BJC/OR-133

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EXECUTIVE SUMMARY

Regression models and uptake factors for use in estimating the uptake of inorganic elements by above-ground plant tissues from soil were derived. These included models for arsenic, cadmium, copper, lead, mercury, nickel, selenium, and zinc. Models were developed using published data from soil contaminated in the field, after it was demonstrated that patterns of uptake of inorganic salts by plants were different from those of contaminated soils from waste sites. Models were validated using measured concentrations from two contaminated sites. Single-variable regression models of concentrations in plants versus concentrations in soil are generally recommended over simple uptake factors for use in estimating plant uptake of inorganic contaminants in ecological risk assessments. Multiple regression models with soil concentration and pH as the variables are also recommended for estimating the uptake of four chemicals (cadmium, mercury, selenium, and zinc) by plants. Models for use in screening risk assessments, i.e., the upper 95% prediction interval on the regressions, are recommended as conservative models of uptake of inorganic chemicals by plants.

Two previously published reports, *Development and Validation of Bioaccumulation Models for Earthworms* (Sample et al. 1998a) and *Development and Validation of Bioaccumulation Models for Small Mammals* (Sample et al. 1998b), provide a similar function for estimating uptake of contaminants by earthworms and small mammals as components of the wildlife diet.

1. INTRODUCTION

The major pathway of exposure of terrestrial wildlife to contaminants in soil is through food ingestion. The prediction or estimation of risks to wildlife requires knowledge of their diets, body weights, habitats, and concentrations of contaminants in all ingested media (food, soil, and water). The direct measurement of chemical concentrations in wildlife food is advisable to minimize uncertainty in ecological risk assessments. However, site-specific data on the bioaccumulation of contaminants in vegetation and other biota that comprise wildlife diets are often not available because of constraints in funding or time.

At a minimum, concentrations of inorganic and organic chemicals in soils are measured at contaminated sites prior to a risk assessment. The challenge is to develop models that estimate concentrations of chemicals in plants from these concentrations in soil. The simplest linear model for estimating the concentrations of chemicals in vascular plants is the soil-plant uptake factor, the ratio of the concentration of a chemical in a plant or portion of a plant to that in soil. The concentration of a contaminant in plants at a particular location is estimated by multiplying the measured concentration in soil by the soil-plant uptake factor. Chemical concentrations in plants and soil are assumed to be at equilibrium; thus, exposure time is not considered. The usefulness of uptake factors lies in the ease by which distributions can be developed and conservative (e.g., 90th percentile) values chosen. However, the evidence below suggests that uncertainty in uptake model predictions may be minimized if: (1) nonlinear models are employed and (2) environmental factors and other sources of variability are incorporated in the model.

Uptake factors would be most useful if they did not vary with soil concentration. Although the uptake relationship between soil and plants is probably valid for narrow ranges of chemical concentration in the relatively nontoxic range (e.g., Jiang and Singh 1994, Carlson and Bazzaz 1977), some evidence demonstrates that uptake factors are dependent on soil concentration. Baes et al. (1984), who developed soil-vegetative tissue uptake factors that are often used in human health and ecological risk assessments, found that the uptake factors for copper and zinc were inversely correlated with soil concentration. These metal contaminants are also nutrients, and it is not surprising that they would be regulated by plants. Alsop et al. (1996) showed that the use of Baes factors underpredicted the uptake of lead and zinc by oats at concentrations within background ranges in soil and overpredicted metal concentrations in the plants at concentrations exceeding background levels. Clearly, nonlinear models would sometimes be more useful for risk assessments than the Baes factors. Both Neuhauser et al. (1995) and Sample et al. (1998a) have obtained significant regressions for the uptake of inorganic elements by earthworms using log-transformed concentrations, so it is reasonable to assume that log-transforming soil and plant concentrations could result in a statistically significant relationship.

Inorganic chemicals are passively taken up by plants from soil water, with the additional possibility of active uptake in the case of required nutrients, such as copper and zinc. Soil properties such as pH, clay content, and organic matter strongly affect the concentrations of inorganic chemicals in soil solution. For example, the amount of zinc in soil water and plant tissues is generally observed to increase with decreasing pH and cation exchange capacity (Bysshe 1988). Cadmium uptake by plants has been shown in numerous studies to decrease with increasing pH (He and Singh 1994, Miller et al. 1976). Sims and Kline (1991) found significant multiple regression models between nickel, copper, and zinc in wheat and soybean and soil metal concentrations and pH, but not with soil metal concentrations alone. The type of soil is significant for accumulation of chemicals by plants, with arsenic uptake in crops dependent on soil type (Jiang and Singh 1994) and cadmium uptake by soybeans related to the sorptive capacity of soil (Miller et al. 1976).

In this report we present: (1) single-variable regressions using ln-transformed, above-ground plant and soil concentrations, (2) multiple regressions of ln-transformed plant concentration on ln-transformed soil concentration and pH, and (3) summary statistics for and distributions of soil-plant uptake factors for eight inorganic elements: arsenic, cadmium, copper, lead, mercury, nickel, selenium, and zinc. Measurements of chemicals in plants and collocated soils from Bartlesville, Oklahoma (PTI Environmental Services 1995) and the Clark Fork River floodplain in Montana (PTI Environmental Services 1994) are used to validate the uptake models.

2. METHODS

2.1 DATABASE DEVELOPMENT

Field and greenhouse studies which report concentrations of arsenic, cadmium, copper, lead, mercury, nickel, selenium, or zinc in both surface soil and collocated, aboveground plant tissue were identified. Most plant species were agricultural crop plants. For some elements, many studies were pot studies in which inorganic salts were added to soil. Information regarding soil and plant concentrations, soil parameters, exposure time, chemical form, dry or wet weight, extraction method, plant species, and plant part was compiled in a spreadsheet. Only studies in which concentrations were expressed on a dry weight basis were used. Some soils were air dried rather than oven dried. Although most studies reported that plant material was washed, studies were not excluded if the extent of washing was not stated in the paper. Studies were used even if the individual investigators observed no correlation between concentrations of contaminants in soils and plants (e.g., arsenic in Norway spruce, Wyttenbach et al. 1997; copper in Sitka-spruce seedlings, Burton et al. 1984; copper in radish foliage, Davies 1992). Concentrations of chemicals in soil or plants were sometimes estimated visually from a figure, but only if estimates could be made within about 10%. Studies were not used if the only plants tested were those known to hyperaccumulate elements.

Each plant species or variety, soil type, location, concentration of the test element in soil, and form of an added element represented an independent observation in the dataset. Differences in exposure duration or above-ground plant part did not constitute separate observations. That is, concentrations in soils or plants that differed on the basis of one of these two variables were averaged. (The number of observations in these means, which ranged between 1 and 6, was not retained in the subsequent statistical analysis.) For example, concentrations of nickel in upper and lower leaves of bush bean (Sajwan et al. 1996) and concentrations of lead in corn leaves and stalks (de Pieri et al. 1997) were averaged and each constituted a single observation. Also, concentrations of lead in spruce needles (Nilsson 1972) and cadmium in clippings of red fescue (Carlson and Rolfe 1979) after different periods of exposure were averaged. A pattern of higher levels of accumulation with increased exposure time was not generally observed. The database of bioaccumulation concentrations is presented in Appendix A.

Concentrations of contaminants in soil at the time of plant sampling were used if known. If these concentrations were not measured (as was often the case in pot studies), the initial concentration of the element measured in or added to soil was assumed to be equivalent to the final concentration. In field experiments, the change in soil concentration of an element over time was assumed to be minimal (e.g., selenium in van Mantgem et al. 1996). However, total soil concentrations of elements in pot studies have been observed to change as much as twenty percent during an experiment. The concentration of an element in soil prior to the addition of the salt in a pot study was often not stated. Thus, the added concentration was often assumed to be equivalent to the total concentration.

Experimental treatments or field studies in which aerial contaminants potentially contributed to uptake were excluded from the database. In some early field studies with lead, aerial exposure to lead additives from gasoline was likely (e.g., Parker et al. 1978). In other field studies, ongoing exposure to metal contaminants from smelters or other sources was possible, though data from the vicinity of a smelter or other air source were not used unless it was demonstrated in the study that air was not a significant route of contamination.

Observations were included in the database if the total chemical concentration in soil was measured, either by extraction with strong acid or by extraction with moderately strong acid (e.g., 4 N sulfuric acid) sometimes accompanied by heat. In one study, it was shown that extraction of arsenic with 6M HCl for 2 h under constant rotation gave the same recovery as digestion in aqua regia, a mixture of concentrated nitric and hydrochloric acids (Otte et al. 1990). Studies in which concentrations of contaminants in soil were determined by a partial extraction with DTPA (diethylene triamine pentaacetic acid), weak acids or water were excluded from analysis, unless DTPA was used only to extract the background fraction of the element, and salts were added. Although concentrations of DTPA-extracted contaminants from soils sometimes correlate with those taken up by plants (Sadiq 1985), this estimate of bioavailability has been observed not to be valid for some metals (Sadiq 1985, Sadiq 1986, Hooda and Alloway 1993) or for comparisons of soils of varying pH (Miles and Parker 1979).

For studies in which contaminant concentrations at multiple depths were measured, the concentration at the 0-10, 0-15, or 0-20 cm depth interval was recorded. However, where only a single soil depth was measured, it ranged from 5 to 70 cm. An exception was the one-to-two-centimeter depth samples in Severson et al. (1992) which represented A horizons of the Frisian Islands, which have no B horizon development. Soil depth was not a factor in the derivation of the uptake model.

A distinction was made in the dataset between freshly added inorganic salts and other forms of the chemicals. Non-salts studies are referred to as "field" studies, though some were undertaken in pots and involved fresh additions of non-salt materials. Non-salts studies included the following sources of contamination: mine waste, smelter deposits, vehicle and other urban emissions, other industrial sources, wastewater effluent, compost, fertilizer, dredged material, sewage sludge, fly ash, and flue dust. In addition, some measurements were taken from background locations. As stated above, only data in which aerial uptake was not a major contributor to the bioaccumulation were included. For example, smelter-contaminated soil was typically added to a pot in a greenhouse before the accumulation of contaminants by plants was measured.

2.2 MODEL DEVELOPMENT AND VALIDATION

Bioaccumulation data were assigned to two groups: the "model" dataset used for initial model development and the "validation" dataset, employed to test the accuracy and predictive utility of the bioaccumulation models (Appendix A). The division of studies into the two datasets was arbitrary and based on the sequence of when copies of the studies were obtained. The final two studies from Bartlesville, Oklahoma (PTI Environmental Services 1995), and the Clark Fork River watershed in

Montana (PTI Environmental Services 1994) were the final datasets obtained and comprised the validation dataset. Also, data from these studies were obtained for use in ecological risk assessments, the expected primary use of the models developed in this report. Because sampling and analytical variability and environmental characteristics are likely to be correlated among data from the same study, it was assumed that data from wholly independent studies (i.e., studies from which no data were included in the initial model development) would be unbiased and would provide a better test of the uptake models than would randomly selected observations extracted from the total dataset.

Using data in the initial model dataset, preliminary analyses were undertaken to determine whether bioaccumulation tests using inorganic salts should be used in the derivation of regression models and uptake factors for contaminants in the field. Linear regressions of the natural-log transformed plant and soil concentrations in the salts dataset were performed and compared to regression models developed from the non-salt ("field") observations using the F-test procedure for comparing regression lines described in Draper and Smith (1981). Differences were considered significant if $p \leq 0.05$. In addition, concentrations from salt and non-salt studies were plotted to permit visualization of the relationship between plant uptake data from salts and other studies. Because salt and non-salt regression models differed significantly for all chemicals considered, salts-associated data were excluded from all further analyses (see Sect. 3.1 Modeling Results).

