

Eradication Manual For Common Crupina (*Crupina vulgaris* Cass.)

D. L. Zamora, D. C. Thill and R. E. Eplee



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Published and distributed by the
Idaho Agricultural Experiment Station
 Gary A. Lee, Director
 University of Idaho College of Agriculture
 Moscow, Idaho 83843

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Eradication Manual for Common Crupina (*Crupina vulgaris* Cass.)

D. L. Zamora, D. C. Thill and R. E. Eplee

This manual is written to help weed management personnel eradicate common crupina. Procedures and recommendations are based on best current information. Situations may be encountered that are not covered in this manual. In these cases, consult with your state Extension weed specialist or other weed control authority.

General Information

Distribution, Habitats and Life History

Common crupina was first reported in North America in 1969 near Grangeville, Idaho. It has since been found in California, Oregon, Washington and British Columbia. Common crupina is native to the Mediterranean Region of Europe. Common crupina is a potential pest in the South Atlantic states, parts of the Midwest, the Intermountain Region and the Pacific Coast states. Most infestations occur on rangeland in relatively deep canyons with steep, southerly slopes. Common crupina has less nutritional value than downy brome (*Bromus tectorum* L.) and is palatable to livestock only through the rosette stage of development.

Common crupina is a winter annual species that reproduces by achene (seed). The plants overwinter as seedlings or compact rosettes. Most seeds germinate in the fall of the year they are produced; some, however, germinate in late spring. Seed longevity in the soil is about 32 months (Thill et al. 1985; Zamora and Thill 1989). For further biological information on common crupina, see University of Idaho CIS 542 (Thill et al. 1987). For more information on eradication plans for plant invasion, refer to Zamora et al. (1989).

Definitions

Infestation: The presence of a common crupina plant or seed.

Area Infested: All land in the same unit of rangeland where the organism is found and any additional land which may be incorporated within the boundaries of that rangeland unit.

Rangeland Unit: All rangeland within the boundaries of a fence or other border which makes a grazing unit. A property may have one or more rangeland units.

Category A Rangeland Unit: Rangeland units supporting an active infestation of common crupina on which seed production is still occurring.

Category B Rangeland Unit: Rangeland units that are not producing seed through the application of eradication measures, but which have not been eradicated.

Category C Rangeland Unit: Infested rangeland units with utilization that prevents reproduction of common crupina and does not allow for control applications.

Category R Rangeland Unit: Common crupina has been declared eradicated on these units subject to a continuing survey.

Appraisal Survey: A survey of an infestation that is conducted to determine the adequacy of or need for treatment.

Delimiting Survey: A survey conducted to determine the borders of known infestations.

Detection Survey: A survey conducted in previously uninfested areas to find infestations.

Spot Survey: A visual survey of the historical area of infestation within a rangeland unit.

Suppression Area: The area infested with common crupina in which control treatments are applied to reduce reproduction.

Eradication Area: The area infested with common crupina in which treatments are applied to eradicate common crupina.

Quarantine: The regulation of the production, movement or existence of plants, plant products, animals, animal products or any other article or material, or the normal activity of persons to prevent or limit introduction or spread of a pest.

Survey Procedures

Survey Guidelines

Methods — Common crupina infestations are examined physically when walking, flying or driving. Flying and driving are time efficient and are suited to detection and delimiting surveys conducted in June when common crupina plants are highly visible. Walking surveys are used to detect, delimit and appraise small, isolated infestations. Brush thickets, forests, rock crevices and residential areas may support small infestations consisting of only a few common crupina plants. Surveyors must be careful when walking or using off-road vehicles to prevent spreading seed.

Tactics — Surveys usually are conducted progressively outward from known foci of the infestation and along distribution routes for livestock, agricultural products and timber. The search area for detection surveys can be narrowed by surveying common crupina's normal habitat (open, south-facing slopes) and plant associations (Table 1). Delimiting surveys can be more thorough.

