspalum urvillei</i>
Velvetgrass (31)	<i>Holcus</i> spp.
Waterhyacinth (28)	<i>Eichornia crassipes</i>
Waterlettuce (29)	<i>Pistia stratiotes</i>
Waterprimrose (30)	<i>Ludwigia</i> spp.
Wheatgrass, western (12)	<i>Agropyron smithii</i>

[†] Partial control.

^{††} Partial control in southeastern states. See "Specific Weed Control Recommendations" below.

Specific Perennial Weed Control Recommendations:

- Alligatorweed:** Apply 6 pints of this product per acre as a broadcast spray or as a 1 1/4 percent solution with hand-held equipment to provide partial control of alligatorweed. Apply when most of the target plants are in bloom. Repeat applications will be required to maintain such control.
- Bermudagrass:** Apply 7 1/2 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Apply when target plants are actively growing and when seedheads appear.
- Bindweed, field / Silverleaf Nightshade / Texas Blueweed:** Apply 6 to 7 1/2 pints of this product per acre as a broadcast spray west of the Mississippi River and 4 1/2 to 6 pints of this product per acre east of the Mississippi River. With hand-held equipment, use a 1 1/2 percent solution. Apply when target plants are actively growing and are at or beyond full bloom. For silverleaf nightshade, best results can be obtained when application is made after berries are formed. Do not treat when weeds are under drought stress. New leaf development indicates active growth. For best results apply in late summer or fall.
- Brackenfern:** Apply 4 1/2 to 6 pints of this product per acre as a broadcast spray or as a 3/4 to 1 percent solution with hand-held equipment. Apply to fully expanded fronds which are at least 18 inches long.
- Cattail:** Apply 4 1/2 to 6 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Apply when target plants are actively growing and are at or beyond the early-to-full bloom stage of growth. Best results are achieved when application is made during the summer or fall months.
- Cogongrass:** Apply 4 1/2 to 7 1/2 pints of this product per acre as a broadcast spray. Apply when cogongrass is at least 18 inches tall and actively growing in late summer or fall. Allow 7 or more days after application before tillage or mowing. Due to uneven stages of growth and the dense nature of vegetation preventing good spray coverage, repeat treatments may be necessary to maintain control.
- Cordgrass:** Apply 4 1/2 to 7 1/2 pints of this product per acre as a broadcast spray or as a 1 to 2 percent solution with hand-held equipment. Schedule applications in order to allow 6 hours before treated plants are covered by tidewater. The presence of debris and silt on the cordgrass plants will reduce performance. It may be necessary to wash targeted plants prior to application to improve uptake of this product into the plant.
- Cutgrass, giant:** Apply 6 pints of this product per acre as a broadcast spray or as a 1 percent solution with hand-held equipment to provide partial control of giant cutgrass. Repeat applications will be required to maintain such control, especially where vegetation is partially submerged in water. Allow for substantial regrowth to the 7 to 10-leaf stage prior to retreatment.
- Dogbane, hemp / Knapweed / Horseradish:** Apply 6 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the late bud-to-flower stage of growth. For best results, apply in late summer or fall.
- Fescue, tall:** Apply 4 1/2 pints of this product per acre as a broadcast spray or as a 1 percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the boot-to-head stage of growth. When applied prior to the boot stage, less desirable control may be obtained.
- Guineagrass:** Apply 4 1/2 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Apply when target plants are actively growing and when most have reached at least the 7-leaf stage of growth.
- Johnsongrass / Bluegrass, Kentucky / Bromegrass, smooth / Canarygrass, reed / Orchardgrass / Ryegrass, perennial / Timothy / Wheatgrass, western:** Apply 3 to 4 1/2 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the boot-to-head stage of growth. When applied prior to the boot stage, less desirable control may be obtained. In the fall, apply before plants have turned brown.
- Lantana:** Apply this product as a 3/4 to 1 percent solution with hand-held equipment. Apply to actively growing lantana at or beyond the bloom stage of growth. Use the higher application rate for plants that have reached the woody stage of growth.
- Loosestrife, purple:** Apply 4 pints of this product per acre as a broadcast spray or as a 1 to 1 1/2 percent solution using hand-held equipment. Treat when plants are actively growing at or beyond the bloom stage of growth. Best results are achieved when application is made during summer or fall months. Fall treatments must be applied before a killing frost.

15. **Lotus, American:** Apply 4 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Treat when plants are actively growing at or beyond the bloom stage of growth. Best results are achieved when application is made during summer or fall months. Fall treatments must be applied before a killing frost. Repeat treatment may be necessary to control regrowth from underground parts and seeds.
16. **Maidencane / Paragrass:** Apply 6 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Repeat treatments will be required, especially to vegetation partially submerged in water. Under these conditions, allow for regrowth to the 7 to 10-leaf stage prior to retreatment.
17. **Milkweed, common:** Apply 4 1/2 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the late bud-to-flower stage of growth.
18. **Nutsedge: purple, yellow:** Apply 4 1/2 pints of this product per acre as a broadcast spray, or as a 3/4 percent solution with hand-held equipment to control existing nutsedge plants and immature nutlets attached to treated plants. Apply when target plants are in flower or when new nutlets can be found at rhizome tips. Nutlets which have not germinated will not be controlled and may germinate following treatment. Repeat treatments will be required for long-term control.
19. **Pampasgrass:** Apply a 1 1/2 percent solution of this product with hand-held equipment when plants are actively growing.
20. **Phragmites:** For partial control of phragmites in Florida and the counties of other states bordering the Gulf of Mexico, apply 7 1/2 pints per acre as a broadcast spray or apply a 1 1/2 percent solution with hand-held equipment. In other areas of the U.S., apply 4 to 6 pints per acre as a broadcast spray or apply a 3/4 percent solution with hand-held equipment for partial control. For best results, treat during late summer or fall months when plants are actively growing and in full bloom. Due to the dense nature of the vegetation, which may prevent good spray coverage and uneven stages of growth, repeat treatments may be necessary to maintain control. Visual control symptoms will be slow to develop.
21. **Quackgrass / Kikuyugrass / Muhly, wirestem:** Apply 3 to 4 1/2 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment when most quackgrass or wirestem muhly is at least 8 inches in height (3 to 4-leaf stage of growth) and actively growing. Allow 3 or more days after application before tillage.
22. **Reed, giant / ice plant:** For control of giant reed and ice plant, apply a 1 1/2 percent solution of this product with hand-held equipment when plants are actively growing. For giant reed, best results are obtained when applications are made in late summer to fall.
23. **Spatterdock:** Apply 6 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Apply when most plants are in full bloom. For best results, apply during the summer or fall months.
24. **Sweet potato, wild:** Apply this product as a 1 1/2 percent solution using hand-held equipment. Apply to actively growing weeds that are at or beyond the bloom stage of growth. Repeat applications will be required. Allow the plant to reach the recommended stage of growth before retreatment.
25. **Thistle, Canada / artichoke:** Apply 3 to 4 1/2 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment for Canada thistle. To control artichoke thistle, apply a 2 percent solution as a spray-to-wet application. Apply when target plants are actively growing and are at or beyond the bud stage of growth.
26. **Torpedograss:** Apply 6 to 7 1/2 pints of this product per acre as a broadcast spray or as a 3/4 to 1 1/2 percent solution with hand-held equipment to provide partial control of torpedograss. Use the lower rates under terrestrial conditions, and the higher rates under partially submerged or a floating mat condition. Repeat treatments will be required to maintain such control.
27. **Tules, common:** Apply this product as a 1 1/2 percent solution with hand-held equipment. Apply to actively growing plants at or beyond the seedhead stage of growth. After application, visual symptoms will be slow to appear and may not occur for 3 or more weeks.
28. **Waterhyacinth:** Apply 5 to 6 pints of this product per acre as a broadcast spray or apply a 3/4 to 1 percent solution with hand-held equipment. Apply when target plants are actively growing and at or beyond the early bloom stage of growth. After application, visual symptoms may require 3 or more weeks to appear with complete necrosis and decomposition usually occurring within 60 to 90 days. Use the higher rates when more rapid visual effects are desired.
29. **Waterlettuce:** For control, apply a 3/4 to 1 percent solution of this product with hand-held equipment to actively growing plants. Use higher rates where infestations are heavy. Best results are obtained from mid-summer through winter applications. Spring applications may require retreatment.
30. **Waterprimrose:** Apply this product as a 3/4 percent solution using hand-held equipment. Apply to plants that are actively growing at or beyond the bloom stage of growth, but before fall color changes occur. Thorough coverage is necessary for best control.
31. **Other perennial weeds listed above:** Apply 4 1/2 to 7 1/2 pints of this product per acre as a broadcast spray or apply as a 3/4 to 1 1/2 percent solution with hand-held equipment.

