TECHNICAL NOTE

USDA-Natural Resources Conservation Service
Boise, Idaho

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APPLYING PRE-COMMERCIAL THINNING ON CRP TREE PLANTATIONS

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NRCS

Background:

Since the inception of the Conservation Reserve Program (CRP) in 1985, many acres of cropland and pasture have been seeded to permanent vegetation. CRP fields have also been planted to trees in order to produce future stands of viable timber. In the past 20 years, many of these stands have matured to the point where they are now overstocked.

This Technical Note is intended for treatment on CRP fields which have been planted to Ponderosa pine. Ponderosa pine is the most common species selected for planting throughout Idaho. Guidance given here can be applied to other planted tree species (with appropriate stocking charts) or to even-aged, naturally occurring Ponderosa pine sapling and pole-size stands.

Purposes:

1) Make landowners aware that pre-commercial thinning is a viable management option on CRP enrolled lands.
2) Give landowners guidance to layout and conduct thinning operations.
3) Provide program guidance and direction for landowners who want to conduct thinning on active CRP contracts which are currently administered by the local USDA-Farm Services Agency (FSA).

APPLYING PRE-COMMERCIAL THINNING ON CRP TREE PLANTATIONS

Introduction:

Forests, both natural and planted, are limited by inherent site factors in their ability to support live trees. Foresters refer to "stocking level" as a way of describing the number of trees of known size to the desired number of trees that the site would have for optimum growth and management. Foresters also use the term "Basal Area" to describe a relative density for any given site. Basal area is the sum of the square feet of wood material of all living trees, expressed as ft^2/acre at a height of 4 ½ feet.

Although this may sound complicated, the important fact to keep in mind is that trees and forests grow over time. Healthy trees should grow in two major visible ways, both in height and in diameter. As these stands grow, the number of trees (usually expressed on a "per acre" basis) that the site can support will decrease because of the natural ecologic limits of the site.

In natural settings, many interrelated factors will reduce or "thin" the number of trees throughout the life of the stand. This process can take time, and during periods of intense plant competition, individual trees and entire stands can weaken to the point where there may be high rates of mortality from stress induced insect and/or disease infestations. In addition, the natural buildup in the amount of fuels and associated fire risk can impact a stand.

Even in the best case scenario, allowing "thinning" to occur under natural conditions in planted plantations usually decreases total wood production because growth rates are constantly affected by intra-species competition.

A common forest management technique is to apply planned thinning to forest stands which speeds up and mimics the natural process of thinning. Pre-commercial thinning is done on young stands that are typically too small to yield a commercial product from the trees which are cut or otherwise removed from the stand.

Pre-commercial thinning is used by forest managers to artificially reduce stocking levels in order to:

1) Increase the total volume (productivity) of the stand over the length of the rotation.
2) Select the future crop and seed trees from those which exhibit favorable growth characteristics at the time of thinning.
3) Reduce intra-species stress which in turn increases stand health and vigor.
4) Decrease the potential for excessive stand mortality from disease and insect infestations brought about from stress.
5) Reduce the threat of stand loss from fuel buildup and unwanted wildfire.

A number of references to pre-commercial thinning are cited at the end of this Technical Note. Landowners are encouraged to read these references prior to planning and conducting thinning operations on CRP lands. Any landowner who does not feel competent in applying thinning or other forest stand activities on CRP plantations should

contact the Natural Resources Conservation Service (NRCS), Idaho Department of Lands (IDL) or a private forestry consultant for assistance.

Inventory:

To determine if a stand is overstocked, an inventory and evaluation must be completed. Although basal area and stocking guidelines are available, there are two general methods of stocking assessments that simplify the process for the landowner. These methods are[1]:

1) The "D + X" stocking assessment. The inventory is done by conducting a "zig-zag" transect(s). **Appendix A** provides an inventory for this type of assessment.
2) Fixed plot sampling using circular plots. **Appendix B** provides guidance on this method of sampling.

