TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE
PLANT MATERIALS - 15 SPOKANE, WASHINGTON
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CONSERVATION RESERVE PROGRAM TECHNOLOGY

This Technical Note is subdivided into the following Sections:

SECTION 15.1 Planting Considerations

1. TILL FALLOW ONE YEAR THEN SOW-

- Competition from existing vegetation is removed
- Vegetative cover for rodents is destroyed
- Timing of fallow operations not as critical as spray operations
- Tillage can greatly reduce weed seed populations
- Moisture stored during fallow period
- Soil erosion can be severe
- Some tillage operations can greatly dry and loosen the soil
- Lose wildlife habitat during fallow period

Double-disk openers with or w/o depth bands can be used. Seeding should be postponed until after fall rains have settled the soil and fall germinating cheatgrass controlled. Relatively LOW risk.

Broadcast seeding will require doubling the seeding rate. Fall germinating cheatgrass must be controlled prior to seeding. Harrowing immediately before seeding is generally superior to harrowing after seeding. Relatively HIGH risk.

Hoe openers should be discouraged because inadequate control of seed depth placement. Relatively HIGH risk.

2. CHEMICAL FALLOW ONE YEAR THEN SOW-

- Competition from existing vegetation is removed
- Soil erosion hazard is reduced
- Dead vegetation can shelter seedlings from adverse conditions
- Dead vegetation can interfere with drill operation
- Rodent activity can be very high
- Dormant weed seeds in the soil may not adequately reduced
- Timing of spray applications critical.

Double-disk openers with or w/o depth bands can be used. Proper seed depth placement may be difficult. Relatively LOW to MODERATE risk.
Broadcast seeding will require doubling the seeding rate. Fall germinating cheatgrass must be controlled prior to seeding. Harrowing improves seed to soil contact but can result in more cheatgrass. Relatively HIGH risk.
Hoe openers should be discouraged because inadequate control of seed depth placement. Trash can accumulate on hoe openers. Relatively HIGH risk.

3. TILL & SOW, (NO FALLOW YEAR)-

- Relatively inexpensive tillage operations to destroy vegetation and prepare seedbed
- Saves time since a one year fallow period is not utilized
- Competition from existing vegetation is removed
- Vegetative cover for rodents is destroyed
- Weed seed reserves may not be adequately reduced
- Soil erosion can be a hazard
- Inadequate time for crowns of dead grasses to break down which can interfere with drill operations

Double-disk openers with or w/o depth bands can be used. Proper seed depth placement will be difficult. Relatively MODERATE risk.
Broadcast seeding will require doubling the seeding rate. Fall germinating cheatgrass must be controlled prior to seeding. Harrowing improves seed to soil contact but can result in more cheatgrass. Relatively HIGH risk.
Hoe openers should be discouraged because inadequate control of seed depth placement. Trash can accumulate on hoe openers. Relatively HIGH risk.

4. BURN, GLYPHOSATE & SOW-

- Vegetative cover for rodents is destroyed
- Burning reduces trash and improves drill operation
- Glyphosate removes competition from existing vegetation
- Erosion hazard is reduced
- Wildfire hazard
- Complete burning is difficult to achieve on sparsely vegetated sites
- Timing of glyphosate application critical for good control of existing vegetation
- Seeding operations will disturb soil and cause a flush of cheatgrass that will compete with grass seedlings

Double-disk openers with or w/o depth bands can be used. Proper seed depth placement may be difficult. Relatively MODERATE risk.
Broadcast seeding will require doubling the seeding rate. Harrowing will be necessary but will place some seed too deep. Relatively HIGH risk.
Hoe openers should be discouraged because inadequate control of seed depth placement. Relatively MODERATE to HIGH risk.

5. BURN & SOW-

- Requires little labor to destroy existing vegetation
- Vegetative cover for rodents is destroyed
- Erosion hazard is reduced
- Drill operation not impeded by trash
- Wildfire hazard
- Incomplete kill of existing vegetation that will compete with seedlings
- Crowns interfere with drill operation
- Weed seed reserves not depleted. Weeds emerging with CRP seedlings will complete for moisture.

Double-disk openers with or w/o depth bands can be used. Proper seed depth placement may be difficult. Relatively HIGH risk.
Broadcast seeding will require doubling the seeding rate. Harrowing will be necessary but will place some seed too deep. Relatively HIGH risk.
Hoe openers should be discouraged because inadequate control of seed depth placement. Relatively HIGH risk.

6. DRILL OR BROADCAST WITH NO FIELD PREPARATION-

- Erosion hazard is slight on existing stands of old CRP and standing crop residue
- Labor input is minimal
- Competition from existing vegetation will be severe
- Vegetative cover for rodents is maintained
- Trash will interfere with drill operation

Double-disk openers with or w/o depth bands can be used. Proper seed depth placement will be extremely difficult. Relatively HIGH risk.
Broadcast seeding will require doubling the seeding rate. Harrowing will be necessary but will place some seed too deep. Relatively HIGH risk.
Hoe openers should be discouraged because inadequate control of seed depth placement. Relatively HIGH risk.

