TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE RENO, NEVADA SOIL CONSERVATION SERVICE

JUNE 1993

AGRONOMY TECHNICAL NOTE NO. NV-70

SUBJECT: CPA - SIMPLIFIED METHOD OF USING THE IMHOFF CONE TO MEASURE SEDIMENT MOVING IN IRRIGATION WATER

The attached Idaho Technical Note Agronomy No. 38 is useful in planning areas with slopes that are steep enough to have water erosion. The Winnemucca Field Office used the Imhoff Cone to measure sediment leaving ends of furrows for planning tailwater recovery systems.

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Technical Notes

USDA-Soil Conservation Service
Boise, Idaho

TN AGRONOMY NO. 38 June 1992

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A SIMPLIFIED METHOD OF USING THE IMHOFF CONE TO MEASURE SEDIMENT MOVING IN IRRIGATION WATER

Traditional sediment monitoring of furrow irrigation water with the Imhoff Cone requires frequent collection of large numbers of sediment samples. These samples are filtered, dried and weighed. Weighing time, filtering time, filter paper cost, storage containers, and labor and oven requirements make existing techniques very slow and costly.

The Agricultural Research Service (ARS) at Kimberly, Idaho, has developed a much faster, cheaper and less labor-intensive method to determine sediment concentrations in water. During extensive research, they observed that, regardless of soil texture, the vast majority of suspended soil in a sample settled out of suspension in less than 30 minutes. Even in clayey soils, settling was fairly rapid since most of the suspended soil occurs as aggregates and not as individually suspended particles. They also found the amount of soil settling out of suspension after a 30-minute period was small enough not to cause serious errors if the settling interval was inadvertently exceeded.

After testing several sampling devices, the Imhoff Cone proved to be best adapted. In order to use the Imhoff Cone soil mass, volume regression analyses were needed to develop relationships between deposited soil and sediment load under variable field conditions. This was done in the laboratory by comparing data from gently suspended soil with data from soils dispersed with a blender. These data were compared, using the Portneuf soil with field derived weight times volume regressions obtained at Kimberly, Idaho, during the summer of 1989.

Conclusions from this research are as follows:

1. Sediment loss from furrow irrigation can be accurately measured in the field after settling 30 minutes in the Imhoff Cone, if properly calibrated for the soil being studied.

2. For diagnostic purposes, calibration can be quickly accomplished in the laboratory.

3. For research purposes, a small number of samples should be saved from each run to check calibration for the episode.

4. The primary limitation of the technique is associated with monitoring runoff with very low sediment loads (<1.5 gm/1). This is primarily due to inability to read cone volumes with acceptable accuracy below 0.5 m1. Variation in slope of field-derived calibrations is related largely to the range of sediment loads included in the calibration. Field calibration corresponded closely to the shaken laboratory calibration for the Portneuf soil.

5. The Inhoff Cone technique greatly reduces labor, material costs, storage requirement and oven requirements. It provides the ability to make a highly accurate estimate of erosion rates in the field 30 minutes following sampling. In a research environment, it provides the capacity to greatly increase the number of samples, or sampling frequency that can be supported by a given set of logistical constraints.

These techniques can be used by the Soil Conservation Service to monitor sediment in water. Calibrations need to be developed for each soil. The ARS at Kimberly will assist us with calibrations when needed. Calibrations should be scheduled through the Area/State Agronomist.