Soil-plant uptake factors were calculated for each observation in the initial model dataset (with salts data excluded). Summary statistics were generated for each chemical. To facilitate the use of the uptake factors in probabilistic risk evaluations, the distribution of the calculated factors for each chemical in the database was evaluated. The Shapiro-Wilk test (PROC UNIVARIATE; SAS Inst. Inc. 1988a) was applied to the untransformed and natural-log transformed uptake factors for each chemical to determine whether the distribution of uptake factors was normal or log-normal, respectively.

To evaluate the relationship between the contaminant concentration in soil and plants, single-variable and multiple regressions were performed using SAS PROC REG (SAS Inst. Inc. 1988a). Contaminant concentrations in both soil and plants were natural-log transformed prior to regression analyses. Because data concerning the number of individuals and samples included in composites or means were not available for all observations, a weighting of observations was not applied. Linear regression models of ln-plant concentration on ln-soil concentration were developed for each chemical. Multiple regression models incorporating soil pH were also developed for each chemical, though pH was not available for all observations.

Uptake factors and regression models from the initial model dataset were applied to the soil concentration data in the validation dataset, and estimated contaminant concentrations in plants at the observed contaminant concentration in soil were generated. To evaluate the appropriateness and accuracy of various models for generating estimates for general application, estimated concentrations in above-ground plant tissues were generated using the median uptake factor and single-variable and multiple regressions developed in this study. Because conservative estimates are needed for some purposes (e.g., screening assessments), estimates were also generated using the 90th percentile uptake factor and the upper 95% prediction limit (95% UPL) for the single-variable regression model from this study. The 95% UPL was calculated according to a method from Dowdy and Wearden (1983) that is presented in Appendix B.

For each chemical and model, differences between estimated and measured concentrations in validation observations were evaluated using Wilcoxon sign-rank tests (PROC UNIVARIATE; SAS

Inst. Inc. 1988a). Differences were considered significant if $p(H_0=0) \leq 0.05$. Relative accuracy and quality of different estimations were evaluated by calculating the proportional deviation of the estimate from the measured value:

$$PD = (M_i - E_i) / M_i$$

where

PD = proportional deviation

M_i = measured concentration for chemical in plant at soil concentration i

E_i = estimated concentration for chemical in plant at soil concentration i

Negative values for PD indicate overestimation of the measured values by the modeled values, while positive PD values indicate underestimation. The percentage of estimated values that exceeded their corresponding measured value was also tabulated by each chemical and estimation method. Relative quality of general estimation methods was evaluated by the following criteria.

1. median PD closest to 0 (indicates that estimates center around measured values)

2. PD with narrowest range (indicates relative accuracy of method)

3. percentage overestimation closest to 50% (indicates that estimates center around measured values)

4. difference between estimated and measured values not significantly different, as determined by Wilcoxon sign-rank tests.

Estimation methods were evaluated using these criteria in a weight-of-evidence approach. The fourth criterion was weighted somewhat less than the other three.

Relative quality of conservative estimation methods was evaluated by

1. smallest, negative median PD value (indicates that method overestimates while minimizing the degree of overestimation) and

2. PD with narrowest range (to minimize the degree of overestimation).

Linear regressions of the natural-log transformed concentrations in the plant and soil validation dataset were performed and compared to single-variable regression models (i.e., soil concentration only) developed from the original observations using the F-test procedure for comparing regression lines outlined in Draper and Smith (1981). Differences were considered significant if $p \leq 0.05$.

Following validation analyses, the initial model and validation datasets were pooled, even if they differed significantly, and uptake factors and single and multiple regression models were recalculated. These results were reported as the final uptake factor or regression model.

Data for additional chemicals were present in one of the validation datasets (PTI Environmental Services 1995) that were not represented in the initial model dataset. Uptake factors were generated, and summary statistics and distributions were determined for those chemicals. Because these data represent a single study, regression models were not fit to the data. These data are presented in Appendix A.

3. RESULTS

3.1 MODELING RESULTS

Based on preliminary analyses, regressions of plant concentrations versus soil concentrations using salt data differed significantly from those using field data. Significance values (p) were 0.035 for arsenic, 7.9 x 10^{-15} for cadmium, 4.5 x 10^{-5} for copper, 0.0017 for lead, 0.0059 for mercury, 0.00011 for nickel, 7.2 x 10^{-29} for selenium, and 0.0013 for zinc. For some of the chemicals (arsenic and nickel), the salt uptake data were within the 95% prediction limit of the field data regressions (Appendix C). However, for most chemicals, several data points were outside of these bounds. Most concentrations of selenium in plants when the source of selenium was selenate or selenite were higher than most concentrations of selenium in plants in the field studies (Appendix C, Fig. C.7). For some chemicals, such as arsenic, cadmium, and zinc, the plant concentrations associated with salts additions were comparable to the highest plant concentrations from the field dataset. For other chemicals, such as mercury, the range of soil concentrations in the salts dataset was simply too narrow to give a good regression line (Appendix C, Fig. C.5). However, because for some chemicals, salts-amended soils were generally associated with higher chemical concentrations in plants than chemicals in field soils, the decision was made to exclude salts data from the models for uptake of all chemicals by plants. All results below are for field data only.

Soil-plant regression models and uptake factors were developed for eight inorganic chemicals: arsenic, cadmium, copper, lead, mercury, nickel, selenium, and zinc (Figs. 1 to 8). In the initial dataset with salts data excluded, the number of observations ranged from 99 for arsenic to 164 for zinc (Table 1). The number of studies incorporated in the models ranged from seven for nickel to twenty for zinc. Six of eight distributions of uptake factors fit a lognormal distribution more closely than a normal distribution, though only the distribution of uptake factors for arsenic, lead, selenium, and zinc fit the lognormal form well (Table 1). Median uptake factors for all chemicals were less than one; however, the maximum uptake factor for all chemicals exceeded one. The distributions of uptake factors for the eight chemicals spanned at least two orders of magnitude; e.g., for copper the range of uptake factors was less than three orders of magnitude and for arsenic the range was greater than five orders of magnitude. An example of the cumulative distribution of uptake factors for selenium is presented in Fig. 9. [**Note**: the mean and standard deviation of the natural-log-transformed uptake factors are presented as parameters for describing the uptake factor distributions for chemicals where the distribution is lognormal (Table 1). Whereas these untransformed uptake factors are best fit by a lognormal distribution, the natural-log-transformed uptake factors are normally distributed. These parameters may be used in two ways. They may be applied to normal

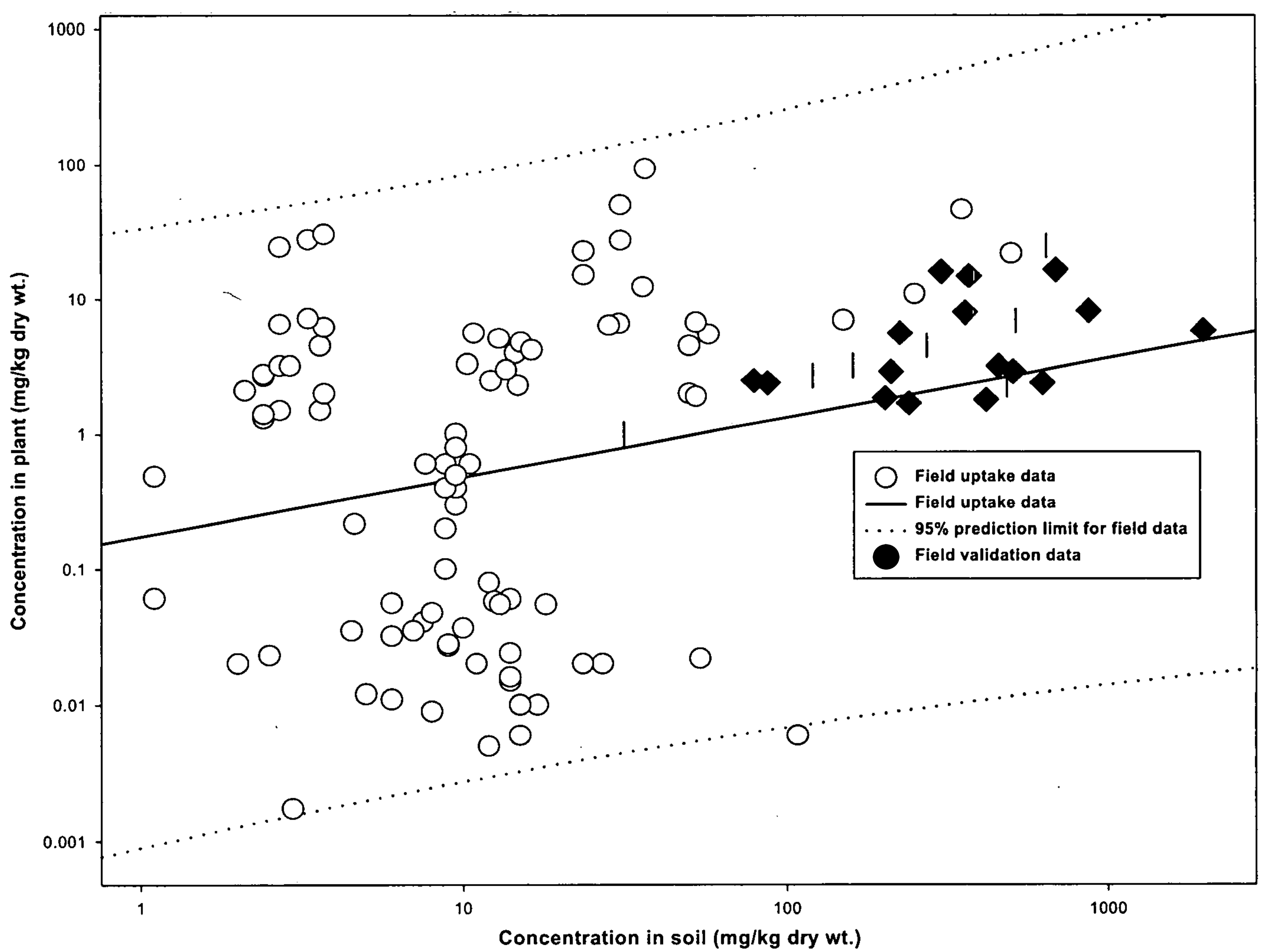

Fig. 1. Scatterplots of arsenic concentrations in vegetation versus soil. Concentrations include both those from the initial model dataset and those from the validation dataset. The single-variable regression for the initial model dataset and the 95% upper prediction limit on the regression are depicted.

