# TECHNICAL NOTES

U S Department of Agriculture Natural Resources Conservation Service

TNT - PLANT MATERIALS - 36

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DETERMEIMNG VIABILITY OF SOIL SEED BANKS AFTER WILDFIRES

Under the Emergency Watershed Protection program, USDA provides assistance in disaster areas caused by wildfires, floods, and earthquakes. Assistance addresses potential damage which may be caused by imminent or future floods, erosion, and sedimentation which may threaten life or property.

This technical note provides additional guidance on determining the viability of resident seed after wildfires; therefore, concentrating erosion control seeding efforts on areas where the Natural Resources Conservation Service (NRCS) has quantitatively documented that the resident seed is not adequate. This will save tax dollars and protect the affected ecosystem.

Preliminary reconnaissance of a fire area by NRCS, local sponsors and other agency scientists on the assessment team leads to the selection of potential areas to be treated (seeded). These areas are then placed on a map of the fire area. The potential treatment areas are selected based on having steep slopes, high erosion hazard potential and white ash. White ash shows where the fire ,was very hot and **seeds most** likely were destroyed. At this point, a **seed survey team** would start efforts as soon as possible and before significant rainfall events to confirm which parts of the potential treatment area do not have an adequate amount of viable seed. Consider using some members of the assessment team to work on the seed survey team.

Obtain seed samples.

Step 1. Use a 5 point transect method with points evenly spaced as much as possible across hillside components. Transects should match soil mapping units and include north and south aspects and be across the drainage slopes and summit, shoulder, backslope, footslope and toeslope hillside components. One transect per 1,000 acres or a minimum of four transects in the potential treatment area should be carried out, plus a minimum of four transects in a burned, nontreatment area for a control. A 20,000 acre fire with a potential treatment area of 8,000 acres would need 12 transects [8,000il 000 + 41. If an eight person seed survey team assigns two persons to do a transect and assuming two hours per transect, then all 12 transects could be completed in six hours by the team [2 * 12 = 24 hrs/4 survey par-ties].

**Step 2.** It is critical that each transect point is selected at random. When at the general vicinity of a transect point,, close your eyes and throw an object of your choice at least fifty feet. This will provide a random seed collection point where microrelief did not influence the selection.

Document transect locations (like on the USGS Quad) and establish a transect log and numbering system. This is important for followup evaluations. Example for Laguna fire, transect one, point one would be LT1 PA. Slope percent, slope length and hydrophobic soil data should be collected at the same time.

Collect one square foot of soil surface to a one-inch depth (top one inch of A horizon plus remaining 0 layer and ash) and discard any rock. Ensure that the five samples from each transect are kept separate and properly numbered.

**Step 3. Use the No.** 10, 18, and 35 sieves at the office to stratify the sample and then pick out the seed by hand. Skip this step if using Alternate Step 4B or 4C. A Clipper Office Seed Cleaner with a # 10 screen on the top, 1 /22 screen on the bottom, and with 3/4 open air can be used to stratify the sample. Place seeds in a collection envelope and write log number on the envelope. Ensure that the five samples from each transect are kept separate. [An eight person seed survey team was able to process the 60 samples in 15 working hours].

**Send seed to a seed laboratory for a TZ**

**Seed viability test**

Step 4. Send all seed obtained in Step 3 for each transect point to a seed laboratory. Send samples via overnight express and request an ASAP deadline in obtaining laboratory results. The TZ test (Tetrazolium) on native species can take seven days. Request that each seed sample be separated by species with a seed count by species. Request a TZ test for each species in a seed sample. The cost for the above is $60.00 to $90.00 per sample. The cost will increase if there is a large number of species per sample and if the sample is not clean. Send a plant community list of the fire area to the laboratory. A lab person can do twenty samples in an eight hour day.

At a minimum, solicit cost bids and ability to accomplish work ASAP from the following seed laboratories which are known to have experience with TZ tests on native seeds:

AMM Seed Testing, 1482 East Valley Rd.,Ste J609, Santa Barbara, CA 93108, (805)-564-2155 Mik-Lyn Seed Testing, 4625 W. Jennifer, Ste 116, Fresno, CA 93722, (209)-275-1926 CDFA State Seed Lab, 1220 N Street, Rm 340, Sacramento, CA 95814, (916)-654-0466 Ext.328

The TZ test relies on the action of dehydrogenase enzymes to release hydrogen ions which subsequently reduce the colorless and water soluble tetrazolium salt to a red, water insoluble compound called formazan. Thus, living cells turn red while dead cells remain colorless. Vigor evaluations are made on the basis of the identification, location, and appraisal of sound, weak, and dead embryonic tissues as they relate to seedling development, the presence and condition of essential structures, and their influence on seed storage longevity.

