Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

FOREST STAND IMPROVEMENT

CODE 666

(ac)

DEFINITION

The manipulation of tree and shrub species composition, structure, or density to achieve desired forest conditions.

PURPOSE

This practice is used to accomplish one or more of the following purposes:

- Maintain or improve forest carbon stocks.
- Maintain or improve forest health and productivity.
- Maintain or improve forest structure and composition.
- Maintain or improve wildlife, fish, and pollinator habitat.
- Manage natural precipitation more efficiently.
- Reduce forest pest pressure.
- Reduce forest wildfire hazard.

CONDITIONS WHERE PRACTICE APPLIES

All land where the quantity and quality of trees can be enhanced.

CRITERIA

General Criteria Applicable to All Purposes

Use appropriate silvicultural techniques to achieve the desired future conditions that meet client objectives and are compatible with the site.

Comply with applicable Federal, State, and local laws and regulations. Protect and maintain water quality and hydrologic conditions by controlling and minimizing rutting, compaction, soil erosion, and damage to desirable residual vegetation. Protect soil and site resources from vehicle impacts from temporary vehicle access impacts. Retire unused forest roads, trails, and landings, as needed.

Assess risk to water quality associated with herbicide movement through leaching, solution runoff, and soil absorbed runoff referenced in NRCS CPS Pest Management Conservation System (Code 595), and comply with applicable State and local laws when herbicides are used for forest stand improvement.

Reduce wildfire, safety, environmental, or pest hazards associated with woody debris. Treat remaining woody material to avoid interference with the intended purpose or other management activities. Use prescribed burning to broadcast-burn onsite slash and other debris, as appropriate.

Additional Criteria to Maintain or Improve Carbon Stocks

Manage carbon sequestration by manipulating forest characteristics that alter the rate of plant photosynthesis wherein atmospheric carbon is captured and stored within trees and vegetation. To increase carbon sequestration, maintain or increase the extent of forest stands. Use techniques that increase the growth and vigor of trees and shrubs, especially relatively young plants. Implement appropriate forest regeneration methods following natural or human-caused disturbances and within understocked productive forests.

Manage carbon storage by manipulating the amount of trees, vegetation, woody debris, and soil organic matter, wherein carbon is stored in trees, plants and soils as a “carbon stock.” To increase carbon stocks, retain trees for as long as is practicable and enhance horizontal and vertical distribution of trees. Retain woody debris intact onsite for a long as permissible based on wildfire hazard. Build forest resilience by favoring preferred species that are better adapted to increased temperatures and extreme weather. To increase soil carbon storage, adopt techniques for maintaining and improving soil health, such as appropriately distributing soil organic matter for the site and maintaining future inputs through decomposition of woody debris.

Additional Criteria to Maintain and Improve Forest Health and Productivity

Use appropriate tools, such as ecological site descriptions, tree and shrub suitability groups, natural reference conditions, and regional guidelines to determine trees adapted to the site. Treatments, including litter and woody biomass removal, will be sustainable, will maintain or improve soil organic matter and wildlife habitat, and will recruit and retain acceptable levels of coarse woody debris for the site. Manipulate stand characteristics to mitigate harmful plant, insect, and disease risk.

Additional Criteria to Maintain or Improve Forest Structure and Composition

Manage forest structure by manipulating the horizontal and vertical distribution of trees. Manage forest composition by manipulating proportions of individual tree species. Use appropriate ecological site descriptions, tree and shrub suitability groups, natural reference conditions, and regional guidelines to determine compatible structure and composition. Use appropriate silvicultural methods to ensure adequate natural regeneration or to facilitate artificial regeneration.

Additional Criteria to Maintain or Improve Wildlife, Fish, and Pollinator Habitat

Use appropriate State wildlife habitat guidelines, wildlife habitat evaluation guides, stream or riparian zone assessments, best management practices, or other applicable tools to estimate the value of the treatment area for target wildlife, fish, and pollinators before and after forest stand improvement activities. Manage food (e.g., hard and soft mast, pollen, nectar), cover (e.g., live and dead trees, roosts, nest sites, perches, down woody material), space, and water, as well as the arrangement of these habitat elements, at the appropriate scale to meet desired wildlife, fish, and pollinator habitat requirements.

Time forest stand improvement activities to minimize disturbance to seasonal wildlife, fish, and pollinator activities, such as breeding, dispersal, migration, hibernation, etc. Use habitat creation and maintenance criteria in NRCS CPSs Early Successional Habitat Development/Management (Code 647), Restoration of Rare or Declining Natural Communities (Code 643), Structures for Wildlife (Code 649), Upland Wildlife Habitat Management (Code 645), or Wetland Wildlife Habitat Management (Code 644), as appropriate, to manage wildlife-related activities.

Additional Criteria to Manage Natural Precipitation More Efficiently

Create a mosaic of age classes to increase water yield and stabilize seasonal water yield from watersheds. Create openings in the forest canopy to allow more sunlight to reach the ground, stimulating understory vegetation and diversifying plant species composition and vertical structure. Retain leaf litter, needles, and other biomass onsite. These improvements will increase rainfall infiltration and reduce runoff, thereby reducing soil erosion and improving water quality.