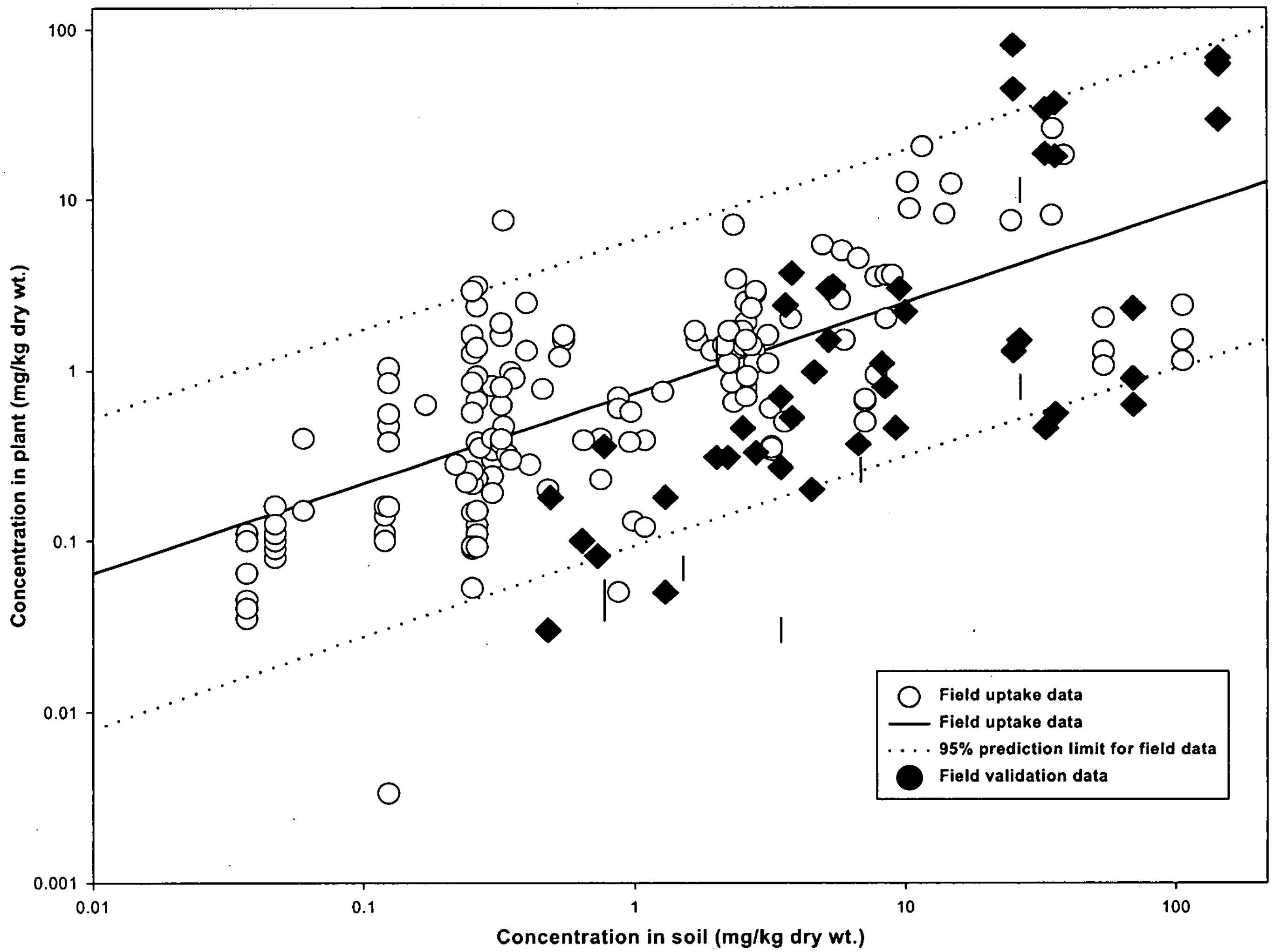

Fig. 2. Scatterplots of cadmium concentrations in vegetation versus soil. Concentrations include both those from the initial model dataset and those from the validation dataset. The single-variable regression for the initial model dataset and the 95% upper prediction limit on the regression are depicted.

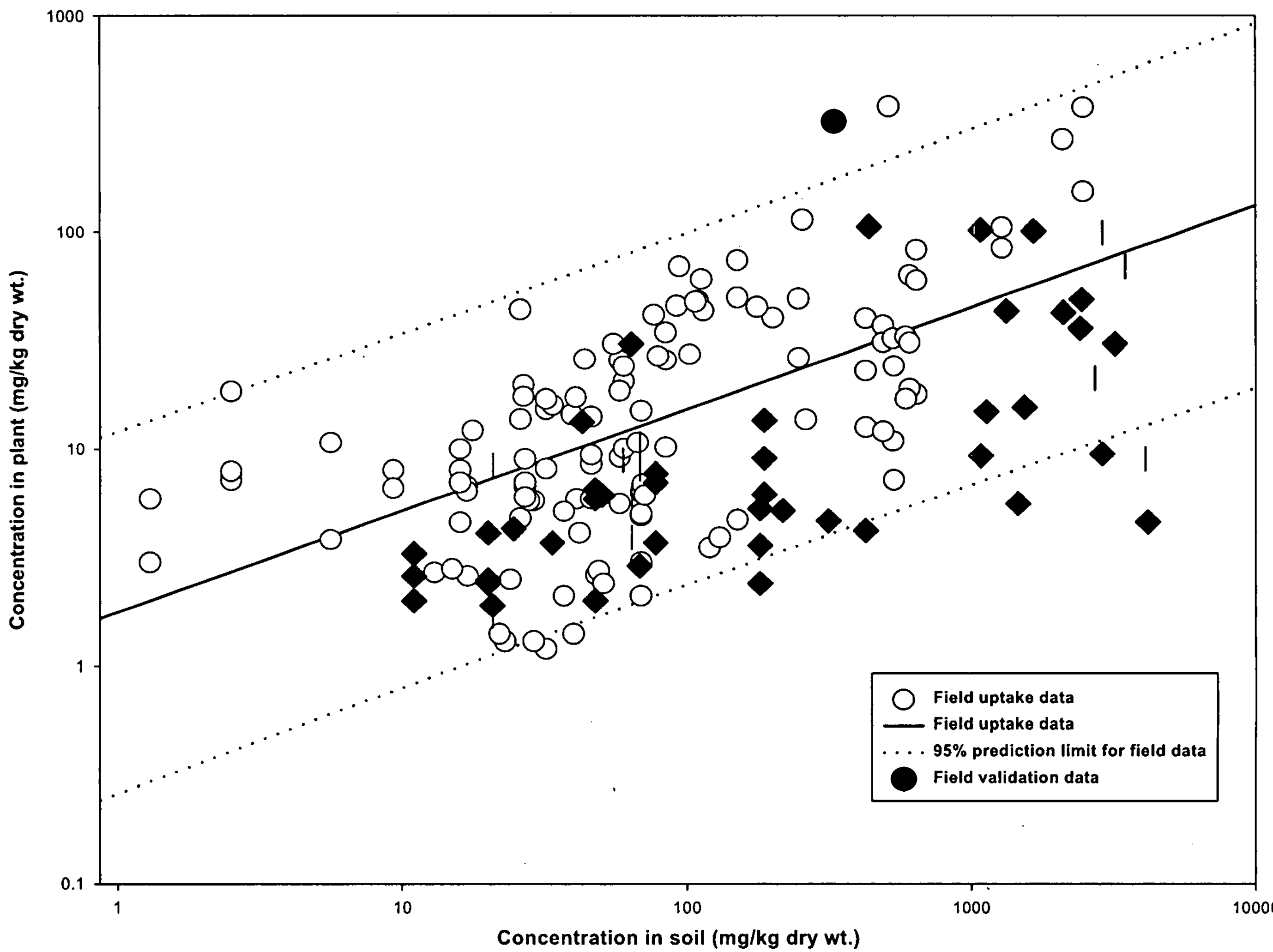

Fig. 3. Scatterplots of copper concentrations in vegetation versus soil. Concentrations include both those from the initial model dataset and those from the validation dataset. The single-variable regression for the initial model dataset and the 95% upper prediction limit on the regression are depicted.

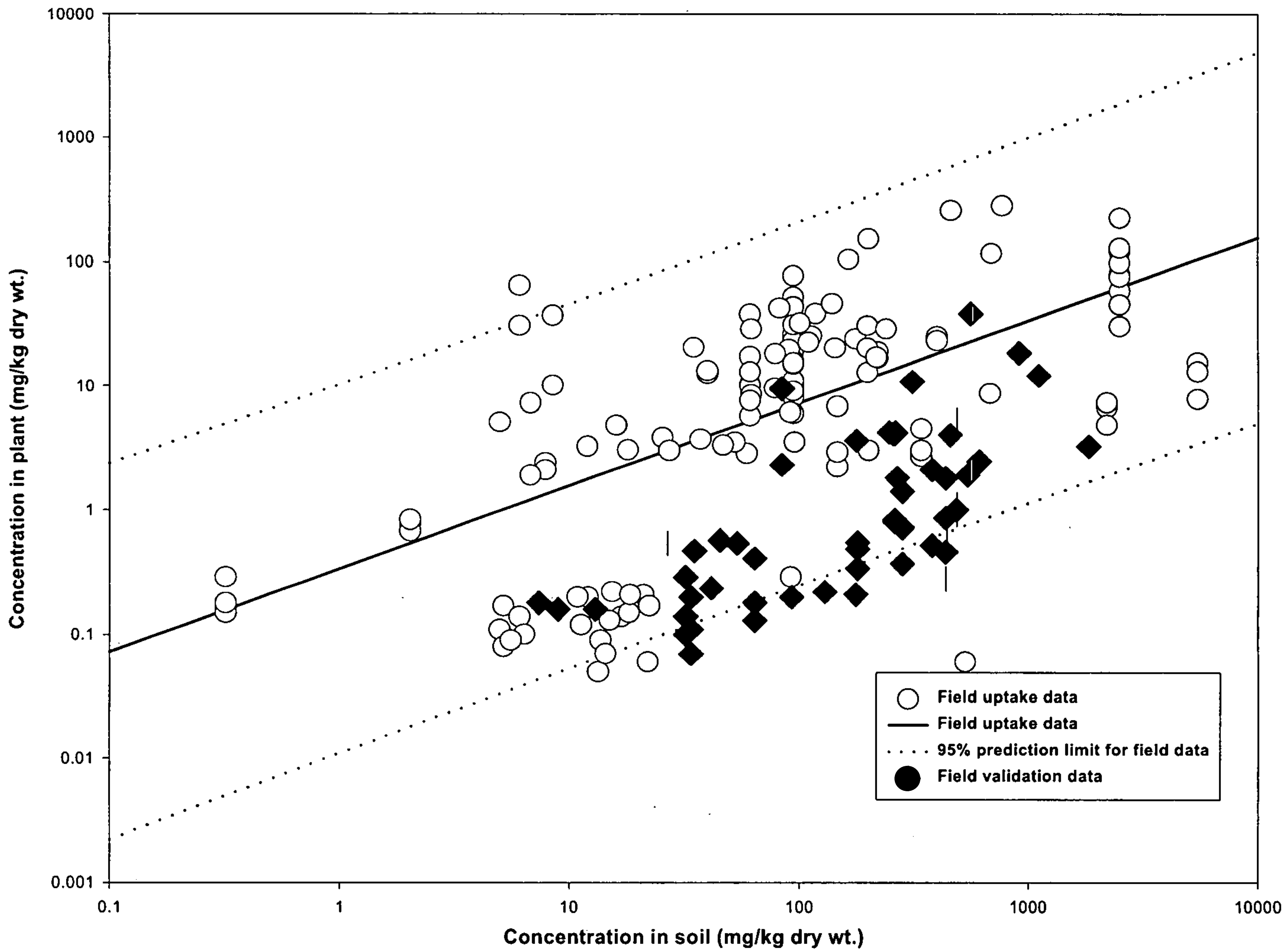

Fig. 4. Scatterplots of lead concentrations in vegetation versus soil. Concentrations include both those from the initial model dataset and those from the validation dataset. The single-variable regression for the initial model dataset and the 95% upper prediction limit on the regression are depicted.

