

WEED CONTROL IN FORAGE LEGUME ESTABLISHMENT

(Roger L. Becker)

Cultural Practices and Seeding Techniques

- L1.** Each year Minnesota farmers establish nearly one million acres of alfalfa and legume-grass mixtures for livestock feed. Most of this acreage is seeded with a companion crop such as oats, wheat, or barley. A companion crop can crowd out weeds that otherwise would compete excessively with forage legumes. However, this companion or “nurse” crop also competes with forage legumes and sometimes may reduce forage stands. Companion crops should be harvested at or before the boot-stage to optimize forage yield and quality, and to limit competition. Seeding alfalfa or other forage legumes alone (direct seeding) in early spring using herbicides to control annual weeds results in little or no competition with forage legumes. This method may give better stands and higher alfalfa yields in seeding and subsequent years, and can give at least two cuttings of higher quality alfalfa forage the establishment year.
- L2.** Seedling legumes compete poorly with weeds. Annual grasses such as foxtails and annual broadleaf weeds such as pigweeds and common lambsquarters usually compete aggressively with spring-seeded legumes. A herbicide usually is needed unless the field is relatively weed free, repeated tillage is used to kill seedling weeds prior to legume establishment, or repeated clipping is performed after seeding. Repeat clippings often do not coincide with optional harvest schedules and may unduly stress the establishing legume. If alfalfa or other forage legumes are direct-seeded with a grass herbicide, forage grasses cannot be included in the mixture as they may be injured or killed. Direct-seeding of alfalfa should not be attempted on steep slopes or on soils where wind or water erosion is a problem. On these sites, a companion crop will give soil protection. No-till or companion crop mulch establishment systems are better suited for erodible soil situations. Late summer no-till seeding into small grain stubble following small grain harvest has been successful in southern Minnesota. Spring seeding using sethoxydim or clethodim may be used in oat-mulch systems to remove oats interseeded with alfalfa, removing oat competition with alfalfa, yet protecting the soil on erodible slopes where first year alfalfa production is more desirable than oat silage or grain. Imazethapyr or imazamox can also be used in oat-mulch systems, but control less consistent and the window for application narrower than with sethoxydim or clethodim.

Herbicide Recommendations for Direct-Seeding or Oat-Mulch Systems (PHI = Preharvest Interval)

- L3.** **Balan (bifenox)** preplant-incorporated gives good control of annual grasses, and fair to good control of pigweed and kochia. Wild oats, common ragweed, and wild mustard control is not adequate. Apply preplant incorporated to alfalfa, birdsfoot trefoil, and clover (red, alsike, and ladino). Use 2 lbs dry flowable/A on coarse and medium soils and 2.5 lbs dry flowable on fine textured soils. Generally ineffective on peat or muck soils. No PHI stated.
- L4.** **Buctril 2L, Buctril 4 EC, others (bromoxynil)** controls most broadleaf weeds postemergence in seedling alfalfa. Apply 1 to 1.5 pts 2L or 0.5 to 0.75 pt 4EC formulations/A to seedling alfalfa in the fall or spring when the majority of the field has a minimum of 4 trifoliolate leaves. Unacceptable injury may occur to alfalfa in the 2 trifoliolate stage or smaller, typical with uneven stands or under weather conditions favoring leafburn. Broadleaf weeds should not exceed 2 inches in height, the 4-leaf stage or 1 inch in diameter, which ever comes first. The use of EPTC prior to bromoxynil applications may enhance alfalfa leaf burn. Use the low rate to control eastern black nightshade, cocklebur, lambsquarters, shepherdspurse, pennycress, smartweeds and wild buckwheat. Use the high rate of bromoxynil to control redroot pigweed, velvetleaf, ragweeds, Kochia, and wild mustard. Tank mix the low rate of bromoxynil with 1 qt/A 2,4-DB amine to improve kochia and pigweed control, but the more restrictive 2,4-DB 60 day grazing restrictions apply. Reduced rates of bromoxynil (0.5 to 0.75 pt 2L/0.25 to 0.38 pt 4 EC) can also be tank mixed with the equivalent of 3 to 6 oz/A Pursuit W or 1.08 to 2.16 oz/A Pursuit 70 DG or 70 W for broad spectrum broadleaf weed control.
- Do not:**
- apply to alfalfa under moisture, temperature, insect or disease stress or that has been stressed by other pesticide carryover or injury. Injury may occur if air temperature exceeds 80°F at or 3 days following application. Experiences in Minnesota have shown alfalfa injury associated with spring temperatures that are abnormally cold, or abnormally hot.
 - add surfactants or crop oil concentrate.
 - cut for feed or graze spring applications within 30 days of treatment; fall applications until at least 60 days after application.
- L5.** **Butyrac 175 or 200, Butoxone 175, 200, or 7500 (2,4-DB)** control certain annual broadleaf weeds applied postemergence. Butyrac products can be used on alfalfa, birdsfoot trefoil and clover (red, alsike, and ladino), Butoxone products on alfalfa only. Butyrac 200 amine does not specify legume height at

application, Butoxone formulations state alfalfa should be in the 1- to 2-trifoliolate stage. Apply 1 to 3 qt 200 formulations or 1.33 to 2 lbs 175 or 7500 formulations/A when weeds are less than 3 inches tall.

Do not:

- feed or graze within 60 days of application.
- apply if temperatures are expected to exceed 90°F within three days or fall below 40°F shortly after treatment.
- apply to sweet clover, other legumes not specifically mentioned, or to clovers grown for seed.
- add any wetting agents or detergents.
- apply to **forage grass/legume mixtures**, except on Conservation Reserve Program government acres in which case, treated forage **cannot** be grazed or harvested if released.

- L6. Eptam (EPTC)** should be applied preplant and incorporated immediately after application for annual grass and some broadleaf weed control in alfalfa, birdsfoot trefoil, and clovers (red, alsike, and ladino). The 3.5 to 4.5 pt rates give fair to good control of pigweed, lambsquarters, and velvetleaf. Wild oats and wild mustard generally are suppressed. The 2.25 pt rate may be used on alfalfa for annual grass control. EPTC rates are dependent on soil type, generally ineffective on peat or muck soils. Some alfalfa stand reduction and stunting may occur. First emerging leaves may stick together but seedlings usually recover after the first rain or irrigation. May be impregnated or applied in liquid fertilizer. No PHI stated.

Do not:

- use on alfalfa if any atrazine has been applied the previous 12 months or serious injury may result.

- L7. Gramoxone Max 3L, Boa 2.5L (paraquat).** Rates and pre-harvest interval vary by product, age of the alfalfa stand, and dormant vs. between cutting applications. See label for specific details. Apply 0.7 pt/A of the 3L or 0.8 pt/A of the 2.5L formulation to first year alfalfa (assume spring seeded but not clear on the labels) within 5 days after cutting before alfalfa regrows 2 inches. PHI of 30 days. Weeds must have adequate foliage remaining to be controlled since is a contact herbicide. Can also be applied to fall seeded alfalfa (stands less than 1 year old) when dormant in the fall or following spring. Do not apply if spring regrowth has exceeded two inches. Apply 1.7 to 1.3 pts/A 3L or 0.8 to 1.6 pts/A 2.5L. Then the PHI is 60 days. Alfalfa foliage present at application will be burned. May be useful where late flushes of annual weeds occur. Paraquat can also be used at planting before crop emergence to burndown emerged weeds at 1.7 to 2.7 pts/A 3L or 1.6 to 3.2 pts 2.5L with a PHI of 70 days. Can also be applied to clovers, see label for specific use rates. **Restricted use herbicide.**

- L8. Kerb (pronamide)** can be applied postemergence to fall-seeded alfalfa, clover (types not specified), birdsfoot trefoil, and crown vetch after legumes reach the trifoliolate stage. For spring seeded legumes, wait until the following fall or early winter before application.

Do not:

- apply within 25, 45, or 120 days of grazing or harvest. See Kerb verbiage in the Established Alfalfa section for rates, precautions, specific PHIs, etc.