SECTION 15.2 Weed Management for Cover Establishment and Maintenance on Conservation Reserve Program Acres

J. Yenish, M. Stannard, J. Nelson, and G. McKinney, 1998

INTRODUCTION

The Conservation Reserve Program (CRP) is an aggressive government program, initiated in 1985, which sets millions of highly erodible agricultural acres aside to improve air and water quality. The program has been extended and may include land previously not enrolled in the program or extend the contract on lands previously enrolled. To qualify for annual rental payments, producers contract with the United States Department of Agriculture to establish permanent vegetative cover on eligible land. Perennial grass species, such as the wheatgrasses, have been and continue to be the recommended cover for most of CRP acreage in Washington state.

Establishment of suitable vegetative cover is both difficult and frustrating without adequate weed management. Growers must develop and use weed management programs for the establishment of a vigorous, desired community of vegetative cover species. Once established, these covers will help prevent the establishment of perennial weeds and minimize annual weeds which can cause problems on CRP and adjacent lands.

Consequences of weed infestations on CRP acreage to the growers include:

- Costs associated with replanting infested lands
- Fines imposed by the USDA
- CRP contract cancellation
- Spread of weeds to surrounding lands
- Problems with neighbors who see CRP lands as a source of weeds on their land
- Increase in the soil weed seed bank which can cause problems when the land is returned to production
- Action by county or state Noxious Weed Control Board

The cost of uncontrolled weeds far exceeds the cost of sound management practices. Most importantly, it is simply good land stewardship to control weeds.

SHIFTS IN WEED PROBLEMS

Annual weed species and a few perennial species that thrive under cropping systems will hinder establishment of cover species. Under suitable conditions, the cover will establish, but weed problems will likely change as the management of the lands changes from annual cropping to undisturbed permanent vegetation. Three distinct periods of CRP management are recognized. Each of these periods is characterized as having different weed management challenges. These periods are the preplant (land preparation), cover establishment, and established (maintenance).

Preplant (Land Preparation)

Weeds must be controlled at or prior to planting of the CRP cover. The types of weeds present will depend upon previous weed infestations and cropping practices in the field. The weed species causing the greatest problem will also be different if the CRP cover is planted in the spring or fall. This is also an excellent time for the use of nonselect herbicides to most effectively control perennial weeds.

Cover Establishment (At and Immediately After Planting)

It takes two or more years to adequately establish a desired perennial cover on CRP lands. The cover species are most vulnerable to weed infestations during establishment because perennial characteristics and competitive ability have not been totally developed during this period. Special considerations must be addressed and weed management must be flexible during cover establishment.

Annual weeds that readily establish for soil seed banks and exhibit rapid growth are the greatest threat to cover establishment. These weeds can rapidly develop populations which crowd out seedling plants of the CRP cover and use resources intended for cover establishment. Also, allowing these annual weeds to produce seed creates a large reservoir of weed seed in the soil causing greater problems when subsequent attempts are made to establish covers or when lands are returned to annual cropping.

Established Period

Perennial weeds not adequately control prior to cover establishment can become severe problems on CRP lands after the establishment period. Many perennial weeds are noxious weeds and there are laws mandating their control. Landowners are responsible for control of noxious weeds and any fines levied due to noxious weed infestations.

On most CRP lands, annual weeds become less of a problem following cover establishment. Winter mustards tend to be prevalent the first year, Russian thistle populations typically peak in the second year, and downy brome replaces Russian thistle thereafter. Disturbance to established CRP stands such as wildfire commonly causes a shift back to mustards. Downy brome may infest CRP lands throughout the life of the

CRP stand. While less than optimal, stands of downy brome can prevent the establishment of more problematic annual weeds such as jointed goatgrass. Downy brome is characterized by a relatively short persistence in the soil weed seed bank. Management practices in the three or four years prior to CRP takeout can minimize downy brome in the soil seed bank and result in little to no downy brome in the first few years of annual cropping following takeout.

THE INTEGRATED APPROACH

Virtually all crop management practices affect the competitive ability of crops and weeds. Variety selection, crop seed quality, seedbed preparation, time of planting, crop planting depth, stand density, pesticide use and pest damage all can have a dramatic influence on both crop vigor and the vigor and species of weeds. A weed management program must take all these factors into account, integrating a plan which includes preventive, cultural, mechanical, biological, and chemical management tools. The sole use of any one of these tools, including herbicides, will not provide satisfactory weed control.

Properly integrated weed management will provide control of weeds throughout the year. Additionally, weeds will be controlled over several years by preventing weed seed production and the introduction of seed or other reproductive plant parts into the field.

WEED MANAGEMENT METHODS

PREVENTATIVE

Successful weed management programs prevent the introduction of new infestations by preventing the introduction of weed seed or other vegetative plant parts, such as roots or rhizomes, into uninfested lands. Some simple preventative measures, although not noticeable when effective, provide the most effective weed management in CRP lands at the lowest cost of any management practice.

- Use intensive management to reduce or eliminate weed infestations prior to CRP cover establishment.
- Use certified weed-free crop seed.
- Clean all tillage, seeding, or other equipment prior to moving it from field to field.
- Take steps to ensure that any hay or manure spread on fields is free of weed seed or vegetative parts from which infestations can arise.
- Restrict domestic animal movement through CRP fields. When moving animal, provide a “quarantine” period for plant parts in the digestive system or attached to the animal to remove themselves prior to trailing animals through CRP fields.