Additional Criteria to Reduce Forest Pest Pressure

Reduce forest damage from harmful plants, animals, diseases, and other pests by creating resilient forest conditions and managing plant hosts. Use appropriate tools, such as USDA Forest Service forest insect and disease leaflets, USDA APHIS pests and diseases resources, ecological site descriptions, tree and shrub suitability groups, regional guidelines, and natural reference conditions to determine resilient forest conditions.

Additional Criteria to Reduce Forest Wildfire Hazard

Manage stocking rates and alter spatial arrangement of trees to reduce wildfire hazard. Use criteria for wildfire risk, including reduction of ladder fuels, in NRCS CPSs Firebreak (Code 394), Fuel Break (Code 383), or Woody Residue Treatment (Code 384), as appropriate.

CONSIDERATIONS

General Considerations

Enlist the assistance of a professional forester in developing management alternatives. Use prevention, avoidance, monitoring, and suppression ("PAMS") strategies such as cleaning boots, gear, vehicles, and equipment and controlling existing pests prior to forest stand improvement implementation to avoid spreading pests. Cut trees along forest trails and roads to "daylight" these accessways, if compatible with the intended purpose and pests are controlled.

Consider the effects of grazing and browsing by livestock and wildlife on desirable vegetation and implement measures to control, if needed.

Consider retaining slash and woody debris on site for nutrient cycling and carbon storage. When removal of woody materials is necessary, consider using it for bioenergy, renewable energy production, or biochar. Leave trees that are attractive in shape and structure or flower and are appropriate for the site, especially around structures, roads, and home sites.

Considerations to Maintain or Improve Carbon Stocks

Consider the forest's natural disturbance regime, traits, successional status, structure, and composition as these factors may affect carbon storage and sequestration. In fire-adapted landscapes, implement prescribed burning and thinning treatments that mimic the natural fire regime to reduce catastrophic carbon losses from wildfire. Consider individual species' growth rate, size at maturity, lifespan, and historical range when selecting species to manage.

Lengthen rotations and manage for species likely to be used in durable manufactured products. Use crop tree management techniques to concentrate growth on suitable long-lived species, where appropriate.

Considerations to Maintain or Improve Forest Health and Productivity

Silvicultural objectives and harvest-regeneration strategies may change over time and may be limited by prior management. Rehabilitation of stands that have been repeatedly degraded by exploitative timber harvesting (e.g., high-grading) may require development of a complex site-specific treatment plan with multiple entries into the stand. Consider crop tree management when making decisions about which trees to retain and which to cut or kill. Successful regeneration of desirable species is usually dependent upon timely application of forest stand improvement and its associated practices.

Within the limits of access, pests, wildfire risk, wildlife movements, and other factors, consider retaining at least one-fourth to one-third of the slash, tops, and limbs after harvest to protect site productivity. When using whole-tree harvesting systems minimize the removal of needles or leaves by harvesting in the dormant season, retaining fine woody materials onsite, or leaving felled trees onsite to allow for needle or leaf drop.

Considerations to Maintain or Improve Wildlife, Fish, and Pollinator Habitat

Mimic natural disturbance regimes to meet habitat requirements of native wildlife, fish, and pollinators. Create a mosaic of stands with different ages, species composition, and vertical structure if the client objective is to benefit a variety of wildlife, fish, and pollinator species. Consider removing vines from crop trees, but retaining vines with wildlife value (e.g., grape and poison ivy) on noncrop trees. Consider the impacts to water temperature and woody debris in the water when using forest stand improvement above and adjacent to aquatic systems.

PLANS AND SPECIFICATIONS

Plans and specifications for applying this practice will be prepared for each site and recorded using approved specification sheets, implementation requirements, technical notes, and narrative statements in the conservation plan or other acceptable documentation. At a minimum, provide—

- Objectives for forest stand improvement.
- Map showing the treatment location including size and relevant topographical features, such as slope, aspect, and landform.
- Silvicultural prescription.
- Treatment method, such as mechanical or hand felling, girdling, stem injection, etc.
- Tree species to be retained or to be cut or killed.
- Timing of treatment relative to seasonal factors, plant physiology, disease, insects, and wildlife impacts.
- Existing, post-treatment, and desired future condition of the stand of trees using appropriate metrics derived from locally accepted forest inventory methods, such as:
    - basal area,
    - diameter at breast height,
    - trees per acre,
    - species composition,
    - stocking, and
    - structure.
- Landowner is responsible for notifications and for obtaining all necessary permits for the project prior to implementation.

OPERATION AND MAINTENANCE

Prepare an operation and maintenance plan for the site and review it with the client. The plan will describe actions that must be taken to ensure that the practice is applied correctly during its lifespan. As a minimum, include periodic inspections for assessment of invasive plants, insects, disease, and other pests, damage by storms and trespass, and erosion.

REFERENCES

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