- L9. Poast, Poast Plus (sethoxydim)** applied postemergence will control annual and suppress perennial grasses in direct-seeded or oat-mulch systems. Sedges and broadleaf weeds will not be controlled. Poast can be used on alfalfa, clovers, birdsfoot trefoil, and sainfoin, Poast Plus only on alfalfa. Use the following pts/A of Poast or fl oz/A Poast Plus; 1/2 pt or 12 fl oz for wild proso millet, 1 pt or 24 oz for wild oat, foxtails, barnyardgrass, crabgrass, and fall panicum, and 1.5 pts or 36 fl oz for sandbur and volunteer small grains except interseeded oat, which requires only 0.75 pt or 18 fl oz. Sethoxydim will suppress, but not control quackgrass. Poast Plus is labeled at a reduced rate, 18 fl oz, and Poast at 0.75 pt/A for early treatment of green and giant foxtail, barnyardgrass, and fall panicum. Always use with crop oil concentrate or Dash HC at 1pt/A. Depending on weed species, UAN or ammonium sulfate may also be needed (see label). Insure good alfalfa canopy spray penetration and grass coverage. Applications before first cutting generally give the best results.

Do not:

- apply sethoxydim within 7 days of feeding, grazing or cutting for forage (undried), or within 14 days of cutting for hay (dried). May be tank mixed with 2,4-DB if the more restrictive 60 day feeding, grazing and harvesting restrictions of 2,4-DB are followed.
- use flood, whirl chamber, or CDA nozzles (poor coverage or canopy penetration).
- use selective application equipment.
- add UAN or ammonium sulfate to 2,4-DB tank mixtures.

- L10. Pursuit (imazethapyr)** should be applied postemergence when seedling alfalfa is greater than the second trifoliolate stage and the majority of the weeds are 1 to 3 inches in height. Controls many annual grass and broadleaf weeds in direct-seeded or oat-mulch systems. Will suppress some perennial weeds. Apply 3 to 6 oz/A Pursuit W or 1.08 to 2.16 oz/A Pursuit 70 DG or 70 W and vary rate by weed species. Imazethapyr can be tank mixed with 2,4-DB, bromoxynil, clethodim, or sethoxydim. See the imazethapyr label and tank mix product labels for specific recommendations. Use a nonionic surfactant with greater than or equal to 80% active ingredient at the rate of 1 quart per 100 gallons of spray solution. Organo-silicon surfactants can be

used instead of nonionic surfactants. Crop oil concentrate can be used at the rate of 1 quart per acre when water or temperature stress is present or SUN-IT II can be used at 0.75 to 1 quarts per acre. Always add UAN nitrogen at 1.25 to 2.5 gal/100 gallons of spray, or 12 to 15 lbs ammonium sulfate/100 gallons spray solution. Apply in 10 or more gpa carrier (ground) or 5 or more gpa (air). Spring-seeded legumes should **not** be treated until the following fall. A four-month restriction is required before replanting alfalfa back into the stand. Imazethapyr can be applied to suppress oat at the 3- to 4-leaf stage to achieve direct seeded alfalfa in oat-mulch systems.

Do not:

- treat spring-seeded legumes until the following fall.

- apply within 30 days of grazing or harvest.

- L11. Raptor (imazamox)** can be applied postemergence at 4 to 6 fl oz/A with 1 to 2 gal COC or 1 to 2 qt nonionic surfactant plus 2.5 gal UAN or 12-15 lbs AMS per 100 gal spray solution. COC can be used instead of nonionic surfactant to improve grass control. Apply when seedling alfalfa is in the second trifoliolate stage or larger and when the majority of weeds are 1 to 3 inches in height. Controls annual grass and broadleaf weeds and will suppress some perennial weeds. Can be tank mixed with bromoxynil, 2,4-DB, sethoxydim, or clethodim. Interseeded oat or suppression in oat-mulch systems in not mentioned on the Raptor label, but control of volunteer oat up to 3 inches in height or less is labeled. A 3-month restriction is required before replanting alfalfa back into the stand. There are no grazing or haying restrictions with Raptor.
- L 12. Roundup OriginalMAX, WeatherMAX, and UltraMAX II (glyphosate formulations)** now have a supplemental label for use on Roundup Ready Alfalfa. There is a technology fee estimated to be approximately \$30 per acre for a 12 pound per acre seeding rate. Purchaser must sign a Monsanto Tech and Stewardship agreement and a Seed and Feed Use Agreement that the forage will be used on-farm, if sold, on-farm in the USA. May apply up to 5.3 qts of 4.5 lb ae/gal formulations per year including any preplant burndown applications, up to 4.1 qts per year in crop, up to 44 fl oz. product in any single application. This is a transgenic crop. Will provide rate-dependant excellent control of seedling weeds and suppress many perennial weeds with minimal preharvest intervals. See label for species-specific use rates. Applications to non-tolerant Roundup Ready alfalfa will cause severe crop damage or stand loss.
- Remove livestock before application, and a 5 day grazing reentry interval applies.
 - 5 day PHI for grazing, cutting or feeding.
 - Up to 10% non-tolerant seed may be present so label suggest to spray when newly seeded alfalfa is in the 2 to 4 trifoliolate stage to avoid stand loss of susceptible alfalfa once fully established.
- L13. Select or Arrow 2 EC, Prism 1 EC (clethodim)** applied postemergence will control annual grasses in seedling alfalfa, birdsfoot trefoil, or sainfoin grown for forage or seed. Apply 6 to 16 fl oz/A Select or 13 to 34 fl oz/A Prism. Use the higher rates when annual grass pressure is heavy or at the maximum height, or when perennial grasses are present. Always add crop oil concentrate containing at least 15 % emulsifier at 1 % v/v. UAN or ammonium sulfate may be added to improve control. Clethodim has no activity on sedges or broadleaf weeds. May be tank mixed with 2,4-DB products, or with Pursuit W, 70 DG, or 70W to control broadleaf weeds. With tank mixes, the most restrictive harvest interval must be followed. Crop oil concentrate must still be added for clethodim performance which will increase the risk of crop injury if tank mixed with 2,4-DB. When tank mixed with Pursuit, the minimum rate of clethodim is higher; use Select/Arrow at 8 to 16 oz/A, or Prism at 17 to 34 oz/A.
- Do not:**
- apply within 15 days of grazing, feeding, or harvesting (cutting) for forage or hay.
- L14. Treflan HFP (trifluralin).** Apply 1 to 1.5 pts/A preplant-incorporated to direct seed alfalfa. Rate is dependent on soil type. No grazing or haying restrictions stated on the supplemental label. Some alfalfa stand reduction and stunting may occur. Trifluralin products are more economical and available than Balan, but have slightly more injury potential than Balan. No PHI stated.

Federal Conservation Reserve Program Land

- L15.** To control annual grasses and some broadleaf weeds, **Prowl/Pendimax (pendimethalin)** can be applied preplant-incorporated to establish legumes, and **Pursuit (imazethapyr)** can be applied postemergence to establish legumes and grasses. Will injure some grass species in CRP plantings. Rates of Prowl/Pendimax are dependent on soil type. Prowl/Pendimax or Pursuit treated forage may not be grazed or hayed if CRP acreage is released for emergency forage.

Companion Crop Seedings

- L16. Buctril 2L or 4EC , others (bromoxynil)** applied postemergence controls most broadleaf weeds in companion seeded alfalfa. Apply after small grain emergence up to boot stage, alfalfa should have a

minimum of 4 trifoliolate leaves at application. Broadleaf weeds should not exceed the 4-leaf stage or 2 inches in height or 1 inch in diameter, whichever comes first. Offers much less alfalfa injury potential than MCPA or 2,4-D amine. Cleared for wheat, barley, oats, rye, and triticale underseeded with alfalfa.

Do not:

- apply within 30 days of cutting for feed or grazing spring treated underseeded alfalfa; fall treated alfalfa until at least 60 days after application.
- apply when underseeded alfalfa is under moisture, temperature, insect or disease stress or has been stressed by other pesticide carryover or application.
- add a surfactant or crop oil when underseeded with alfalfa.
- apply if temperatures are expected to exceed 80°F at or 3 days following application or unacceptable alfalfa injury may occur.
- apply when alfalfa is under moisture, temperature, insect, disease, or herbicide carryover stress.
- apply the tank mixture with 2,4-DB when underseeded to small grains (2,4-DB not cleared for application to small grains).