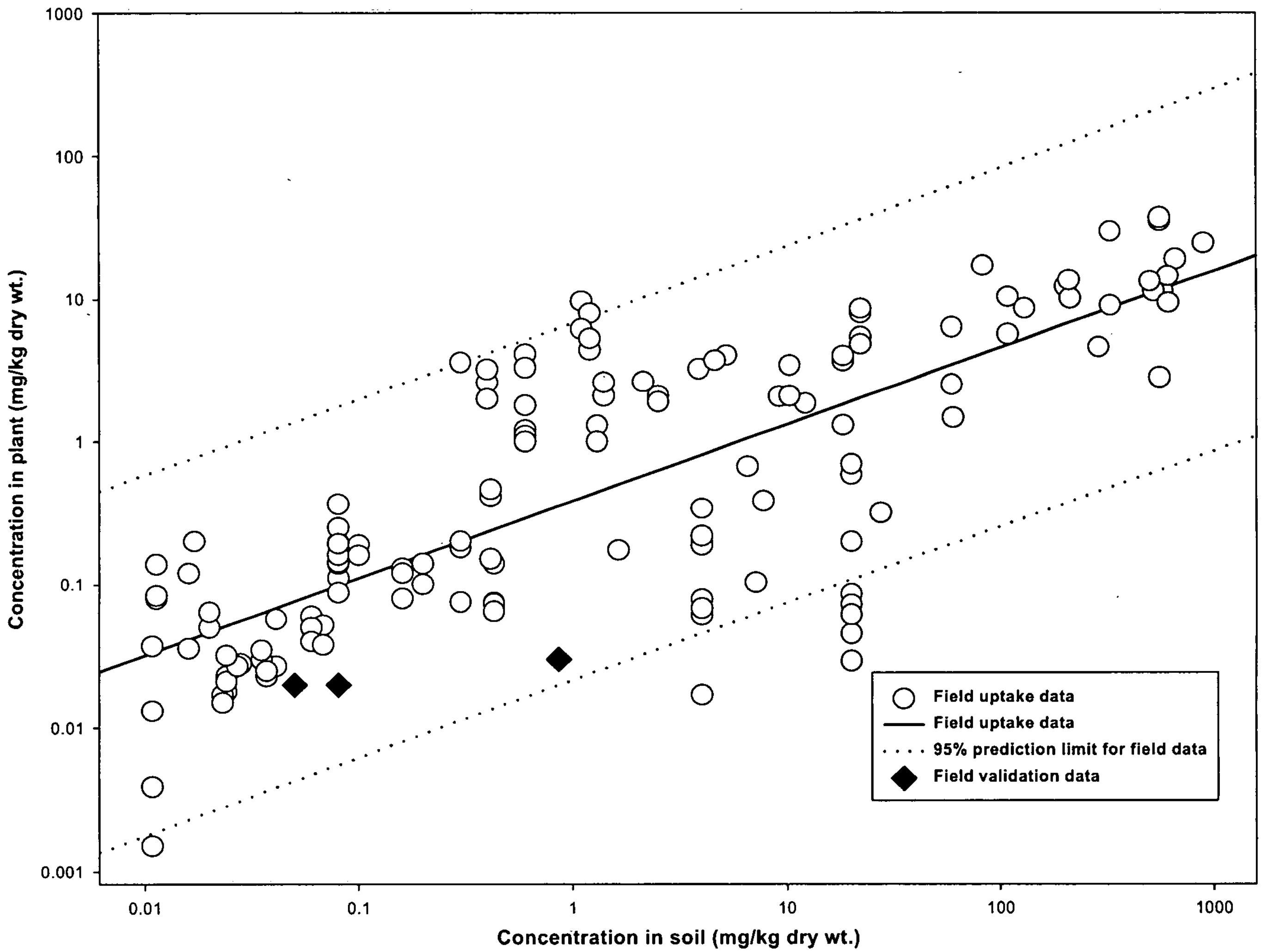

Fig. 5. Scatterplots of mercury concentrations in vegetation versus soil. Concentrations include both those from the initial model dataset and those from the validation dataset. The single-variable regression for the initial model dataset and the 95% upper prediction limit on the regression are depicted.

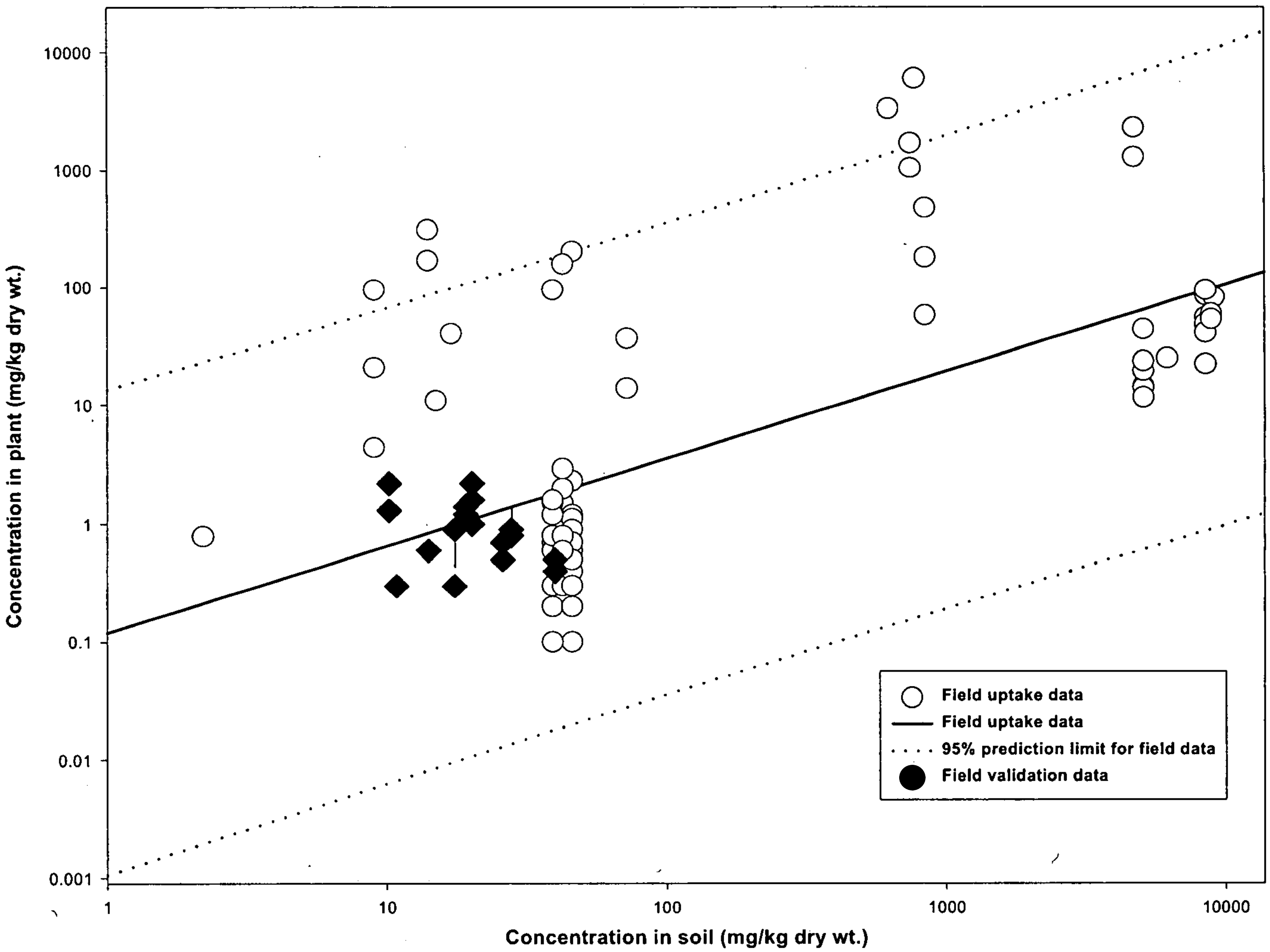

Fig. 6. Scatterplots of nickel concentrations in vegetation versus soil. Concentrations include both those from the initial model dataset and those from the validation dataset. The single-variable regression for the initial model dataset and the 95% upper prediction limit on the regression are depicted.

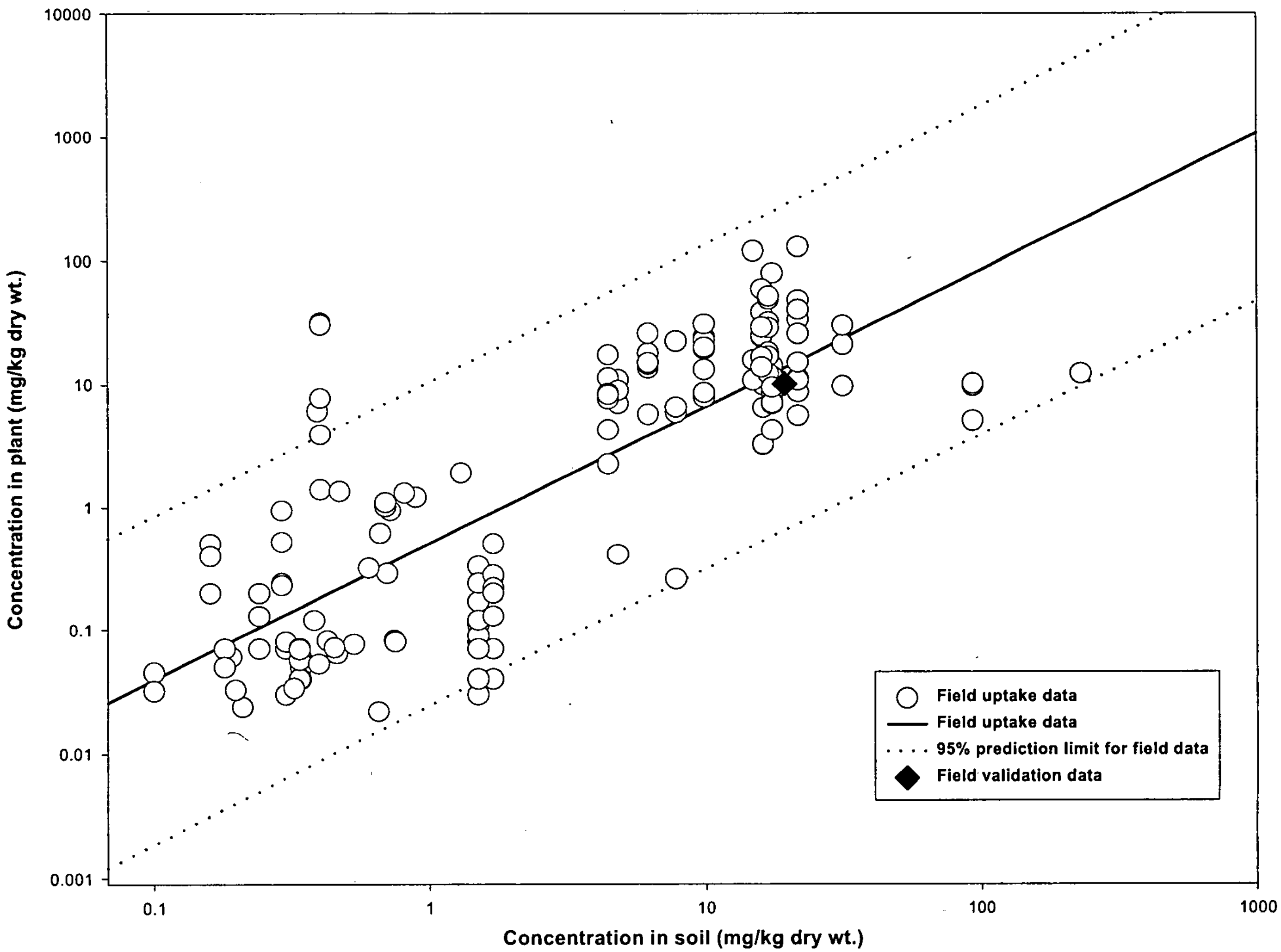

Fig. 7. Scatterplots of selenium concentrations in vegetation versus soil. Concentrations include both those from the initial model dataset and those from the validation dataset. The single-variable regression for the initial model dataset and the 95% upper prediction limit on the regression are depicted.

