Fall/Winter 2007

WSA Currents & PROFILES

INFORMATION WITHIN REACH

Welcome

to the fall/winter issue of "Currents & Profiles," the National Watershed, Soil, and Air (WSA) Technology and Development Centers' news and notes to the field. It's time to submit project proposals for the FY 2009 Watershed T&D program of work. See the section "News from the WSA T&D Steering Committee."

"Currents & Profiles" updates the watershed community on the progress of our projects and newly available publications. This issue includes the following topics:

Mission Statement

To systematically apply scientific knowledge and advanced technology to create new or substantially improved equipment, systems, materials, processes, techniques, and procedures to meet the challenges and objectives of sustainable forest ecosystems management.

Watershed, Soil, and Air Technology & Development Program

0825 1802—SDTDC

• PROJECT HIGHLIGHTS

Measuring Soil Moisture to Lower Risk of Compaction from Equipment Operations

Proposed by: Wayne Johannson, Plumas National Forest (Region 5)

In 2007, the San Dimas Technology and Development Center (SDTDC) worked in collaboration with several soil scientists across the country to test soil moisture probes. The following is a report on the Aquaterr Digital Soil Moisture Meter written by Brad Rust of the Shasta-Trinity National Forest (Region 5). For more information on soil moisture probes, consult the project Web page, which is updated when new information is received. http://fsweb.sdtdc.wo.fs.fed.us/programs/im/Soil%20Projects/Moisture/im%20template.shtml

Problem

When are soils dry enough to operate on without causing detrimental compaction? The study area is the Beegum-Corral Timber Sale (units 49, 70, 76, and 81).

Soils

Most soils are rocky (Deadwood and Neuns) with flatter, nonrocky areas of Holland and Marpa. For harvest units 49, 70, 76, the soil map unit is 106 – Holland-Neuns Complex, 20- to 40-percent slopes. For unit 81, the soil map unit is 202 Neuns – Holland Complex, 20- to 40-percent slopes.

Study Design

The study area was a thinning project with green tree removal patches using helicopter, skyline, and tractor skidding. All units selected are mechanical tractor thinning on flatter, nonrocky soils (Holland, Marpa).

Site selection process

- Eliminate soils with rock fragments greater than 35 percent and focus on mechanical harvest grounds with less than 35-percent slopes.
- Identify soils with high or severe compaction ratings.
- Sample undisturbed, disturbed, landings, and skid-trails on homogeneous soils.
- Randomly measure soil moistures and compare with grab samples for lab soil moisture determinations and bulk density (do 10 reps/disturbance/harvest area from May to July when soils are drying).

Testing Methodology

Calibrate the Moisture Function

The moisture calibration should be performed before testing and at regular intervals during testing (once every several hours). This ensures accuracy and repeatability of the tests.

Fully immerse the sensor end in water, keeping the meter end out of the water at all times. While the probe is in the water, push the "MSTR" button. While pushing down on the "MSTR" button, turn the "SET" knob until the meter reads 100. The moisture meter is now ready to use.

Measure Soil Moisture Content

Ensure that the probe is contacting the soil. Take several readings about 1-foot apart at each location to make sure that there is not a problem with one location.

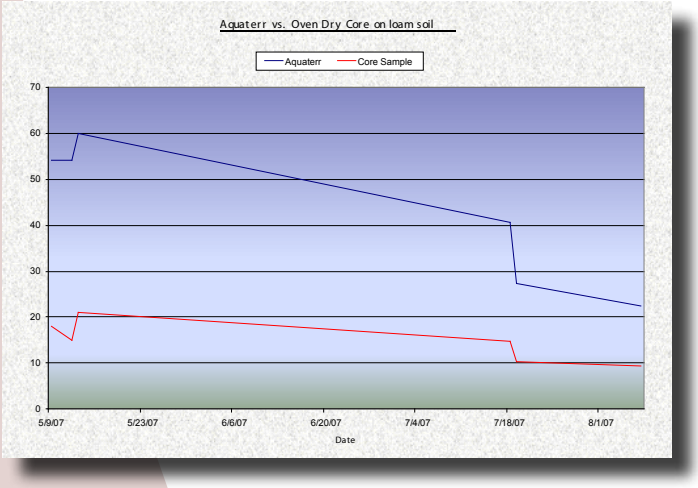
Push the probe into the soil to desired depth. If the ground is too hard, dig a hole to the desired test depth, insert probe, and tamp tightly. The sensing window must be in contact with the soil to get repeatable results. Push

the "MSTR" button. The meter reading indicates the soil moisture level. Wipe off the probe with a towel between readings.

Frequency of testing
If possible, test soils every 2 weeks from May to the end of July.

Results

Sites were measured using five random 200-foot transects in the activity area both before and after harvest (measured from May 9 to August 7, as soils were drying). Aquaterr soil moisture and soil core samples were taken to create a cross-walk graph (see below).



In addition to penetrometer readings, soil cores were taken at the 4- to 8-inch zone along each transect. These measurements evaluated soil strength and bulk density. The data from each transect were evaluated by averaging and then comparing the type and extent of disturbance.

The machine performs well when calibrated before starting each day. Take five readings per site and average the results for that site. Ensure good soil contact. When working in rocky soil, dig a hole to the desired depth, insert probe, and tamp to get good soil contact. Take five readings per hole and average the readings. By creating a cross-walk graph for sandy loam, loam, and clay loam soils, the machine can be used with confidence by matching the texture to the correct graph.

Strategy for developing soil moisture ratings for forest-level management

Test area to be harvested on soil of concern before onset and during operations (May to July). Test with soil moisture probe and compare with grab samples to create cross-walk graph (see above).

Develop ratings for various fine-textured soils (sandy loams, loams, clay loams) throughout your forest to be used in developing a forest soil moisture harvesting map. Create three graphs for sandy, loamy, and clayey soils with varying amounts of precipitation throughout the forest.

Use soil moisture in conjunction with bulk density to develop limited operating period (LOP) map for various areas and soils throughout the forest (for LOP map development, create a forest precipitation map and group precipitation zones in 2-inch zones to be used with soils layer and created data to create LOP map).

With LOP map, use a cone penetrometer to locally adjust "put on" and "take off" times based on soil strength (create soil strength graph in relation to time, moisture, and bulk density to judge significance).

Advantages and disadvantages of Aquaterr soil moisture probe

The Aquaterr is easy and fast to use on fine-textured soils that are moist or slightly moist, but use on rocky soils requires predigging. When pushing a probe into the ground, voids, rocks, and roots cause errors and may require additional sampling to ensure accurate readings.

Since Aquaterr measures soil moisture on a volumetric basis, collect additional soil samples to create a cross-walk graph to measure soil moisture on a weight basis. Collect samples on sandy loams, loams, and clay loams to create a complete cross-walk graph, or separate into three graphs.

For more information on this study, contact Brad Rust at (530) 226-2427 or by e-mail at brust@fs.fed.us.

• CURRENT PROJECTS - UPDATES

Development of Science-Based Winter Guidelines for Mechanical and Fuels Treatment Operations

Proposed by: John Townsley, Randy Tepler, and Brad Flatten (Region 6)

Winter logging guidelines vary from forest to forest and often lack science-based guidelines to determine appropriate field conditions. Field practitioners from the Okanogan and Wenatchee National Forest (Region 6) have tried to identify the conditions which are conducive to winter logging. This year we hope to field test different equipment to determine depth of frozen snow, soil temperatures, air temperatures, and snow depth that correlate with easily identifiable visual indicators. Working with a team of researchers, soil scientists, timber sale specialists, and timber sale administrators we hope to increase our understanding of the dynamics involved in determining appropriate winter logging conditions for protection of the soil resource.

We need to hear from you! If you have winter logging guidelines or suitable tools to measure snow and frozen ground conditions send an e-mail to SDTDC project leader Carolyn Napper at cnapper@fs.fed.us.

We are also interested in testing the criteria we develop in winter 2008 on other forests. If you have an area where you expect to be conducting winter logging in both 2008 and 2009, send us an e-mail.