Woody Brush and Trees

NOTE: If brush has been mowed or tilled or trees have been cut, do not treat until regrowth has reached the recommended stage of growth.

Application Rates and Timing

When applied as a 5 to 8 percent solution as a directed application as described in the "Hand-Held and High-Volume Equipment" section, this product will control or partially control all wood brush and tree species listed in this section of this label. Use the higher rate of application for dense stands and larger woody brush and trees.

Specific Brush or Tree Control Recommendations: Numbers in parentheses "(-)" following the common name of a listed brush or tree species refer to "Specific Brush or Tree Control Recommendations" which follow the species listing. See this section for specific application rates and timing for listed species.

For woody brush and trees, apply the recommended rate plus a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient. Use of this product without surfactant will result in reduced herbicide performance. Refer to the "Mixing and Application Instructions" section of this label and the surfactant manufacturer label for more information. Make applications when plants are actively growing and, unless otherwise directed, after full-leaf expansion. Use the higher rate for larger plants and/or dense areas of growth. On vines, use the higher rate for plants that have reached the woody stage of growth. Best results are obtained when application is made in late summer or fall after fruit formation.

In arid areas, best results are obtained when application is made in the spring or early summer when brush species are at high moisture content and are flowering. Ensure thorough coverage when using hand-held equipment. Symptoms may not appear prior to frost or senescence with fall treatments.

Allow 7 or more days after application before tillage, mowing or removal. Repeat treatments may be necessary to control plants regenerating from underground parts or seed. Some autumn colors on undesirable deciduous species are acceptable provided no major leaf drop has occurred. Reduced performance may result if fall treatments are made following a frost.

See the "Directions for Use" and "Mixing and Application Instructions" sections in this label for labeled use and specific application instructions. **When applied as directed, this product plus a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient will control the following woody brush plants and trees:** (Numbers in parentheses "()" following common name of a listed brush or tree species refer to "Specific Brush or Tree Control Recommendations" for that species which follow the species listing.)

Common Name	Scientific Name
Alder (1)	<i>Alnus</i> spp.
Ash ¹ (20)	<i>Fraxinus</i> spp.
Aspen, quaking (2)	<i>Populus tremuloides</i>
Bearclover, Bearmat (20)	<i>Chamaebatia foliolosa</i>
Birch (3)	<i>Betula</i> spp.
Blackberry (1)	<i>Rubus</i> spp.
Broom, French (4)	<i>Cytisus monspessulanus</i>
Broom, Scotch (4)	<i>Cytisus scoparius</i>
Buckwheat, California ¹ (5)	<i>Eriogonum fasciculatum</i>
Cascara ¹ (20)	<i>Rhamnus purshiana</i>
Catsclaw ¹ (6)	<i>Acacia greggii</i>
Ceanothus (20)	<i>Ceanothus</i> spp.
Chamise (17)	<i>Adenostoma fasciculatum</i>
Cherry, bitter (7)	<i>Prunus emarginata</i>
Cherry, black (7)	<i>Prunus serotina</i>
Cherry, pin (7)	<i>Prunus pensylvanica</i>
Coyote brush (8)	<i>Baccharis consanguinea</i>
Creeper, Virginia ¹ (20)	<i>Parthenocissus quinquefolia</i>
Dewberry (1)	<i>Rubus trivialis</i>
Dogwood (9)	<i>Comus</i> spp.
Elderberry (3)	<i>Sambucus</i> spp.
Elm ¹ (20)	<i>Ulmus</i> spp.
Eucalyptus, bluegum (10)	<i>Eucalyptus globulus</i>
Hasardia ¹ (5)	<i>Haplopappus squamosus</i>
Hawthorn (2)	<i>Crataegus</i> spp.
Hazel (3)	<i>Corylus</i> spp.
Hickory (9)	<i>Carya</i> spp.
Holly, Florida (11) (Brazilian peppertree)	<i>Schinus terebinthifolius</i>
Honeysuckle (1)	<i>Lonicera</i> spp.
Hornbeam, American (20)	<i>Carpinus caroliniana</i>
Kudzu (12)	<i>Pueraria lobata</i>
Locust, black ¹ (20)	<i>Robinia pseudoacacia</i>
Manzanita (20)	<i>Arctostaphylos</i> spp.
Maple, red ¹ (13)	<i>Acer rubrum</i>
Maple, sugar (14)	<i>Acer saccharum</i>
Maple, vine ¹ (20)	<i>Acer circinatum</i>
Monkey flower ¹ (5)	<i>Mimulus guttatus</i>
Oak, black ¹ (20)	<i>Quercus velutina</i>
Oak, northern pin (14)	<i>Quercus palustris</i>
Oak, post (1)	<i>Quercus stellata</i>