- Where possible, eliminate movement of seeds and other plant parts into fields by wind or water. If this is not possible, control weeds upstream or upwind from fields. This may require an agreement with other land managers in the area.

- Eliminate weeds from areas surrounding fields. Mowing or spraying ditches and fence rows while establishing weed suppressing perennial covers on these areas will prevent or reduce sources of weed infestations in fields.

CULTURAL CONTROL

Minor adjustments in cultural operations can dramatically affect weed infestations. Some effective cultural control methods include the following.

- Fallow to reduce weed populations before seeding CRP covers. Repeated tillage combined with herbicide applications can reduce soil weed seed reserves and weaken perennial weeds.

- Control weeds in the preceding crop. Weed "escapes" produce abundant seed, increasing the soil weed seed reserves.

- Evenly spread chaff and straw over the field while harvesting the preceding crop. Concentration of crop residue also concentrates weed and crop seed and increases weed or volunteer grain infestations. Crop residue can also interfere with the efficiency of tillage or no-till planting operations. Heavy surface residue also protects seedling weeds or volunteer grain, making control of them more difficult.

- Select seeding dates that give the best chance for good establishment.
  - <u>Fall dormant planting:</u> Dormant planting of covers involve seeding late enough in the fall so that germination doesn't occur until the early spring. This effectively allows for spring establishment earlier than can be done due to wet or cold conditions which delay planting in the spring. Early fall seedings of covers are prone to infestations by winter annual weeds, such as downy brome or jointed goatgrass. Winter annual weeds can be effectively controlled by late fall applications of herbicides just prior to seeding covers. With winter annual weeds controlled, covers may germinate and establish in relatively weed free conditions prior to germination and establishment of summer annual weeds. Fall dormant seeding is the recommended timing for most of eastern Washington.

  - <u>Spring planting:</u> Winter annual weeds can be controlled prior to seeding, but cover seedlings are more vulnerable to competition from summer annual weeds, such as Russian thistle or kochia, than earlier germinating seedlings. Many of these summer annual weeds are difficult to control and, if allowed to mature, can cause problems in future years in CRP or adjoining croplands. It is recommended to seed spring covers as early as possible. However, spring planting date is more dependent upon conditions. An early seed date may not be possible and the

competitive advantage of early germination and establishment of the cover may be lost.

- Plant into a firm seedbed and use an appropriate drill. Plant the cover at an appropriate depth and assure good soil/seed contact. Broadcast seeding should only be considered for very dry, loose soil where drill operation would be impossible to control depth and ensure good seed/soil contact.

- Use cultivars of species best adapted for your environmental conditions. Rapid germination is critical so every effort should be made to seed at the proper depth, proper seeding rate, and the seed must exhibit a high percentage of germiable seed. Use seed that meets Washington State Certified Seed standards and that has been recently tested.

- Use proper seed inoculants when appropriate and avoid fertilizing newly seeded fields with histories of annual weeds. Annual weeds respond much faster to fertilizer than perennial CRP covers.

MECHANICAL CONTROL

Mechanical control of weeds prior to or during establishment of CRP covers can be very effective without compromising soil conservation. Mechanical control measures need to be planned, timed, and executed to provide the greatest level of weed control with the lowest level of soil erosion.

- Fallow: Repeated tillage during fallow can minimize weed infestations in establishing CRP covers.
  - Annuals: Cultivation not only kills seedling and established weeds, but it also promotes germination in the soil weed seed bank. This reduces the amount of viable seed present in the soil prior to seeding of covers.

  - Perennials: Mechanical cultivation kills the shoots and breaks up rhizomes and roots. This can stimulate buds to break dormancy, drawing from their energy reserves to produce shoots. Tilling perennials just after shoot emergence requires the plants to expend more energy to produce more shoots and further depletes energy reserves. Repeating this scenario several times will deplete the soil of these plant parts and reduce the ability for perennial weeds to reestablish. However, effective reduction of reproductive plant parts from the soil may take repetitive tillage over 2 or 3 years. It is best to integrate mechanical tillage with other control measures, such as herbicides, to lessen cost of control and improve effectiveness of control.

- Preplant tillage: Tillage just prior to seeding CRP covers will destroy existing weed vegetation on these lands.

-Shallow tillage of small weeds will effectively control these weeds without excessively depleting soil moisture.
-Time tillage operations when the soil surface is dry and no rains are expected within a few days. This will prevent re-establishment of the weeds from dislodged plants.

- Clipping or mowing can be an effective means of mechanical control for annual weeds and will have some effect on perennials.
-Clip early, as soon as weeds grow above seeded cover plants. Cover plants can rapidly grow through the weeds and may have a competitive advantage over the clipped weeds.
-Clip just above the height of desired cover plants. This will allow the maximum amount of sunlight to reach these plants. Clipping too low may damage desired plants and not give them the competitive advantage desired.
-In established stands of CRP cover, some control of perennial weeds may be achieved by clipping them in the bud stage of growth.
-Repeated clipping of weeds may be necessary to achieve most effective control. Again, it may be best to integrate clipping with other control measures for maximum weed control.