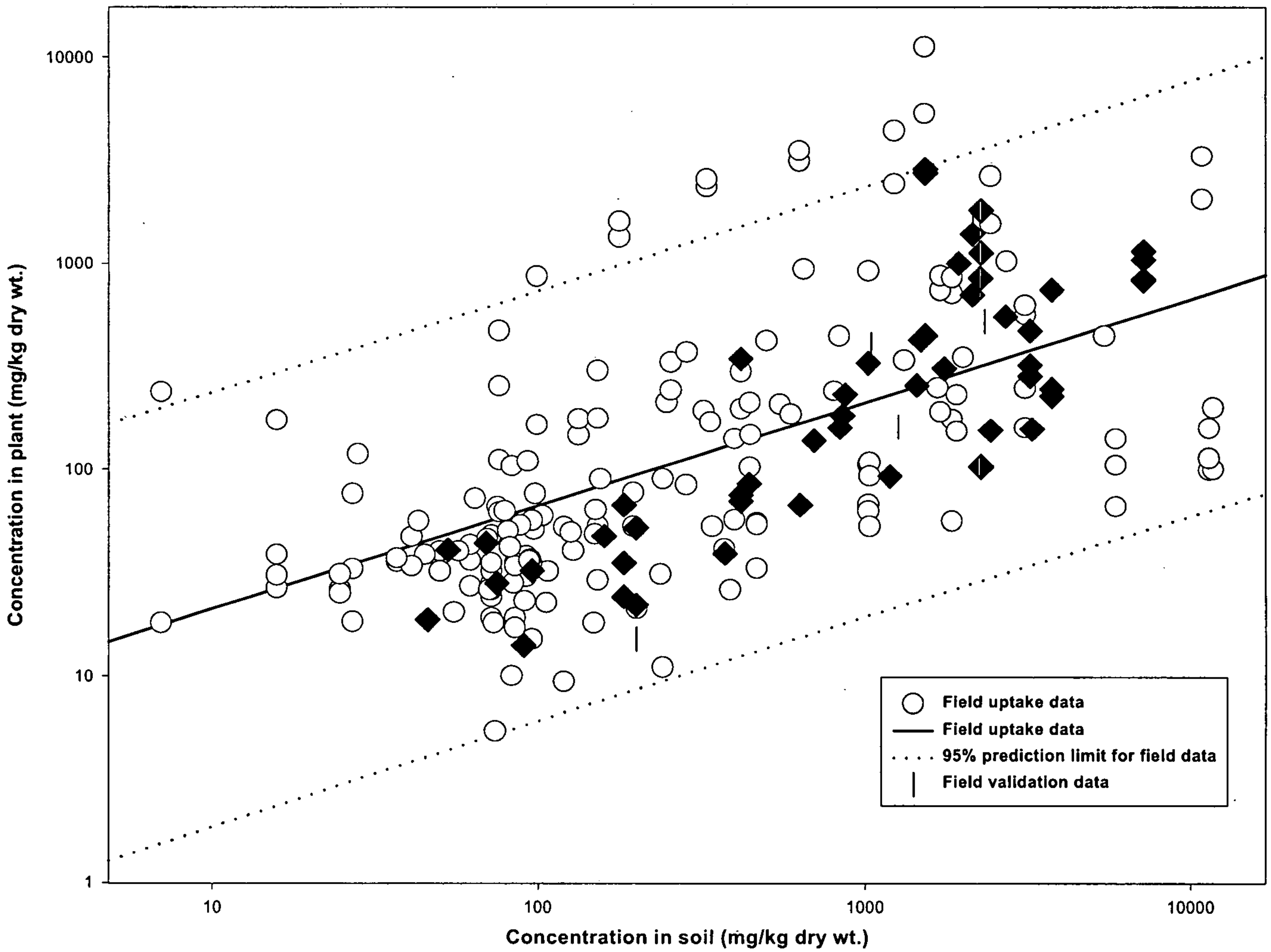

Fig. 8. Scatterplots of zinc concentrations in vegetation versus soil. Concentrations include both those from the initial model dataset and those from the validation dataset. The single-variable regression for the initial model dataset and the 95% upper prediction limit on the regression are depicted.

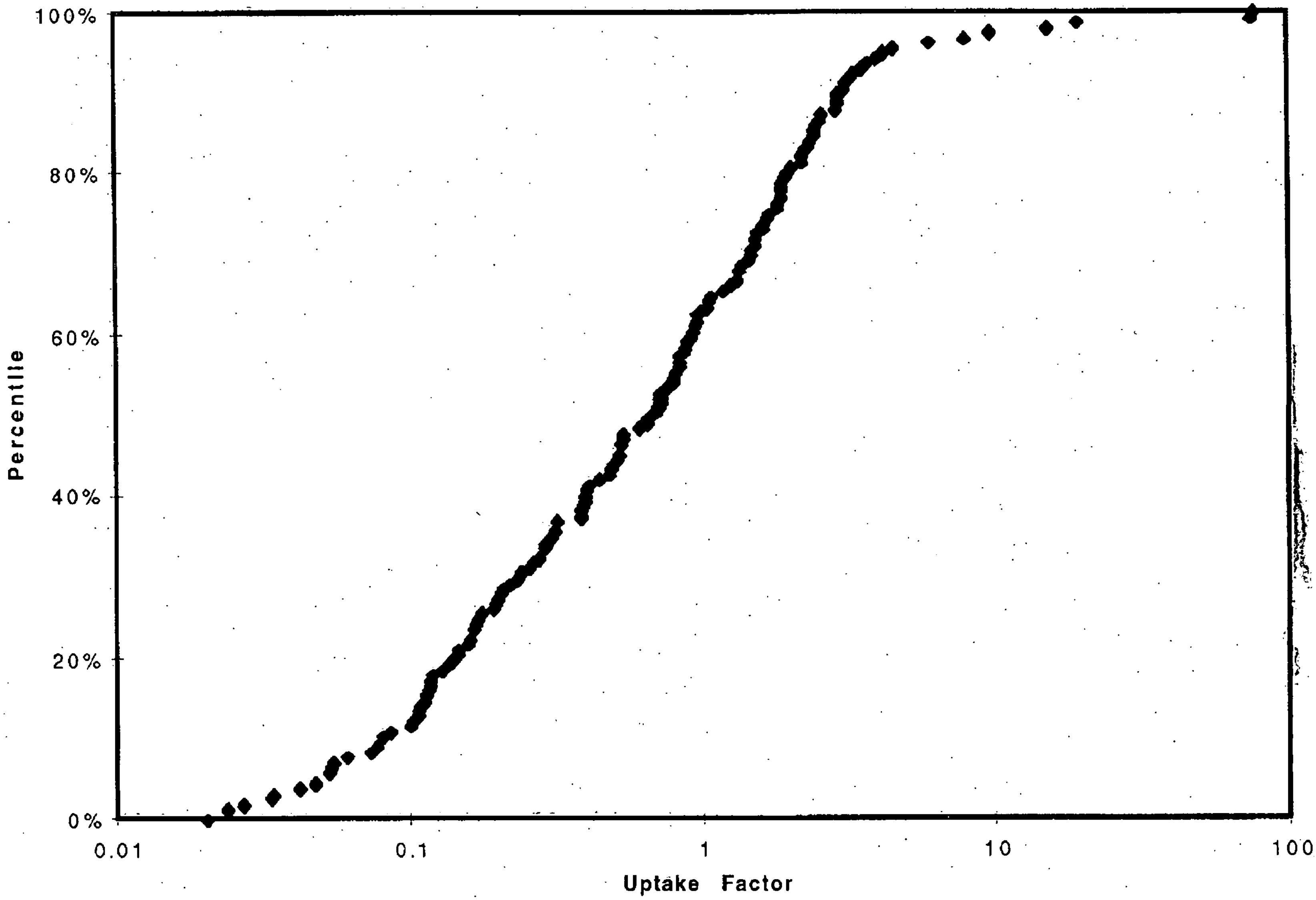

Fig. 9. Distribution of soil-plant uptake factors for selenium.

Table 1. Summary statistics for soil-to-plant uptake factors. Uptake factors are calculated from concentrations expressed on a dry weight basis

Chemical	N (studies)	N (observ- ations)	Mean	Standard deviation	Minimum	Median	90th percentile	Maximum	Mean of ln-trans- formed values	Std. Dev. of trans- formed values	Distribution
Arsenic	9	99	0.555	1.522	0.000056	0.0472	1.185	9.074	-3.069	2.665	lognormal
Cadmium	17	155	1.700	2.656	0.0107	0.833	3.806	22.879	-0.247	1.364	neither (lognormal closest)
Copper	17	125	0.443	0.909	0.0135	0.200	0.710	7.400	-1.687	1.253	neither (lognormal closest)
Lead	19	133	0.343	1.078	0.000113	0.117	0.563	10.601	-2.488	1.832	lognormal
Mercury	12	142	1.508	2.480	0.00145	0.663	5.000	12.230	-1.051	2.099	neither
Nickel	7	90	0.911	3.052	0.00217	0.0136	2.361	22.214	-3.420	2.375	neither
Selenium	14	156	2.276	8.740	0.02	0.700	3.012	77.000	-0.566	1.536	lognormal
Zinc	20	164	1.261	3.185	0.00855	0.430	2.571	34.286	-0.853	1.468	lognormal

distribution functions in Monte Carlo simulation software, however the output from the sampling from this distribution must be back-transformed. Alternatively, the parameters may be incorporated into the LOGNORM2 function in the @RISK[1] Monte Carlo simulation software (Palisade Corp. 1994b). Use of the LOGNORM2 function requires no back-transformation. Comparable results are obtained using either approach.]

Regression of the natural log of chemical concentrations in plants versus the natural log of those in soil produced significant model fits for seven of eight chemicals using the initial model data (Table 2). The exception was arsenic, though the P value was almost low enough to be significant (Table 2). Slopes of all significant regression models were positive. r^2 values for the significant models ranged from 0.12 for nickel to 0.68 for mercury. The slopes of all regression models were positive. Intercepts differed significantly from zero for all eight chemicals.

Table 2. Results of regression of ln (conc. in plant) on ln (conc. in soil)

Chemical	N	B0±SE	B1±SE	r^2	P model fit
Arsenic	99	-1.754±0.601[b]	0.442±0.230[NS]	0.7684	0.0573
Cadmium	155	-0.304±0.084[c]	0.529±0.045[c]	0.4549	0.0001
Copper	125	0.573±0.246[a]	0.468±0.054[c]	0.4091	0.0001
Lead	133	-1.088±0.334[b]	0.666±0.071[c]	0.4385	0.0001
Mercury	142	-0.958±0.122[c]	0.538±0.037[c]	0.6763	0.0001
Nickel	90	-2.122±0.597[c]	0.737±0.110[c]	0.119	0.0001
Selenium	156	-0.676±0.142[c]	1.106±0.068[c]	0.6305	0.0001
Zinc	164	1.892±0.328[c]	0.502±0.057[c]	0.3226	0.0001

model: ln (conc. in aboveground plant) = B0 + B1 (ln [conc. in soil]), where concentrations (mg/kg) are expressed on a dry weight basis.

[a] $0.01 < p \leq 0.05$
[b] $0.001 < p \leq 0.01$
[c] $p \leq 0.001$
[NS] $p > 0.05$

The soil pH was not available for many observations in the database; thus the inclusion of this variable in the regression models resulted in decreases in sample size (Table 3). Consequently, the single-variable and multiple regression models are not directly comparable. The addition of soil pH in the regression model resulted in significant model fits for all chemicals except nickel. pH contributed significantly to the model fit for copper, lead, mercury and selenium (Table 3).

[1]Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply endorsement, recommendation, or favoring by the United States Government or any agency thereof.

Table 3. Results of regression of ln (conc in plant) on ln (conc. in soil) and pH

Chemical	N	B0+SE	B1+SE	B2+SE	r^2	P model fit
Arsenic	24	-4.852±2.740[NS]	0.682±0.305[a]	0.403±0.555[NS]	0.7684	0.0001
Cadmium	117	0.704±0.635[NS]	0.544±0.056[c]	-0.166±0.100[NS]	0.4549	0.0001
Copper	85	-0.667±0.470[NS]	0.286±0.067[c]	0.272±0.084[b]	0.4091	0.0001
Lead	103	-3.398±1.046[b]	0.683±0.077[c]	0.311±0.147[a]	0.4385	0.0001
Mercury	79	-4.119±1.155[c]	0.635±0.063[c]	0.419±0.187[a]	0.6763	0.0001
Nickel	36	-0.428±2.329[NS]	0.128±0.117[NS]	0.620±0.354[NS]	0.119	0.1235
Selenium	146	-8.936±0.733[c]	0.984±0.050[c]	1.182±0.107[c]	0.8469	0.0001
Zinc	167	2.280±0.505[c]	0.571±0.082[c]	-0.128±0.101[NS]	0.8447	0.0001

model: ln (conc in aboveground plant) = B0 + B1(ln[soil]) + B2(pH), where concentrations (mg/kg) are expressed on a dry weight basis.