Common Name	Scientific Name
Oak, red (14)	<i>Quercus rubra</i>
Oak, southern red (7)	<i>Quercus falcata</i>
Oak, white ¹ (20)	<i>Quercus alba</i>
Persimmon ¹ (20)	<i>Diospyros</i> spp.
Poison-ivy (15)	<i>Rhus radicans</i>
Poison-oak (15)	<i>Rhus toxicodendron</i>
Poplar, yellow ¹ (20)	<i>Liriodendron tulipifera</i>
Prunus (7)	<i>Prunus</i> spp.
Raspberry (1)	<i>Rubus</i> spp.
Redbud, eastern (20)	<i>Cercis canadensis</i>
Rose, multiflora (16)	<i>Rosa multiflora</i>
Russian-olive (20)	<i>Elaeagnus angustifolia</i>
Sage: black (17), white	<i>Salvia</i> spp.
Sagebrush, California (17)	<i>Artemisia californica</i>
Salmonberry (3)	<i>Rubus spectabilis</i>
Salt cedar ¹ (9)	<i>Tamarix</i> spp.
Saltbush, sea myrtle (18)	<i>Baccharis halimifolia</i>
Sassafras (20)	<i>Sassafras albidum</i>
Sourwood ¹ (20)	<i>Oxydendrum arboreum</i>
Sumac, poison ¹ (20)	<i>Rhus vernix</i>
Sumac, smooth ¹ (20)	<i>Rhus glabra</i>
Sumac, winged ¹ (20)	<i>Rhus copallina</i>
Sweetgum (7)	<i>Liquidambar styraciflua</i>
Swordfern ¹ (20)	<i>Polystichum munitum</i>
Tallowtree, Chinese (17)	<i>Sapium sebiferum</i>
Thimbleberry (3)	<i>Rubus parviflorus</i>
Tobacco, tree ¹ (5)	<i>Nicotiana glauca</i>
Trumpetcreeper (2)	<i>Campsis radicans</i>
Waxmyrtle, southern ¹ (11)	<i>Myrica cerifera</i>
Willow (19)	<i>Salix</i> spp.

¹Partial control (See below for control or partial control instructions.)

Specific Brush or Tree Control Recommendations:

- Alder / Blackberry / Dewberry / Honeysuckle / Oak, Post / Raspberry:** For control, apply 4 1/2 to 6 pints per acre as a broadcast spray or as a 3/4 to 1 1/4 percent solution with hand-held equipment.
- Aspen, Quaking / Hawthorn / Trumpetcreeper:** For control, apply 3 to 4 1/4 pints of this product per acre as a broadcast spray or as a 3/4 to 1 1/4 percent solution with hand-held equipment.
- Birch / Elderberry / Hazel / Salmonberry / Thimbleberry:** For control, apply 3 pints per acre of this product as a broadcast spray or as a 3/4 percent solution with hand-held equipment.
- Broom, French / Broom, Scotch:** For control, apply a 1 1/4 to 1 1/2 percent solution with hand-held equipment.
- Buckwheat, California / Hasardia / Monkey flower / Tobacco, tree:** For partial control of these species, apply a 3/4 to 1 1/2 percent solution of this product as a foliar spray with hand-held equipment. Thorough coverage of foliage is necessary for best results.
- Catsclaw:** For partial control, apply a 1 1/4 to 1 1/2 percent solution with hand-held equipment when at least 50 percent of the new leaves are fully developed.
- Cherry, bitter / Cherry, black / Cherry, pin / Oak, southern red / Sweetgum / Prunus:** For control, apply 3 to 7 1/2 pints of this product per acre as a broadcast spray or as a 1 to 1 1/2 percent solution with hand-held equipment.
- Coyote brush:** For control, apply a 1 1/4 to 1 1/2 percent solution with hand-held equipment when at least 50 percent of the new leaves are fully developed.

9. **Dogwood / Hickory / Salt cedar:** For partial control, apply a 1 to 2 percent solution of this product with hand-held equipment or 6 to 7 1/2 pints per acre as a broadcast spray.
10. **Eucalyptus, bluegum:** For control of eucalyptus resprouts, apply a 1 1/2 percent solution of this product with hand-held equipment when resprouts are 6 to 12-feet tall. Ensure complete coverage. Apply when plants are actively growing. Avoid application to drought-stressed plants.
11. **Holly, Florida / Waxmyrtle, southern:** For partial control, apply this product as a 1 1/2 percent solution with hand-held equipment.
12. **Kudzu:** For control, apply 6 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Repeat applications will be required to maintain control.
13. **Maple, red:** For control, apply as a 3/4 to 1 1/4 percent solution with hand-held equipment when leaves are fully developed. For partial control, apply 2 to 7 1/2 pints of this product per acre as a broadcast spray.
14. **Maple, sugar / Oak: northern pin / Oak, red:** For control, apply as a 3/4 to 1 1/4 percent solution with hand-held equipment when at least 50 percent of the new leaves are fully developed.
15. **Poison-ivy / Poison-oak:** For control, apply 6 to 7 1/2 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Repeat applications may be required to maintain control. Fall treatments must be applied before leaves lose green color.
16. **Rose, multiflora:** For control, apply 3 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Treatments should be made prior to leaf deterioration by leaf-feeding insects.
17. **Sage, black / Sagebrush, California / Chamise / Tallowtree, Chinese:** For control of these species, apply a 3/4 percent solution of this product as a foliar spray with hand-held equipment. Thorough coverage of foliage is necessary for best results.
18. **Saltbush, sea myrtle:** For control, apply this product as a 1 percent solution with hand-held equipment.
19. **Willow:** For control, apply 4 1/2 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment.
20. **Other woody brush and trees listed above:** For partial control, apply 3 to 7 1/2 pints of this product per acre as a broadcast spray or as a 3/4 to 1 1/2 percent solution with hand-held equipment.

Aquatic and other Noncrop Sites

Apply this product as directed and under conditions described to control or partially control weeds and woody plants listed in the "Weeds Controlled" section in Industrial, recreational and public areas or other similar aquatic or terrestrial sites on this label.

Noncrop Sites

This product may be used to control the listed weeds in and around aquatic sites and on noncrop sites such as :

Airports
 Golf Courses
 Habitat Restoration & Management Areas
 Highways & Roadsides
 Industrial Plant Sites
 Lumberyards
 Parking Areas
 Parks
 Petroleum Tank Farms

Pipeline, Power, Telephone & Utility Rights-of-Way
 Pumping Installations
 Railroads
 Schools
 Storage Areas
 Similar Sites

Aquatic Sites

This product may be applied to emerged weeds in all bodies of fresh and brackish water which may be flowing, nonflowing or transient. This includes lakes, rivers, streams, ponds, estuaries, rice levees, seeps, irrigation and drainage ditches, canals, reservoirs, wastewater treatment facilities, wildlife habitat restoration and management areas and similar sites.

