

# Tools to Meet Your Rangeland Soil and Vegetation Monitoring Needs

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## ABSTRACT

Synergy Resource Solutions, Inc. refined soil penetrometer and soil erosion bridge designs to make these sampling tools more durable, reliable, user friendly, and suitable for production. The soil penetrometer is based on the design of Herrick and Jones following the standards for the American Society of Agricultural Engineers. Several refinements were made during production and following field testing.

## SOIL EROSION BRIDGE

The erosion bridge is a portable device consisting of a rigid bar mounted on fixed stakes whose height does not change over time. The distance between the ground and the bar gives a micro-topographic profile. Repeated measurements allow the magnitude of loss or gain in soil to be quantified.

### KEY FEATURES

- Sturdy construction
- High repeatability

### SOIL EROSION BRIDGE REFINEMENTS

**Stability:** The needle bar is now the bottom leg of a rectangle which greatly increases strength and durability. Additionally the design keeps the camera off the ground when the frame is inverted for needle reset.

**Improved Leg Design:** The legs have been lengthened to provide more adjustability and the design improved to allow better storage of the legs within the unit when not in use. This improves transportability and reduces chance of damage.



**Improved camera mount:** The camera mount now accepts a standard tripod head greatly increasing the stability and adjustability of the camera mount while providing improved ease of use.

**Improved Needle Drop Mechanism:** The drop trigger was refined to allow less friction in the mechanism allowing more uniform drop of the needles. The trigger was redesigned reduce disturbance to the frame at needle release.

## SOIL PENETROMETER

The importance of soil compaction is well known, but the inadequate availability of cost effective, repeatable methods to measure soil compaction has limited its potential use on agricultural and range lands. Synergy's soil penetrometer is an easy to use, inexpensive tool to measure soil compaction, even in heavily compacted rangeland soils. Soil compaction is determined by the work needed to push a penetrometer cone into the soil with successive blows. The penetrometer can be used to monitor changes in soil condition in response to management and to identify where more detailed measurement of soil properties are required. The penetrometer is sensitive to changes in soil moisture and texture and therefore cannot be used as a substitute for direct measurement of soil bulk density.

### KEY FEATURES

- Standard drop-height and standard hammer mass ensure repeatability, even with different observers
- Lightweight (13 pounds) and easy to carry
- Low Cost
- Easy to use
- Reliable
- Replaceable Cones
- Follows the standards of the American Society of Agricultural Engineers

**Removal tool:** An additional slide was added to the package which serves primarily as a tool to remove the penetrometer from tight soils. A 1-KG slide was designed to allow the cone to pass through before insertion into the soil. This slide can be used as a slide hammer to remove the tool in a similar (but opposite) manner to how the 2KG slide drives the cone into the soil. The removal tool reduces potential to damage the shaft or cone during removal from the soil. The cone travels back through the same path it traveled during insertion.

The removal tool provides a stable platform to use as a reference for measuring the depth that the cone penetrates the soil. This is particularly valuable on soils that cave in or pucker up at the insertion point. The slide is designed to align with the 10 cm line before the cone enters the soil. The 1-KG slide also provides an alternative slide hammer for very soft soils since it is one half the mass of the standard 2-KG slide.



**Positive Height Stops:** R-clips are inserted through the upper shaft to provide precise drop heights for the slide. 3 drop heights are easily used. It is still possible to use cable clamps if custom drop heights are desired.



## SOIL PENETROMETER REFINEMENTS

**Increased Quality Control of Cone and Slide Dimensions:** The angle of the cone and the weight of the slide are critical to the calculations. The cone angle is more precisely set and the weight of the slides are stamped on each individual slide to nearest gram.

**Improved Cone Attachment:** The cone now has longer threads to increase the interval between retightening the cone. A locknut arrangement was tested, but field tests raised concern about increased friction skewing test results. The locknut was abandoned.

**Shipping/Carrying Tube:** The storage container has been redesigned to make it safer and better protect the penetrometer. It is also easier to tighten and loosen the end caps in the field without pipe wrenches. The tube is has been changed to include a carrying strap and made to roll less in a vehicle. Removal of the slides is notably safer.



**Positive Shaft Locks:** Set screws are used in the middle joint to provide definitive positions where the upper shaft screws into the anvil. This allows more precision of the drop height and increases durability of the unit for field use.

For more information , please contact:

