



**CONSERVATION ENHANCEMENT ACTIVITY**

**CONSERVATION STEWARDSHIP PROGRAM**

**E666107Z- Colorado**

Maintaining and improving forest soil quality by limiting compaction

**Conservation Practice 666: Forest Stand Improvement**

**APPLICABLE LAND USE: Forest**

**RESOURCE CONCERN ADDRESSED: Soil Quality Degradation**

**ENHANCEMENT LIFE SPAN: 10 Years**

**Enhancement Description**

Adopts guidelines for maintaining and improving soil quality on sites where forest management activities are practiced. These guidelines will increase soil organic matter content, improve nutrient cycling, and increase infiltration and retention of precipitation. Avoiding soil compaction will allow for greater root development and tree growth, limit windthrow, and reduce drought stress. Increasing carbon storage on site will maintain the soil microbial community and provide wildlife benefits.

**Criteria**

- States will apply general criteria from the NRCS National Conservation Practice Standard Forest Stand Improvement (Code 666) as listed below, and additional criteria as required by the NRCS State Office.
- Update or modify the Forest Management Plan to include the following guidelines for forest soil quality management, as appropriate for the site.
  - Limit the area of compacted soils
    - Operate equipment on established roads and trails and minimize travel into the general forest area
    - Operate equipment on woody debris (slash) in areas with sensitive or wet soils



## CONSERVATION STEWARDSHIP PROGRAM

- Sequence forest management activities (back to front) to limit the number of equipment passes
- Use smaller and lighter equipment, track equipment, low PSI tires, and lighter loads. Where appropriate, use mules, draft horses or other animals for moving harvested trees
- Restore heavily compacted areas (e.g., by sub-soiling or other mechanical method)
- Limit impacts of roads and landings
  - Avoid disturbing natural drainage channels (e.g., design road locations to minimize stream crossings and diversions)
  - Roads and landings occupy 5% or less of total wooded acreage
  - Establish cover on roads and landings that are not in use
- Limit soil disturbance and control erosion
  - Avoid disturbing forest litter and the soil surface
  - Protect roads through the use of water bars/rolling dips
  - Establish cover on disturbed areas
  - Retain downed tops and other unharvested materials for ground cover, nutrient recycling, and organic matter retention
- Maintain favorable conditions for forest growth
  - Control the amount of road use, and off-road travel, to prevent erosion, compaction, and disturbance of the soil surface
  - Establish cover on any disturbed areas
  - Monitor the forest area for signs of insect damage, tree diseases, invasive plants, or other impacts on forest growth and health
- Retain and enhance carbon storage to support soil ecologic functions
  - Follow stocking guidelines to maintain tree canopy cover (i.e., between the A and B lines of stocking guides at a minimum; preferably closer to the A line). See the stocking chart shown below.
  - Add woody material to the soil by girdling or cutting non-merchantable trees or trees of undesired species

## CONSERVATION STEWARDSHIP PROGRAM

- Use extended rotations to keep carbon on the site for a longer period
- Retain fallen trees, branches, snags, downed tops and other unharvested materials for ground cover, nutrient recycling, and organic matter retention, in quantities as specified below, or by the NRCS State Office.

▲ For western conifer forests, maintain coarse woody residue:

- that is greater than 3” in diameter,
- left lying on the soil surface, and
- which meets the post-harvest target levels of the following chart:

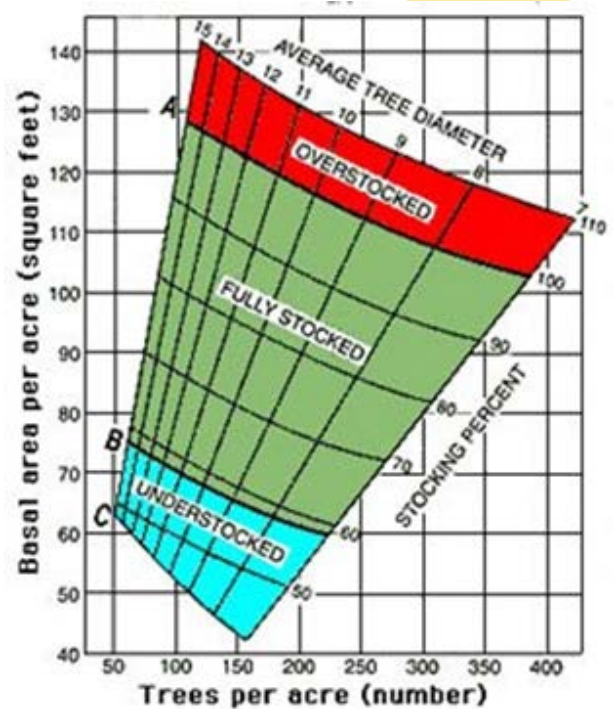
	Habitat Type	Target tons per acre of coarse woody debris
	Ponderosa pine types	5-13 tons/acre
↕	Douglas-fir types	7-14 tons/acre
	Grand fir types	7-14 tons/acre
	Moist Forests Western hemlock types	16-33 tons/acre

- Maintain soil productivity by soil testing and fertilization if needed (including options for fertilizing with manure, biochar, or other organic materials).
- Identify and retain preferred tree and understory species to achieve all planned purposes and landowner objectives.
- Use available guidelines for species and species groups to determine spacing, density, size-class distribution, number of trees, and amount of understory species to be retained. Schedule treatments to avoid overstocked conditions using approved silvicultural/ stocking guides.
- Describe the current and desired future condition of each stand that will be treated. Include the species, cover type, and size-class distribution. Stocking will be described in terms of crop trees per acre, basal area per acre, trees per acre, between-tree spacing, or by any other appropriate and professionally accepted density or stocking protocol.

## CONSERVATION STEWARDSHIP PROGRAM

- Refer to WIN-PST criteria in NRCS Conservation Practice Standard Integrated Pest Management (Code 595), and comply with applicable State and local laws if an herbicide will be used.
- Time tree girdling or felling to avoid buildup of insect or disease populations.
- Implement forest stand improvement activities in ways that avoid or minimize soil erosion, compaction, rutting, and damage to remaining vegetation, and that maintain hydrologic conditions.
- Protect site resources by selecting the method, felling direction and timing of tree felling, and heavy equipment operation. For temporary access use NRCS Conservation Practice Standard Forest Trails and Landings (Code 655) to protect soil and site resources from vehicle impacts. Use NRCS Conservation Practice Standard Access Road (Code 560), for more heavily used roads associated with forest stand improvement activities.

**Figure 1: Stocking Chart** showing tree size and density scales indicating when forests are overstocked (too crowded), fully stocked (providing good growth), and understocked (trees do not fully utilize the site). Stocking guides were developed by Gingrich (1967).





## CONSERVATION STEWARDSHIP PROGRAM

### Documentation and Implementation Requirements:

#### Participant will:

- Prior to implementation, review the NRCS Conservation Practice Standard Forest Stand Improvement (Code 666) conservation practice standard or appropriate state Job Sheet and use this information to meet the criteria of this enhancement.
- Prior to implementation, have a current or updated Forest Management Plan (FMP) that includes activities required to implement this enhancement. The FMP will include guidelines for rehabilitating existing soil resource damage including compaction, ruts, puddling, erosion, downslope soil movement, exposed mineral soil, and depletion of the forest floor. It will also address rehabilitation for any water resource concerns such as diverted streams or intermittent flows. It will assess road layout and provide guidance on practices to correct any erosion or hydrologic impacts. Have the FMP available for NRCS review.
- Prior to implementation, arrange for soil tests to be conducted, one per each five acres. The FMP will include guidance for correcting any significant nutrient deficiencies.
- Prior to implementation, arrange for a forestry specialist to evaluate the stand and perform site-specific marking of areas to be seeded with cover plantings, locations where water control is needed, and trees that are to be girdled for snag creation.
- Prior to implementation, be aware of the state's Forestry Best Management Practices (BMP's) so they can be followed to protect the site and maintain soil and water quality.
- Prior to implementation, be aware of the current stocking level of trees on the site and the target level of stocking to maintain as part of this enhancement. This information should be detailed in the Forest Management Plan.
- During implementation, maintain the stand in a fully stocked condition using the appropriate stocking chart, between the A and B lines (see figure 1). The target stocking level should be between the A and B line, but closer to the A line.
- During implementation, follow state BMP guidelines and any additional guidance from the NRCS State Office to protect trails, roads and landings from soil loss or damage. Re-vegetate these disturbed areas or close them off to traffic to allow natural vegetation to grow on these areas.



## CONSERVATION STEWARDSHIP PROGRAM

- During implementation, spread tops and limbs across the site during any tree reduction operations to protect the soil.
- After implementation, provide the following information to NRCS; dates completed, methods used, representative post-treatment photos, and a map delineating the treated acres.

### **NRCS will:**

- Prior to implementation, provide assistance with interpretation of a current or updated FMP on acres targeted by this enhancement.
  - Prior to implementation, provide and explain the following NRCS Conservation Practice Standards as they relate to implementing this enhancement.
    - Forest Stand Improvement (Code 666)
    - Integrated Pest Management (Code 595)
    - Forest Trails and Landings (Code 655)
    - Access Road (Code 560)
- As needed, prior to implementation, NRCS will provide technical assistance in:
  - Preparing specifications for applying this enhancement for each site using approved specification sheets, job sheets, technical notes, and narrative statements in the conservation plan, or other acceptable documentation, and will discuss the details with the participant.
- Prior to implementation, discuss the requirement to follow the state's Forestry Best Management Practices (BMPs).
- During implementation, provide technical assistance if requested by the participant.
- During implementation, evaluate any planned changes to verify they meet the enhancement criteria.
- After implementation, verify that the enhancement was completed according to the NRCS Conservation Practice Standard Forest Stand Improvement (CPS 666) specifications and the enhancement criteria.



**NRCS Documentation Review:**

**CONSERVATION  
STEWARDSHIP  
PROGRAM**

I have reviewed all required participant documentation and have determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name \_\_\_\_\_ Contract Number \_\_\_\_\_

Total Amount Applied \_\_\_\_\_ Fiscal Year Completed \_\_\_\_\_

\_\_\_\_\_

NRCS Technical Adequacy Signature

Date



**USDA is an equal opportunity employer, provider and lender.**