If aquatic sites are present in the noncrop area and are part of the intended treatment, read and observe the following directions:

- **This product does not control plants which are completely submerged or have a majority of their foliage under water.**
- There is no restriction on the use of treated water for irrigation, recreation or domestic purposes.
- Consult local state fish and game agency and water control authorities before applying this product to public water. Permits may be required to treat such water.
- **NOTE:** Do not apply this product directly to water within 1/2 mile upstream of an active potable water intake in flowing water (i.e., river, stream, etc.) or within 1/2 mile of an active potable water intake in a standing body of water such as lake, pond or reservoir. To make aquatic applications around and within 1/2 mile of active potable water intakes, the water intake must be turned off for a minimum period of 48 hours after the application. The water intake may be turned on prior to 48 hours if the glyphosate level in the intake water is below 0.7 parts per million as determined by laboratory analysis. These aquatic applications may be made **only** in those cases where there are alternative water sources or holding ponds which would permit the turning off of an active potable water intake for a minimum period of 48 hours after the applications. This restriction does not apply to intermittent inadvertent overspray of water in terrestrial use sites.
- For treatments after drawdown of water or in dry ditches, allow 7 or more days after treatment before reintroduction of water to achieve maximum weed control. Apply this product within 1 day after drawdown to ensure application to actively growing weeds.
- Floating mats of vegetation may require retreatment. Avoid wash-off of sprayed foliage by spray boat or recreational boat backwash or by rainfall within 6 hours of application. Do not re-treat within 24 hours following the initial treatment.
- Applications made to moving bodies of water must be made while traveling upstream to prevent concentration of this herbicide in water. When making any bankside applications, do not overlap more than 1 foot into open water. Do not spray in bodies of water where weeds do not exist. The maximum application rate of 7 1/2 pints per acre must not be exceeded in any single broadcast application that is being made over water.

- When emerged infestations require treatment of the total surface area of impounded water, treating the area in strips may avoid oxygen depletion due to decaying vegetation. Oxygen depletion may result in fish kill.

Forestry Sites and Utility Rights-of-Way

In forest and utility sites, this product is recommended for the control or partial control of woody brush, trees, and annual and perennial herbaceous weeds. This product is also recommended for use in preparing or establishing wildlife openings within these sites, in pine straw plantations for maintaining logging roads, and for side trimming along utility rights-of-way.

In forestry sites, this product is recommended for use in site preparation prior to planting any tree species, including Christmas trees and silvicultural nursery sites.

In utility sites, this product is recommended for use along electrical power, pipeline, and telephone rights-of-way, and in other utility sites associated with these rights-of-way, such as substations.

Application Rates [†]:

Method of Application	Application Rate	Spray Volume (gal/acre)
Broadcast		
Aerial	1.5 to 7.5 qt/acre	5 to 30
Ground	1.5 to 7.5 qt/acre	10 to 60
Spray-to-Wet		
Handgun, Backpack Mistblower	0.75 to 2% by volume	spray-to-wet
Low Volume Directed Spray ^{††}		
Handgun, Backpack Mistblower	5% to 10% by volume	partial coverage

[†]Where repeat applications are necessary, do not exceed 8.0 quarts per acre per year.

^{††}For low volume directed spray applications, coverage should be uniform with at least 50 percent of the foliage contacted. For best results, coverage of the top one-half of the plant is important.

In forestry site preparation and utility rights-of-way applications, this product requires use with a surfactant such as a non-ionic surfactant containing greater than 80 percent active ingredient. Use of this product without surfactant will result in reduced herbicide performance. Refer to the "Mixing and Application Instructions" section of this label and the surfactant manufacturer label for more information.

Use higher rates of this product within the recommended rate ranges for control or partial control of woody brush, trees and hard-to-control perennial herbaceous weeds. For best results, apply to actively growing woody brush and trees after full leaf expansion and before fall color and leaf drop. Use increased rates within the recommended rate range to control of perennial herbaceous weeds from emergence up to the appearance of seedheads, flowers or berries appear. Use lower rates within the recommended rate range to control annual herbaceous weeds and actively growing perennial herbaceous weeds after seedheads, flowers or berries appear. Apply to foliage of actively growing annual herbaceous weeds anytime after emergence.

Tank Mixtures

This product may be used in tank mix combination with other herbicide products to broaden the spectrum of vegetation controlled. When tank mixing, read and observe applicable use directions, precautions and limitations on the respective product labels. Use according to the most restrictive precautionary statements for each product on the mixture. Any recommended rate of this product may be used in a tank mix.

Note: For forestry site preparation, make sure the tank mix product is approved for use prior to planting the desired species. Observe planting interval restrictions. For side trimming treatments in utility rights-of-way, tank mixtures with Arsenal 2WSL herbicide are not recommended. For side trimming treatments, it is recommended that this product be used alone as recommended, or as a tank mix with Garlon.

Product	Broadcast Rate	Use Sites
Arsenal Applicators Concentrate	2 to 16 fl oz/acre	Forestry site preparation
Oust	1 to 4 oz/acre	Forestry site preparation, utility sites
Garlon 3A [†]	1 to 4 qt/acre	Forestry site preparation, utility sites
Garlon 4	1 to 4 qt/acre	Forestry site preparation, utility sites
Arsenal 2WSL	2 to 32 fl oz/acre	Utility sites
	Spray-to-Wet Rates	
Arsenal Applicators Concentrate	1/32% to 1/2% by volume	Forestry site preparation
Arsenal 2WSL	1/32% to 1/2% by volume	Utility sites
	Low Volume Directed Spray Rates	
Arsenal Applicators Concentrate	1/8% to 1/2% by volume	Forestry site preparation
Arsenal 2WSL	1/8% to 1/2% by volume	Utility sites

[†]Ensure that Garlon 3A is thoroughly mixed with water before adding this product. Agitation is required while mixing this product with Garlon 3A to avoid compatibility problems.

For control of herbaceous weeds, use the lower recommended tank mixture rates. For control of dense stands or difficult-to-control woody brush and trees, use the higher recommended rates.

Forestry Conifer and Hardwood Release

Directed Sprays and Selective Equipment

This product may be applied as a directed spray or by using selective equipment in forestry conifer and hardwood sites, including Christmas tree plantations and silvicultural nurseries. This product requires use with a surfactant. Use only surfactants that are approved for conifer release and specified on the surfactant label as safe for use in conifer release (pine release). Use of this product without surfactant will result in reduced herbicide performance. Refer to the "Mixing and Application Instructions" section of this label and the surfactant manufacturer label for more information.

Tank Mixing: In hardwood plantations, tank mixtures with Oust may be used. In pine plantations, tank mixtures with Garlon 4 or Arsenal AC may be used. Comply with all site restrictions, forestry species limitations, and precautions on the tank mix product labels.

Avoid contact of spray drift, mist or drips with foliage, green bark or non-woody surface roots of desirable plant species. See "Application Equipment and Techniques" section of this label for specific recommendations and precautions.

Spray-to-Wet Applications: Use a 2 percent spray solution to control undesirable woody brush and trees. To control herbaceous weeds, use a 1 to 2 percent spray solution.

Low Volume Directed Spray Applications: Use a 5 to 10 percent spray solution. Coverage should be uniform with at least 50 percent of the foliage contacted. Coverage of the top one-half of the unwanted vegetation is important.

Broadcast Applications: For equipment calibrated for broadcast applications, use 1 1/2 to 7 1/2 quarts of this product per acre. Apply in 10 to 60 gallons of clean water per acre. Shielded application equipment may be used to avoid contact of the spray solution with desirable plants. Shields should be adjusted to prevent spray contact with the foliage of green bark of desirable vegetation.