A Web page of our progress will be posted on the WSA Web site and updated as new information is available. Remember to bookmark this site for future needs: http://fsweb.sdtdc.wo.fs.fed.us/programs/wsa/index.htm

For further information, contact SDTDC project leader Carolyn Napper by phone: (909) 599-1267, ext 229, or e-mail: cnapper@fs.fed.us.

Science-based guidelines help determine appropriate winter logging conditions.

The depth of frozen soil may be an important criterion to prevent adverse impacts to soils.

National Road Best Management Practices: Compilation of Research on Their Effectiveness

Proposed by: Carolyn Napper (SDTDC)

The proposed Forest Service National Best Management Practices (BMP) Program is the Agency's nonpoint source pollution control program for achieving water resource conservation and protection. The program consists of direction and guidance to facilitate an adaptive management approach for accomplishing land and water treatments while protecting water resources as required by the Clean Water Act. The two main components of the program include:

1. Direction (Forest Service Handbook) – National BMPs
   - Consistent set of practices for common FS management activities.
   - General overview for applying BMPs to projects.
   - Part of Forest Service Directives system – regions and forests can supplement to meet local conditions.
2. Guidance (Technical Guide) – BMP Monitoring
   - Consistent set of protocols for monitoring BMP implementation and effectiveness.
   - National BMP monitoring program.
   - National multimedia training program.
   - Standardized data collection forms and database.

In conjunction with the new National BMP program, SDTDC is developing a technical reference on the effectiveness of national road best management practices. For further information contact SDTDC project leader Kim Clarkin by phone (909) 599-1267, ext 209, or e-mail: kclarkin@fs.fed.us.

Water Diversion Control Structures

Proposed by: Dave Gloss, Medicine Bow National Forest (Region 2).

A rough draft of the field guide for planning diversion installations is about 60-percent complete. We are looking for matching funds from agency partners to complete the draft. Dan Axness, an experienced diversion designer from McMillen Engineers, Boise, Idaho, is the author.

Phase 2 of this project aims to develop diversion infrastructure capable of controlling the headgate such that negotiated variable in-stream flows are maintained downstream of the diversion. The U.S. Department of the Interior, Bureau of Reclamation, Water Resources Research Lab is already working on such installations and is willing to help on the project. We are looking for funding partners to help support the Bureau's participation.

For further information, see the project Web page http://fsweb.sdtdc.wo.fs.fed.us/programs/wsa/h2odiver/index.htm, or contact SDTDC project leader Kim Clarkin at (909) 599-1267, ext. 209 or kclarkin@fs.fed.us.

Soldier Creek diversion, Medicine Bow National Forest, May 30, 2006. (photo by Dave Gloss)

Software Application for BMP Monitoring Field Data Recorder

Proposed by: Sherry Hazelhurst and Rick Henderson (WO)

The National BMP effort is well underway and several teams are contributing to the development of the new monitoring protocol. Draft monitoring protocols were developed for 'Vegetation Harvest and Regeneration Activities' and 'Rangelands' during summer 2007. Draft 'Road' BMP monitoring protocol is expected to be completed by April 2008.

SDTDC is assisting these teams in developing recommendations for data recorders best suited for BMP monitoring and suitable data entry software application for the BMP data.

For further information, contact SDTDC project leader Carolyn Napper by phone: (909) 599-1267, ext 229, or e-mail: cnapper@fs.fed.us.

Low Impact Fire Plow Line Sweeper/Blower

Proposed by: Allen Nicholas and Kara Kleinschmidt, Shawnee National Forest (Region 9)

This project is to develop an attachment for a low ground-pressure implement to remove organic litter off the fireline and to reduce adverse impacts to soils from repeated plowing. Currently, a market search has been completed and field testing of equipment is scheduled for 2008. Contact Missoula Technology and Development Center (MTDC) project leader Keith Windell (406) 329-3956 or kwindell@fs.fed.us.

Soil, Water, Road Condition Index (SWRCI)

Proposed by: John Bell, WO Engineering, and Keith Simila, Alaska Region Engineering. Project is cofunded by Engineering and WSA.

SWRCI is being edited and will be available spring 2008. The field guide provides users with a data collection sheet, photographs of the selected indicators in various conditions, and instructions on how to use SWRCI as a rapid assessment tool for the effect of roads to soil and water. The document provides the scientific rationale for the selection of each indicator. The final draft document will be posted to the following Web page in January 2008: http://fsweb.sdtdc.wo.fs.fed.us/programs/eng/SWRCI/project_index.shtml. For more information on the project, contact SDTDC project leader Carolyn Napper at (909) 599-1267, ext 229, or cnapper@fs.fed.us.

Road surface drainage can be a source of erosion and sediment delivery to streams.

New Satellite Telemetry System for Smoke Monitors

Proposed by: Interagency Smoke Monitoring Committee

Air quality specialists and fire managers use smoke monitors to determine particulate- concentration levels and impacts from prescribed and wildfire smoke. Data from these monitors are transmitted by satellite to a Web server (http://www.airsis.com/usfs) for updated, real-time results. A new satellite telemetry system has been developed for most air quality monitors used by the Forest Service. The new system uses the Iridium satellite constellation which provides much more reliable and timely data transmission than the previous telemetry system. Testing has shown that the system is powerful enough to transmit data inside buildings, a stark improvement over the original system. Systems have been tested satisfactorily for the Met One Instrument's EBAM and E-Sampler particulate monitors. The project will be completed when testing for the DataRam 4 particulate monitor is finished this winter.

For more information about this project, contact MTDC project leader Andy Trent at (406) 329-3912 or atrent@fs.fed.us.

Smoke Monitoring Training Aid

Proposed by Pete Lahm, WO Fire

A Flash Media training program is being developed for the E-BAM (Environmental Beta-Attenuation Monitor) which monitors smoke particulate concentrations. Like the program developed for the DataRam4, the program will be distributed via the Web (see Using the DataRam4 Particulate Monitor below, under Publications and Training Aids).

For further information, contact MTDC project leader MaryAnn Davies at (406) 329-3981 or mdavies@fs.fed.us.

• NEWS FROM THE WSA T&D STEERING COMMITTEE

The formal FY 2009 call letter for proposals was signed December 11, 2007. The WSA committee plans to meet April 8-10, 2008, to review proposals for new projects. If you have an idea for a project, we encourage you to submit it using the form on the SDTDC WSA Web page: http://fsweb.sdtdc.wo.fs.fed.us/programs/wsa.

Proposals should be in line with program objectives: to seek out the latest technology, processes, methods, and equipment that will facilitate solutions to field problems. The criteria the committee uses to evaluate proposals are listed on the Web page under "Selection Criteria." Note that proposal should have nationwide application or significance, and should not be requests for funding forest projects. You may want to consider discussing your ideas with your regional representative. They may be able to help you with the proposal and better address the evaluation criteria. Early awareness and/or involvement in preparing the project proposal allows the regional representative to better explain and advocate for the project.

The deadline for submitting proposals for FY 2009 projects is March 19, 2008. The committee looks forward to your active participation in the program. To submit a proposal click on: http://fsweb.sdtdc.wo.fs.fed.us/pubs/proposal/online.shtml.

Submitted by: John Potyondy, Watershed, Soil and Air Committee Chairman

• PUBLICATIONS AND TRAINING AIDS

"Smoke Particulate Monitors: 2007 Update". 0625 2842. Missoula, MT: U.S. Department of Agriculture, Forest Service, Missoula Technology and Development Center.
This evaluation updates earlier evaluations of real-time monitors. These monitors can be used to evaluate air quality in areas affected by smoke from wildland fires. The evaluation was conducted in a laboratory setting and compared each monitor to at least one more identical monitor, to the other monitors evaluated, and to a Federal Reference Method sampler that was used as the standard. The DUSTTRAK monitor manufactured by TSI Inc., had not been evaluated before, nor had the external ac pump. http://fsweb.mtdc.wo.fs.fed.us/php/library_card?p%20num=0625%202842.