Although this reference does not give statistical parameters concerning the inventory, landowners should collect enough inventory data to assure that the inventory accurately represents the actual stand condition within the plantation.

Target spacing levels:

Spacing of the residual stand (the stand that is left after thinning) is derived from stocking charts. Target stocking levels are based on species, stand characteristics and site quality. Once again, the simplified methods given in this reference will allow a landowner to easily determine a target stocking level in even-aged Ponderosa pine plantations. Target spacing levels can also be referred to as the planned spacing level or rate.

Appendix C is a stocking chart for use in determining the final stocking of the residual (thinned) stand. The recommended stocking (and spacing) levels are broken down according to site quality and tree diameter. A common reference of site quality is represented by the site index of the dominant soil[2].

The planned spacing rates for the residual stand can be calculated, laid out and evaluated in the field by using the same sampling methods that were explained in **Appendices A and B** for conducting the inventory.

An example of applying pre-commercial thinning to a CRP ponderosa pine plantation is given in **Appendix D**.

Documenting the Prescription:

Appendix E has a planning worksheet that the landowner can use to document existing stocking levels, planned stocking following thinning and other important elements of a pre-commercial CRP tree thinning practice.

Selecting "Leave Trees":

It is important to concentrate on the trees that will be left after a thinning rather than on the trees that will be removed. Leave trees should be those that are:

1) Growing well, free from insect, disease or apparent defects such as forked tops.
2) Show apparent growth dominance for the site in terms of tree diameter and height.

[1] A reference for inventory methods can be found at: ftp://ftp-fc.sc.egov.usda.gov/NSSC/National_Forestry_Handbook/nfh_2004.pdf

[2] The local US Department of Agriculture (USDA) soil survey will give site indices for forested soils.

3) Have good, live crown ratios; usually 1/3 of the tree is composed of a healthy, live crown.

Keep in mind that the residual pre-commercially thinned plantation should not look like a "grid". It is generally more important to select good quality leave trees than to absolutely abide by target spacing parameters. A good rule of thumb is that spacing of any two leave trees can vary by ± 50%. Subsequent thinning on these stands (most likely commercial thinning) will further refine the spacing for the stand at rotation.

Other Important Considerations and Recommendations:

This guidance is not intended to be an all-encompassing guide for conducting pre-commercial thinning on even-age CRP plantations. There are a number of other important considerations landowners need to address in order to conduct a successful pre-commercial thinning operation:

1) Review long term objectives of the tree plantation and adjacent holdings to assure that this practice will help you meet those objectives.
2) Obtain all necessary permits before beginning to thin. The Idaho Department of Lands (IDL) has jurisdiction on the treatment of slash through the Idaho Forest Practices Act (FPA). If a landowner wants to pile and burn slash, local IDL and other authorities require permission due to fire hazard and smoke management mandates.
3) Once a tree is cut, the decision is final! Use the circular plot guides or D + X charts to determine what the residual stand spacing should be prior to any cutting. It is recommended that landowners who have limited experience use flagging to "mark" leave trees within sample areas throughout the stand. One should mark an area, then step back to visualize the residual stand. Look the entire leave tree over from top to bottom as a final check.
4) Carefully consider what type of slash management will meet your objectives. Cut trees must fall on the ground and not hang up in the canopy. If slash is left to decompose, it is recommended that it be cut into lengths which will facilitate rapid decomposition. All types of slash management must also take into consideration the affect on wildlife use within the plantation, and the impact, if any, on the composition, health and vigor of the under story plant community.
5) Carefully manage the time of year that slash is generated, in order to minimize the risk of insect buildup which could destroy the residual stand. Read the references given in this publication concerning insects and slash.
6) Consider the structure and make-up of the stand when it grows to the next anticipated thinning entry. How long will it take for that to occur? Will potential commercial products be generated from the next thinning? Will the CRP contract be expired at that point? (Provisions for CRP rental reductions to offset the commercial value of forest

residues are explained in the next section).