L17. MCPA OR 2,4-D amine can be used on seedling stands of alfalfa, birdsfoot trefoil, and clover (red, alsike or ladino) established with small grain companion crops (check individual herbicide labels). **Do not use these herbicides except for rescue situations to control severe infestations of broadleaf weeds that threaten legume seeding survival as serious legume injury can occur.** Legumes are more tolerant of MCPA. A canopy of grain or weeds that will shield legumes from herbicide spray will reduce legume injury. Reduced sprayer pressure and lower spray volume may also minimize injury.

Do not:

- apply within 14 days of grazing or harvest for 2,4-D and 7 days for MCPA, but PHIs vary by specific product. See specific product label for PHI specific to that product.
- use ester formulations.
- use these herbicides on sweetclover.
- substitute 2,4-DB. 2,4-DB is not cleared for use on underseeded small grains.

WEED CONTROL IN ESTABLISHED FORAGE LEGUMES

Cultural Practices and forage quality

- L18.** Properly established stands of small-seeded legumes can effectively compete with many annual and perennial weeds. Weeds may become a problem due to inadequate soil fertility, low soil pH, poor soil drainage, or poor stand management. Maintaining proper soil fertility and pH levels will increase forage yields while increasing legume growth and vigor for better competition with weeds. Many annual, biennial weeds common in established legumes may be controlled effectively by harvesting the crop before weed seed formation and dispersal. If weed seeds are mature and included in harvested forage, forage should be ensiled if possible, as fermentation kills many weed seeds.
- L19.** Weed control in forage crops often does not increase total dry matter production since a fixed level of tonnage can be produced per acre whether composed of pure alfalfa, for example, or a weed-alfalfa mix. First-cut legume yield could actually be lowered if forage legume populations are too low before weed removal. Since weeds are often less palatable and lower in protein than desirable forages, controlling weeds can improve forage quality by increasing protein content, digestibility and forage consumption. Forage should be quality tested and feed ration adjusted accordingly to take advantage of high quality forage obtainable with weed control practices.
- L20.** Many of the biennial or perennial broadleaf weeds such as white cockle and dandelion are troublesome in established alfalfa and are deep rooted and similar to alfalfa in growth habit. These weeds are difficult to control with herbicides without injuring alfalfa. Quackgrass and other grass weeds that invade alfalfa are shallow rooted and are morphologically different enough from alfalfa that control with soil applied herbicides is more feasible. The best option is to use sethoxydim or clethodim for postemergence quackgrass suppression with good crop tolerance. Pursuit or Raptor offer less quackgrass suppression, but may be useful if broadleaf weed control is desired. Herbicides that control quackgrass can also injure or kill most perennial forage grasses.

Herbicide Recommendations (PHI = Preharvest Interval)

- L21. Butyrac 175 or 200, Butoxone 175, 200, or 7500 (2,4-DB)** control certain annual broadleaf weeds applied postemergence. Apply 1 to 3 qts of Butyrac 200, 2 to 3 qts of Butoxone 200, or 1.33 to 2 lbs 175 or 7500 formulations/A when annual broadleaf weed seedlings are 1 to 3 inches tall or rosettes are less than 2 inches in diameter and have not bolted. Late fall treatments are more effective on winter annuals than spring

treatments. 2,4-DB provides only fair control of field pennycress, shepherdspurse, and Virginia pepperweed if applied after flower stalk elongation, but good control when applied to small rosettes.

Do not:

- graze or feed hay for 30 days after application (60 day restriction on seedling alfalfa).
- apply if temperatures are expected to exceed 90°F within three days or fall below 40°F shortly after treatment.
- add any wetting agents or detergents.
- apply to **forage grass/legume mixtures**, except on Conservation Reserve Program government acres in which case forage **cannot** be grazed or harvested if released.

- L22. Eptam (EPTC) or Treflan (others) (trifluralin)** may be used on established alfalfa **where irrigation potential exists** and annual grasses such as foxtails or crabgrass are a problem. EPTC can be applied to ladino clover as well. Broadcast granular Treflan 10G formulations and irrigate if 0.5 in of rainfall is not received within 3 days after application. Or, apply liquid EPTC or trifluralin formulations through chemigation equipment. With either method apply **before** weeds emerge during alfalfa dormancy or immediately after cutting.

Do not:

- apply EPTC within 14 days of harvest or grazing alfalfa, 45 days for ladino clover.
- cut or graze alfalfa within 21 days after trifluralin applications.
- rotate to non-labeled crops the season following trifluralin application or serious crop injury may occur.

- L23. Gramoxone Max 3L/Gramoxone Inteon2S (paraquat).** Rates and preharvest interval vary by product, age of the alfalfa stand, and dormant vs. between cutting applications. See label for specific details. Can be applied to dormant, established alfalfa in the fall following the last cutting when regrowth is 6 inches or less, or in the spring before regrowth exceeds 2 inches in height at 1.3 to 2.0 pts/A 3L or 1.5 to 2.5 pts/A 2.5L. Paraquat can also be applied between cuttings for annual weed seedling control, apply within 5 days after cutting at 0.7 pt/A of the 3L or 0.8 pt/A of the 2.5L formulation. Since paraquat is a contact herbicide, only emerged weed vegetation contacted by spray will be controlled. Most effective on small annual seedlings. Do not cut, graze, or harvest within 30 days after "between cutting" applications or for 42 days following "dormant" applications. Apply paraquat with 1 pt nonionic surfactant/100 gallons of water (greater than 75% active ingredient) or 2 pts (50 to 74% active ingredient). Can also be applied to clovers, see label for specific use rates. Both paraquat formulations can be applied tank mixed with 1 to 2 qts/A Velpar before regrowth exceeds 2 inches in height to add residual control with dormant applications. Tank mix paraquat rates have a 42 day PHI before cutting or harvest. Do not use a Velpar tank mix the first growing season. Sencor can also be tank mixed with both paraquat formulations to provide residual control. See Sencor label for rates and restrictions. **Paraquat is a restricted use product.**

- L24. Kerb (pronamide)** can be used on legume stands of alfalfa, clover (types not specified), birdsfoot trefoil, or crown vetch to suppress quackgrass and other perennial grasses. Pronamide will control many annual grasses and some annual broadleaf weeds, but will not control perennial broadleaf weeds. Suggested rates are 1 to 4 lbs product/A applied in the fall when soil temperatures are below 55°F but before freeze-up. Use lower rates in labeled ranges where rainfall is dependable or where irrigated. Performance on soils above 4% organic matter is inconsistent, ineffective on peat or muck soils.

Do not:

- graze or harvest alfalfa west of the Mississippi River within 25 days (below 3 lbs product/A) to 45 days (3 to 4 lbs product/A) after application.
- graze or harvest alfalfa grown east of the Mississippi River, or clover, birdsfoot trefoil, or crown vetch within 120 days of application.
- rotate to corn or soybeans for 3 to 5 months or to small grains or grasses for 6 to 12 months. Actual time intervals depend on rates applied.
- exceed 4 lbs product/A per year.
- apply to legume-grass mixtures, however, Kerb can be applied to control susceptible grass species in tolerant established grass plantings in the Conservation Reserve Program. See label for details.

- L25. Poast, Poast Plus (sethoxydim)** applied postemergence to established alfalfa will control annual and suppress perennial grasses. Sedges and broadleaf weeds will not be controlled. Use the following pts/A of Poast or fl oz/A Poast Plus; 1/2 pt or 12 fl oz for wild proso millet, 1 pt or 24 oz for wild oat, foxtails, barnyardgrass, crabgrass, and fall panicum, and 1.5 pts or 36 fl oz for sandbur and volunteer small grains except interseeded oat, which requires only 0.75 pt or 18 fl oz. Sethoxydim will suppress, but not control quackgrass. Poast Plus is labeled at a reduced rate, 18 fl oz, and Poast at 0.75 pt/A for early treatment of green and giant foxtail, barnyardgrass, and fall panicum. Always use with crop oil concentrate or Dash HC at 1pt/A. Depending on weed species, UAN or ammonium sulfate may also be needed (see label). Insure good alfalfa canopy spray penetration and grass coverage. Applications before first cutting generally give the best results.

