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January 6, 2010

**FORESTRY/WOODLAND TECHNICAL NOTE NO. NM 43**

**SUBJECT:** ECS – MASTICATION: BEST MANAGEMENT PRACTICES AND  
OPERATIONAL CONSIDERATIONS

**Effective Date:** Effective when received.

**Purpose:** To provide guidance for those planning to use mastication for forest treatments.

**Background:** The technical note is a supplement to the Colorado State Forest Service and Colorado Timber Industry Association document “Colorado Forest Stewardship Guidelines – To Protect Water Quality” published in February 1998. New Mexico has a similar document that contains best management practices as well as the timber harvest regulations. It contains sections on watersheds, roads, streamside management, wildfire, timber harvesting, hazardous substances and stream crossings.

Mastication has become much more popular in the last decade, and this document was created to provide best management practices and guidance on any type of forest mastication project. The intent of the document is to reduce the potential for erosion, habitat destruction, and vegetative health issues.

A handwritten signature in black ink, appearing to read "George Chavez", with a long, sweeping flourish extending to the right.

GEORGE CHAVEZ  
State Resource Conservationist



**MASTICATION  
BEST MANAGEMENT PRACTICES  
and  
OPERATIONAL CONSIDERATIONS**

Best Management Practices (BMPs) are a combination of practices determined by a state or a designated planning agency to be the most effective and practicable means (including technological, economic, and institutional considerations) for controlling point and nonpoint source pollutants at levels compatible with environmental quality goals.

*(Note: BMPs were originally conceptualized in the 1972 US Federal Water Pollution Control Act.)*

The Colorado State Forest Service and Colorado Timber industry Association published “Colorado Forest Stewardship Guidelines – To Protect Water Quality” in February 1998. This publication is considered the Best Management Practices for Colorado. It contains sections on watersheds, roads, streamside management, wildfire, timber harvesting, hazardous substances and stream crossings.

Since 1998 mastication of forest growth for wildfire hazard reduction and forest health improvement has expanded dramatically across the state. The BMPs in this document are meant to supplement existing published BMPs. They focus on mastication activities and expand the scope of BMPs beyond point and non-point pollutants to also include wildlife, public safety and vegetative health concerns also.

Regardless of the mastication method the following items should be considered during any such project:

1. Inspect all equipment prior to the start of work for compliance with requirements for spark arrestors, fire extinguishers, lack of oil leaks, etc. Require that all equipment be thoroughly washed to reduce the risk of invasion of noxious weeds.
2. Conspicuously post signs on roads and trails in the project area warning people of the hazards of flying debris.
  - a. Temporarily close roads or post flagmen to control traffic when working adjacent to roads and trails open to the public.
3. Conduct mastication activities in a way that projects mastication debris away from buildings and other things that may be damaged by flying chunks of biomass, rock or machine operation.
  - a. Different combinations of machine carriers and mastication heads affect how and where mastication debris is projected.
  - b. Consider specific equipment combinations and/or contract requirements to specifically address limits on how and where debris is projected if significant “target areas” are part of an individual project.
4. Avoid depositing mastication by products (chips and chunks) in the following areas:
  - a. Perennial streams