7) Only operate machinery within the scope of your abilities.
8) Contact professional foresters and consider contracting the pre-commercial thinning if you are not sure how to execute this practice on your own.

Obtaining Permission and Concurrence from your local USDA-FSA office:

Many Idaho landowners and operators have taken advantage of the CRP program to plant viable stands of trees on land that had previously been in crop production; most often under the Tree Planting (CP3) practice. However, viable plantations may have been established on CRP land enrolled in other CRP practices with or without program or cost share assistance

The CRP guidelines allow forest improvement activities even while lands are still enrolled in the program[3].

Check with your local Farm Service Agency (FSA) office to verify the contract status of your particular tree plantation, and to obtain permission and concurrence to conduct a pre-commercial thinning.

Landowners who plan to do pre-commercial thinning on active CRP lands need to submit a detailed plan of this activity (**Appendix E**) to their local USDA-FSA office. The plan will be reviewed and approved by either an NRCS, IDL or other qualified forester, and must also be approved prior to the start of the thinning by the FSA office and/or local County Committee.

Landowners also need to make sure that any supplemental contract agreements, such as cost-shared habitat improvements done with the Idaho Department of Fish & Game (IDF&G), are not adversely impacted by thinning or slash treatment.

It is a good idea to develop and review the thinning proposal with all the agencies and entities that have been involved in the CRP contract to date!

There are cases where thinning can produce commercial products from the thinned trees (which becomes a commercial thinning) or from other forest residues. In this case, the CRP contract holder can choose to utilize these residues with a concurrent reduction in rental payment for that year. Use form CRP-37 **(see Exhibit 1)** to present this request to your local FSA office.

Landowners need to be aware that federal cost share is NOT available at this time to offset the cost of the thinning operation on active CRP forest stands, even though the action is permissible.

Cost share assistance may be available to assist in pre-commercial thinning on stands that have come out of contract. In addition, other agencies or entities may have cost share funds that can be applied toward the cost of thinning on active CRP tree plantations.

Thinning operations can not be done in any way that would impair the area from meeting all other contracted benefits. For example, erosion control measures must still function as originally planned.

[3] See 2-CRP (Rev. 4) Amend. 2

Make your own diameter tape from the template below.

Cut out and tape together the pieces, forming a continuous tape with measurements from 0" to 9". Take measurements at 4 ½ feet on the bole of the tree as measured from the ground up. This is referred to as the "Diameter at Breast Height" or "**DBH**". Use this measuring tape to record the DBH values of sample trees for both inventory methods given.

Cut & Tape (tape underneath the next section)	**1.0"**	**.5"**	**Measure to here** ←
Cut & Tape	**3.0"**	**.5**	**2.0"**	**.5"**
Cut & Tape	**5.0"**	**.5"**	**4.0"**	**.5"**
Cut & Tape	**7.0"**	**.5"**	**6.0"**	**.5"**
End of tape	**9.0"**	**.5"**	**8.0"**	**.5"**

References:

Using Precommercial Thinning to Enhance Woodland Productivity, The Woodland Workbook. Oregon State University, EC 1189. April 1977
http://extension.oregonstate.edu/catalog/pdf/ec/ec1189.pdf

Thinning, An Important Timber Management Too. Pacific Northwest Cooperative Extension (PNW) Publication # 184. Reprinted march 2002.
http://extension.oregonstate.edu/catalog/pdf/pnw/pnw184.pdf

Silvicultural Decisions V-Why and How to Thin. R. Mahoney, U of Idaho CES Forest Management # 31.
http://www.cnr.uidaho.edu/extforest/FM31.pdf

Bark Beetles, Slash, and Forest Fertility. C. Schnepf, U of Idaho CES Insects and Disease # 6.
http://www.cnr.uidaho.edu/extforest/ID6.pdf

American Red Cross. "Fact Sheet: Using a Chain Saw Safely"
http://www.redcross.org/pubs/dspubs/chainsaw.pdf

PHOTO ILLUSTRATIONS

A Ponderosa pine plantation on a CRP field in Benewah County. This stand is about 20 years old.

View from inside the stand. The trees were planted at 435 trees per acre with 10 x 10 foot spacing.

In most thinning operations of these types of stands, the number of cut trees exceed the number of trees that are left in the residual stand. Initial slash amounts may be large. At the time of the photo, this slash has been on the ground for over five years

Appendix A

INVENTORY AND PLANNING WORKSHEET FOR THE D + X METHOD

Tree Number	Tree Species	Distance to Next Tree (feet)	Diameter (inches) **(DBH)**	Height (optional - in feet)	Condition	Notes	Would this be a good leave tree?
(Starter)							
1	PP						
2	PP						
3	PP						
4	PP						
5	PP						
6	PP						
7	PP						
8	PP						
9	PP						
10	PP						
TOTALS							
AVERAGE							
Existing "D + X" is							

Site Index of the Major soil =_____

TO DETERMINE THE "D = X" SPACING:

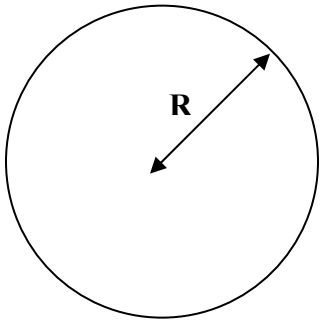
- Calculate the average diameter of the stand. This is the "D" part of the equation. Ignore units, for example an average diameter of 5 inches is just "5".
- Calculate the average distance in between trees. This is also without units, for example an average distance of 8 feet is just "8"
- The "x" of the equation is solved by subtracting the average diameter from the average distance. In this example X is (8-5), or 3. This is a "D + 3" indexed site.
- Check it out: D + X is (5 + 3 = 8).

Appendix B

INVENTORY/PLANNING WORKSHEET FOR CIRCULAR PLOT METHOD

Circular plots are used to sample areas within a larger sized stand. Plot sizes vary according to the uniformity of the stand, and according to the number of samples within the plot. Generally, the plot sizes can decrease as the number of expected samples within the plot area increase.

Plot Size	**Plot Radius (R)** ⟷	**Multiplication Factor necessary to determine trees per acre:**
1/10th acre	37.2 feet	10
1/20th acre	26.3 feet	20
1/30th acre	12.1 feet	30
1/250th acre[4]	7.4 feet	250



Plot Size = _____ Radius = _____				Multiplication Factor = _____		
Tree Number	Tree Species	Diameter (inches) **(DBH)**	Tree Height (optional - in feet)	Condition	Notes	Would this be a good leave tree?
TOTALS						
AVERAGE						
Trees per acre = total number of trees x plot multiplication factor						

[4] The 1/250th sample plot size can be used for inventory but is too small to accurately judge thinned stand densities.

Appendix C

RECOMMENDED STOCKING LEVELS FOR CRP PLANTATION PONDEROSA PINE, IDAHO[5]

For site index of 100 or greater	Average Diameter of the Stand:	D + X Thin to:	Target Residual Spacing between trees:	Target trees per acre	Average number of trees in various size circular plots following treatment:		
					1/10th acre	*1/20th acre*	1/30th acre
	4 ”	D + 6	10 ’	435	43	22	14
	5 ”		11 ’	360	36	18	12
	6 ”		12 ’	303	30	15	10
	7 ”		13 ’	258	25	13	9
	8”		14 ’	222	22	11	7

For site index of 80 -100	Average Diameter of the Stand:	D + X Thin to:	Target Residual Spacing between trees:	Target trees per acre	Average number of trees in various size circular plots following treatment:		
					1/10th acre	*1/20th acre*	1/30th acre
	4 ”	D + 8	12 ’	303	30	15	10
	5 ”		13 ’	258	26	13	9
	6 ”		14 ’	222	22	11	7
	7 ”		15 ’	194	19	10	6
	8 ”		16 ’	170	17	9	6

[5] The majority of the CRP plantings in Idaho were established at 435 trees per acre (average spacing of 10 x 10 feet) down to 303 trees per acre (12 x 12 foot spacing). Therefore “overstocking” will not typically occur at the smaller tree diameters given on the charts. These are included to address higher density, naturally occurring even aged stands that have encroached on CRP fields in some situations.

