



Project Summary

Direct/Delayed Response Project: Interlaboratory Differences in the Northeastern Soil Survey Data

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Soil samples collected during the Direct/Delayed Response Project (DDRP) northeastern soil survey were analyzed using the procedures described in the analytical methods manual for the DDRP by four different laboratories. Inconsistencies in results were reported by the different laboratories regardless of use of standardized procedures. Audit samples Oa, A, Bs, Bw, and C Horizons were included in this survey. The audit sample data were used for an interlaboratory comparison to determine if there are significant differences in the audit sample values reported by the laboratories. This analysis compares the laboratories to each other rather than to a true audit value. Such analysis has been completed for each chemistry variable in the DDRP northeast soil chemistry database. Various graphics display the results. Numerous significant interlaboratory differences were identified. The impact of significant interlaboratory value differences on data analyses is difficult to assess. If the samples from each sampling class, region, and state were uniformly distributed across all the laboratories, the interlaboratory value differences would likely have little effect on analyses conclusions. However, this is not the case. The significant value differences among laboratories are not consistent across all audit horizons, which makes it even more difficult to assess their effect on data

analyses. The averaging that takes place during data aggregation will likely negate the effect of interlaboratory value differences. However, it is not possible to test this negation on a general scale.

This Project Summary was developed by EPA's Environmental Monitoring Systems Laboratory, Las Vegas, NV, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

Soil samples collected during the Direct/Delayed Response Project (DDRP) northeastern soil survey were analyzed by four different laboratories. The laboratories were required to use the procedures described in the analytical methods manual for the DDRP soil survey. Despite the use of standardized procedures, it is possible for laboratory biases to cause consistent differences in results reported by the different laboratories.

Audit samples from Oa, A, Bs, Bw and C horizons were included in the DDRP northeastern soil survey. The audit sample data were used for an interlaboratory comparison to determine if there are significant differences in the audit sample values reported by the laboratories. For each variable, the audit sample results are presented graphically, the significant interlaboratory differences are displayed in tabular form, and summary statistics of the DDRP routine

sample results are provided to aid the reader in determining the practical importance of the observed differences.

Procedure

The method of analysis of variance was used to determine significant differences among the audit sample values reported by the laboratories. The Scheffe multiple-comparison procedure was used to identify the specific laboratory differences that were significant. All significance tests were performed at the 0.05 significance level.

The statistically significant differences among values reported by the laboratories may or may not be of practical importance to the data user. These significant differences were determined relative to the within-laboratory variation observed in the audit samples. If the variation in the audit samples was smaller than the variation observed in routine samples, the interlaboratory differences may have little impact on the conclusions derived from

the soils data. Therefore, the observed interlaboratory differences were also compared with the within-sampling-class standard deviation estimates. When the interlaboratory differences were large, relative to this routine data variation, they could affect inferences based on the routine data and should be considered when interpreting the results of data analyses.

Results and Discussion

Numerous statistically significant interlaboratory value differences were found, however, only a few of these differences are large with respect to the variation observed in the routine data. Interlaboratory value differences that could cause problems in the analyses of routine sample data occurred for iron in 0.002 M CaCl₂, aluminum in citrate-dithionite, aluminum in 0.002 M CaCl₂, aluminum in KCl, calcium in 0.002 M CaCl₂, cation-exchange capacity in NH₄Cl, and very fine sand.

Conclusions and Recommendations

The impact of the interlaboratory differences on data analyses is difficult to assess. The soil survey design used the concept of sampling classes which group soil series that, in theory, should be similar. If the samples from each sampling class, region, and state were uniformly distributed across all laboratories, the interlaboratory value differences would likely have little effect on analyses conclusions. However, this is not the case.

Many of the proposed levels of evaluation require data aggregated to the sampling class level. This aggregation involves some type of averaging within a sampling class and horizon combination. This averaging will likely negate the effect of the interlaboratory value differences; however, this is very difficult to test on a general scale. Researchers using the DDRP data should be advised to include the appropriate caveats concerning interlaboratory value differences in the conclusions of their studies.

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The complete report, entitled "Direct/Delayed Response Project: Interlaboratory Differences in the Northeastern Soil Survey Data," (Order No. PB90-219 403/AS; Cost: \$17.00, subject to change) will be available only from:

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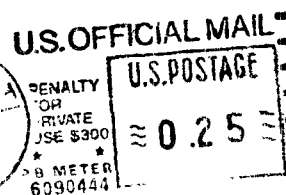
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