To delimit a new infestation, expand the search area around the initial siting and resurvey the area traveled just before finding a new infestation. The search area should be expanded to a geographical border or the limits of the habitat. Surveyors should be trained to use

multiple search images of common crupina. The plant's various polymorphs, distinctive characteristics such as colors or silhouettes, habitat(s) and plant associations are multiple images. Polymorphs of common crupina are its distinctive cotyledons, bolting plants and flowering plants (see CIS No. 542). Silhouettes of common crupina plants are especially visible in the early morning or late evening. Many infestations are on game trails that cross open slopes and on trails in habitats that only marginally support common crupina.

Detection Survey

Detection surveys should be conducted to find infestations around the infested counties or other suspected areas. Rangeland units should be surveyed thoroughly enough to detect common crupina in all areas. The optimum time to conduct a detection survey is when common crupina plants are flowering.

Random selection of rangeland units can be made as follows:

1. On a county map gridded with section lines, mark and consecutively number all section corners with a rangeland unit within a ½-mile radius of the corner.
2. Select a minimum of 20 percent of the points marked per township (36 sections) on the map to be surveyed.
3. The survey crew will survey the rangeland unit nearest the selected point. The rangeland unit may be either fully or partially in the circle.

Delimiting Survey

Blocks bounded by natural or manmade boundaries will be marked off on maps to survey for each county in the suppressive and eradication areas. Surveys should be conducted on these blocks to detect the limits of known common crupina infestations. This should be accomplished by ground survey, but initial surveys by helicopter may be necessary for extensive areas of heavy infestation.

All noninfested rangeland units in each block should be surveyed once every 5 years. Additional surveys should be conducted in units where spread potential is the greatest. Units frequently used by livestock, wildlife or man or units that receive agricultural products from infested areas have a high potential of becoming infested.

Appraisal Survey

Appraisal surveys are conducted to monitor the status of common crupina on infested properties, to determine the effectiveness of eradication functions and to meet the criteria for release of rangeland. Spot treatments are applied when live plants are found after broadcast treatments.

Surveys may be conducted from early spring to late fall. Appraisal surveys conducted in the spring should not be started until the broadcast treatments have had

Table 1. Plant species frequently associated with common crupina in Idaho.

| Common Associations | |
|--------------------------|---|
| Bluebunch wheatgrass | <i>Agropyron spicatum</i> (Pursh) Scribn. and Smith |
| Idaho fescue | <i>Festuca idahoensis</i> Elmer |
| Big bluegrass | <i>Poa ampla</i> Merr. |
| Arrowleaf balsamroot | <i>Balsamorhiza sagittata</i> (Pursh) Nutt. |
| Lupine | <i>Lupinus</i> sp. |
| Downy brome | <i>Bromus tectorum</i> L. |
| Less Common Associations | |
| Rattlesnake brome | <i>Bromus brizaeformis</i> Fisch. and Mey |
| Common snowberry | <i>Symphoricarpos albus</i> (L.) Blake |
| Mallow ninebark | <i>Physocarpus malvaceus</i> (Greene) Kuntze |
| Creambush oceanspray | <i>Holodiscus discolor</i> (Pursh) Maxim. |
| Poison ivy | <i>Rhus radicans</i> L. |
| Smooth sumac | <i>Rhus glabra</i> L. |
| Ponderosa pine | <i>Pinus ponderosa</i> Dougl. ex Loud. |

sufficient time to act. Spring surveys should be completed before flowering so that spot treatments made during the survey will stop seed production. Treatments made to flowering plants will usually not prevent seed production. If a rangeland unit is found with flowering plants, it should be reported on the appropriate form to plan future eradication operations.

Mail Survey

A mail survey should be used to supplement, but not replace, a detection survey. Informational brochures (e.g. University of Idaho CIS No. 542) and questionnaires should be distributed on or about April 1 and should coincide with arrangements made for public announcement. Follow-up visits or contacts should be made for all positive replies. Counties should be surveyed at least once every 3 years.