Do not:

- apply sethoxydim within 7 days of feeding, grazing or cutting for forage (undried), or within 14 days of cutting for hay (dried). May be tank mixed with 2,4-DB if the more restrictive 60 day feeding, grazing and harvesting restrictions of 2,4-DB are followed.
- use flood, whirl chamber, or CDA nozzles (poor coverage or canopy penetration).
- use selective application equipment.
- add UAN or ammonium sulfate to 2,4-DB tank mixtures.

L26. Pursuit W, 70 DG, or 70 W (imazethapyr). Apply imazethapyr to established alfalfa in the fall or spring when dormant, or apply between cuttings with alfalfa regrowth below 3 inches in height. Since good coverage is necessary for postemergence applications, weeds topped by harvest may have low herbicide uptake and possibly reduced performance when applied between cuttings. Apply 3 to 6 oz/A Pursuit W or 1.08 to 2.16 oz/A Pursuit 70 DG or 70 W. A 4-month restriction is required before replanting alfalfa back into the stand. Always add UAN nitrogen at 1.25 to 2.5 gal/100 gallons of spray, or 12 to 15 lbs. ammonium sulfate/100 gallons spray solution. Apply in 10 or more gpa carrier (ground) or 5 or more gpa (air). The label is unclear as to whether Pursuit can be tank mixed with other herbicides labeled for established alfalfa.

Do not:

- apply within 30 days of grazing or harvest.
- apply imazethapyr to the last year of the alfalfa stand prior to rotation to other crops.
- apply more than the equivalent of 1.44 oz/A 70 DG north of highway 210.

L27. Raptor (imazamox) can be applied postemergence at 4 to 6 fl oz per acre with 1 to 2 gal COC or 1 to 2 qt nonionic surfactant plus 2.5 gal UAN or 12-15 lbs AMS per 100 gal spray solution. COC can be used instead of nonionic surfactant to improve grass control. Apply in the fall, winter, or in the spring to dormant, or semi-dormant alfalfa, or between cuttings. Apply before alfalfa regrowth exceeds 3 inches to allow spray to reach target weeds. Since good coverage is necessary for postemergence applications, weed topped by harvest may have low herbicide uptake and possibly reduced performance when applied between cuttings. Controls annual grass and broadleaf weeds and will suppress some perennial weeds. Can be tank mixed with 2,4-DB, sethoxydim, or clethodim products. A 3-month restriction is required before replanting alfalfa back into the stand. There are no grazing or haying restrictions with Raptor.

Do not:

- apply within 20 days of grazing or harvest.
- apply imazethapyr to the last year of the alfalfa stand prior to rotation to other crops.
- apply more than the equivalent of 1.44 oz/A 70 DG north of highway 210.

L28. Roundup OriginalMAX, WeatherMAX, and UltraMAX II (glyphosate formulations) now have a supplemental label for use on Roundup Ready Alfalfa. There is a technology fee estimated to be approximately \$30 per acre for a 12 pound per acre seeding rate. Purchaser must sign a Monsanto Tech and Stewardship agreement and a Seed and Feed Use Agreement that the forage will be used on-farm, if sold, on-farm in the USA. May apply up to 5.3 qts of 4.5 lb ae/gal formulations per year including any preplant burndown applications, up to 4.1 qts per year in crop, up to 44 fl oz. product in any single application. This is a transgenic crop. Will provide rate-dependant excellent control of seedling weeds and suppress many perennial weeds with minimal preharvest intervals. See label for species-specific use rates. Applications to non-tolerant Roundup Ready alfalfa will cause severe crop damage or stand loss. Established white cockle, white campion and common dandelion will be difficult to completely control. Can be used to effectively manage perennial or annual grasses to maintain high forage quality, such a preventing quackgrass encroachment.

- Remove livestock before application, and a 5 day grazing reentry interval applies.
- 5 day PHI for grazing, cutting or feeding.
- Up to 10% non-tolerant seed may be present so label suggest to spray when newly seeded alfalfa is in the 2 to 4 trifoliolate stage to avoid stand loss of susceptible alfalfa once fully established. If not applied until established year, will give the impression of larger gaps once larger plants are removed.

L29. Roundup formulations, Glyphomax, others (glyphosate) are registered for use prior to harvest in declining alfalfa stands or any stand of alfalfa where crop destruction is acceptable to control labeled annual and perennial weeds including quackgrass. The treated crop can be harvested and fed to livestock. The labeled rate is 2.0 lb ai (52 oz) Roundup UltraMax. Applications can be made at any time of the year but only one application should be made per year to an existing stand of alfalfa. If quackgrass is a primary target, glyphosate can be applied in the spring, late summer or fall when quackgrass is actively growing with the caveat that treatments must be followed by deep tillage for a complete control.

Do not:

- apply within 1.5 days of grazing or harvest.
- use where alfalfa is grown for seed.

L30. Select or Arrow 2 EC, Prism 1 EC (clethodim) applied postemergence will control annual grasses and suppress perennial grasses in established alfalfa, birdsfoot trefoil, or sainfoin grown for forage or seed. Apply 8 to 16 fl oz/A Select or 17 to 34 fl oz/A Prism. Use the higher rates when annual grass pressure is

heavy or at the maximum height, or when perennial grasses are present. Always add crop oil concentrate containing at least 15 % emulsifier at 1 % v/v. UAN or ammonium sulfate may be added to improve control. Clethodim has no activity on sedges or broadleaf weeds. May be tank mixed with 2,4-DB products, or with Pursuit W, 70 DG, or 70W to control broadleaf weeds. Crop oil concentrate must still be added for clethodim performance which will increase the risk of crop injury if tank mixed with 2,4-DB.

Do not:

- apply within 15 days of grazing, feeding, or harvesting (cutting) for forage or hay. With tank mixes, the more restrictive 30-day harvest interval, and the application alfalfa stage limits must be followed.

- L31. Sencor 75 DF (metribuzin)** may be applied to alfalfa or alfalfa-grass mixtures at 0.5 to 1.33 lbs product/A to control certain grass and broadleaf weeds when alfalfa is dormant. Do not use after growth begins in the spring or before growth ceases in the fall. Rates higher than 0.5 to 0.75 lb/A will severely reduce forage grass stands. Sencor may be used at higher rates to reduce forage grass stands crowding alfalfa.

Do not:

- graze or harvest within 28 days after application.
- apply within the first growing season (12 months) after seeding or serious injury may result.
- use on sandy soils or on soils with less than 1/2% organic matter. Note **ground water** precautions on the label.

- L32. Sinbar (terbacil)** may be applied to pure alfalfa stands established for one or more years at 0.5 to 1.5 lbs product/A to control several annual grass and broadleaf weeds. Application may be made in the fall or spring while alfalfa is dormant. There is potential for alfalfa injury, especially on sandy soils or soils with low organic matter. **Karmex (diuron)** is another urea herbicide labeled for alfalfa use, but both Karmex and Sinbar have generally been replaced by Velpar based on performance for this market. No PHI stated.

Do not:

- rotate to any other crop within 2 years after application.
- apply to frozen or snow covered ground.
- apply to seedling alfalfa or mixed stands.

- L33. Velpar (hexazinone)** is registered for use in pure alfalfa stands established for one year or more. In Minnesota, for "**semi-dormant**" varieties, (roughly analogous to "moderately winter-hardy" varieties), apply a single application before new spring growth exceeds 2 inches in height. Or, apply Velpar to stubble after cutting, following hay removal before regrowth exceeds 2 inches in height or severe injury could occur. Labeled use states to apply after cutting before alfalfa regrowth exceeds 2 inches. "**Dormant**" varieties (roughly analogous to "winter-hardy and "very winter-hardy" varieties) may be treated spring or fall anytime after dormancy, but before new growth begins in the spring. The difficulty lies in determining when alfalfa is truly dormant in the fall, or when dormancy breaks in the spring to avoid crop injury, as varieties respond differently to environmental conditions regardless of their winter hardiness classification. Lower 1 to 2 qts/A equivalent rates of Velpar will control broadleaf weeds such as hoary alyssum, chickweed, buttercup, shepherdspurse, pennycress and yellow rocket. Rates equivalent to 2 to 3 qts/A are needed for dandelion, quackgrass and white cockle suppression. Fertilizer impregnation is cleared. **Velpar AlfaMax MP** is a prepackage mixture of diuron and hexazinone which results in a lower overall rate of either herbicide applied when used as a stand-alone product, but generally the higher rates of Velpar when used as a stand-alone are required for key target weed species in Minnesota such as common dandelion.

Do not:

- graze or feed treated alfalfa for 30 days after application.
- overlap during application to avoid alfalfa injury.
- plant any crop within 12 months after an application of Velpar; after 12 months **only** corn can be planted, and only if 0.75 lb ai/A or less was used. Therefore, if winterkill is likely, waiting to apply Velpar after the first spring cutting to make sure the alfalfa stand is still adequate leaves replanting options open.
- apply to alfalfa that is stressed on sandy, rocky, or gravelly soils, or on alkali or poorly drained soils.
- apply to frozen or snow covered ground.
- apply to regrowth greater than 2 inches tall, or if air temperatures exceed 90°F, or if significant stubble is left as serious crop injury is likely.

- L34. MCPA.** Some formulations can be applied to established alfalfa or red clover, but can cause severe crop injury and should be used only when a disastrous weed problem exists. Apply MCPA only in late fall when legumes are dormant to control susceptible broadleaf weeds present at this time. MCPA amine equivalent to 1 pt of a 4 lb ae gal product will control certain winter annuals such as shepherdspurse and pennycress; gives partial control of yellow rocket, but does not control white cockle. See specific labels for crop clearance, weeds controlled, and use precautions.

Do not:

- apply within 7 days of grazing or harvest, but PHIs vary by specific product. See specific product label for PHI specific to that product.

Table L1. Package mixtures labeled for use in Forage Legumes are as follows:

Trade Name	Formulation	Common Name	Active Ingredient
Velpar AlfaMax MP	79.7 DG	hexazinone & diuron	35.3% & 42.4%

Table L2. Crop Stage and Harvest Restrictions for Forage Legumes

Herbicide Name	Minimum Crop Stage	Maximum Crop Stage	Harvest Restriction (days)
<u>Direct Seeded Forage Legumes</u>			
Arrow (clethodim)	none	none	15
Balan (benefin)	n.a.	n.a.	none
Buctril (bromoxynil)	2 trifoliolate (alfalfa)	none	n.a.
Butoxone (2,4-DB)	1-2 trifoliolate leaf	none	n.a.
Butyrac (2,4-DB)	none	none	n.a.
Eptam (EPTC)	n.a.	n.a.	none
Kerb (pronamide)	after cutting (fall)	n.a.	n.a.
Moxy (bromoxynil)	4 leaf	none	n.a.
Pendant (pendimethalin)	n.a.	n.a.	none
Pendimax (pendimethalin)	n.a.	n.a.	none
Poast (sethoxydim)	none	none	n.a.
Poast Plus (sethoxydim)	none	none	n.a.
Prism (clethodim)	none	none	15
Prowl (pendimethalin)	n.a.	n.a.	none
Prowl H20 (pendimethalin)	n.a.	n.a.	none
Pursuit (imazethapyr)	second trifoliolate	none	30
Raptor (imazamox)	second trifoliolate	before bud stage	0
Section (clethodim)	none	none	15
Select (clethodim)	none	none	15
Treflan (trifluralin)	n.a.	n.a.	none
trifluralin, others (trifluralin)	n.a.	n.a.	none
Trust (trifluralin)	n.a.	n.a.	none
<u>Companion Seeded Forage Legumes</u>			
2,4-D, others (2,4-D)			
Buctril (bromoxynil)	4 leaf	none	n.a.
MCPA, others (MCPA)			
Moxy (bromoxynil)	4 leaf	none	n.a.
<u>Established Forage Legumes</u>			
Arrow (clethodim)	none	none	15
Butoxone (2,4-DB)	none	none	n.a.
Butyrac (2,4-DB)	none	none	n.a.
Eptam (EPTC)	n.a.	n.a.	none
glyphosate, others (glyphosate)			
Gramoxone (paraquat)			
Kerb (pronamide)	after cutting (fall)	n.a.	n.a.
MCPA, others (MCPA)			

Table L2. Crop Stage and Harvest Restrictions for Forage Legumes

Herbicide Name	Minimum Crop Stage	Maximum Crop Stage	Harvest Restriction (days)
Poast (sethoxydim)	none	none	n.a.
Poast Plus (sethoxydim)	none	none	n.a.
Prism (clethodim)	none	none	15
Pursuit (imazethapyr)	second trifoliolate	none	30
Raptor (imazamox)	none	before regrowth exceeds 3 inches	0
Section (clethodim)	none	none	15
Select (clethodim)	none	none	15
Sencor (metribuzin)	n.a.	n.a.	28
Sinbar (terbacil)	n.a.	n.a.	none
Treflan (trifluralin)	n.a.	n.a.	none
trifluralin, others (trifluralin)	n.a.	n.a.	none
Trust (trifluralin)	n.a.	n.a.	none
Velpar (hexazinone)	n.a.	n.a.	30
Velpar AlfaMax MP (hexazinone & diuron)	n.a.	n.a.	30

<u>Roundup Ready Alfalfa</u>			
Roundup Original MAX (glyphosate)	none	none	5
Roundup UltraMAX II (glyphosate)	none	none	5
Roundup WeatherMAX (glyphosate)	none	none	5

Table L3. Summary of herbicides for use in Forage Legumes

Application Type			
Herbicide / Formulation	Rate Range	Crop Tolerance	Remarks
<u>Direct Seeded Forage Legumes</u>			
<u>Burndown</u>			
glyphosate, others (glyphosate)	varies by product (1.5 to 3 lb ai/A)	-	Many formulations available including Roundup, Cornerstone, etc...
Gramoxone Inteon 2 S	2.5 to 4 pts	-	Apply to emerged weeds prior to crop emergence.
Gramoxone Max 3 S (paraquat)	1.7 to 2.7 pts (0.6 to 1.0 lb ai/A)	-	
<u>Preplant Incorporated</u>			
Balan 60 DF (bifenox)	2 to 2.5 lbs (1.125 to 1.5 lb ai/A)	G	Annual grass and some broadleaf weed control. Can use on alfalfa, clover (red or alsike), sweetclover, and birdsfoot trefoil.
Eptam 7 E (EPTC)	2.25 to 4.5 pts (2 to 4 lb ai/A)	F/G	Annual grass and some broadleaf weed control. Can be used on alfalfa, clovers, sweetclover, and birdsfoot trefoil. Do not use on Dutch white clover.
Pendant 3.3 E (pendimethalin)	1.2 to 3.0 pts (0.5 to 1.2 lb ai/A)	G	For use only in establishing forage legumes used as a cover crop on the Acreage Conservation Reserve Program or Agricultural Reserve (set-aside) Program. Controls annual grasses and some broadleaves.
Pendimax 3.3 E (pendimethalin)	1.2 to 3.0 pts (0.5 to 1.2 lb ai/A)	G	For use only in establishing forage legumes used as a cover crop on the Acreage Conservation Reserve Program or Agricultural Reserve (set-aside) Program. Controls annual grasses and some broadleaves.
Prowl 3.3 E (pendimethalin)	1.2 to 3.0 pts (0.5 to 1.2 lb ai/A)	G	For use only in establishing forage legumes used as a cover crop on the Acreage Conservation Reserve Program or Agricultural Reserve (set-aside) Program. Controls annual grasses and some broadleaves.
Prowl H20 3.8 CS (pendimethalin)	1 to 2.5 pts (0.5 to 1.2 lb ai/A)	G	For use only in establishing forage legumes used as a cover crop on the Acreage Conservation Reserve Program or Agricultural Reserve (set-aside) Program. Controls annual grasses and some broadleaves.
Treflan 4 E (trifluralin)	1 to 1.5 pts (0.5 to 0.75 lb ai/A)	G	Annual grass and some broadleaf weed control in alfalfa.
trifluralin 4 E (trifluralin)	1 to 1.5 pts (0.5 to 0.75 lb ai/A)	G	Annual grass and some broadleaf weed control in alfalfa.
Trust 4 E (trifluralin)	1 to 1.5 pts (0.5 to 0.75 lb ai/A)	G	Annual grass and some broadleaf weed control in alfalfa.
<u>Postemergence</u>			
Arrow 2 EC (clethodim)	8 to 16 fl oz (0.125 to 0.25 lb ai/A)	G	Grass control in alfalfa, birdsfoot trefoil and sainfoin. Always use a crop oil concentrate at 1% v/v. Use the high rate for perennial grass suppression.
Buctril 2 E	1 to 1.5 pts	F	Annual broadleaf control in alfalfa only. Observe precautions for application to avoid injury.
Buctril 4 E (bromoxynil)	0.5 to 0.75 pt (0.25 to 0.38 lb ai/A)	F	

Table L3. Summary of herbicides for use in Forage Legumes

Application Type			
Herbicide / Formulation	Rate Range	Crop Tolerance	Remarks
<u>Direct Seeded Forage Legumes</u>			
<u>Postemergence</u>			
Butoxone 175 1.75 L	4.3 to 6.5 pts	F/G	Annual broadleaf weed control when weeds are small. Use on alfalfa, clover (red, alsike, or ladino) and birdsfoot trefoil.
Butoxone 200 2 L	4 to 6 pts		
Butoxone 7500 75 DF (2,4-DB)	1.3 to 2 lbs (1 to 1.5 lb ai/A)		
Butyrac 200 2 S (2,4-DB)	2 to 6 pts (0.5 to 1.5 lb ai/A)	F/G	Annual broadleaf weed control when weeds are small. Use on alfalfa, clover (red, alsike, or ladino) and birdsfoot trefoil.
Kerb 50 W (pronamide)	1 to 4 lbs (0.5 to 2.0 lb ai/A)	G	Annual and perennial grasses and some annual broadleaf weed control. Can be used on alfalfa, clover (types not specified), birdsfoot trefoil, and crown vetch.
Moxy 2 E (bromoxynil)	1 to 1.5 pts (0.25 to 0.38 lb ai/A)	F	Annual broadleaf control in alfalfa only. Observe precautions for application to avoid injury.
Poast 1.5 E (sethoxydim)	0.5 to 2.5 pts (0.09 to 0.47 lb ai/A)	G	For annual grass control and perennial grass suppression in alfalfa, clovers, birdsfoot trefoil, sainfoin. The higher rates are for perennial grass suppression. Always add 2 pts/A crop oil concentrate or Dash HC.
Poast Plus 1 E (sethoxydim)	12 to 60 fl oz (0.09 to 0.47 lb ai/A)	G	For annual grass control and perennial grass suppression in alfalfa only. The higher rates are for perennial grass suppression. Always add 2 pts/A crop oil concentrate or Dash HC.
Prism 0.94 E (clethodim)	17 to 34 fl oz (0.125 to 0.25 lb ai/A)	G	Grass control in alfalfa, birdsfoot trefoil and sainfoin. Always use a crop oil concentrate at 1% v/v. Use the high rate for perennial grass suppression.
Pursuit 2 S	3 to 6 fl oz	G	Controls most annual grass and broadleaf weeds and interseeded oats for oat mulch seeding of alfalfa. Will suppress perennial grass and broadleaf weeds.
Pursuit 70 DG	1.08 to 2.16 oz		
Pursuit W 2 S	3 to 6 oz		
Pursuit W 70 DG (imazethapyr)	1.08 to 2.16 oz (0.047 to 0.094 lb ai/A)		
Raptor 1 S (imazamox)	4 to 6 fl oz (0.32 to 0.047 lb ai/A)	G	Controls most annual grasses and broadleaf weeds and suppresses some perennial weeds in alfalfa.
Section 2 EC (clethodim)	8 to 16 fl oz (0.125 to 0.25 lb ai/A)	G	Grass control in alfalfa, birdsfoot trefoil and sainfoin. Always use a crop oil concentrate at 1% v/v. Use the high rate for perennial grass suppression.
Select 2 EC (clethodim)	8 to 16 fl oz (0.125 to 0.25 lb ai/A)	G	Grass control in alfalfa, birdsfoot trefoil and sainfoin. Always use a crop oil concentrate at 1% v/v. Use the high rate for perennial grass suppression.

Table L3. Summary of herbicides for use in Forage Legumes

<u>Application Type</u>			
Herbicide / Formulation	Rate Range	Crop Tolerance	Remarks
<u>Direct Seeded Forage Legumes</u>			
<u>Post Harvest</u>			
Gramoxone Inteon 2 S	1 pt	-	Apply after harvest (between cuttings) for late emerging annual grass and broadleaf weeds.
Gramoxone Max 3 S (paraquat)	0.7 pts (0.25 lb ai/A)		
<u>Companion Seeded Forage Legumes</u>			
<u>Postemergence</u>			
2,4-D Amine 4 S (2,4-D)	0.25 to 0.5 pt (0.12 to 0.25 lb ai/A)	P	Use amine formulation only. Legumes may be severely injured. Use only to control heavy stands of broadleaf weeds as a rescue treatment.
Buctril 2 E (bromoxynil)	1 to 1.5 pt (0.25 to .38 lb ai/A)	F	Annual broadleaf weed control for alfalfa underseeded to oats, wheat, barley, rye, or triticale. Preferred choice of companion seeded options.
MCPA Amine 4 S (MCPA)	0.25 to 0.5 pt (0.12 to 0.25 lb ai/A)	P	Use amine or sodium salt formulations only. Legumes may be injured. Use only to control heavy stands of broadleaf weeds as a rescue treatment.
Moxy 2 E (bromoxynil)	1 to 1.5 pt (0.25 to 0.38 lb ai/A)	F	Annual broadleaf weed control for alfalfa underseeded to oats, wheat, barley, rye, or triticale. Preferred choice of companion seeded options.