"Using the DataRam4 Particulate Monitor" – The DataRam4 is a portable smoke particulate monitor that determines smoke concentration trends. A training presentation is available that shows how to set up the monitor and the satellite transmission unit to send data to the Interagency Real-Time Smoke Particulate Monitoring Web site. The presentation is available for Forest Service and Bureau of Land Management personnel in Flash Media format at: http://fsweb.mtdc.wo.fs.fed.us/pubs/flash/fla07252F01/index.swf, or can be viewed at: http://fsweb.mtdc.wo.fs.fed.us/pubs/flash/fla07252F01/videos/256k.wmv.
For all other agencies, the presentation is available in Flash Media format at http://www.fs.fed.us/t-d/pubs/flash/fla07252F01/index.swf (Username: t-d, Password: t-d), or can be viewed at: http://www.fs.fed.us/t-d/pubs/flash/fla07252F01/videos/256k.wmv (Username: t-d, Password: t-d). Contact MTDC project leader Mary Ann Davis at (406) 329-3981, or mdavies@fs.fed.us.

• LINKS OF INTEREST

1. The Natural Resources Conservation Service recently released "Stream Restoration Design"—a new section of the National Engineering Handbook (NEH-654) intended to be a companion guide to "Stream Corridor Restoration: Principles, Processes, and Practices" (NEH-653). Part 654 includes design techniques and assessment methods for stream rehabilitation design (chapter 14), information on preconstruction and construction (chapter 15), monitoring and maintenance (chapter 16), and permitting (chapter 17). Information on how to download or order the guide on CD is at http://www.nrcs.usda.gov/news/thisweek/2007/100307/techtip100307.html

2. Currently available online is "Developing Monitoring Plans for Structure Placement in the Aquatic Environment." This guide has three objectives:

- To provide a recommended format for designing and planning monitoring projects.
- To create a list of possible methods for monitoring various project objectives, such as human, riparian, aquatic habitat, and aquatic populations.
- To highlight case studies of monitoring efforts.

Most publications on monitoring take a "how to" approach, focusing on describing procedures or methodologies. This guide takes a management approach, studying ways of identifying, planning, designing, and implementing a successful project monitoring effort. The guide lists and refers to appropriate procedures or methodologies it does not focus on describing them in detail. Look for this document at the following address: http://fsweb.sdtdc.wo.fs.fed.us/programs/eng/Monitoring%20Channel%20Structure%20Placements/sample-project/index.shtml

3. Information on the Soil Field Guide project, which links the draft Region 1 Soil Disturbance Guide to photos of each soil disturbance class, can be found at: http://fsweb.sdtdc.wo.fs.fed.us/programs/im/Soil%20Projects/Field%20Guide/im%20template.shtml. During FY 2007, each Forest Service region was visited to obtain pictures of soil disturbance from mechanical activity. Over 1,000 photographs were taken to capture visually identifiable soil disturbance. Currently a small team is working on organizing the photographs to define visual attributes that are easily communicated, and correlate with soil variables that affect productivity and hydrological or ecological function.

The photo guidebook will also contain background information on why the guide is needed, objectives, and standardized terminology. Our targeted audience includes soil scientists, hydrologists, sale administrators, NEPA coordinators, timber cooperators, and the general public. The guide provides an adaptive management approach and explains how visual classes will enable us to move forward in ensuring soil health and productivity are maintained.

Platey soil structure serves as a visual indicator of disturbance.

Working together with research quantitative indicators of soil quality will then be validated and correlated to each of the visual soil disturbance categories. To stay informed on the progress of this project contact the project leader or check the following Web page for more information.

The page is continually updated to provide the latest information on the project, disturbance class condition forms, and photos of mechanized equipment. This SDTDC Inventory and Monitoring Program project is ongoing with help from Rocky Mountain Research Station (http://forest.moscowfsl.wsu.edu/smp/solo/whats_new.php) and Region 6. For more information on the project, contact SDTDC project leader Carolyn Napper at (909) 599-1267, ext. 229, or cnapper@fs.fed.us.

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