Mail surveys often are unreliable because misidentification is common, survey accuracy is unknown, property owners/users are difficult to locate and their responses are limited. However, learning of even one previously unknown infestation can justify a mail survey.

Soil Sampling

Soil sampling for seed is a useful method to monitor the decline of seed in the soil. It is not as effective as a detection survey because seed are not present at sufficient density to make a soil-sampling survey cost-effective. Seed in the soil are most abundant after dissemination (July) and before emergence (October), when senesced plants are still very visible.

Records

The Common Crupina Survey and Eradication Report form (Fig. 1) should be prepared immediately after finding a new infestation. The record is normally prepared by the surveyor. The record must be prepared promptly and correctly.

The date the infestation is found is written in the space marked "Mo., Day, Yr." The property number (Prop. #) is the number assigned to the property by the county involved. This number usually is available at the county tax assessor's office. The name and address of the property owner and the user (if different from the owner) are shown in the space provided.

"Infestation No." refers to isolated infestations within the property. Consider a small group of isolated infestations as a single large infestation because scattered plants may actually connect the small, isolated infestations. Infestations separated by less than 1/4 mile should be considered contiguous. The "Geographical Description" refers to the actual infested acreage. The description should be definite and complete so that another person can locate the property and infestation.

The "Total Acres Infested" block refers to the total acres of the individual infestations. The classification of an infestation into a rangeland unit category, A, B,

C or R, can be noted in the "Remarks" area of the "Record of Visits" section. Several years of information may be recorded on a single infested property record.

Eradication Strategy

Guidelines

The strategy to eradicate common crupina is to stop spread, prevent reproduction and deplete viable seeds from the soil. To accomplish this strategy, treatments must be located properly, prescribed, scheduled and appraised. Quarantining infested areas and revegetating treated infestations also may be necessary.

Treatment Location

Prioritizing infestations — Certain infestations must be treated before others to stop spread. The first priority is to eradicate satellite infestations since they cause the fastest spread. Satellite infestations are groups of plants on the periphery of the main infestation. The second priority is to eradicate the borders of large infestations, and the final priority is to control population growth in noneradication areas.

Infestations with first and second priority status are eradication areas and third priority infestations are suppression areas. Treatments are applied in eradication areas to stop seed production and decrease the size of the infested area. Treatments are applied in suppression areas to minimize seed production. Small infestations located more than 1/4 mile from other infestations should be considered separate infestations. Infestations separated by less than 1/4 mile should be considered contiguous.

Area to treat on large infestations — Eradication treatments applied on large areas must stop spread and decrease the size of the initial infested area. The minimum area that must be treated to stop spread is the unin-fested buffer zone on the periphery of the infestation that is large enough to encompass the area seed could disperse to. To decrease the initial infested area, treatments must extend into the infestation the maximum distance to which most seed could disperse.

Most seed is dispersed within 300 feet of the mother plant, but the distance can vary from 5 to 300 feet. Wind probably disperses 95 percent of seed within 5 feet of the mother plant. Rodents cache seeds up to 50 feet beyond infestation borders. Single, isolated plants that probably originated from seed spread by deer or cattle have been found up to 300 feet from infestation borders. These single, isolated plants often are found in habitats such as dense forests or brush that support only limited growth and reproduction.

Application Methods and Prescribed Treatments

Application methods — Herbicide treatments usually are applied by helicopter, handgun or bottle sprayers at delivery rates of 5, 50 and 5 gallons per acre,

Initial Identifier :

Descriptions:

B. Treatment: 1. Tordon 22K 2. Banvel 3. Other _____ 4. Cultural _____

D. Growth Stage: 1. Seedling 2. Rosette 3. Bolting 4. Flowering 5. Mature plant

E. Density: 1. Single to scattered 2. Small patch (less than 1 acre) 3. Large patch (Estimate size in acres _____)

F. Degree of Control: 1. Poor 2. Incomplete 3. Complete

G. Applicator: 1. _____ 2. _____ 3. _____ (specify)

[illegible][illegible]

6

respectively. Application by helicopter is least expensive and least time consuming. Spray coverage is good on open slopes, but coverage often is inadequate in ravines, brush and forested areas.