BIOLOGICAL CONTROL

Biological control agents, such as insects or pathogens, can be effective at holding an infestation in check once the weed is established. Typically, biological control agents are slow, relative to other control measures, and complete control or eradication of a targeted species of weed is not possible. Integrate biological control with other measure for most effective weed control.

CHEMICAL CONTROL

Herbicides are the most effective means to selectively control weeds in fields. However, mismanagement or misapplication of herbicides, or any weed control measure, can create greater environmental problems than the weeds themselves. While herbicides provide an effective "safety net" when other measures of control fail, it is best to use them as part of an integrated part of a weed management program. Herbicides also cost money to purchase and apply. Eliminating the need for a herbicide in an integrated management program can save money and prevent any undesired environmental effects, such as spray drift to nontargeted areas. Always read and follow the directions on herbicide labels before applying them to fields.

Application and Timing of Herbicides

The timing of herbicide applications depends on the activity and characteristics of the chemical. Proper timing of herbicide application will ensure or enhance weed control effectiveness.

Preplant Herbicides

Preplant herbicides are applied within a few weeks, usually within a few days or on the planting date, of crop planting. These herbicides may be applied to the surface or incorporated into the soil mechanically or by rainfall. Typically, preplant herbicides applied to the soil surface have no effect on weed vegetation present in the field.

Preemergence Herbicides

Preemergence herbicides are applied after planting anytime until weed or crop seedlings emerge. They are applied to the soil and do not require mechanical incorporation. Typically, rainfall or irrigation are needed in order to active them.

Postemergence Herbicides

Postemergence herbicides need the foliage of the targeted weed present in order to control them. It is important to apply postemergence herbicides at the correct growth stage of the weed or crop to ensure maximum effectiveness against weeds with minimal injury to CRP covers.

SELECTING A WEED MANAGEMENT PROGRAM

Integrated weed management programs are based on three critical considerations. These are weed monitoring, weed identification, and determining the stage of growth of the crop and weeds.

WEED MONITORING

Field Records

One of the most important, but often neglected, aspects of weed control is maintaining accurate field records. Primary information that need to be recorded include:

- Assessment of species and relative density of the weed population. This is done through scouting and recording information on weed populations within a field.
- Herbicide application and performance.
- A minimum of four years of weed control measures used in that field. These measures include any preventative, cultural, mechanical, biological, and chemical means of weed management. It is important to record cultural and mechanical measures applied to the field even if weed management was not the primary reason for their use.

These records will guide in planning the best integrated management in terms of strategies in terms of control options or herbicide selection. Using these records as base information, the grower can integrate current information on herbicides, such as cost and effectiveness, to determine the most efficient means of weed control.

Never substitute capital for management. Money, or the cost of herbicides, thrown at a problem does not guarantee good weed control. Long term, cost effectiveness will definitely not be a result of solely relying on herbicides for weed control.

Field Scouting

To determine the most efficient weed management methods, strategies for individual fields should be developed. The importance of field scouting cannot be emphasized enough. The species and density of weed populations will vary within and between fields. Scouting is the first step in getting the best evaluation of the weed population and using the best management strategy. Scouting merely involves inspecting and recording weed populations that are present and the conditions of the crop. It takes time, but it is time well spent to determine how to approach weed, or other pest, and crop management. Scouting several times a year, particularly following the use of a control measure, will allow the grower to evaluate effectiveness of control and any shifts in weed populations in response to these measures. Furthermore, the weed population is quite transitional and different species may be present at different times of the year. Scouting once per year only provides a "snapshot" of the dynamics of that field.

Scouting and recording pest populations are particularly import if the land is not well known to the grower. Land recently acquired through purchase or lease needs to be scouted thoroughly in order make the most informed decisions on pest management and crop production.

To begin scouting the field, view the field to determine obvious differences in topography. Determine if the field should be divided to and observations done on the whole field or divided into segments. Once the field or management area is determined it is best to walk a zigzag pattern through the field, stopping to make observations a minimum of ten times per 80 acres. This method will give the best evaluation of weed and crop conditions in the field.

Prior to Planting

- Scout preceding crop.
- Scout after harvest.
- Scout after preplant herbicide or tillage to determine effectiveness. This an extremely important time to scout. Weeds may still be small or in some other vulnerable stage of growth and alternative control measures can still be effective if initial control fails.

Establishment Period

Fall dormant seeding -

- Scout in fall prior to seed bed preparation.
- Scout once a week for a period of eight weeks in spring following fall planting.
- Scout after herbicide application or other control measures are applied. Some herbicides take up to two weeks before their effectiveness can be full determined.
- Scout every two weeks during the spring, summer, and fall to determine the need for timely weed management measures including, herbicides, clipping, biological control, or other tools.

Spring seeding-

- Scout prior to and after seeding.
- Scout once a week for eight weeks.
- Scout after herbicide or other control measures are applied.
- Scout every two weeks during the spring, summer, and fall to determine the need for timely weed management measures.
- Scout for perennial weeds in the fall.

Perennial Cover has been Established

- Scout in spring, summer, and fall.
- Scout every two weeks to accurately stage perennial weeds and crops.
- Scout after herbicide or other control measures are applied.