Table L3. Summary of herbicides for use in Forage Legumes

Application Type			
Herbicide / Formulation	Rate Range	Crop Tolerance	Remarks
<u>Established Forage Legumes</u>			
<u>Fall</u>			
Kerb 50 W (pronamide)	1 to 4 lbs (0.5 to 2 lb ai/A)	G	Fall apply to alfalfa, clovers, birdsfoot trefoil, or crownvetch when soil temperatures are less than 55 degrees F, but before freeze up. May injure alfalfa
<u>Dormant</u>			
Gramoxone Inteon 2 S	2 to 3 pts	P	Apply postemergence to weeds in dormant alfalfa in the spring or fall to control annual grass and broadleaf seedlings. Specific use limitations. May injure alfalfa.
Gramoxone Max 3 S (paraquat)	1.3 to 2 pts (0.5 to 0.75 lb ai/A)		
MCPA Amine 4 S (MCPA)	0.5 to 1 pt (0.25 to 0.5 lb ai/A)	P	Apply to dormant alfalfa or red clover only in the late fall. May cause severe injury. Use only for a rescue treatment.
Sencor 75 DF (metribuzin)	0.5 to 1.33 lbs (0.38 to 1 lb ai/A)	F	Apply to dormant alfalfa in late fall or early spring. Residual control of weed seedlings. Suppression of dandelions. May injure alfalfa.
Sinbar 80 WP (terbacil)	0.5 to 1.5 lbs (0.4 to 1.2 lb ai/A)	F	Apply to dormant alfalfa only in late fall or early spring. May injure alfalfa.
Velpar 2 L	1 to 3 qts	F	Apply only to alfalfa. Apply in early spring while alfalfa is dormant. May injure alfalfa. Residual control of weed seedlings. Suppression of dandelion.
Velpar 75 DF (hexazinone)	0.6 to 2 lbs (0.5 to 1.5 lb ai/A)		
Velpar AlfaMax MP 79.7 DG (hexazinone & diuron)	0.71 to 4.3 lbs (3.3 to 20 A/unit Pack) (0.56 to 3.4 lb ai/A)	F	Make a single application after Alfalfa becomes dormant and before new growth begins in the spring. Use a surfactant if weeds have emerged. Do not apply to seedling alfalfa or alfalfa/grass mixtures. Velpar use alone may be a better product fit for Minnesota if dandelion is the target weed.
<u>Chemigation</u>			
Eptam 7 E (EPTC)	2.25 to 3.5 pts (2 to 3 lb ai/A)	F	Chemigation application to established alfalfa for annual grass control. May also be used on Ladino clover.
Treflan 4 E (trifluralin)	2 qts (2 lb ai/A)	F	Chemigation applications to established alfalfa for annual grass control.
trifluralin 4 E (trifluralin)	2 qts (2 lb ai/A)	F	Chemigation applications to established alfalfa for annual grass control.
Trust 4 E (trifluralin)	2 qts (2 lb ai/A)	F	Chemigation applications to established alfalfa for annual grass control.
<u>Postemergence</u>			
Arrow 2 EC (clethodim)	6 to 16 oz (0.094 to 0.25 lb ai/A)	G	Grass control in alfalfa, birdsfoot trefoil, and sanfoin. Always add 1% v/v crop oil concentrate. Use higher rates for perennial grass suppression.

Table L3. Summary of herbicides for use in Forage Legumes

<u>Application Type</u>			
Herbicide / Formulation	Rate Range	Crop Tolerance	Remarks
<u>Established Forage Legumes</u>			
<u>Postemergence</u>			
Butoxone 175 1.75 L	4.3 to 6.5 pts	F/G	Apply to 1-3 inch broadleaf weeds in alfalfa. May temporarily injure established alfalfa.
Butoxone 200 2 L	4 to 6 pts		
Butoxone 7500 75 DF (2,4-DB)	1.3 to 2 lbs (1 to 1.5 lb ai/A)		
Butyrac 200 2 S (2,4-DB)	2 to 6 pts (0.5 to 1.5 lb ai/A)	F/G	Apply to 1-3 inch broadleaf weeds in alfalfa. May temporarily injure established alfalfa.
glyphosate, others (glyphosate)	varies by product (0.75 lb ai/A)	P	Non Roundup Ready varieties. Apply preharvest to alfalfa. Will cause crop destruction. Controls most annual and perennial weeds.
Poast 1.5 E (sethoxydim)	0.5 to 2.5 pts (0.09 to 0.47 lb ai/A)	G	Apply to alfalfa for annual grass control and perennial grass suppression. Will not control broadleaves. Excellent alfalfa tolerance.
Poast Plus 1 E (sethoxydim)	12 to 60 oz (0.09 to .47 lb ai/A)	G	Apply to alfalfa for annual grass control and perennial grass suppression. Will not control broadleaves. Excellent alfalfa tolerance.
Prism 0.94 E (clethodim)	13 to 34 oz (0.094 to 0.25 lb ai/A)	G	Grass control in alfalfa, birdsfoot trefoil, and sanfoin. Always add 1% v/v crop oil concentrate. High rates are for perennial grass suppression.
Pursuit 2 S	3 to 6 oz	G	Controls most annual grass and broadleaf weeds in established alfalfa. Will suppress perennial grass and broadleaf weeds.
Pursuit 70 DG	1.08 to 2.16 oz		
Pursuit W 2 S	3 to 6 oz		
Pursuit W 70 DG (imazethapyr)	1.08 to 2.16 oz (0.047 to 0.094 lb ai/A)		
Raptor 1 S (imazamox)	4 to 6 oz (0.032 to 0.047 lb ai/A)	G	Controls most annual grass and broadleaf weeds and suppress some perennial weeds in alfalfa.
Section 2 EC (clethodim)	6 to 16 fl oz (0.094 to 0.25 lb ai/A)	G	Grass control in alfalfa, birdsfoot trefoil, and sanfoin. Always add 1% v/v crop oil concentrate. Use higher rates for perennial grass suppression.
Select 2 EC (clethodim)	6 to 16 oz (0.094 to 0.25 lb ai/A)	G	Grass control in alfalfa, birdsfoot trefoil, and sanfoin. Always add 1% v/v crop oil concentrate. Use higher rates for perennial grass suppression.
<u>Post Harvest</u>			
Gramoxone Inteon 2 S	1 pt	P	Apply to alfalfa after harvest and prior to regrowth to control annual grass and broadleaf seedlings.
Gramoxone Max 3 S (paraquat)	0.7 pt (0.25 lb ai/A)		

Table L3. Summary of herbicides for use in Forage Legumes

<u>Application Type</u>		Crop	
Herbicide / Formulation	Rate Range	Tolerance	Remarks
<u>Established Forage Legumes</u>			
<u>Post Harvest</u>			
Velpar 2 L	1 to 3 qts	F	Apply to alfalfa only. Apply after cutting and before regrowth, often impregnated on fertilizer. May injur alfalfa.
Velpar 75 DF (hexazinone)	0.6 to 2 lbs (0.5 to 1.5 lb ai/A)		
Velpar AlfaMax MP 79.7 DG (hexazinone & diuron)	0.71 to 4.3 lbs (3.3 to 20 A/unit Pack) (lb ai/A)	F	Apply to alfalfa only. Apply after cutting and before regrowth. May injur alfalfa. Velpar use alone may be a better product fit for Minnesota if dandelion is the target weed.
<u>Roundup Ready Alfalfa</u>			
<u>Postemergence</u>			
Roundup Original MAX 4.5 S (glyphosate)	16 to 44 fl oz (0.56 to 1.5 lb ai/A)	G	Provides excellent broadspectrum control of annual weeds and perennial weed seedlings. Will supress many established perennial weeds and repeat applications will control most perennial weeds. Excellent on perennial grass control.
Roundup UltraMax II 4.5 S (glyphosate)	16 to 44 fl oz (0.56 to 1.5 lb ai/A)	G	Provides excellent broadspectrum control of annual weeds and perennial weed seedlings. Will supress many established perennial weeds and repeat applications will control most perennial weeds. Excellent on perennial grass control.
Roundup WeatherMAX 4.5 S (glyphosate)	16 to 44 fl oz (0.56 to 1.5 lb ai/A)	G	Provides excellent broadspectrum control of annual weeds and perennial weed seedlings. Will supress many established perennial weeds and repeat applications will control most perennial weeds. Excellent on perennial grass control.

Table L4. Effectiveness of herbicides on major weeds in establishing Forage Legumes