Uniform spray coverage is essential for highest treatment efficacy. Agricultural dye markers and water-sensitive indicator cards can be used to evaluate coverage of aerial- and ground-applied herbicides. Water soluble dyes are most useful with picloram and dicamba applied at high delivery rates of spray solution. Careful selection of the dye and herbicide is necessary to avoid incompatible combinations (Zamora and Thill 1988). Water-sensitive cards are best used to determine presence or absence of spray.

Bottle sprayers holding 2 quarts of spray solution are useful for small, isolated infestations. Because uniform coverage is harder to obtain with bottle sprayers, higher herbicide rates are recommended for bottle spraying than for handgun and aerial application. The first application must be effective because spraying these remote areas is difficult and time consuming.

Handgun delivery is thorough and quick compared to application with a bottle sprayer. A high delivery volume allows spray to penetrate dense vegetation such as grass and brush where common crupina seedlings may be hidden. In Idaho, a three-person crew is the minimum number that can effectively use a 200-gallon tank mounted on a pickup and equipped with 1,200 feet of spray hose.

Field crews of three to four people are the optimum size for common crupina infestations in Idaho. A field crew of this size can do an initial survey and make ground herbicide applications twice in a season on about 200 infested acres. The infested acres may be scattered over 2,000 to 3,000 acres and may include areas accessible only by walking. Infestations in brush or terrain not suitable for effective aerial application, or in terrain inaccessible to a truck-mounted handgun sprayer, require more time to survey and treat.

Herbicide treatments — The herbicides currently both registered for and effective in controlling common crupina are picloram, dicamba and 2,4-D amine. Product labels should be consulted for authorized usage and safety precautions.

Recent studies show that picloram applied in the fall and spring at 0.25 pound active ingredient per acre (ai/acre) or in the spring at 0.5 pound ai/acre, is the only herbicide that will effectively eliminate common crupina for 1 year or more. Dicamba applied at 0.5 to 0.75 pound ai/acre in the spring when air temperatures are above 70°F has, in most cases, effectively controlled common crupina for one growing season. All other herbicides tested control less than 100 percent of common crupina. Herbicides for sensitive areas (such as around towns, farmsteads, waterways and croplands) include dicamba and 2,4-D. Sensitive areas should be identified early so that timely plans for control can be made.

Picloram (0.25 pound ai/acre): This treatment works best applied in the fall or early spring when plants are in the seedling, rosette or early bolting stages. Aerial application should be made when brush is without leaves. Otherwise a handgun application is preferable. This treatment controls common crupina even when applied during light rainfall (< 0.05 inch/day).

Picloram (0.5 pound ai/acre): This is the best treatment for situations where only one application can be made per year. This picloram rate controls the most common crupina for the longest time (2 years) compared to all other treatments. This rate is not recommended for common use because of potential injury to perennial vegetation. Light rain does not hinder effectiveness.

Picloram + 2,4-D amine [0.25 (or 0.5) + 1.0 pound ai/acre]: Picloram plus 2,4-D effectively controls bolting plants and decreases viable seed production in flowering plants. Picloram alone often only retards growth, still permitting seed production to occur. The higher rate of picloram is used when the treatment is applied with bottle sprayers. Some shrubs and perennial herbs will be affected by this treatment. Precipitation within 6 hours after application decreases control.

Dicamba (0.5 or 0.75 pound ai/acre): Dicamba is applied by air or handgun, or by bottle sprayer to sensitive areas. Warm, dry weather during and after application is needed for good control, especially at the lower application rate. Since these weather conditions are infrequent during early spring, delaying treatment with dicamba until May and using the higher rate will usually increase control. Delaying treatment until May can cause more injury to nontarget vegetation.

