WESTERN WATER ASSESSMENT
A NOAA RISA TEAM

Snowtography: Snowpack & Soil Moisture Monitoring Handbook

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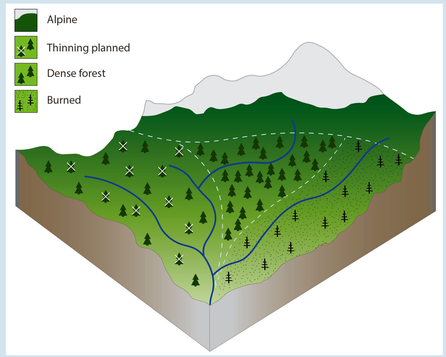
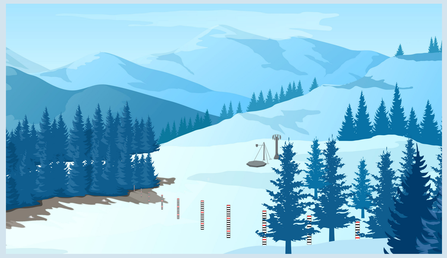
BACKGROUND

Field observations of snowpack, soil moisture, and other hydroclimate variables are essential for understanding the role snowpack plays in forest resilience, stream health, and water supply. In forested settings, accumulation, ablation, and the spatial distribution of snow and soil moisture are strongly controlled by elevation, vegetation, slope, and aspect.

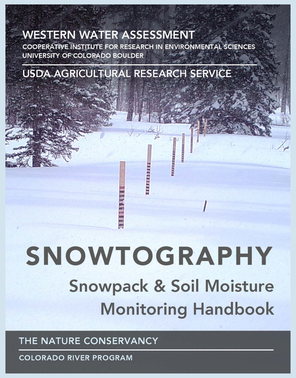


Western Water Assessment, in collaboration with The Nature Conservancy and the USDA-Agricultural Research Service, has produced a snowtography handbook to support resource managers, researchers, and practitioners working in forested headwater settings where the arrangement and density of trees, or the size and severity of disturbances, affect snowpack persistence and soil moisture availability.



OBJECTIVES AND SCOPE

The goal of this handbook is to guide users through the process of establishing their own snowtography and soil moisture monitoring stations. The handbook offers guidance on site selection, snowtography options, equipment requirements, and installation for three monitoring options. Its contents are based on snow-forest research and hands-on experience honing the snowtography method and learning what works. The instructions in the handbook were tested by volunteer "beta testers" in Colorado and Arizona.



THREE MONITORING OPTIONS

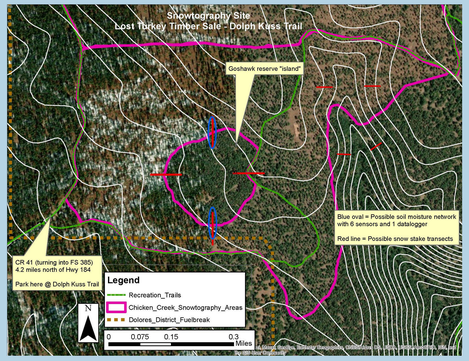
- Basic snowtography, which is a system of automated trail cameras and graduated snow stakes arranged in transects to monitor snow depth.
- Snowtography with periodic site visits and a snow sampler to measure snow density and snow water equivalent.
- Snowtography with soil moisture sensors and data loggers to monitor soil moisture status.

SITE PLANNING: LOCATION

The handbook shows readers how to plan a snowtography station--including selecting a site location. It asks the reader,

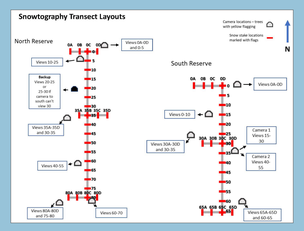
- What are the research questions?
- What are the information needs?
- What variables affect snow and/or soil moisture in the watershed or forest of interest?
- Where is there a transition in the variable to be studied?
- Are there any recent or planned management activities or areas at high risk of disturbance, such as fire, where pre-change monitoring should be conducted?

Planning also involves estimating costs in terms of time and funds. The handbook provides an estimated range of equipment costs and person-hours for each of the monitoring options. The size of the area to cover will determine the total cost and labor required. Time lapse trail cameras and soil moisture monitoring equipment are limited in how much area they can cover. Larger areas will require more cameras and soil moisture sensors and data loggers.



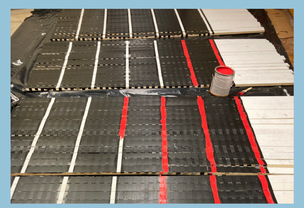
SITE PLANNING: LAYOUT

After helping readers select a site location, the handbook guides site layout planning. A good layout will position the equipment in locations to capture clear observations across a transition in the landscape. The handbook provides instructions for designing the snow stake transects, choosing camera locations, and selecting soil moisture sensor locations and depths.



PREPARATION AND INSTALLATION

The handbook provides specifics of installing equipment, including listing supplies and step-by-step instructions. Snowtography and soil moisture monitoring setups benefit from advance preparation in a lab or garage, where equipment can be tested under controlled conditions and snow stakes can be painted.



In the field, programmable, time-lapse trail cameras are mounted on trees to take pictures of installed snow stakes daily through the winter.

APPLICATIONS

Current and anticipated applications of snowtography include: water supply, forest management, calibration and validation of remote sensing methods, and soil changes after disturbance.

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