IDENTIFICATION

Another critical step in planning an effective weed management program is correctly identifying the species of weed. Typically, only a few species will be a problem within a region. Herbicide retailers or county Extension Service personnel are a good source of information on which weeds to beware of in your area. They will be able to provide you with specific information on the identification of weeds.

While it can be a difficult task, it is important to be able to identify weeds as seedlings. The seedling stage is when weeds are particularly vulnerable to management

practices. Proper identification of weeds is necessary in order to select the proper herbicide or other management tool or the need to worry about controlling the weed. Misidentification of weeds can result in the selection of a herbicide which will provide no benefit. This is a waste of money, equipment use, labor, or other operating resources.

BUILDING AN INTEGRATED MANAGEMENT PROGRAM

STEP ONE: PREPARE FIELD RECORDS

Before implementing any treatment plan, the producer should have the following informational resources gathered and at hand.

- Field history.
- Field scouting information.

STEP TWO: CONSIDER EACH FIELD INDIVIDUALLY

Likely, each field will have different problems or require different approaches to solve weed problems. The grower and advisor should approach each field or even different areas of the same fields differently.

STEP THREE: PREVENTION

Follow the preventive measures discussed earlier. Savings realized in the future control of weeds will far outweigh the cost and time taken for preventive measures. Prevention is often neglected, but this step will greatly influence weed populations and the cost and effectiveness of managing future weed populations.

STEP FOUR: OPTIMIZE STAND ESTABLISHMENT OPPORTUNITY

Best establishment practice choices vary from field to field or within a field. Select those cultural practices that optimize stand establishment.

Cultural practice directly affect the types of weeds and effectiveness of individual weed management practices. However weed control decisions should compliment stand establishment practices, not determine them. Remember, the establishment of a competitive perennial cover is the absolute foundation of weed management in CRP lands.

Consider the following factors which affect the establishment of cover species and the ability to manage weeds.

- Cover species selection.

- Seed quality.
- Seedbed preparation.
- Time of planting.
- Seeding rate, row spacing, depth of planting, and drill type.
- Soil fertility.
- Weed management practices.

STEP FIVE: SELECT CULTURAL, MECHANICAL, CHEMICAL, AND BIOLOGICAL CONTROL MEASURES

Available control options must be carefully selected bearing in mind the strengths, limitations and specific efficacies of control practices. Carefully modify crop establishment cultural practices to accommodate expected weed problems. Match weed infestations with practices that will produce the best control in light of treatment cost and labor or equipment requirements. The best programs integrate control measures and provide back-up alternatives, should initial applied practices fail.

STEP SIX: MONITOR PROGRAM EFFICACY

Monitoring fields during the season, particularly after treatment measures are applied, is crucial. It allows the grower to chart the effectiveness of treatments and to plan remedial or follow-up treatments as necessary. It also allows the grower to identify and act on newly developing weed problems before these weeds go to seed or develop perennial characteristics. Early detection and identification are especially important for managing noxious weeds. Surveying crop stands throughout the season aids in developing future plans weed management plans and the effectiveness of weed management in general.

HERBICIDE AND RATE SELECTION

Several factors must be considered when making a herbicide selection. For specific information consult with retail herbicide personnel, extension personnel, or other knowledgeable people in your area. Refer to herbicide guidelines in the most current PNW Weed Control Handbook. Also, always read and follow directions on the herbicide label.

CROP AND VARIETY

- Certain perennial cover species or varieties of these species a susceptible to certain herbicide treatments.

WEED SPECTRUM

- All herbicides control a limited number of weed species. Select the herbicide which best controls the species identified as problems in CRP lands and are deemed safe to the cover species or variety used. Make sure that the use of a particular product will not affect cover establishment.

- Weed patches not controlled by a general herbicide applications may be spot-treated with another product or different control measure, such as tilling the affected area and reestablishing covers.

DEVELOPMENT STAGE OF WEEDS AND CROPS

- For safe, effective control, herbicides must be applied at recommended stages of crops and weed growth. Inconsistent herbicide performance or crop injury due to the herbicide may occur if applications are made either sooner or later in the development stage of the crop or weeds than recommended.
  -Herbicides applied preplant may require a time interval between application and crop planting.
  -Nonselective preemergence herbicides, such as Roundup or Gramoxone Extra, must be applied before crop seedlings emerge.
  -Postemergence herbicides must be applied after crop plants have attained a minimum development stage to minimize crop injury.

WEATHER

- Rainfall is needed to move preplant and preemergence into the soil surface before weeds have emerged. Where possible, a shallow tillage operation, such as harrowing or rotary hoeing, may be needed to activate herbicides if rainfall has not occurred by the time weeds begin to emerge.

- Most postemergence herbicides require a rainfree period of a few hours or more following application for complete uptake by weeds and maximum activity.

CROP AND WEED CONDITION

- Both crop safety and weed control are influence by crop and weed condition. Conditions that favor good plant growth also favor herbicide effectiveness.
  -Adequate soil moisture.
  -High humidity.
  -Moderate temperatures.
  -Low wind.

SOIL CHARACTERISTICS

- Soil texture, organic matter content, and pH may influence the availability and persistence of certain soil active herbicides.
- Soil active herbicides are less available to plants in high clay and organic matter content soil.
- Herbicides application rates for certain herbicides must be adjusted for soil characteristics.