Differences in color, lack of color, tissue turgidity or flaccidness assist in distinguishing sound, weak, or dead tissues. Observations of the location and extent of fractures, missing embryo parts, and abnormalities provide additional information for evaluation of embryo soundness as does the presence, amount, depth, and location of embryo imperfections in reference to their presence within essential embryonic structures, (AOSA Tetrazolium Testing Handbook, Grabe 1970).

**Germinate seed samples at office.**

**Alternate Step 4A.** Germinate the seed samples from Step 3 for each transect point on wet paper towels that are kept moist for a 10 day period at the office. This method would not be as fast as the TZ test, but would give you an indication of seed viability per square foot of soil.

**Grow samples of seed+ soil at office.**

**Alternate Step 4B.** Place the samples of seed with soil from Step 2 in shallow pans at the office (there should be enough soil in the sample), water them, and count the seedlings that grow in a 10 day period. This method would give you an indication of seed viability per square foot of soil and avoids having to do the additional sieving at the office.

Grow samples of seed+ soH at local greenhouse.

Alternate Step 4C. Have the samples of seed with soil from Step 2 delivered to a local greenhouse. Place samples in one square foot flats [16 inch x 20 inch flat with a piece of 2x4 in the middle] in the greenhouse and count the seedlings that grow in a 10 day period. This method would give you an indication of seed viability per square foot of soil and avoids having to do the additional sieving and growing at the office. Non-coastal, high elevation shrub seed which requires many months of cold stratification cannot be evaluated in a timely manner for viability using Alternate Steps 4A, 48, or 4C; however, the intent of these Alternate Steps is to show how much seed is immediately available for erosion control.

Analyze the **laboratory, germination or growth data.**

Step 5. Compare the number of viable seeds and/or seedlings per square foot in the proposed treatment zone transects to the control transects. The desirable seeds for sheet and rill erosion control are grasses and clovers.

The minimum amount of seed is an aggregate of 50 grass, clover, and other legume seeds per square foot; or an aggregate of 100 grass and other seeds per square foot.

RESEEDING IS JUSTIFIED WHERE THE MINIMUM IS NOT PRESENT

Exposed earth areas like new roads, firebreaks and embankments including cut and fill slopes also should be planted.

**Minimize reseeding** an slopes steeper than 1.5 to 1 [65 percent] where geologic **erosion (like dry ravel) will prevent** successful establishment.

The following documentation forms on the following pages can be used for this effort: Mobilization List, Field Log, and Checklist for Soil Samples.

The Impact of Burn ratings used on the Field Log are based on Section 29.31 - Fire Intensity in the USDA-USFS's BURNED-AREA EMERGENCY REHABILITATION HANDBOOK. The purpose of the criteria is to provide supplemental guidelines to rate fire intensity as defined in Sections 29.31 and 22.5 of the Burned-Area Rehabilitation Handbook (FSH 2509.13). The criteria are intended to rate the impact of fire intensity on chaparral watersheds only. Three degrees of fire impact or hazards are recognized: low, medium, and high. Naturally hydrophobic or water repellent soils are assumed to be present in preburn watershed conditions. Prebum repellency is probably confined mostly to the soil-duff interface. Natural soil crusting may also have been present in bare soil areas previous to the fire. As a supplemental rating, water repellency may be evaluated when practical. If this factor is included in the rating it should be appraised by a competent person with field training in detection of water repellency. Field checking for water repellent soil conditions can be done by digging a shallow trench with a vertical wall and applying water droplets from the surface down in centimeter increments.

MOBILIZATION LIST

1. Burn perimeter map
2. Treatment (seeding) area map
3. Burn intensity map
4. Copies of technical note and associated forms
5. Metal one square foot grid, 8 ea.
6. Seed packets, 100 ea.
7. Paper lunch sacks, 300 ea.
8. Wood stakes, 18 inch., 100 ea.
9. Flagging tape, 4 ea.
10. Percent slope measuring device, 4 ea.
11. Comuass, 4 ea
12. Topographic maps, 4 ea.
13. Rubber bands for paper sacks, 400 ea.
14. Black marker pins, 8 ea.
15. Hand lens, 5X to 20X, 8 ea.
16. Paper dust masks, 40 ea
17. Medical gloves, 40 ea.
18. Packs, medium size with internal frame, 8 ea.
19. Shovel, sharpshooter, 4 ea.
20. Hand shovel, 4 ea.
21. No. 10, 18, and 35 hand sieves, 8 ea.
22. Clipper office seed cleaner, No. 10 and 1/22 screen I ea., this can be obtained at most agricultural colleges ( this is not required but nice to have)
23. Plastic trays, 9 by 16 inches, 10 ea.
24. Canteens, 8 ea.
25. Water bottle, small drip type, 8 ea.