Wiper Application Equipment: See the "Selective Equipment" section of this label for equipment and application rate recommendations.

Broadcast Application

Note: Except where specifically recommended below, make broadcast applications of this product only where conifers have been established for more than one year.

Broadcast application must be made after formation of final conifer resting buds in the fall or prior to initial bud swelling in the spring.

Injury may occur to conifers treated for release, especially where spray patterns overlap or the higher rates are applied. Damage can be accentuated if applications are made when conifers are actively growing, or are under stress from drought, flood water, improper planting, insects, animal damage or diseases.

This product requires use with a surfactant. Use a surfactant that is labeled/recommended for use in over-the-top release applications. Use of this product without a surfactant will result in reduced herbicide performance. Refer to the "Mixing and Application Instructions" section of this label and the surfactant manufacturer label for more information.

For release of the following conifer species outside the Southeastern United States:

Douglas fir (*Pseudotsuga menziesii*)

Fir (*Abies* species)

Hemlock[†] (*Tsuga* species)

Pines[†] (*Pinus* species)

Redwood, California^{††} (*Sequoia* species)

[†] Includes all species except loblolly pine, longleaf pine, shortleaf pine or slash pine.

^{††} Use of a surfactant is not recommended for release of hemlock species or California redwood. In mixed conifer stands, injury to these species may result if a surfactant is used.

Application Rate for Conifer Release: Apply 3/4 to 1 1/2 quarts per acre as a broadcast spray. In Maine and New Hampshire, up to 2 1/4 quarts per acre of this product may be used for the control and suppression of difficult-to-control hardwood species.

To release Douglas fir, and pine and spruce species at the end of the first growing season (except in California), apply 3/4 to 1 1/8 quarts per acre of this product. Make sure that all conifers are well hardened off.

Note: For release of Douglas fir with this product or recommended tank mixtures, a nonionic surfactant recommended for over-the-top foliar spray may be used. To avoid possible conifer injury, nonionic surfactants may be used at 2 fluid ounces per acre at elevations above 1500 feet, or 1 fluid ounce per acre in the coastal range or at elevations below 1500 feet. Use of surfactant rates exceeding those listed above may result in unacceptable conifer injury and are not recommended. Make sure that the nonionic surfactant has been adequately tested for safety to Douglas fir before use.

Tank Mixtures with Oust: To release jack pine, white pine and white spruce, apply 3/4 to 1 1/2 quarts of this product with 1 to 3 ounces (1 to 1 1/2 ounces for white pine) of Oust per acre. Make applications to actively growing weeds as a broadcast spray over the top of established conifers. Applications at these rates should be made after formation of conifer resting buds in the late summer or fall.

Tank Mixtures with Arsenal Applicators Concentrate: This product may be tank mixed with Arsenal Applicators Concentrate for release of Douglas fir. Tank mix 3/4 to 1 1/8 quarts of this product with 2 to 6 fluid ounces of Arsenal Applicators Concentrate per acre. For release of balsam fir and red spruce, apply a mixture of 1 1/2 quarts of this product with 1 to 2 1/2 fluid ounces of Arsenal Applicators Concentrate per acre.

In Maine and New Hampshire for the release of red pine, balsam fir, red spruce, white spruce, Norway spruce, and black spruce with dense tough-to-control brush and where maples make up a large component of the undesirable trees, up to 2 1/4 quarts per acre of this product may be tank mixed with 1 to 2 1/2 fluid ounces per acre of Arsenal Applicators Concentrate herbicide and applied as a broadcast spray.

Tank mixtures with Arsenal Applicators Concentrate and Oust or Oust XP Herbicides: In Maine and New Hampshire for release of red pine, balsam fir, red spruce, white spruce, Norway spruce and black spruce with heavy grass and herbaceous weed densities, tough-to-control brush and where maples make up a large component of the undesirable trees up to 2 1/4 quarts per acre of this product may be tank mixed with 1 to 2.5 fluid ounces per acre of Arsenal Applicators Concentrate and 1 to 3 oz of Oust or Oust XP herbicides and applied as a broadcast spray.

For release of the following conifer species in the Southeastern United States:

Loblolly pine (*Pinus taeda*)

Eastern white pine (*Pinus strobus*)

Shortleaf pine (*Pinus echinata*)

Slash pine (*Pinus elliottii*)

Virginia pine (*Pinus virginiana*)

Longleaf pine (*Pinus palustris*)

Apply 1 1/8 to 1 7/8 quarts of this product per acre as a broadcast spray during late summer or early fall after the conifers have hardened off. For applications at the end of the first growing season, use 3/4 quart of this product alone or in a recommended tank mixture.

Tank Mixtures with Arsenal Applicators Concentrate: For conifer release, apply 3/4 to 1 1/2 quarts of this product with 2 to 16 fluid ounces of Arsenal Applicators Concentrate per acre as a broadcast spray. Use only on conifer species that are labeled for over-the-top spray for both products. Use the higher recommended rates for dense tough-to-control wood brush and trees.

Read and observe label claims, cautionary statements and all information on the labels of each product used in these tank mixtures. Use according to the most restrictive precautionary statements for each product in the mixture.

Herbaceous Release

When applied as directed, this product plus listed residual herbicides provides postemergence control of the annual weeds and control or suppression of the perennial weeds listed in this label, and residual control of the weeds listed in the residual herbicide label. Make applications to actively growing weeds as a broadcast spray over the top of labeled conifers.

Tank Mixtures with Oust: To release loblolly pines, tank mix 12 to 18 fluid ounces of this product with 2 to 4 ounces of Oust per acre.

To release slash pines, tank mix 9 to 12 fluid ounces of this product with 2 to 4 ounces of Oust per acre.

In Maine and New Hampshire for release of red pine, balsam fir, red spruce, white spruce, Norway spruce, and black spruce with heavy grass and herbaceous weeds infesting the site, up to 2 1/4 quarts per acre of this product may be tank mixed with 1 to 3 oz of Oust herbicide or Oust XP herbicide to control grass, herbaceous weeds and woody brush, and applied as a broadcast spray.

For tank mixtures with Oust use a surfactant that is labeled/ recommended for use in over-the-top herbaceous release applications. Use of this product without a surfactant will result in reduced herbicide performance. Refer to the "Mixing and Application Instructions" section of this label and the surfactant manufacturer label for more information.

Weed control may be reduced if water volumes exceed 25 gallons per acre for these treatments.

Tank Mixture with Atrazine: To release Douglas fir, apply 3/4 quart of this product with 4 pounds a.i. of atrazine per acre. Apply only over Douglas fir that has been established for at least one full growing season. Apply in the early spring, usually mid-March through early April. Injury will occur if applications are made after bud swell in the spring. For this use, do not add surfactant to the tank mixture.

Always read and follow the manufacturer's label for all herbicides and surfactants used.