- b. Intermittent streams
  - c. Road surfaces, drainage ditches and culvert basins
    - i. Remove mastication by products larger than 1-inch diameter and/or 1-foot long from the surface of roads and trails on a periodic basis appropriate to the level of road or trail use.
5. Depending upon the type of equipment being used, chips and chunks can be thrown up to 300 feet. Approaching operating equipment is generally best done from the rear of the machine.
- a. Some operators use small radios for communicating between machines. Often they will provide the project administrator a radio to contact them when face-to-face discussions are needed.
6. Clearly mark or otherwise identify project area boundaries with paint, flagging or by description.
- a. If work will not begin immediately boundaries should be marked with paint and not just flagging. (Flagging breaks down over time and may also be removed deer, elk and other wildlife.)
  - b. It has proven useful to “refresh” boundaries with new flagging just prior to project startup. This is especially helpful in very dense and very open stands.
  - c. Flag all property corners, survey monuments and witness trees prior to beginning work on a treatment unit and make sure equipment operators are aware of their presence.
  - d. Clearly designate any specific trees *not* to be removed. Examples include wildlife trees, “character” trees, etc. Designation may be through flagging and marking, and by description in the contract.
  - e. Make equipment operators aware of any overhead power or telephone lines within the project area. Conspicuously flag poles and the line corridor.
7. Mastication projects are best conducted using an “end results contract” that defines conditions desired at the completion of the project. Avoid using “marked tree” contracts.
- i. Provide a desired target and an acceptable range for basal area or tree spacing.
  - ii. Specify if existing down and/or dead materials are to be treated.
  - iii. Define realistic maximum chip/chunk depths, percent of area covered, piece size and lengths. Understand that smaller piece sizes directly affect project cost per acre.
8. Avoid damaging the residual stand of trees during mastication process.
- a. Ensure that target basal area or tree spacing is adequate to allow sufficient room for equipment to operate.
  - b. Carefully review the operator’s proposal for the type(s) of equipment to be used to ensure that it is appropriately scaled to desired basal area or tree spacing.
  - c. Most common are “bump” or “rub” trees.
  - d. It is often best to require mastication of bump and rub trees if this will not significantly affect the desired basal area or tree spacing.

9. Consider valuable shrubs response to mastication.
  - a. Avoid species that are not likely to respond well to mastication (i.e. bitter brush).
  - b. Consider leaving species such as mountain mahogany, choke cherry or other browse species if they do not represent ladder fuels.
10. Schedule mastication treatments in a way that compliments important wildlife nesting, fawning, calving and breeding seasons.
11. Collect all liquids, containers and packaging associated with equipment fueling and maintenance and dispose of it properly off site. Collect any soil contaminated with spilled liquids or grease and dispose of it properly off site.
12. Use appropriate caution to avoid starting a forest fire when welding or cutting metal during equipment maintenance. Include appropriate wording in contracts related to such activities as well as the necessary tools, equipment, water and water delivery systems required for wildfire suppression.
13. Provide significant levels of administration during project startup to ensure achievement of desired results.
  - a. Some have found it useful to designate a demonstration area that must be worked first at project startup. Here, desired leave trees, clumps of trees and other desired features are very clearly marked to illustrate desired end results. Identify and discuss special project requirements such as leave trees on site to insure they receive appropriate attention and protection.
  - b. In either situation the project administrator must allow the contractor adequate time and sufficient area within which to operate before “corrective instructions” are given. Avoid tree-by-tree instructions.
  - c. Certain types of mastication equipment can move quickly through project areas. Schedule administrative visits frequently enough to match project progress.
14. Match equipment to the slopes and other terrain features found within the project area. Rules of thumb are:
  - a. Wheeled equipment is generally effective on slopes  $\leq 35\%$ .
  - b. Tracked equipment is generally most effective on slopes  $>35\%$ . Maximum slopes for operation of tracked equipment are  $\pm 55\%$ .
  - c. Broken terrain, areas where numerous drainages bisect the project area, are best operated using tracked machinery equipped with a mastication head mounted on a boom or arm. An example is a Timbco equipped with a Quadco mastication head.
  - d. On relatively consistent, un-broken terrain, wheeled equipment has been used on slopes up to 45%.
15. Tracked equipment will create berms whenever they turn. This can be accentuated on steeper slopes and during wet conditions. Specify a maximum allowable height for berms within the contract. Require that berms exceeding this height be smoothed prior to acceptance of an operational unit.

Berms can often be smoothed by dragging a boom-mounted mastication head across the area during normal operations. (Some contractors very effectively use ATVs equipped with a front blade to smooth berms.)

16. Equipment will often use the same access trail when traveling from equipment staging or service areas to the project area.
  - a. Reseed if necessary and install waterbars or other water-diversion treatments. If additional information on erosion control is needed consult the publication Colorado's Best Management Practices for Protecting Water Quality.
  - b. Close such trails by brushing-in and/or by installing gates or temporary fencing.
17. Rehabilitate staging and equipment serving areas if necessary. Consider ripping compacted soils, reseeding and mulching requirements.