Herbicides	Grasses						Annual Broadleaves										Perennials
	Giant and robust Foxtail	Green Foxtail	Interseeded Oat	Large Crabgrass	Wild Oats	Yellow Foxtail	Alyssum, Hoary (seedlings)	Common Cocklebur	Common Lambsquarters	Common Ragweed	Kochia	Night-flowering Catchfly	Pigweed spp.	Smartweed spp.	Velvetleaf	Wild Mustard	Quackgrass
Direct Seeded Forage Legumes																	
Burndown																	
Gramoxone (paraquat)	G	G	F/G	G	G	G	G	G	G	G	G	G	G	G	G	G	P/F
Postemergence																	
Arrow (clethodim)	G	G	G	G	G	G	N	N	N	N	N	N	N	N	N	N	P/F
Buctril (bromoxynil)	N	N	N	N	N	N	F	G	G	G	F/G	F/G	F/G	G	G	F/G	N
Butoxone (2,4-DB)	N	N	N	N	N	N	F/G	G	G	G	F	P	G	P	G	F	N
Butyrac (2,4-DB)	N	N	N	N	N	N	F/G	G	G	G	F	P	G	P	G	F	N
Kerb (pronamide)	P	F	-	P	F	F	-	-	P	P	F	-	P	P	N	P	F
Moxy (bromoxynil)	N	N	N	N	N	N	F	G	G	G	F/G	F/G	F/G	G	G	F/G	N
Poast (sethoxydim)	G	G	G	G	G	G	N	N	N	N	N	N	N	N	N	N	P/F
Poast Plus (sethoxydim)	G	G	G	G	G	G	N	N	N	N	N	N	N	N	N	N	P/F
Prism (clethodim)	G	G	G	G	G	G	N	N	N	N	N	N	N	N	N	N	P/F
Pursuit (imazethapyr)	G	G	F/G	F	F	G	F/G	G	F	F	G	-	G	G	G	G	P/F
Raptor (imazamox)	G	G	F/G	F	F/G	G	F/G	G	F/G	F	G	-	G	G	G	G	P/F
Section (clethodim)	G	G	G	G	G	G	N	N	N	N	N	N	N	N	N	N	P/F
Select (clethodim)	G	G	G	G	G	G	N	N	N	N	N	N	N	N	N	N	P/F
Preplant Incorporated																	
Balan (benefin)	G	G	G	G	P	G	N	N	F/G	N	G	G	G	P	P	N	N
Eptam (EPTC)	G	G	G	G	F	G	G	P	F	P	F	F/G	F/G	P	F/G	P/F	P
Pendant (pendimethalin)	G	G	G	G	P	G	N	N	G	N	G	-	G	P	P	N	N
Pendimax (pendimethalin)	G	G	G	G	P	G	N	N	G	N	G	-	G	P	P	N	N
Prowl (pendimethalin)	G	G	G	G	P	G	N	N	G	N	G	-	G	P	P	N	N
Prowl H20 (pendimethalin)	G	G	G	G	P	G	N	N	G	N	G	-	G	P	P	N	N
Treflan (trifluralin)	G	G	G	G	P	G	N	N	F/G	N	G	-	G	P	P	N	N
trifluralin, others (trifluralin)	G	G	G	G	P	G	N	N	F/G	N	G	-	G	P	P	N	N
Trust (trifluralin)	G	G	G	G	P	G	N	N	F/G	N	G	-	G	P	P	N	N
Companion Seeded Forage Legumes																	
Postemergence																	
2,4-D, others (2,4-D)	N	N	N	N	N	N	G	G	G	G	G	G	P	G	G	N	N
Buctril (bromoxynil)	N	N	N	N	N	N	F	G	G	G	F/G	F/G	F/G	G	G	F/G	N
MCPA, others (MCPA)	N	N	N	N	N	N	-	G	G	G	F	G	G	P	G	G	N
Moxy (bromoxynil)	N	N	N	N	N	N	F	G	G	G	F/G	F/G	F/G	G	G	F/G	N

NOTE: G = Good; F= Fair; P = Poor; N = No control. Effectiveness ratings apply if herbicide is used according to label recommendations as to rate, time of application, etc., and favorable temperature and moisture conditions prevail.

Table L4. Effectiveness of herbicides on major weeds in establishing Forage Legumes

Herbicides	Grasses					Annual Broadleaves							Perennials				
	Giant and robust Foxtail	Green Foxtail	Interseeded Oat	Large Crabgrass	Wild Oats	Yellow Foxtail	Alyssum, Hoary (seedlings)	Common Cocklebur	Common Lambsquarters	Common Ragweed	Kochia	Night-flowering Catchfly	Pigweed spp.	Smartweed spp.	Velvetleaf	Wild Mustard	Quackgrass
Roundup Ready Alfalfa																	
Postemergence																	
Roundup Original MAX (glyphosate)	G	G	G	G	G	G	G	G	F/G	G	G	G	F/G	G	F/G	G	G
Roundup UltraMAX II (glyphosate)	G	G	G	G	G	G	G	G	F/G	G	G	G	F/G	G	F/G	G	G
Roundup WeatherMAX (glyphosate)	G	G	G	G	G	G	G	G	F/G	G	G	G	F/G	G	F/G	G	G

NOTE: G = Good; F= Fair; P = Poor; N = No control. Effectiveness ratings apply if herbicide is used according to label recommendations as to rate, time of application, etc., and favorable temperature and moisture conditions prevail.

Table L5. Effectiveness of herbicides on major weeds in established Forage Legumes

Herbicides	Annual							Biennial		Perennials												
	Field Pennycress	Foxtail spp.	Hempnettle	Night-flowering Catchfly	Shepherdspurse	Smooth Hawkbeard	Virginia Pepperweed	Bull Thistle	Spotted Knapweed	Canada Thistle	Common Dandelion	Curly Dock	Hemp Dogbane	Hoary Alyssum	Orange Hawkweed	Oxeye Daisy	Perennial Sowthistle	Quackgrass	Tansy	White Cockle	Wirestem Mulhy	Yellow Rocket
Established Forage Legumes																						
Fall																						
Kerb (pronamide)	P	G	N	-	P	-	P	P	P	N	N	N	N	N	N	N	N	F	N	N	F	N
Dormant																						
MCPA, others (MCPA)	G	N	N	G	G	P	G	F	P	P	F	P	P	F	P	P	P	N	N	P	N	F
Sencor (metribuzin)	G	F	N	G	G	F	G	F	F	P	F	F	P	F/G	P	P	N	P	N	F	P	F
Sinbar (terbacil)	G	F	N	G	G	G	G	F	F	P	F/G	P	P	G	P	P	N	F/G	N	P	P	F
Velpar (hexazinone)	G	F/G	N	G	G	G	G	N	N	N	F/G	F	N	G	N	N	N	F/G	N	F	F	G
Chemigation																						
Eptam (EPTC)	P/F	G	N	F/G	P/F	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Treflan (trifluralin)	N	G	N	P/F	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
trifluralin, others (trifluralin)	N	G	N	P/F	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Trust (trifluralin)	N	G	N	P/F	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Postemergence																						
Arrow (clethodim)	N	G	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	F	N	N	F	N
Butoxone (2,4-DB)	F/G	N	N	P	F/G	P	F/G	F	F	P	P	P	N	F	N	N	P	N	N	P	N	P
Butyrac (2,4-DB)	F/G	N	N	P	F/G	P	F/G	F	F	P	P	P	N	F	N	N	P	N	N	P	N	P
glyphosate, others (glyphosate)	G	G	G	G	G	G	G	G	G	F	F	F	F	G	F	F	F	G	F	F	F/G	F
Poast (sethoxydim)	N	G	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	F	N	N	F	N
Poast Plus (sethoxydim)	N	G	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	F	N	N	F	N
Prism (clethodim)	N	G	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	F	N	N	F	N
Pursuit (imazethapyr)	G	G	-	-	G	-	G	G	G	P	P	P	-	G	-	-	-	F	-	P	P	P
Raptor (imazamox)	G	G	-	-	G	-	G	G	G	P	P	P	-	G	-	-	P	F	-	P	P	P
Section (clethodim)	N	G	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	F	N	N	F	N
Select (clethodim)	N	G	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	F	N	N	F	N
Post Harvest																						
Gramoxone (paraquat)	F/G	F/G	P	F/G	F/G	P	F/G	P	P	P	F	P	P	P	P	P	P	P	P	P	P	P
Roundup Ready Alfalfa																						
Postemergence																						
Roundup Original MAX (glyphosate)	G	G	G	G	G	G	G	G	G	F	F	F	F	G	F	F	F	G	F	F	F/G	F
Roundup UltraMAX II (glyphosate)	G	G	G	G	G	G	G	G	G	F	F	F	F	G	F	F	F	G	F	F	F/G	F
Roundup WeatherMAX (glyphosate)	G	G	G	G	G	G	G	G	G	F	F	F	F	G	F	F	F	G	F	F	F/G	F

NOTE: G = Good; F= Fair; P = Poor; N = No control. Effectiveness ratings apply if herbicide is used according to label recommendations as to rate, time of application, etc., and favorable temperature and moisture conditions prevail.