COST

- Institute weed control practices that reduce infestations to manageable levels.

CROP SAFETY AND WEED CONTROL CONSISTENCY

- Certain herbicides perform well over varying environmental conditions and crop and weed stages with little chance of failure or crop injury. Other herbicides are more restrictive and should not be used unless certain specifications are met.

RESIDUAL WEED CONTROL AND HERBICIDE CARRYOVER

- Certain herbicides provide residual weed control for an anticipated length of time determined by weed susceptibility, the rate of herbicide applied, soil characteristics, and weather conditions.
- Herbicide soil residues may harm certain crop species and limit future crop rotation choices.
- Carefully follow label rate recommendations. Keep accurate records and plan for future use.

RATE SELECTION

- Use the rate recommended for crop species, soil type, weed species and numbers present, and weed and crop condition.
- Do not exceed the rate specified on the product label.
- A rate higher than the recommended rate may injure the crop or carryover to injure succeeding crops.

WEED MANAGEMENT PROGRAMS

This section recognizes weed problems common to CRP lands in the PNW. Some recommendations for control of these weeds are presented. Obviously, it is not possible to cover every producer's specific situation. If certain weed problems are not covered combine aspects of the individual programs to meet particular field requirements.

WINTER ANNUAL GRASSES

Downy brome (cheatgrass), jointed goatgrass, and volunteer grains are examples of winter annual grassy weeds common to Washington. Both spring and fall flushes of these grasses can cause crop establishment problems. Spring germinating plants can head and produce seed if exposed to cool temperatures following germination. The best winter annual grassy weed control program is spring planting of the crop combined with preplant tillage or a preplant or preemergence application of a non select herbicide. Fall plantings can be successful, but they depend on rains to bring on flushes of winter annual grasses in order to control them with nonselect herbicides. Clipping winter annual grasses is ineffective for control and may actually enhance growth of the weeds.

Fall Dormant Planting

Cultural Control

- Planting date
  -Delay planting in the fall until winter annual grasses have emerged. Control with preplant tillage or with nonselect herbicides. Good fall moisture is essential to germination of winter annual grasses.

- Seedbed preparation
  -Prepare a firm seedbed to promote the most rapid germination and establishment of the cover crop.

Chemical Control

There are products available which can provide excellent control of winter annual grasses when applied at a preplant or preemergence timing. Check the PNW Weed Control Handbook or other information sources for specific use recommendations of each product.

Spring Planting

Cultural Control

The spring weed control program for downy brome and volunteer grain is the same as the fall program. But the grower should remember spring planted crops plants

are less competitive against summer annual weeds. Be prepared to respond as required to developing weed problems.

Chemical Control

There are products available which can provide excellent control of winter annual grasses when applied at a preplant or preemergence timing. Check the PNW Weed Control Handbook or other information sources for specific use recommendations of each product.

WINTER ANNUAL BROADLEAF WEEDS

Mustards

Cultural Control

- Planting date
  -Plant in spring or delay planting in the fall until germinating mustards have emerged. Control with preplant tillage or with preplant or preemergence herbicides.

Mechanical Control

- Clipping
  -Intensive clipping has proven a satisfactory mustard control method.

Chemical Control

There are products available which can provide excellent control of winter annual broadleaf weeds both before and after crop emergence. Check the PNW Weed Control Handbook or other information sources for specific use recommendations of each product.

SUMMER ANNUAL GRASSES

Wild Oats

Prevention

- Plant only wild oat-free seed.

Cultural Control

- Delayed Planting (spring planting only)
  -Delayed spring planting is an effective measure against wild oat. Work the soil as early as possible in the spring to stimulate germination. Then till again when

the first flush of wild oats is in the 2-3 leaf stage. If it is impossible to till due to wet soils or other factors, strong control measures must be implemented to control wild oats. Delaying planting too long to control wild oats may create a severe infestation of summer annual weeds.

Chemical Control

No selective herbicides are labeled for control of wild oat in CRP lands. Certain non-select herbicides, such as Roundup, may be applied through a rope-wick applicator. This treatment is done later in the season after the wild oats have headed and is primarily used to reduce wild oat seed production.

SUMMER ANNUAL BROADLEAF WEEDS

Kochia, Russian Thistle and Others

Cultural Control

Plant infested fields early to ensure good crop competition exists before summer annual broadleaf seedlings emerge. This conflicts with the cultural control advise for spring annual grasses, such as wild oats. Knowing the weed populations of that field in previous years through scouting and accurate can help you make decisions about planting date with less overall risk.

Mechanical Control

- Tillage
  -Tillage may be used to destroy weeds left uncontrolled from the previous crop and seedling weeds that emerge before cover crop planting.

- Clipping
  -It may be necessary to clip or otherwise remove excessive weed vegetation left uncontrolled in the previous crop.

  -Intensive clipping has proven a satisfactory method for controlling summer annual broadleaf weeds in establishing perennial cover crops.

Chemical Control

- If weeds exist in the stubble of the crop previous to the establishment of CRP covers, they should be control to reduce seed production or moisture use. Herbicides should be applied immediately after harvest of the previous crop. In some cases, application immediately prior to harvest may be of benefit to the harvest of the crop and lessening weed seed production.