[a] $0.01<p\leq0.05$

[b] $0.001<p\leq0.01$

[c] $p\leq0.001$

[NS] $p>0.05$

3.2 VALIDATION RESULTS

Data for model validation were available for all chemicals, but the two observations of selenium in soils and plants, which were identical concentrations, were insufficient for the construction of a regression model. A comparison of single-variable regression models for the log-transformed contaminant concentrations from literature studies and the validation data indicated that the models were statistically significantly different for cadmium (p=1E-8), copper (p=1E-5), lead (p=2E-16) and zinc (p=0.02)).

The predictive utility of soil-plant uptake factors and regression models was measured by evaluating statistically significant differences between measured and estimated values. Using the validation dataset, significant differences between measured and estimated concentrations were observed for 6 of 7 chemicals using the median uptake factor; such a difference was not observed in the case of mercury (Table 4). (Selenium was not included in the analysis because the validation data, 2 points, were not sufficient to construct a regression.) Significant differences in concentrations measured and those estimated using the single-variable regression model were observed for arsenic, copper and lead, but not cadmium, copper, nickel or zinc (Table 4). Significant differences between concentrations measured and those estimated using the multiple regression model with pH were found for lead and nickel only. All three general estimation methods overestimated measured plant concentrations for over 50% of soil concentrations for all chemicals except for the uptake factor for nickel (10% overestimation) and the single-variable regression model for arsenic (17% overestimation). Median proportion deviations of estimated values from measured values ranged from -0.19 for the multiple regression model for Zn to a maximum of -48.61 for the multiple regression model for nickel (Table 4).

Table 4. Comparison of quality of general estimation methods as determined by the proportional deviation (PD) of the estimated values from measured values. PD = (measured - estimated)/measured

		Median uptake factor		Single-variable regression model		Regression model with pH	
Chemical	**N**	**Median PD (range)**	**% over estimated**	**Median PD (range)**	**% over estimated**	**Median PD (range)**	**% over estimated**
Arsenic	23	-1.85[c] (-14.83 to 0.11)	96	0.48[c] (-0.38 to 0.88)	17	-3.46[NS] (-43.90 to 0.95)	65
Cadmium	52	-4.64[c] (-94.83 to 0.7417)	90	-1.82[NS] (-46.33 to 0.95)	67	-1.65[NS] (-43.90 to 0.95)	69
Copper	55	-2.28[c] (-180.37 to 0.80)	85	-1.25[c] (-18.17 to 0.92)	85	-0.65[NS] (-7.17 to 0.97)	67
Lead	56	-24.16[c] (-179.97 to -0.02)	100	-11.42[c] (-67.58 to 0.40)	95	-11.01[c] (-60.75 to 0.70)	91
Mercury	3	-1.65[NS] (-18.00 to -0.66)	100	-3.92[NS] (-10.79 to -2.82)	100	-1.02[NS] (-6.19 to -0.92)	100
Nickel	21	0.656[c] (-0.36 to 0.94)	10	-0.27[NS] (-3.54 to 0.70)	67	-46.81[c] (-224.39 to -16.90)	100
Zinc	56	-1.20[c] (-8.58 to 0.77)	82	-0.21[NS] (-5.29 to 0.91)	55	-0.19[NS] (-4.60 to .90)	59

[NS] Estimate not significantly different from measured as determined by Wilcoxon signed-rank test ($p<0.05$)
[a] Estimate significantly different from measured as determined by Wilcoxon signed-rank test ($0.01<p\leq 0.05$)
[b] Estimate significantly different from measured as determined by Wilcoxon signed-rank test ($0.001<p\leq 0.01$)
[c] Estimate significantly different from measured as determined by Wilcoxon signed-rank test ($p \leq 0.001$)

Using the selection criteria outlined in Sect. 2.2, the best estimates for the uptake of arsenic and nickel are provided by the single-variable regression model, and the best estimates for copper and mercury are provided by the multiple regression with pH. Criteria for cadmium, lead, and zinc are comparable for the single-variable and multiple regressions. (These results do not constitute a recommendation of these models. A test of significance of the variable of pH [see below] was also required.)

Among conservative estimation methods, both the 90th percentile uptake factor and the 95% upper prediction limit for the single-variable regression model significantly overestimated measured concentrations in plants for all chemicals except mercury. The 95% upper prediction limit produced the best, conservative estimate (i.e., smallest negative median and smallest range proportional deviation) of chemical concentrations in above-ground plant tissue for arsenic, copper, and zinc, with percent overestimates ranging from 96 to 100% (Table 5). The best conservative estimates for cadmium, lead, and mercury were obtained using the 90th percentile uptake factor. Conservative estimation methods were approximately equivalent for nickel.

Table 5. Comparison of quality of conservative estimation methods as determined by the proportional deviation (PD) of the estimated values from measured values.
PD = (measured - estimated)/measured

		90th percentile uptake factor		Upper 95% prediction limit for simple regression model	
Chemical	**N**	**Median PD (range)**	**% over estimated**	**Median PD (range)**	**% over estimated**
Arsenic	23	-70.64[c] (-396.75 to -21.31)	100	-38.11[c] (-99.27 to -7.647)	100
Cadmium	52	-24.78[c] (-436.65 to -0.18)	100	-85.13[c] (-12886.84 to -604)	100
Copper	55	-10.66[c] (-643.88 to 0.28)	98	-9.82[c] (-90.51 to 0.60)	98
Lead	56	-119.94[c] (-838.87 to -3.92)	100	-209.36[c] (-1159.20 to -9.09)	100
Mercury	3	-19.00[NS] (-142.33 to -11.50)	100	-217.53[NS] (-252.21 to -135.30)	100
Nickel	21	-58.88[c] (-234.78 to -9.95)	100	-59.58[c] (-216.27 to -13.37)	100
Zinc	56	-12.16[c] (-56.23 to -0.39)	100	-8.04[c] (-46.16 to 0.31)	96

[NS] Estimate not significantly different from measured as determined by Wilcoxon signed-rank test ($p<0.05$)
[a] Estimate significantly different from measured as determined by Wilcoxon signed-rank test ($0.01<p\leq0.05$)
[b] Estimate significantly different from measured as determined by Wilcoxon signed-rank test ($0.001<p\leq0.01$)
[c] Estimate significantly different from measured as determined by Wilcoxon signed-rank test ($p \leq 0.001$)

3.3 MODELS INCORPORATING VALIDATION DATA

Final regression models and soil-plant uptake factors that incorporate data from both the initial model and validation datasets were calculated for all chemicals. Uptake factors based on the combined dataset were generally similar to those based only on the model dataset, though the median uptake factors of the combined dataset were always lower than those from the initial dataset except in the case of nickel (Table 6). Distributions of uptake factors for most chemicals more closely resembled a lognormal than a normal shape. No median uptake factor was greater than one, though for six of eight chemicals, the 90th percentile uptake factor was >1. (Table 6).

In general, results of simple regression analyses differed little between the original and combined datasets. The model fit for arsenic was improved (and became significant) after the addition of the validation data to the dataset (Table 7). Slopes and intercepts of single-variable

Table 6. Summary statistics for soil-plant uptake factors following inclusion of validation data

Chemical	N (studies)	N (observns)	Mean	Standard Deviation	Minimum	Median	90th percentile	Maximum	Mean of ln-transformed values	St. dev. of ln-transformed values	Distribution
Arsenic	11	122	0.454	1.386	0.00006	0.0375	1.103	9.074	-3.295	2.470	lognormal
Cadmium	19	207	1.359	2.386	0.0087	0.586	3.250	22.879	-0.666	1.547	neither (lognormal closest)
Copper	19	180	0.341	0.777	0.0011	0.124	0.625	7.400	-2.095	1.442	lognormal
Lead	21	189	0.245	0.916	0.00011	0.0389	0.468	10.601	-3.278	2.063	neither (lognormal closest)
Mercury	14	145	1.481	2.461	0.00145	0.652	5.000	12.230	-1.068	2.086	neither
Nickel	9	111	0.749	2.766	0.00217	0.018	1.411	22.214	-3.375	2.163	neither
Selenium	16	158	2.253	8.686	0.02	0.672	3.012	77.000	-0.567	1.526	lognormal
Zinc	22	220	1.021	2.784	0.00855	0.366	1.820	34.286	-1.028	1.371	lognormal

regressions for all chemicals became highly significant ($p \leq 0.001$), even if they were not significant prior to the inclusion of the validation data.

Table 7. Results of regression of ln (conc. in plant) on ln (conc. in soil) following inclusion of validation data

Chemical	N	B0±SE	B1±SE	R^2	P model fit
Arsenic	122	-1.992±0.431[c]	0.564±0.125[c]	0.145	0.0001
Cadmium	207	-0.476±0.088[c]	0.546±0.042[c]	0.447	0.0001
Copper	180	0.669±0.213[c]	0.394±0.044[c]	0.314	0.0001
Lead	189	-1.328±0.350[c]	0.561±0.072[c]	0.243	0.0001
Mercury	145	-0.996±0.122[c]	0.544±0.037[c]	0.598	0.0001
Nickel	111	-2.224±0.472[c]	0.748±0.093[c]	0.371	0.0001
Selenium	158	-0.678±0.141[c]	1.104±0.067[c]	0.633	0.0001
Zinc	220	1.575±0.279[c]	0.555±0.046[c]	0.402	0.0001

model: ln (conc. in plant) = B0 + B1(ln[conc in soil]), where concentrations (mg/kg) are expressed on a dry weight basis.
NS Not significant: $p>0.05$
[a] $0.01<p\leq 0.05$
[b] $0.001<p\leq 0.01$
[c] $p\leq 0.001$

After the inclusion of the validation data, the multiple regression model for nickel that included pH became significant (Table 8). Thus, multiple regression models for all eight chemicals were significant. pH dropped out as a contributor to the regression for copper and lead, but became a contributor to the regressions for cadmium and zinc (Table 8). The slope of the regression for nickel, which was not significantly different from zero prior to the inclusion of validation data, became significant after their inclusion. With the inclusion of the validation data in the multiple regression with pH, the intercept for arsenic became significant, and the intercept for lead became insignificant.

Chemicals not included in the above models, but for which concentrations in soil and plants and soil pH were measured in the validation dataset from Bartlesville, Oklahoma (PTI Environmental Services 1995) include: aluminum, antimony, barium, calcium, chromium, cobalt, iron, magnesium, manganese, potassium, silver, sodium, and vanadium. Summary statistics for distributions of soil-plant uptake factors for this site are presented in Appendix D, Table D-1.

Table 8. Results of regression of ln (conc. in plant) on ln (conc. in soil) and pH following inclusion of validation data

Chemical	N	B0±SE	B1±SE	B2±SE	R^2	P model fit
Arsenic	47	-2.556±0.763[b]	0.694±0.057[c]	0.018±0.124[NS]	0.780	0.0001
Cadmium	170	1.152±0.638[NS]	0.564±0.047[c]	-0.270±0.102[b]	0.462	0.0001
Copper	140	0.513±0.492[NS]	0.362±0.045[c]	0.012±0.076[NS]	0.331	0.0001
Lead	159	-1.929±1.030[NS]	0.561±0.075[c]	0.043±0.141[NS]	0.272	0.0001
Mercury	82	-4.186±1.144[c]	0.641±0.062[c]	0.423±0.186[a]	0.677	0.0001
Nickel	57	-2.064±2.534[NS]	0.574±0.104[c]	0.262±0.388[NS]	0.364	0.0001
Selenium	148	-8.831±0.723[c]	0.992±0.050[c]	1.167±0.106[c]	0.847	0.0001
Zinc	193	2.362±0.440c	0.640±0.057c	-0.214±0.077[b]	0.409	0.0001

model: ln (conc. in plant) = B0 + B1(ln[conc in soil]) + B2(pH), where concentrations (mg/kg) are expressed on a dry weight basis.