Dicamba + 2,4-D [(0.5 + 1.0) or (0.75 + 1.9) pound ai/acre]: Dicamba plus 2,4-D is a good treatment for sensitive areas with bolting or flowering plants. The low rate is effective on small bolting plants if warm, dry weather follows the application, and is less injurious to perennial herbs and shrubs. The high rate quickly stops seed production on flowering plants, but will injure perennial herbs and shrubs.

Cultural control — Hand pulling or hoeing is the least desirable eradication treatment. Many visits to the infested site are necessary to find all common crupina plants and eradicate them by hand pulling or hoeing.

Treatment Schedule

General guidelines — Initial and follow-up treatments must be scheduled to stop reproduction and deplete viable seeds in the soil. Initial treatments eliminate the majority of common crupina plants, and follow-up treatments eradicate escaped plants and plants that originate from seed in the soil. The size of the infestation partially determines the treatment schedule. Small infestations may only require a single broadcast treatment with spot applications for follow-up treatments. At least

caped plants is difficult, even on small infestations. Large infestations may require broadcast applications to the entire infestation for 2 or 3 years to decrease escaped plants and seed in the soil enough that fewer surveys will suffice to find escaped common crupina.

Treatments should be applied to common crupina seedlings because the seedlings are most susceptible to herbicides. Only picloram provides acceptable control when applied in the fall to common crupina seedlings. After broadcast treatments are applied in the spring, appraisal surveys should be conducted to determine if spot treatments are necessary. It is important to make broadcast treatments early enough in the spring to allow sufficient time for appraisal surveys so that escaped plants can be found before seeds are produced.

Appraisal surveys — Appraisal surveys are needed to find escaped plants and to evaluate progress in eradicating common crupina. Appraisal surveys should be conducted after broadcast treatments are made in the spring. The entire eradication area should be surveyed and escaped plants treated as needed. Subsequent herbicide applications should be based on treatment evaluations made during appraisal surveys. Appraisal surveys should extend the distance from an infestation's periphery that escaped plants may have dispersed. Escaped plants are isolated and difficult to find, so appraisal surveys often are conducted several times per year.

If plants found cannot be controlled with herbicides they should be removed from the field in plastic bags and fumigated or burned. Seed produced by escaped plants should be tested for viability at a seed testing laboratory. When conducting appraisal surveys, field personnel should carry suitable hand sprayers or other herbicide applicators for spot treatment as necessary to preclude the necessity for large scale treatments.

Spray schedule — The time periods in a spray schedule apply to infestations in which seed production was stopped permanently the spring after seed were last produced. If seed production was permanently stopped, no viable seed should remain in the soil after 3 years. The following schedule should be followed for the treatment of common crupina throughout the eradication period:

1. **First treatment:** Treat with 0.25 pound ai/acre of picloram in the fall or spring or 0.5 pound ai/acre dicamba in the spring. Treat in the fall after common crupina emerges. This will generally be during the first part of October. Spring treatments must be applied before plants bolt, usually in April.
2. **Second treatment:** Repeat of first treatment. If the first treatment is completed in the fall, apply the second treatment the following spring. If first treatment is completed in the spring, follow with the second treatment in the same season if necessary. A second treatment is warranted if there are too many escaped plants to control with spot treatments.

Follow the spring treatment(s) with one or two appraisal surveys.

3. **Second year:** For large infestations, the first and second treatment should be repeated. For smaller infestations, two complete appraisal surveys in the spring with treatment are needed.
4. **Third year:** Repeat first and second treatment if needed for large infestations. Otherwise conduct two appraisal surveys of the entire area and spot treat as needed.
5. **Fourth year:** Two appraisal surveys in the spring.
6. **Fifth year:** One appraisal survey in the spring.
7. **Sixth year:** One appraisal survey in the spring.