Appendix C

RECOMMENDED STOCKING LEVELS FOR CRP PLANTATION PONDEROSA PINE, IDAHO (Continued)

For site index of 80 or less	Average Diameter of the Stand:	D + X Thin to:	Target Residual Spacing between trees:	Target trees per acre	Average number of trees in various size circular plots following treatment:		
					1/10th acre	*1/20th acre*	1/30th acre
	4 ”	**D + 9**	13 ’	258	26	13	9
	5 ”		14 ’	222	22	11	7
	6 ”		15 ’	194	19	10	6
	7 ”		16 ’	170	17	9	6
	8 ”		17’	151	15	8	5

General Thinning Guide, D + X, Ponderosa Pine (Interior West Region):

Ponderosa pine	Thin When:	Thin To:
Site Index >100	D + 3	D + 6
Site Index 80 - 100	D + 5	D + 8
Site Index < 80	D + 6	D + 9

Appendix D

EXAMPLE OF CRP THINNING ON PONDEROSA PINE PLANTATION NORTHERN IDAHO

This is given as an example of pre-commercial thinning on a typical CRP stand in Northern Idaho.

Background Conditions:

- The stand was established in 1986 on open cropland as part of a new CRP contract. Grass was seeded in the same spring as the tree planting.
- The tree planting is currently 20 years old.
- Ponderosa pine was planted at 435 trees per acre which equates to average 10 x 10 foot spacing. All seed came from the same source and was nursery grown.
- The site index of the main soil is 105.

Inventory Data:

- A number of random 1/20th acre plots were taken to adequately represent the stand. The average results are as follows:

Tree Diameter	**# of trees**	**Trees Per Acre**	**Average Height**
2-4”	1	20	
4-8 ”	16	320	
8 +”	4	80	30 feet
TOTAL	**21**	**420**	

Analysis:

- The inventory shows 420 trees per acre. Mortality since the time of planting has been minimal as the stand was planted at 435 trees per acre.
- The bulk of the trees are in the 4-8 inch diameter range with about 80 trees per acre in the 8 inch plus range. Those larger trees exhibit better growth and form and will be the preferred leave trees of the treated stand.
- With the wide variability of diameters in the current stand it is assumed that a degree of inter-species competition is occurring.

Appendix D

EXAMPLE OF CRP THINNING ON PONDEROSA PINE PLANTATION NORTHERN IDAHO (Continued)

Prescription:

- The thinning will be planned at a "D+6" spacing (see stocking chart, **Appendix C**).
- The target residual crop tree diameter is 8 inches; therefore the planned spacing is 14 feet. This is derived from the "D+X" method by taking the target diameter (8) and adding 6. The result (8+6) is the average spacing, or 14 feet.
- The thinned stand with a spacing of 14 feet between trees will result in 222 trees per acre. See **Appendix C** and compare target spacing and target trees per acre.
- The inventory only accounted for 80 trees per acre in the 8 inch and bigger diameter class. The remaining residual trees will come from the larger and better formed of the 4-8 inch size class (this is about 142 additional leave trees).
- About half of the trees will be removed from the existing planted stand in order to achieve the planned level of stocking in the residual stand.
- For an "average" residual diameter of 8 inches (roughly ± .5 to 1.0 inches), this is how the General Thinning Guide works out for the example stand:

Ponderosa pine (8" residual stand)	**Thin When:**	**Thin To:**	**Spacing of the Residual stand:**
Site Index >100	D + 3	D + 6	14 feet
Site Index 80 - 100	D + 5	D + 8	16 feet
Site Index < 80	D + 6	D + 9	17 feet

- The landowner works with the Idaho Department of Lands for a Forest Practice Act (FPA) slash permit and with the Idaho Department of Fish and Game to analyze the impacts on wildlife in the treated stand.