✎ Refer to the PNW Weed Control Handbook for the most up to date information on herbicides available for use in CRP lands. Before applying any herbicide always read, understand, and following directions on the product label.

PERENNIAL GRASSES

Typically, perennial grasses aren't too great of a problem in CRP lands. Although they pose a serious problem for growers trying to successfully establish a mixture of CRP covers. A weedy, perennial grass can dominate a stand which jeopardizes CRP contracts requiring species mixtures.

If you do wish to control perennial grasses, it is best to scout the fields to determine if the problem is across the whole field or in localized areas. If the problem is across the entire field, decide if the infestation is heavy enough to delay seeding and control the weedy grass prior to planting the CRP cover.. If the problem is isolated, you might consider applying a nonselect systemic herbicide, such as Roundup, followed by tillage and re-establishment of the desired cover in these isolated areas. Be sure to delay tillage for an appropriate length of time to allow complete kill of the perennial grassy weed.

PERENNIAL BROADLEAF WEEDS

Some of the more common perennial broadleaf weeds in the PNW are Canada thistle, field bindweed, leafy spurge, and the knapweeds. An effective means to manage established perennial weeds on land to be planted to CRP cover is preplant or postemergence herbicide applications. Special consideration must be taken for fields to be seeded with legumes and/or forbs. Available preplant and in-crop herbicides will provide satisfactory control of perennial weeds. Cover planting may not be deferred for perennial weed cleanup, except where infestations are heavy or they cover a large area of the field.

Fields with heavy, but isolated or patchy infestations may be spot-treated with an appropriate herbicide. Applications may be made before planting CRP covers, after covers and weeds emerge, and in the fall of the establishment year. Heavily infested areas may require replanting.

Planting may be deferred in heavily infested areas or fields to allow for treatment of perennial weeds with appropriate herbicides. During this period, fields may be fallowed or planted to an annual species of cover crop. Annual weeds may be control with tillage or chemically in fallow. Clipping or herbicides may be used to control annual weeds in annual cover crops. Till, clip, or treat around perennial weed patches to allow for undisturbed growth before and after herbicide applications for perennial weed control. Infestations may then be treated, as needed, before planting CRP covers, again after crop and weeds emerge, and in the fall of the establishment year.

Retreating for several years may be necessary to control re-establishing perennial weeds. These weeds can arise from seed or vegetative parts. Scout fields regularly to detect re-establishing weeds.

Refer to the PNW Weed Control Handbook for the most up to date information on herbicides available for use in CRP lands. Before applying any herbicide always read, understand, and following directions on the product label.

Section 15.3 Shrub Planting Installation and Inspection

Kevin Guinn, Elyse Benson, Mark Stannard, 1999

The intent of this Technical Note section is to provide NRCS field staff, producers; nursery operators and planting contractors with guidance on the planting of live shrubs & trees and the certification of these plantings for the Conservation Reserve Program in the state of Washington.

Many producers elected to establish native shrubs and/or trees when contracting land for the Conservation Reserve Program (CRP). Producers were provided the option of either seeding or planting shrubs & trees. Planting live native shrubs & trees into dryland soils can provide excellent success rates but this practice is not without hazards. Proper care and handling of the seedlings prior to and during the planting process is paramount.

It is extremely important that the producer exercise good quality control to ensure that his/her plantings will be certified as acceptable. Certification of shrub & tree plantings is complete when an NRCS staff has ascertained that the correct number are planted, the shrubs and/or trees meet NRCS minimum quality criteria, planting occurred at the appropriate time of year, and an acceptable planting technique was practiced

The Shrub and Tree Planting Job Sheet for CRP is a working document that the producer and planner should use to plan and install high quality plantings. The Shrub and Tree Planting Inspection Job Sheet for CRP is also a working document that field staff can use to evaluate installed plantings. The Inspection job sheet has three parts: *Procedures*, *Example* of planting data and calculations, and a *Worksheet* for reporting Inspection data.

Certification of Plants before Planting

A. The seed source for shrubs will come from a dry eastern Washington site. The supplier shall provide proof of the planting stock origin.

B. Seedlings will be free of mold and other diseases. Stems will be pliable, while leaves will be turgid & healthy looking. The leaves of sagebrush will be a healthy blue-green color. Soil around the root mass will be moist.

C. Shrub plugs will have a **minimum four (4) cubic inch root mass and a six (6) inch viable root system** with a 10% allowance. Plugs and bare root stock will have a **minimum 1:1 root to shoot ratio** with a 10% allowance. More root mass is very desirable.

D. It is imperative that the plants are adequately hardened to ensure survival. Hardening is physiological process where the cells of the plant accumulate solutes in the cytoplasm to prevent ice formation. Most species accumulate sugars and other hydrocarbons as the primary solutes. Hardening requires exposing the plants to cool temperatures and sometimes short-day lengths to induce this process. The exact hardening requirements are species dependent.

De-hardening can occur if the plants are not handled properly after hardening. Research has shown that evergreen plants stored in the dark will lose hardening. The plants will utilize the stored hydrocarbons during respiration. Loss of these hydrocarbons will make the plant vulnerable to freezing temperatures. Every effort should be made to plant the hardened plants soon after shipment rather than storing them in dark coolers.