2G. Razor blades, 12 ea.

27. Extension cord and multiple plug outlet, 2 ea.
28. Desk lights and clip on lights, 3 ea
29. Tables, 3 ea.
30. Forceps, 8 ea.

# FIELD LOG
## FOR SAMPLING SOIL FOR VIABLE RESIDENT SEED

| Date: | Sampler's Name: |
|---|---|
| Fire Name: | County: |

| Transect Number * | Soil Sym | Aspect | Transect Compass Bearing | Length (feet) | Spacing between Points (feet) |
|---|---|---|---|---|---|
| | | | | | |
| Quad.: | | | T. | R. | Sec. |

| Sample Point | A | | B | | C | | D | | E | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Code * | | | | | | | | | | |
| % Slope | | | | | | | | | | |
| Length of Slope | | | | | | | | | | |
| Water Repellancy ** Depth (inches) | 0 | | 0 | | 0 | | 0 | | 0 | |
| Degree (SL,M,ST) | | | | | | | | | | |
| Impact of Burn (L,M,H) | | | | | | | | | | |
| Color of Ash (white or black) | | | | | | | | | | |

* Transect and Sample Code Scheme: example HT1PA-TN
H = Highway 41 Fire  T1 = Transect one  PA = Point A -
T = Treatment (to be seeded) or C = Control (not to be seeded)
N = North Aspect or S = South Aspect

** Give water repellancy at surface of mineral soil and at deepest occurance.

**IMPACT OF BURN (FIRE** INTENSITY) (Record highest rating on Field Log)

| Property | Low | Medium | High |
|---|---|---|---|
| | | | |
| Litter or Duff | Majority of duff layer is unburned or only slightly scorched. Note: Pre-fire duff may be sparse or absent in some areas. | Duff consists of partially burned or charred pieces of twigs, leaves, etc., and is still intact on surface and recoenizable. | Most or all of original duff has been burned to powdered ash (either black or white) with no recognizable charred pieces or organic residue. |
| | | | |
| Brush Canopy | Brush canopy is mostly unburned or leaves intact but may be highly scorched and will probably fall to ground. 0-30% cover removed. | Most leaves have been burned off limbs but many skeleton limbs and branchin(2 above ground surface. 30-70% cover removed. | Both leaves and skeleton have been burned off. Surface consists mostly of burned stumps a few inches above ground. 70 100% cover removed. |
| Soil Surface Condition | No visible heating effects observed on surface. Soil structure has not been altered and surface remains open and porous. | Some thin or "brittle" surface crusting (< I cm) present but not continuous. Some deeree of reduced infiltration expected in patchy areas only. | Surface has extensive baked crust condition or "Fire brick appearance Significant reduction in infiltration and porosity. |

DEGREE OF WATER REPELLANCY (Record rating on Field Log)

| Property | Slight | Moderate | Strong |
|---|---|---|---|
| Water Repellency | No strong repellency except at immediate soil surface and no moderate repellency below 0.5 inch. Repellency is very spotty in occurence. | Some moderate repellency below 0.5 inch, but not strong repellency below 1 inch. | Moderate repellency between 3 and 6 inches or strong repellency below I inch. This degree of repellency is uniform in extent. |

Field checking for water repellent soil conditions can be done by digging a shallow trench with a vertical wall and applying a drop of water on a dry soil surface from the surface down in centimeter increments. Time in seconds for the droplet to enter the soil surface should be noted.

| | |
|---|---|
| Slight: | Less than 10 seconds |
| Moderate: | Between 10 and 40 seconds |
| Strong: | Greater than 40 seconds |

**Checklist for Soil Samples**
**To Test for Viable Seed**

| Fire Name: | Date: |
|---|---|

| Total Number of Samples | Transect Number | Point | Treated or Control | Aspect | Seed Present (+ or -) | Greenhouse Seedling Count | |
|---|---|---|---|---|---|---|---|
| | | | | | | Date | Date |
| | | A | | | | | |
| | | B | | | | | |
| | | C | | | | | |
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| | | A | | | | | |
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