NS Not significant: $p>0.05$

[a] $0.01<p\leq0.05$

[b] $0.001<p\leq0.01$

[c] $p\leq0.001$

4. DISCUSSION

The measurement of chemicals in vegetation at specific hazardous waste sites is recommended, but such samples are often not obtained for remedial investigations. To estimate concentrations of inorganic chemicals in above-ground plant tissue, risk assessors must use empirical models. Such models usually consist of soil-plant uptake factors. In this study, uptake factors, single-variable regressions of log-transformed plant concentration on soil concentration and multiple regressions incorporating pH as well as soil concentration were generated for eight common inorganic contaminants of soil, using published measurements of chemicals in soil and above-ground vegetation. All single-variable and multiple regressions in which validation data were incorporated (but salts data were excluded) were significant. Interestingly, in some of the individual studies from which data were drawn, such a significant relationship between soil and plant concentrations was not observed, but this lack of a relationship could be due to: (1) the narrow range of chemical concentrations (x-values) or few data points in an individual study, (2) soil characteristics that were dominant contributors to variability, (3) plant regulatory control over the uptake of essential elements, or (4) inappropriate measurement of exposure concentrations, e.g., for trees. In the multiple regression incorporating soil pH, the variable of pH was significant only for cadmium, mercury, selenium, and zinc, though the multiple regression incorporating soil concentration and pH predicted the plant concentration of copper and lead in the validation dataset better than other models. The good predictions for copper and lead were likely a chance occurrence.

The original dataset of plant and soil concentrations included measurements from studies where inorganic salts were added to soil in a laboratory or greenhouse. Statistically, these data were significantly different from field data. It was also clear from visual examination of the graphs of chemical concentration in soil versus that in plants that uptake of some chemicals was generally higher from salts-amended soil than from other chemical forms in the field. The use of these salts data in the calculation of empirical uptake models would be a source of hidden conservatism. Thus, these data were determined not to be useful for developing regression models for use with field data. Although common wisdom is that salts freshly added to soil in pots are more bioavailable to plants than field contaminants, few studies have actually confirmed this relationship. It is notable that some of the data from the uptake of salts by plants were comparable to those from the uptake of contaminants from waste sites, but further analysis or research would be necessary to determine why.

Distributions of soil-plant uptake factors for the chemicals were developed because of the extensive use of this type of model by risk assessors and for two additional purposes: (1) to provide a nonconservative estimate of plant concentration through the use of the median uptake factor and (2) to provide a conservative estimate of plant concentration through the use of the 90th percentile soil-plant uptake factor. It is not surprising that uptake factors did not lead to the best estimates of plant tissue concentrations in the validation dataset. Uptake factors are a specialized case of the log-transformed single-variable regression model, where the slope is one. The closest slope to one in a log-transformed single-variable regression model in this study was the slope for selenium, 1.104. The differences between calculated slopes and 1 were not estimated. For all chemicals except selenium, the calculated slope was less than one, suggesting that the uptake factor should generally decrease with higher concentrations of the chemical in soil. Moreover, for four of eight chemicals, the distribution of uptake factors was neither normal nor lognormal; thus outputs of wildlife exposure models using Monte Carlo analysis and these distributions would be somewhat uncertain. In Table 9, median soil-plant uptake factors are compared to Baes factors for vegetative components of plants (foliage and stems) (Baes et al. 1984), which are used widely in risk assessments. The source of any discrepancy between factors is unknown because the data used in the derivation of the Baes factors are not published. The use of the two sets of uptake factors could lead to substantial differences in the estimation of risks associated with chemicals such as selenium and zinc.

Table 9. Comparison of geometric mean uptake factors from Baes et al. (1984) and the present study

Chemical	Present study	Baes et al. (1984)
Arsenic	0.0371	0.04
Cadmium	0.514	0.55
Copper	0.123	0.40
Lead	0.0377	0.045
Mercury	0.344	0.90
Nickel	0.0342	0.06
Selenium	0.567	0.025
Zinc	0.358	1.5

The amount of variability explained by the regressions as expressed through the r^2 values was not very high. The high scatter around the regression lines and the high variability in uptake factors for single chemicals may be reduced by accounting for the other factors that influence uptake (e.g., soil parameters, plant taxa, exposure time, extent of tilling, and other biases of the data from which the models were derived). For example, numerous multi-crop studies found differential uptake of inorganic contaminants among the crops. It has also been observed that deciduous trees typically accumulate greater concentrations of heavy metals in foliage than do conifers (Greenleaf-Jenkins and Zasoski 1986). However, it is difficult to sample the appropriate soil surrounding tree roots to estimate their exposure. The physiological differences that explain variability in accumulation of different inorganic chemicals by different plant species are largely unknown (Peterson 1983), though in a study of radiocesium, the rooting depth of plants was most important (Guillitte et al. 1994). Additionally, temperature is expected to affect the uptake of all contaminants. For example, ryegrass grown at 25° C accumulated more cadmium and lead than that grown at 15°C (Hooda and Alloway 1993). Environmental factors that may control the accumulation of chemicals by plants are discussed on a chemical-by-chemical basis below.

A large potential source of measurement error for soil concentrations used in all uptake models is the depth to which soil concentrations were measured. The depth interval at which various plants in different environments obtain water and nutrients, and the relative biomass of feeder roots at different depths are unknown. This uncertainty is particularly true for trees, given that their rooting depths are deeper and probably more variable than those of herbs and grasses. Nonetheless, concentrations of a chemical in the top 5 cm of soil versus that in the top 15 cm of soil may vary as much as an order of magnitude, particularly if the source of soil contamination was aerial deposition. For example, the concentrations of cadmium in the top 5 cm, 15 cm, and 40 cm of soil which has been irrigated with wastewater are: 1.16 mg/kg, 0.87 mg/kg, and 0.39 mg/kg, respectively (Shariatpanahi and Anderson 1986). At one semiarid location in Utah, lead concentrations in the top 5 and 15 cm of soil were 230 and 100 mg/kg, and arsenic concentrations were 59 and 30 mg/kg (Sharma and Shupe 1977). In the large majority of studies from which the models in this study were derived, concentrations of chemicals in soil were provided with respect to a single soil depth. More than half of the field studies reported concentrations in the top 15 cm of soil.

Measurements of accumulation of chemicals by plants are usually taken at a single time without knowledge of whether or not vegetation may be in equilibrium with the soil with respect to chemical movement. However, longer exposure does not necessarily lead to higher plant concentrations. Both the age of the plant and seasonal processes apparently affect uptake. For example, for all leafy and root crops grown in a muck soil, heavy metal concentrations were greater in young crops in the early summer than in mature crops (Hutchinson et al. 1974). Moreover, the selenium content of birdsfoot trefoil exposed to natural levels of the element decreased with each cutting until midsummer, after which it remained constant (Lessard et al. 1968). On the other hand, selenium uptake by timothy increased until maturity.

In the sections below, the regressions of plant concentration on soil concentration (and pH) are discussed. In addition, potential sources of variability in uptake of the chemicals by plants are discussed.

4.1 ARSENIC

As with most inorganic chemicals, the uptake of arsenic by crop plants has been observed to vary with plant species and soil type (Otte et al. 1990). Additionally, phosphorus concentrations in soil have a large and complex effect on the uptake of arsenic by plants. The arsenic concentration in ryegrass (Jiang and Singh 1994) and that in the roots of *Urtica dioica* (Otte et al. 1990) were positively correlated with phosphorus in the soil, but in the latter case, negatively correlated with the concentration of arsenic in soil. In a second species, *Phragmites australis*, arsenic concentrations in the plant were measured at a level that was not correlated with concentrations of arsenic or phosphorus in soil (Otte et al. 1990). A better regression may have been obtained in this study if soil phosphorus were included as a variable.

4.2 CADMIUM

The uptake of cadmium has been observed to vary with plant species (Haghiri 1973). Cadmium uptake by plants has been shown in numerous studies to decrease with increasing pH (He and Singh 1994, Miller et al. 1976), so it is not surprising that the multiple regression with pH was significant in this study. Uptake by soybeans is also related to the sorptive capacity of soil (Miller et al. 1976). Lead has been widely observed to increase cadmium uptake; for example, the addition of both lead and cadmium increased the foliage content of each contaminant in American sycamore over the uptake values observed with a single metal added (Carlson and Bazzaz 1977). Lead has also increased the uptake of cadmium in rye and fescue (Carlson and Rolfe 1979) and in corn shoots (Miller et al. 1977). However, Miles and Parker (1979) found only low-level and inconsistent synergistic and antagonistic effects among cadmium, lead and other heavy metals in uptake by little bluestem and black-eyed Susan. A better regression may have been obtained in this study if soil lead were included as a variable.

4.3 COPPER

Prior to this study it was not known whether a significant regression of plant concentration on soil concentration could be derived. Copper is a plant nutrient, and plants would be expected to exert control over uptake at certain ranges of soil concentration. As with other chemicals, in some previous investigations, no correlation was found between copper in plant foliage and underlying soil (Burton et al. 1984, Davies 1992). In contrast to the results in this study (in which pH did not contribute significantly to the multiple regression), pH has sometimes been shown to contribute to the variability in uptake of copper from different soils. Sims and Kline (1991) found a significant regression model between copper in wheat and soybean and soil copper and pH, but not with the copper concentration in soil alone.

4.4 LEAD

Lime has been observed to reduce the uptake of lead by lettuce and oats (John and Laerhoven 1972), suggesting that pH is a variable which controls the uptake of the element from soil. In contrast, Davies (1992) found that lead uptake by radish was best predicted by total lead in soil, and the regression of plant lead on soil lead concentration in that study was not improved by adding other soil characteristics. Similarly, in this study, pH did not contribute significantly to the multiple regression. The uptake of lead by plants has been found to be increased (Carlson and Bazzaz 1977), unaffected (Carlson and Rolfe 1977), and decreased (Miller et al. 1977) by increased concentrations of cadmium. Additional contributors to the variability in uptake of lead are: exposure time (Nilsson 1972) and plant taxon. While the attempt was made to exclude aerial exposure of lead, the use of lead in gasoline may have contributed to aerial exposure of plants to lead in some studies.

4.5 MERCURY

Prior to the analysis in this study, it was uncertain whether a relationship between the concentrations of mercury in soil and plants from multiple studies would be significant. Both the speciation of mercury and the uptake route via air were expected to contribute large uncertainty bounds to any empirical relationship. In contrast to other metals, most mercury in above-ground plant tissue is taken up as volatile, elemental mercury through the leaves (Bysshe 1988, Siegel and Siegel 1988, Lindberg et al. 1979), with limited accumulation from the soil via the roots and transpiration stream. However, significant relationships between soil and plant mercury have been observed previously. For example, a significant correlation between soil mercury and tissue concentrations was observed for several plant species found in mining areas (Siegel et al. 1987) and near chloralkali plants (Lenka et al. 1992 and Shaw and Panigrahi 1986).

Although the contribution of pH to the regression was significant for mercury in this study, little information is available on the role of pH in the uptake of mercury. Differences in the uptake of mercury have been associated with different chemical species (Bache et al. 1973) as well as different plant taxa (Bache et al. 1973, Du and Fang 1982, John 1972). In addition, inorganic selenium added to soil decreased the uptake of mercury by tomato (*Lycopersicum esculentum*) (Shanker et al. 1996).

4.6 NICKEL

In contrast to the results of this study, an association of nickel concentrations in plants and pH has previously been observed. Sims and Kline (1991) found significant multiple regression models between nickel in wheat and soybean and soil metal concentrations and pH, but not with soil metal concentrations alone. Reducing the pH of soils led to increased uptake in several plant species (Sauerbeck and Hein 1991). Thus, it is surprising that pH did not contribute significantly to the variability in the present multiple regression model.