Anticipating the Next Entry:

- The stand will grow, and in 5 to 10 years to have an average diameter of 11 inches and again need to be thinned under this high level of management.
- The next thinning can be considered "commercial" if the thinning generates salable products.
- The landowner must consider the length of contract, whether or not to enter in to any contract extension, or to reduce or forgo annual CRP payment against the commercial value of the cut trees generated from the next stand entry.

Appendix E

SPECIFICATIONS WORKSHEET
FOREST STAND IMPROVEMENT – PRE-COMMERCIAL THINNING
PRACTICE CODE 666

Producer Name & Address: _____

_____

_____

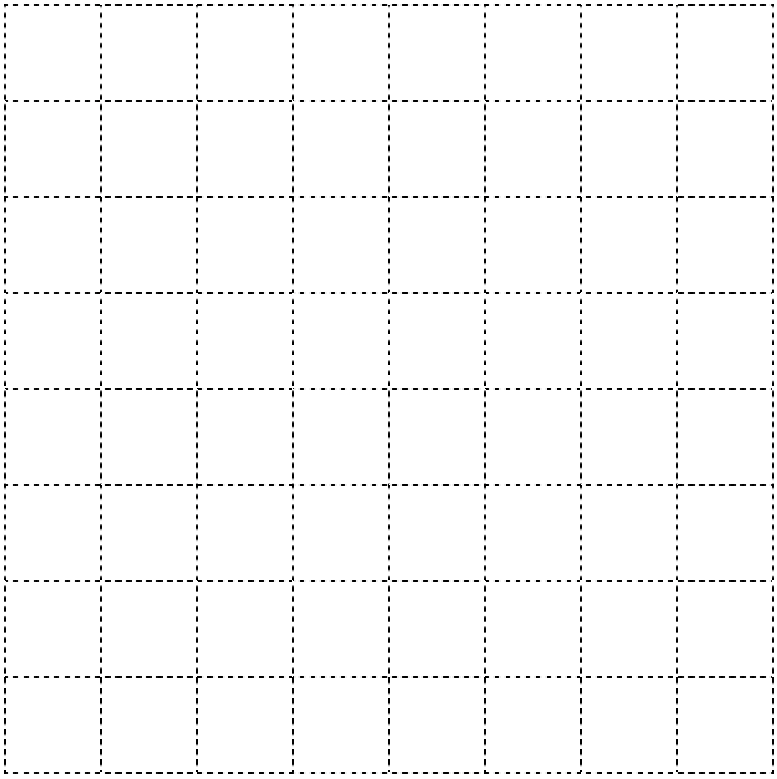
Telephone Number: _____

CRP contract ID: _____

Date of Thinning Plan: _____

Project Location: _____

Scale 1"=_____ ft. (NA indicates sketch not to scale: grid size=1/2" by 1/2")



Township: **Range:** **Section(s):**

Spacing or stocking rate of the original tree planting: _____

Date (approximate) that the CRP tree planting was done: _____

Other pertinent information about the original planting:

_____

_____

INVENTORY:

Date of Inventory: _____ **(Attach Appendix A or B)**

THINNING TREATMENT:

Existing Diameter and Spacing: _____

Planned Spacing and density/acre: _____

Number of trees to remove/acre: _____

Cutting Method: _____

Slash (thinned stems) removal or treatment: _____

Other Considerations:

_____

_____

_____

I agree to follow all Idaho Department of Lands Forest Practices Act and other Federal, State and local rules and regulations pertaining to all aspects of this practice.