Revegetation

Revegetation is recommended for eradication areas to prevent reinvasion by common crupina and other undesirable plants. Some grass species recommended for revegetation are intermediate wheatgrass [*Agropyron intermedium* (Host) Beauv.], bluebunch wheatgrass [*Agropyron spicatum* (Pursh) Scribn. and Smith], crested wheatgrass [*Agropyron cristatum* (L.) Gaertn.], siberian wheatgrass [*Agropyron sibiricum* (Wild) Beauv.], and big bluegrass (*Poa ampla* Merr.) (Ensign and Harris 1975; Roche 1983). The most suitable legume or grass for revegetation depends on eradication treatment, land use and environmental factors.

Quarantine

Items that may require quarantine:

1. Hay or bedding.
2. Nursery stock, bulbs, corms, rhizomes, tubers and transplants.
3. Forest products such as stumpwood, pulpwood, etc.
4. Boxes, crates, machinery, tools.
5. Soil samples, potting soil, gravel, transplant beds.
6. Common crupina herbarium specimens.
7. Livestock and livestock sale yards.
8. Hunters in possession of game animals.
9. Agricultural crops.

Factors to consider:

1. Is the property known to be infested?
2. Is the property located adjacent to or within ¼ mile of an infestation?
3. Does the site include any barriers, such as woods or residential areas, that would help prevent natural spread of common crupina?
4. Is the site part of a property or ranch that has a common crupina infestation?
5. Is it likely that the site has been cultivated or will be cultivated with equipment from an infested area?
6. Is the site located within an eradication area, or suppression area? What is the present overall common crupina population in the area?

Regulatory action

1. Initiate an agreement with the owner stipulating the precautionary measures that must be taken to prevent spread of common crupina because of activities on the property and to protect the property against contamination from outside sources.
2. Make periodic visits to discuss with the owner any change in the status of the site and to determine that stipulations of the agreement are being adhered to. The owner also should be advised of any change in the status of common crupina infestations near the property and how common crupina infestations changes or program changes could affect the owner.
3. Where possible, treat regulated articles (see items listed in Quarantine section) with methylbromide or ethylene oxide to kill common crupina plants and seed. Product labels should be consulted for proper rates and safety precautions. If this treatment cannot be used, the regulated article must be inspected carefully for common crupina plants and seed.

Site Classification

Criteria for Changing Site Classification

Changes in category are based on survey results or alteration of rangeland unit conditions. When no plants or seed are found, rangeland unit points are applied in accordance with the activity that occurred on that rangeland unit for that season. The points that may accrue for each situation are described in Table 2.

Visual surveys to validate rangeland unit points will be conducted at a level sufficient to assure the surveyor that the unit is free of common crupina. This level is normally a complete survey. If no common crupina has been found for at least 3 years, however, spot surveys of only the formerly most densely populated areas may suffice. All visual surveys should be performed during the period when common crupina can be observed

Table 2. Rangeland unit point system.

| Activity code | Criteria | Point value |
|---------------|---|-------------|
| A | Broadcast fall application of picloram at 0.25 to 0.5 pound ai/acre | 1.00-1.50 |
| B | Broadcast spring application of picloram at 0.25 to 0.5 pound ai/acre | 0.75-1.25 |
| C | Broadcast spring application of dicamba at 0.5 to 0.75 pound ai/acre | 0.50-1.00 |
| D | Spot treatment in fall using picloram at 0.25 to 0.5 pound ai/acre | 0.75-1.00 |
| E | Spot treatment in spring using picloram at 0.25 to 0.5 pound ai/acre or dicamba at 0.5 to 0.75 pound ai/acre to all existing plants before seed set | 0.50-1.00 |
| F | Hand roguing or mechanical destruction in spring of all plants in a unit before seed set | 0.50-1.00 |
| G | No plants found during surveys in the spring after bolting but before seed production | 0.75-1.00 |

readily, especially a survey which will validate points for changing Category B to Category R.