Many of the plantings will occur in late fall and late winter-early spring. Minimum temperatures average 20F for many sites in eastern & central Washington. The nursery is responsible for providing plants that are adequately hardened and must be willing to certify that greater than 80% of the plants are hardened to withstand temperatures of 20F for 8 hours. Lush tender growth should be minimal and woody stem development should be occurring at the crown. Rooting must ample enough for the plug to retain its shape and potting mix after pulling. Clipping the tips of the plant to encourage more lateral root development can result in disfigured roots that fail to grow deep, and research has shown that these plants may have lower survival.

Two procedures that <u>can</u> be used by the nurseries to verify cold hardiness are provided as Attachment 1.

Figure 1. Hardy sage plant extracted from a field in March 2000. Note the high degree of root development compared to the amount of top growth. Leaves are compact, turgid, and have a bluish-green tinge.

Figure 2. Sage plant lacking cold-hardiness characteristics. Note the elongated, supple light-green leaves. Rooting is ample, but woody tissue development is nonexistent and the amount of lush top-growth is disproportionately high.

ATTACHMENT 1.

Cold Hardiness Testing of CRP Plugs Using a Variation of the Anekonda, et al. Technique

Step 1. Place the plugs in a refrigerator for 24 hours to acclimate the plants to cool temperatures.

Step 2. Place the plugs in a freezer for 24 hours and set at –2C (28F). This will freeze the extra-cellular water.

Step 3. Turn the freezer down to –9C (15F) for 3 hours. This will freeze any cells that are not adequately hardened.

Step 4. Transfer these plants back to the refrigerator for 24 hours to slowly thaw the plants.

Step 5. Visual observations of lack of hardening will include: brown necrotic stem tissue, copious leaf drop, and brown, necrotic buds.

Cold Hardiness Testing of CRP Plugs Using the Regrowth after Exposure to Freezing Temperature Technique.

Step 1. Place the "hardened" plugs in a freezer for 24 hours and set at –9C (15F).

Step 2. Transfer these plants to a greenhouse and allow these plants to grow for 10-14 days.

Step 3. Visual observations of lack of hardening will include: brown necrotic stem tissue, brown necrotic buds, and outright dead plants.

SHRUB & TREE PLANTING CRP INSPECTION JOB SHEET
WA-JS-612/2 (interim 2/99)

PROCEDURES

1. Inspection transects shall be located throughout the planting area to obtain a representative sample of work performed.

2. Inspection shall include both above ground and below ground compliance.

Above ground inspection shall include:
* planting spot selected
* planting site prep
* planting depth/exposed roots
* stem position or damage
* firmness
* spacing
* seedling vigor/appearance

Below ground inspection shall include:
* planting hole orientation
* root configuration and orientation
* altered root length or damage
* loose soil, debris in hole or air pockets

3. Inspection shall occur on 2% of total number of seedling planted and for every 10 plants satisfactorily planted above ground, 4 shall be dug. Each plant that is dug shall be immediately replanted correctly.

4. Compute planting quality using the following formula:

$$\frac{\text{\# satisfactory above ground}}{\text{total \# inspected}} \times \frac{\text{\# satisfactory dug}}{\text{total \# dug}} \times 100 = \text{Overall Planting Quality (\%)}$$

eg. $\frac{92}{100} \times \frac{24}{25} \times 100 = 88\%$ Overall Planyting Quality

5. Overall planting quality shall be considered unsatisfactory if it falls below 80%.

Method for Digging Seedlings

Begin digging a hole about 6” from stem of seedling, being careful to pull soil away from seedling. Continue to dig to about 1” deeper than expected root depth. Take care not to compress the soil around the roots, which would eliminate any air pockets that may have been present. Carefully slough away soil toward the root until the root is exposed, and note root mass position, condition and orientation. Record any problem that may be observed, correct any improper planting and replace the soil around roots. Pack in soil with heel. The best tool for inspecting is a hoe-dad, but a shovel or sharpshooter may be used. The entire below ground inspection can be completed in less than 2 minutes each.

Operator_____
Tract_____

Inspected by_____ Date_____
Field(s)_____

Total # shrubs planted_____

Total # planted X .02 = _____ Total # inspected

Total # inspected/ 10 X 4 = _____ Total # dug

Plants
Inspected:_____

 # Above Ground Errors:

* Inadequate Site Prep_____

* Planting Depth Error / Exposed roots_____

* Stem Position Slanted or Stem Damaged_____

* Firmness (Too Loose)_____

* Spacing -Too Wide or Too Close_____

* Multiple Plants in Hole _____

* Seedling Health or Vigor_____

Total Above Ground Errors _____

 # Below Ground Errors:

* Planting Hole Orientation_____

* Root Configuration _____

* Root Damage_____

* Loose Soil, Debris in Hole, Air Pockets_____

Total Below Ground Errors _____

Overall Planting Quality Computation

$$\frac{\text{\# satisfactory above ground ( )}}{\text{total \# inspected ( )}} \times \frac{\text{\# satisfactory dug ( )}}{\text{total \# dug ( )}} \times 100 = \text{Overall Planting Quality ( )}$$