Wetland Sites

This product may be used in and around water (aquatic areas) and wetlands found in forestry and in power, telephone and pipeline rights-of-way sites, including where these sites are adjacent to or surrounding domestic water supply reservoirs, supply streams, lakes and ponds. Read and observe the following before making applications in and around water.

Consult local public water control authorities before applying this product in and around public water. Permits may be required to treat in such areas.

There is no restriction on the use of treated water for irrigation, recreation or domestic purposes.

Note: Do not apply this product directly to water within 1/2 mile up-stream of an active potable water intake in flowing water (i.e., river, stream, etc.) or within 1/2 mile of an active potable water intake in a standing body of water such as a lake, pond or reservoir. To make aquatic applications around and within 1/2 mile of active potable water intakes, the water intake must be turned off for a minimum period of 48 hours after application. These aquatic applications may be made ONLY in those cases where there are alternative water sources or holding ponds which would permit the turning off of an active potable water intake for a minimum period of 48 hours after the application. This restriction does not apply to intermittent inadvertent overspray of water in terrestrial use sites.

Do not spray open bodies of water where woody brush, trees and herbaceous weeds do not exist. The maximum application rate of 3 3/4 quarts per acre must not be exceeded in a single over-water broadcast application except as follows, where any recommended rate may be applied:

- Stream crossings in utility right-of-way.
- Where applications will result in less than 20 percent of the total water area being treated.

Wildlife Habitat Restoration and Management Areas

This product is recommended for the restoration and/or maintenance of native habitat and in wildlife management areas.

Habitat Restoration and Maintenance: When applied as directed, exotic and other undesirable vegetation may be controlled in habitat management areas. Applications may be made to allow recovery of native plant species, to open up water to attract waterfowl, and for similar broad-spectrum vegetation control requirements in habitat management areas. Spot treatments may be made to selectively remove unwanted plants for habitat enhancement. For spot treatments, care should be exercised to keep spray off of desirable plants.

Wildlife Food Plots: This product may be used as a site preparation treatment prior to planting wildlife food plots. Apply as directed to control vegetation in the plot area. Any wildlife food species may be planted after applying this product, or native species may be allowed to reinfest the area. If tillage is needed to prepare a seedbed, wait 7 days after applying this product before tilling to allow for maximum effectiveness.

Wiper Applications

For wick or wiper applications, mix 1 gallon of this product with 2 gallons of clean water to make a 33 percent solution. Addition of a nonionic surfactant at a rate of 10 percent by volume of total herbicide solution is recommended.

Wiper applications can be used to control or suppress annual and perennial weeds listed on this label. In heavy weed stands, a double application in opposite directions may improve results. See the "Weed Controlled" section in this label for recommended timing, growth stage and other instructions for achieving optimum results.

Cut Stump Application

Woody vegetation may be controlled by treating freshly cut stumps of trees and resprouts with this product. Apply this product using suitable equipment to ensure coverage of the entire cambium. Cut vegetation close to the soil surface. **Apply a 50 to 100 percent solution of this product to freshly cut surface immediately after cutting.** Delay in applying this product may result in reduced performance. For best results, trees should be cut during periods of active growth and full leaf expansion.

When used according to directions for cut stump application, this product will **control, partially control or suppress** most woody brush and tree species, some of which are listed below:

Common Name	Scientific Name
Alder	<i>Alnus spp.</i>
Coyote brush [†]	<i>Baccharis consanguinea</i>
Dogwood [†]	<i>Cornus spp.</i>
Eucalyptus	<i>Eucalyptus spp.</i>
Hickory [†]	<i>Carya spp.</i>
Madrone	<i>Arbutus menziesii</i>
Maple [†]	<i>Acer spp.</i>
Oak	<i>Quercus spp.</i>
Poplar [†]	<i>Populus spp.</i>
Reed, giant	<i>Arundo donax</i>
Salt cedar	<i>Tamarix spp.</i>
Sweet gum [†]	<i>Liquidambar styraciflua</i>
Sycamore [†]	<i>Platanus occidentalis</i>
Tan oak	<i>Lithocarpus densiflorus</i>
Willow	<i>Salix spp.</i>

[†] This product is not approved for this use on these species in the state of California.

Injection and Frill Applications

Woody vegetation may be controlled by injection or frill application of this product. Apply this product using suitable equipment which must penetrate into living tissue. Apply the equivalent of 1 ml of this product per 2 to 3 inches of trunk diameter. This is best achieved by applying 25 to 100 percent concentration of this product either to a continuous frill around the tree or as cuts evenly spaced around the tree below all branches. As tree diameter increases in size, better results are achieved by applying dilute material to a continuous frill or more closely spaced cuttings. Avoid application techniques that allow runoff to occur from frill or cut areas in species that exude sap freely after frills or cutting. In species such as these, make frill or cut at an oblique angle so as to produce a cupping effect and use undiluted material. For best results, applications should be made during periods of active growth and full leaf expansion.

This treatment will control the following woody species:

Common Name	Scientific Name
Oak	<i>Quercus spp.</i>
Poplar	<i>Populus spp.</i>
Sweet gum	<i>Liquidambar styraciflua</i>
Sycamore	<i>Platanus occidentalis</i>

This treatment will suppress the following woody species:

Common Name	Scientific Name
Black gum [†]	<i>Nyssa sylvatica</i>
Dogwood	<i>Cornus spp.</i>
Hickory	<i>Carya spp.</i>
Maple, red	<i>Acer rubrum</i>

[†] This product is not approved for this use on this species in the state of California.

Release of Bermudagrass or Bahiagrass on Noncrop Sites

Release Of Dormant Bermudagrass And Bahiagrass

When applied as directed, this product will provide control or suppression of many winter annual weeds and tall fescue for effective release of dormant bermudagrass or bahiagrass. Make applications to dormant bermudagrass or bahiagrass.

For best results on winter annuals, treat when weeds are in an early growth stage (below 6 inches in height) after most have germinated. For best results on tall fescue, treat when fescue is in or beyond the 4 to 6-leaf stage.

Weeds Controlled

Rate recommendations for control or suppression of winter annuals and tall fescue are listed below.

Apply the recommended rates of this product in 10 to 25 gallons of water per acre plus a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient. Use of this product without surfactant will result in reduced herbicide performance. Refer to the "Mixing and Application Instructions" section of this label and the surfactant manufacturer label for more information.

Weeds Controlled or Suppressed[†]

Note: C = Controlled; S = Suppressed

Weed Species	Rate (Fluid Ounces Per Acre)					
	6	9	12	18	24	48
Barley, little <i>Hordeum pusillum</i>	S	C	C	C	C	C
Bedstraw, catchweed <i>Galium aparine</i>	S	C	C	C	C	C
Bluegrass, annual <i>Poa annua</i>	S	C	C	C	C	C
Chervil <i>Chaerophyllum tainturieri</i>	S	C	C	C	C	C
Chickweed, common <i>Stellaria media</i>	S	C	C	C	C	
Clover, crimson <i>Trifolium incarnatum</i>	*	S	S	C	C	C
Clover, large hop <i>Trifolium campestre</i>	*	S	S	C	C	C
Speedwell, corn <i>Veronica arvensis</i>	S	C	C	C	C	C
Fescue, tall <i>Festuca arundinacea</i>	*	*	*	*	S	S
Geranium, Carolina <i>Geranium carolinianum</i>	*	*	S	S	C	C
Henbit <i>Lamium amplexicaule</i>	*	S	C	C	C	C
Ryegrass, Italian <i>Lolium multiflorum</i>	*	*	S	C	C	C
Vetch, common <i>Vicia sativa</i>	*	*	S	C	C	C

[†]These rates apply only to sites where an established competitive turf is present.