_____ _____

Landowner Signature Date

Technical Review and Concurrence:

_____ _____

NRCS, IDL or other certified forester Date

FSA/County Committee Approval:

_____ _____

Signature Date

Exhibit 1

This form is available electronically.

CRP-37 (05-13-04)	U.S. DEPARTMENT OF AGRICULTURE Farm Service Agency	
REQUEST FOR INCIDENTAL GRAZING OR USE OF FOREST REFUSE		
1. RETURN TO: *(County FSA Office Name and Address)*	2. CRP CONTRACT NO.	
	3. FARM NO.	4. DATE *(MM-DD-YYYY)*

5. For the _____ crop year, I (we) request authority to:

A. ☐ Conduct incidental grazing in Field Number(s) *(1)* _____ in conjunction with the gleaning of crop residue or grazing a small grain before harvest beginning *(2)* _____ *(MM-DD-YYYY)*

I (we) understand and agree that:

- only CP8A, Grass Waterways, CP13C (Filter Strips), CP15A, Contour Grass Strips, and CP21, Filter Strips, may be grazed under this authority
- all livestock shall be removed from CRP acreage no later than 2 months after the date provided above
- there shall be a 25 percent reduction in the annual rental payment for the CRP acreage being grazed
- I (we) shall re-establish, at my (our) own expense, any cover destroyed or damaged as a result of participation under this authority, regardless of recommendations or determinations made by NRCS.

B. ☐ Make commercial use of the forest refuse obtained from normal forestry practices, such as thinning, pruning, and timber improvement on *(1)* _____ acres in Field Number(s) *(2)* _____ .

I (we) understand and agree that:

- I (we) shall re-establish, at my (our) own expense, any cover destroyed or damaged as a result of participation in this authority, regardless of recommendations or determinations made by FS.
- I (we) shall not receive an annual rental payment for the applicable acres for the year in which the forestry maintenance activity occurred.

CRP-1 is subject to termination or other penalties as may be authorized by COC in accordance with the CRP contract and regulations should there be any violation of this authority.

6. Check the payment reduction option applicable to this request:

A. ☐ The payment reduction has been paid in advance.

B. ☐ The annual rental payment, scheduled to be made after October 1, will be reduced.

7. All signatories to CRP-1 are required to sign, unless the payment reduction is paid in advance. If the payment reduction is paid in advance, only the participant making the request is required to sign.

A. OPERATOR SIGNATURE	DATE *(MM-DD-YYYY)*	C. PARTICIPANT SIGNATURE	DATE *(MM-DD-YYYY)*
B. OWNER SIGNATURE	DATE *(MM-DD-YYYY)*	D. PARTICIPANT SIGNATURE	DATE *(MM-DD-YYYY)*
E. COC SIGNATURE	DATE *(MM-DD-YYYY)*		

NOTE: *The authority for collecting the following information is Pub. L. 107-171. This authority allows for the collection of information without prior OMB approval mandated by the Paperwork Reduction Act of 1995. The time required to complete this information collection is estimated to average 3 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.*

The following statement is made in accordance with the Privacy Act of 1974 (5 USC 552a). The authority for requesting the following information is the Food and Security Act of 1985 (Pub. L. 99-198), as amended, and regulation promulgated at 7 CFR Part 1410. The information will be used to consider and process the request for incidental grazing or use of forest refuse. Furnishing the requested information is voluntary. Failure to furnish the requested information will result in determination of ineligibility for certain program benefits. This information may be provided to other agencies, IRS, Department of Justice, or other State and Federal law enforcement agencies, and in response to a court magistrate or administrative tribunal. The provisions of criminal and civil fraud statutes, including 18 USC 286, 287, 371, 641, 651, 1001; 15 USC 714m; and 31 USC 3729, may be applicable to the information provided. ***RETURN THIS COMPLETED FORM TO YOUR COUNTY FSA OFFICE.***