Classification of rangeland units

1. **Category A:** Seed production is still occurring on these units. Apply herbicides before common crupina blooms. These units should be surveyed twice a year to assure that no plants will produce seed.
2. **Category B:** Seed production on these units has been stopped. These units have accrued 3 to 7 points. Category B units and adjacent properties should be surveyed when plants are most visible at least once annually for 2 consecutive years after the unit is placed in Category B.
3. **Category R:** Rangeland units that have accrued 7 field points. A full season during which no plants or seed are found is required before the unit is eligible for release. After release, a unit must have one complete survey and two spot surveys during the 3 years after release.
4. **Category C:** Infested rangeland unit, with seed production stopped due to utilization.

Rangeland unit point system — The rangeland unit point system allows judgment in assigning points. Normally, the highest point value should be assigned unless there is reason to give a lower rating. Justification for reducing the score should be based on weather and the level of confidence in the survey. Example: Rangeland that has a heavy cover of brush that decreases survey effectiveness may be rated lower than a rangeland unit with more open survey conditions. A record of activity codes and points accrued can be maintained in the "Remarks" section of the Survey and Eradication Report form.

A rangeland unit will change from one category to another under the following conditions:

1. **Category A to B:** Rangeland unit has accrued at least three points.
2. **Category B to A:** If common crupina is found during survey or if viable seeds are produced or found on the soil, the rangeland unit will lose all accumulated points and revert to zero (Category A). If small, isolated infestations are treated with approved fumigants or soil sterilants, the range unit may retain its accumulated points.
3. **Category A or B to Category C:** This change is justified when any change occurs in the use of the property that prevents reproduction of common crupina and does not allow for control applications. Examples of these changes are reforestation, or building structures, animal pens, etc. Any points accrued are retained on the record.

Guidelines for Releasing Sites From the Infested Status

Any rangeland or property that has accumulated a total of 7 points is considered eradicated and eligible

for release from infested status (Category R). Evaluate other situations on the basis of the natural attrition of seed over a period of time where observations assure that seed production has not occurred. No viable seed should remain in the soil after 3 years. After 4 years have elapsed, these situations should be referred to management for a decision.

Monitoring Criteria

For Released Sites (Category R)

During the first 5 years after rangeland has been released through accrual of points, monitor the area annually at a sufficient level to detect common crupina should it recur. Spot survey of the previously known infested area may be considered sufficient, except that at least two complete surveys are to be performed during the 5-year period, preferably in the spring at the time crupina would be blooming. Conduct one additional survey 7 years after common crupina has been declared eradicated from a rangeland unit.

Pesticide Residues — These recommendations for use are based on the information currently available for each pesticide listed. If followed carefully, residues should not exceed the established tolerances. To avoid excessive residues, follow label directions carefully with respect to rate, number of applications and minimum interval between applications and reentry or harvest.

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SERVING THE STATE

Teaching . . . Research . . . Service . . . this is the three-fold charge of the College of Agriculture at your state Land-Grant institution, the University of Idaho. To fulfill this charge, the College extends its faculty and resources to all parts of the state.

Service . . . The Cooperative Extension Service has offices in 42 of Idaho's 44 counties under the leadership of men and women specially trained to work with agriculture, home economics and youth. The educational programs of these College of Agriculture faculty members are supported cooperatively by county, state and federal funding.

Research . . . Agricultural Research scientists are located at the campus in Moscow, at Research and Extension Centers near Aberdeen, Caldwell, Parma, Tetonian and Twin Falls and at the U. S. Sheep Experiment Station, Dubois and the USDA/ARS Soil and Water Laboratory at Kimberly. Their work includes research on every major agricultural program in Idaho and on economic activities that apply to the state as a whole.

Teaching . . . Centers of College of Agriculture teaching are the University classrooms and laboratories where agriculture students can earn bachelor of science degrees in any of 20 major fields, or work for master's and Ph.D. degrees in their specialties. And beyond these are the variety of workshops and training sessions developed throughout the state for adults and youth by College of Agriculture faculty.