Release Of Actively Growing Bermudagrass

NOTE: Use only on sites where bahiagrass or bermudagrass are desired for ground cover and some temporary injury or yellowing of the grasses can be tolerated.

When applied as directed, this product will aid in the release of bermudagrass by providing control of annual species listed in the "Weeds Controlled" section in this label, and suppression or partial control of certain perennial weeds.

For control or suppression of those annual species listed in this label, use 3/4 to 2 1/4 pints of this product as a broadcast spray in 10 to 25 gallons of spray solution per acre, plus a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient. Use of this product without surfactant will result in reduced herbicide performance. Refer to the "Mixing and Application Instructions" section of this label and the surfactant manufacturer label for more information. Use the lower rate when treating annual weeds below 6 inches in height (or length of runner in annual vines). Use the higher rate as size of plants increases or as they approach flower or seedhead formation.

Use the higher rate for partial control or longer-term suppression of the following perennial species. Use lower rates for shorter-term suppression of growth.

Bahiagrass	Johnsongrass [†]
Dallisgrass	Trumpetcreeper ^{**}
Fescue (tall)	Vaseygrass

[†] Johnsongrass is controlled at the higher rate.

^{**} Suppression at the higher rate only.

Use only on well-established bermudagrass. Bermudagrass injury may result from the treatment but regrowth will occur under moist conditions. Repeat applications in the same season are not recommended, since severe injury may result.

Bahiagrass Seedhead and Vegetative Suppression

When applied as directed in the "Noncrop Sites" section in this label, this product will provide significant inhibition of seedhead emergence and will suppress vegetative growth for a period of approximately 45 days with single applications and approximately 120 days with sequential applications.

Apply this product 1 to 2 weeks after full green-up of bahiagrass or after the bahiagrass has been mowed to a uniform height of 3 to 4 inches. Applications must be made prior to seedhead emergence. Apply 5 fluid ounces per acre of this product in 10 to 25 gallons of water per acre, plus a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient. Use of this product without surfactant will result in reduced herbicide performance. Refer to the "Mixing and Application Instructions" section of this label and the surfactant manufacturer label for more information.

Sequential applications of this product plus nonionic surfactant may be made at approximately 45-day intervals to extend the period of seedhead and vegetative growth suppression. For continued vegetative growth suppression, sequential applications must be made prior to seedhead emergence.

Apply no more than 2 sequential applications per year. As a first sequential application, apply 3 fluid ounces of this product per acre plus nonionic surfactant. A second sequential application of 2 to 3 fluid ounces per acre plus nonionic surfactant may be made approximately 45 days after the last application.

Annual Grass Growth Suppression

For growth suppression of some annual grasses, such as annual ryegrass, wild barley and wild oats growing in coarse turf on roadsides or other industrial areas, apply 3 to 4 ounces of this product in 10 to 40 gallons of water per acre plus a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient. Use of this product without surfactant will result in reduced herbicide performance. Refer to the "Mixing and Application Instructions" section of this label and the surfactant manufacturer label for more information. Applications should be made when annual grasses are actively growing and before the seedheads are in the boot stage of development. Treatments made after seedhead emergence may cause injury to the desired grasses.

Terms and Conditions of Use

If terms of the following Warranty Disclaimer, Inherent Risks of Use, and Limitation of Remedies are not acceptable, return unopened package at once to the seller for a full refund of purchase price paid. Otherwise, use by the buyer or any other user constitutes acceptance of the terms under Warranty Disclaimer, Inherent Risks of Use and Limitations of Remedies.

Warranty Disclaimer

Dow AgroSciences warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes stated on the label when used in strict accordance with the directions, subject to the inherent risks set forth below. Dow AgroSciences MAKES NO OTHER EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER EXPRESS OR IMPLIED WARRANTY.

Inherent Risks of Use

It is impossible to eliminate all risks associated with use of this product. Crop injury, lack of performance, or other unintended consequences may result because of such factors as use of the product contrary to label instructions (including conditions noted on the label, such as unfavorable temperatures, soil conditions, etc.), abnormal conditions (such as excessive rainfall, drought, tomatoes, hurricanes), presence of other materials, the manner of application, or other factors, all of which are beyond the control of Dow AgroSciences or the seller. To the fullest extent permitted by law, all such risks shall be assumed by buyer.

Limitation of Remedies

The exclusive remedy for losses or damages resulting from this product (including claims based on contract, negligence, strict liability, or other legal theories), shall be limited to, at Dow AgroSciences' election, one of the following:

- (1) Refund of purchase price paid by buyer or user for product bought, or
- (2) Replacement of amount of product used.

Dow AgroSciences shall not be liable for losses or damages resulting from handling or use of this product unless Dow AgroSciences is promptly notified of such loss or damage in writing. To the fullest extent permitted by law, in no case shall Dow AgroSciences be liable for consequential or incidental damages or losses.

The terms of the Warranty Disclaimer above and this Limitation of Remedies cannot be varied by any written or verbal statements or agreements. No employee or sales agent of Dow AgroSciences or the seller is authorized to vary or exceed the terms of the Warranty Disclaimer or this Limitation of Remedies in any manner.

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**Produced for
Dow AgroSciences LLC
9330 Zionsville Road
Indianapolis, IN 46268**

Label Code: D02-148-005
Replaces Label: D02-148-004
LOES Number: 010-01471

EPA-accepted 07/13/06

Revisions:

1. Updated Storage and Disposal

FOR CHEMICAL EMERGENCY, SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT, CALL CHEMTREC - DAY OR NIGHT 1-800-424-9300

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

FORMULATED FOR:

LOVELAND PRODUCTS, INC.
P.O. Box 1286 • Greeley, CO 80632-1286

24-Hour Emergency Phone: 1-800-424-9300
Medical Emergencies: 1-800-301-7976
U.S. Coast Guard National Response Center: 1-800-424-8802

PRODUCT NAME: LI 700®
CHEMICAL NAME: Blend of Methylacetic Acid, processed Lecithin and surfactant
CHEMICAL FAMILY: Surfactant
PCP REG. NO.: 23026
MSDS Number: 23026-09-LPI **MSDS Revisions:** All sections reviewed **Date of Issue:** 12/14/09 **Supersedes:** 12/14/06

2. HAZARDS IDENTIFICATION SUMMARY

KEEP OUT OF REACH OF CHILDREN - DANGER. LIQUID CAUSES SKIN AND EYE IRRITATION. Wear eye protection and chemical resistant gloves.
WARNING: Contains the allergen soy.

This product is a dark brown liquid with pungent odor. Primary routes of entry are Inhalation, eye contact and skin contact.

3. COMPOSITION, INFORMATION ON INGREDIENTS

<u>Chemical Ingredients:</u>	<u>Percentage by Weight:</u>	<u>CAS No.</u>	<u>TLV (Units)</u>
Surfactant Blend, contains Methylacetic Acid	80.00	Mixture 79-09-4	not listed
Inert Ingredients	20.00		30 mg/m ³

This product is hazardous according to the OSHA Hazard Communication Standard (29 CFR 1910.1200)

4. FIRST AID MEASURES

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 on skin or clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15 to 20 minutes. Call a poison control center or doctor for further treatment advice.

If swallowed: Call a poison control center or doctor immediately for treatment advice. Have 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 inhaled: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration. Call a poison control center or doctor for treatment advice.

5. FIRE FIGHTING MEASURES

FLASH POINT (°F/Test Method): >212°F (100°C) / TCC
FLAMMABLE LIMITS (LFL & UFL): Not established
EXTINGUISHING MEDIA: Considered non-combustible; dry chemical, carbon dioxide, alcohol foam, foam, water spray or fog.
HAZARDOUS COMBUSTION PRODUCTS: May produce hazardous by-products.
SPECIAL FIRE FIGHTING PROCEDURES: Use water spray to cool containers exposed to fire. Remain upwind. Avoid breathing smoke. Wear self-contained breathing apparatus and full protective gear. Avoid using heavy streams of water.
UNUSUAL FIRE AND EXPLOSION HAZARDS: None known.

6. ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:
Release or Spill: Wear chemical safety glasses with side shields or chemical goggles, rubber gloves, rubber boots, long-sleeved shirt, long pants, head covering, and a NIOSH-approved pesticide respirator or air-supplied respirator.
For spills: Spills may be collected with absorbent material and placed in a container for proper disposal in accordance with Federal, State and Local Regulations. Prevent runoff from entering sewer drains and waterways.

7. HANDLING AND STORAGE

HANDLING: Avoid eye and skin contact. Use with ventilation and avoid breathing vapors.
STORAGE: Store above 40°F/4.4°C. Protect from freezing. Store in a cool, dry place. Store in original container. Keep container tightly closed. Do not contaminate water, food or feed by storage or disposal.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS: Local ventilation recommended. Work in well-ventilated area or outdoors.
RESPIRATORY PROTECTION: Wear a NIOSH approved respirator if necessary or if vapors exceed TLV (threshold limit value).
EYE PROTECTION: Chemical goggles or shielded safety glasses.
SKIN PROTECTION: Wear protective clothing: long-sleeved shirts and pants, hat, rubber boots with socks. Wear rubber or chemical-resistant gloves.

Propionic Acid	OSHA PEL 8 hr TWA not listed	ACGIH TLV-TWA 30 mg/m ³
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9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AND ODOR: Dark brown liquid with pungent odor. **SOLUBILITY:** Miscible
SPECIFIC GRAVITY (Water = 1): 1.035 g/ml **BULK DENSITY:** 8.64 lbs/gallon **pH:** 3.6 (1% solution)
VAPOR PRESSURE: not established **BOILING POINT:** not established
PERCENT VOLATILE (by volume): not established **EVAPORATION RATE:** not established
 Note: These physical data are typical values based on material tested but may vary from sample to sample.
 Typical values should not be construed as a guaranteed analysis of any specific lot or as specification items.

10. STABILITY AND REACTIVITY

STABILITY: Stable
CONDITIONS TO AVOID: High alkaline conditions.
INCOMPATIBILITY: Strong oxidizers.
HAZARDOUS DECOMPOSITION PRODUCTS: None known.
HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL INFORMATION

Acute Oral LD₅₀ (male rat): > 5.0 g/kg **Acute Dermal LD₅₀ (rat):** > 5.0 g/kg
Eye Irritation (rabbit): Severe irritant **Skin Irritation (rabbit):** Severely irritating
Inhalation LC₅₀ (rat): > 6.04 mg/L (4 hr) **Skin Sensitization (guinea pig):** Not a sensitizer.
Carcinogenic Potential: Nothing listed in IARC, ACGIH, NTP or OSHA.

12. ECOLOGICAL INFORMATION

Aquatic Acute Toxicity	<u>24 HR LC₅₀</u>	<u>48 HR LC₅₀</u>	<u>96 HR LC₅₀</u>	<u>96 HR No Effect</u>
Rainbow Trout	140 mg/L	130 mg/L	130 mg/L	< 100 mg/L
Bluegill Sunfish	220 mg/L	210 mg/L	210 mg/L	100 mg/L
				<u>48 HR No Effect</u>
Daphnia Magna	450 mg/L	170 mg/L		100 mg/L

13. DISPOSAL CONSIDERATIONS

Do not reuse containers for any purpose. Refillable Container: For disposal, the container may be returned to the point of purchase (dealer/distributor). It must be refilled by the dealer/distributor with the same product. Container is recyclable, and is to be disposed of at a container collection site. Contact your local dealer/distributor for the location of the nearest collection site. Before taking container to the collection site: Triple or pressure-rinse the empty container, adding the rinsate to the spray tank. Make the empty container unsuitable for further use. If there is no container collection site in your area, dispose of the container in accordance with provincial requirements. For information on disposal of unused, unwanted product, contact the manufacturer or the provincial regulatory agency. Do not contaminate water, food, or feed by storage or disposal.

14. TRANSPORT INFORMATION

DOT / TDG Shipping Description: NOT REGULATED
U.S. Surface Freight Classification: ADHESIVES, ADJUVANTS, SPREADERS OR STICKERS (NMFC 4610; CLASS: 60)
 Consult appropriate ICAO/IATA and IMDG regulations for shipment requirements in the Air and Maritime shipping modes.

15. REGULATORY INFORMATION

NFPA & HMIS Hazard Ratings:		NFPA		HMIS	
2	Health	0	Least	2	Health
1	Flammability	1	Slight	1	Flammability
0	Instability	2	Moderate	0	Reactivity
		3	High	G	PPE
		4	Severe		

SARA Hazard Notification/Reporting

SARA Title III Hazard Category: Immediate Y Fire N Sudden Release of Pressure N
 Delayed N Reactive N

Reportable Quantity (RQ) under U.S. CERCLA: Propionic Acid (CAS: 79-09-4) 5000 pounds

SARA, Title III, Section 313: Not listed

RCRA Waste Code: Not listed

CA Proposition 65: Not listed

WHMIS [Canada]: Pest control products are not controlled under WHMIS. Classified D2B

16. OTHER INFORMATION

MSDS STATUS: All sections reviewed and/or revised

PREPARED BY: Registrations and Regulatory Affairs

REVIEWED BY: Environmental/ Regulatory Services

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