Because nickel is hyperaccumulated by some plants, it was expected that the distribution of uptake factors would be bimodal and that regressions would be different at high nickel concentrations from those at lower concentrations in soil. This expected effect was not observed, perhaps because hyperaccumulating plants are tested only in soils with very high nickel levels.

4.7 SELENIUM

Major determinants of the uptake of selenium include chemical form and soil properties. Selenate is taken up more effectively than selenite (Banuelos 1996, Hamilton and Beath 1963, Gissel-Nielson and Bisbjerg 1970, Smith and Watkinson (1984)), and the uptake of organic selenium is lower than that of inorganic forms (Hamilton and Beath 1963). Banuelos (1996) suggests that soils of high redox in arid regions probably have selenate as the primary species in solution, whereas acid or neutral soils are not likely to have much selenate. Thus, because the present regression model was generated predominantly using data from western sites, the uptake of selenium by plants may be somewhat lower in non-arid environments.

pH is a determinant of selenium species and therefore of uptake (Banuelos 1996). This is consistent with the finding in this study that pH was able to explain a significant amount of variation. Liming of the soil led to lowered plant uptake of selenium that was added in the form of selenate (Carlson et al. 1991). Selenium accumulation was elevated in plants growing in soils with lower clay and hydrous oxide content than in other soils (Carlson et al. 1991).

Sulfate and elemental sulfur depress the uptake of selenium, as most plants cannot distinguish between inorganic selenium and sulfur (Williams and Thornton 1972). Selenium-accumulating plant species may preferentially take up selenium compared to sulfur ions (Wu et al. 1997). As with nickel, it was expected that the pattern of accumulation of selenium by hyperaccumulating plants would be different from that of non-hyperaccumulating plants. This expected effect was not observed.

4.8 ZINC

pH has commonly been observed to be a controlling variable in the uptake of zinc. An increase in soil pH was associated with a decrease in the zinc content of radish tops (Lagerwerff 1971). Similarly, a decrease in soil pH was associated with an increase in the concentration of zinc in kidney bean (*Phaseolus vulgaris*), though the mass taken up was unchanged with pH, because the pH decrease was associated with a reduced yield (Xian and Shokohifard 1989). Both of these results are consistent with the relationship derived from data in this study. In contrast, in a study of the uptake of zinc by radish (*Raphanus sativus*), the regression was improved by including pH as a variable (Davies 1992). However, the positive value that was obtained for the pH term would suggest that raising soil pH increases accumulation of zinc, a result opposite to that found here.

Lorenz et al. (1997) found that total soil zinc concentration alone did not predict zinc concentrations in radish leaves, but multiple regressions including zinc concentrations in bulk soil and rhizosphere solution did. Treatment with cadmium has been observed to increase the uptake of zinc by several plant species in nutrient solution (Turner 1973). As with most inorganic chemicals, the uptake of zinc by plants has been observed to vary with plant species; for example, some plants hyperaccumulate zinc (Ebbs et al. 1997).

5. RECOMMENDATIONS

Measurements of contaminant concentrations in plants at a specific waste site are always superior to estimates of these concentrations for assessing risks to herbivorous or omnivorous wildlife. Even a small number of samples (e.g., 10 or 20) from which site-specific uptake factors can be developed would probably give more precise and accurate estimates of concentrations of chemicals in plants at the site than the use of models recommended below. However, in the absence of these data, regression models or uptake factors should be used. Our study demonstrates that regression models are generally superior to uptake factors for estimating concentrations of chemicals in plants from concentrations in soil.

Single-variable regressions of the natural log-transformed chemical concentration in plant on the log-transformed concentration in soil are recommended as good tools for estimating concentrations of contaminants in plant tissues for all eight chemicals tested (Table 10). Multiple regressions with chemical concentration in soil and pH are recommended as good tools for estimating the uptake of cadmium, mercury, selenium, and zinc. Although multiple regressions were good predictors of plant concentrations of copper and lead in the validation dataset, pH was not a significant variable in the final combined models. For mercury, the multiple regression with pH was the best predictor of the plant concentrations in the validation data.

Both the 90th percentile uptake factor and the 95% upper prediction limit for the single-variable regression were adequately conservative for screening ecological risk assessments. Indeed, for data from the two validation studies, these models were arguably too conservative, overpredicting 100% of the measured values for most chemicals. The appropriate level of conservatism should be agreed upon by regulatory agencies, risk assessors, and site managers in the DQO sessions and work plan approval process.

The 95% upper prediction limit for the single-variable regression is recommended as the better of the two models for providing conservative estimates of plant uptake of contaminants. The method provided the best, conservative estimate for four of eight chemicals. For three others, the 90th percentile uptake factor provided the best conservative estimate, though one of these comparisons (for mercury) was based on only three samples. The 95% upper prediction limit would be expected to be the better model for a wide range os soil concentrations. The log-transformed regression models consistently proved to be better than uptake factors for estimating chemical concentrations in plants, and the slopes were apparently different from one, indicating that uptake factors are not the best models to use. Therefore, conservative bounds on the regression models should be better conservative estimates of uptake for most random datasets than the uptake factors. With the validation data included, the final regression models should provide 95% upper prediction limits that are more representative conservative models than the prediction limits prior to the inclusion of the validation data.

Table 10. Recommended application of bioaccumulation models. All recommendations are from dataset with initial model data and validation data combined

Chemical	For general estimates	For conservative estimates
Arsenic	single-variable regression	95% upper prediction limit for the single-variable regression
Cadmium	single-variable regression or multiple regression with pH	95% upper prediction limit for the single-variable regression
Copper	single-variable regression	95% upper prediction limit for the single-variable regression
Lead	single-variable regression	95% upper prediction limit for the single-variable regression
Mercury	multiple regression with pH[1] or single-variable regression	95% upper prediction limit for the single-variable regression
Nickel	single-variable regression	95% upper prediction limit for the single-variable regression
Selenium	single-variable regression or multiple regression with pH	95% upper prediction limit for the single-variable regression
Zinc	single-variable regression or multiple regression with pH	95% upper prediction limit for the single-variable regression

[1] preferred

Additional recommendations for use of the models include the following:

- The models developed in this study are not recommended for use in estimating contaminant concentrations in fruits, seeds, or roots. Plants typically bioaccumulate inorganic elements in these structures to a different extent than in foliage or stems (Greenleaf-Jenkins and Zasoski 1986, Jiang and Singh 1994, Sadana and Singh 1987, Sauerbeck and Hein 1991, Baker 1983).

- It is recommended that these models be used with soil concentrations that represent accurate exposure to plants, with knowledge of the depth of feeder roots, the length of exposure, and how soil concentrations have changed during that time period.

- Soil-plant uptake factors derived from only the validation dataset from Bartlesville, Oklahoma, (Appendix C) are not recommended for use, except at sites with similar soils and other environmental variables.

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APPENDIX A

DATABASE OF BIOACCUMULATION CONCENTRATIONS

Chemic	Form	Total Soil Conc (mg/kg)	soil depth (cm	soil type	pH	Exposur (days)	Common Name	Species	Plant tissue	lant Conc (mg/kg)	Uptake factor	Citation	Dataset	Field or salt form
As	field	2.4		Ghana			elephant grass	Pennisetum purpureur	above-ground	1.4	0.58333	Amonoo-Neizer et al. 19	model	field
As	field	2.4		Ghana			elephant grass	Pennisetum purpureur	above-ground	1.3	0.54167	Amonoo-Neizer et al. 19	model	field
As	field	2.7		Ghana			elephant grass	Pennisetum purpureur	above-ground	1.5	0.55556	Amonoo-Neizer et al. 19	model	field
As	field	2.7		Ghana			elephant grass	Pennisetum purpureur	above-ground	6.5	2.40741	Amonoo-Neizer et al. 19	model	field
As	field	2.9		Ghana			elephant grass	Pennisetum purpureur	above-ground	3.2	1.10345	Amonoo-Neizer et al. 19	model	field
As	field	3.3		Ghana			elephant grass	Pennisetum purpureur	above-ground	7.2	2.18182	Amonoo-Neizer et al. 19	model	field
As	field	3.6		Ghana			elephant grass	Pennisetum purpureur	above-ground	1.5	0.41667	Amonoo-Neizer et al. 19	model	field
As	field	3.7		Ghana			elephant grass	Pennisetum purpureur	above-ground	2	0.54054	Amonoo-Neizer et al. 19	model	field
As	field	23.6		Ghana			elephant grass	Pennisetum purpureur	above-ground	15.2	0.64407	Amonoo-Neizer et al. 19	model	field
As	field	30.7		Ghana			elephant grass	Pennisetum purpureur	above-ground	27.4	0.89251	Amonoo-Neizer et al. 19	model	field
As	field	2.1		Ghana			water fern	Ceraptopteris cornuta	above-ground	2.1	1	Amonoo-Neizer et al. 19	model	field
As	field	2.4		Ghana			water fern	Ceraptopteris cornuta	above-ground	2.7	1.125	Amonoo-Neizer et al. 19	model	field
As	field	2.4		Ghana			water fern	Ceraptopteris cornuta	above-ground	2.8	1.16667	Amonoo-Neizer et al. 19	model	field
As	field	2.7		Ghana			water fern	Ceraptopteris cornuta	above-ground	3.2	1.18519	Amonoo-Neizer et al. 19	model	field
As	field	2.7		Ghana			water fern	Ceraptopteris cornuta	above-ground	24.5	9.07407	Amonoo-Neizer et al. 19	model	field
As	field	2.9		Ghana			water fern	Ceraptopteris cornuta	above-ground	3.2	1.10345	Amonoo-Neizer et al. 19	model	field
As	field	3.3		Ghana			water fern	Ceraptopteris cornuta	above-ground	27.8	8.42424	Amonoo-Neizer et al. 19	model	field
As	field	3.6		Ghana			water fern	Ceraptopteris cornuta	above-ground	4.5	1.25	Amonoo-Neizer et al. 19	model	field
As	field	3.7		Ghana			water fern	Ceraptopteris cornuta	above-ground	6.2	1.67568	Amonoo-Neizer et al. 19	model	field
As	field	3.7		Ghana			water fern	Ceraptopteris cornuta	above-ground	30.4	8.21622	Amonoo-Neizer et al. 19	model	field
As	field	23.6		Ghana			water fern	Ceraptopteris cornuta	above-ground	22.8	0.9661	Amonoo-Neizer et al. 19	model	field
As	field	30.7		Ghana			water fern	Ceraptopteris cornuta	above-ground	50.2	1.63518	Amonoo-Neizer et al. 19	model	field
As	field-background	4.6		silt loam		60	soybean	Glycine max	above-ground	0.217	0.04717	Cataldo and Wildung 19	model	field
As	salt	7.1		silt loam		60	soybean	Glycine max	above-ground	1.053	0.14831	Cataldo and Wildung 19	model	salt
As	field-fly ash	8.8	unknown	sandy loam	6		alfalfa	Medicago sativa	above-ground	0.6	0.06818	Furr et al. 1978	model	field
As	field-fly ash	9.5	unknown	sandy loam	5.9		alfalfa	Medicago sativa	above-ground	0.4	0.04211	Furr et al. 1978	model	field
As	field-fly ash	8.8	unknown	sandy loam	6		birdsfoot trefoil	Lotus corniculatus	above-ground	0.2	0.02273	Furr et al. 1978	model	field
As	field-fly ash	9.5	unknown	sandy loam	5.9		birdsfoot trefoil	Lotus corniculatus	above-ground	0.8	0.08421	Furr et al. 1978	model	field
As	field-fly ash	8.8	unknown	sandy loam	6		brome	Bromus	above-ground	0.2	0.02273	Furr et al. 1978	model	field
As	field-fly ash	9.5	unknown	sandy loam	5.9		brome	Bromus	above-ground	0.4	0.04211	Furr et al. 1978	model	field
As	field-fly ash	8.8	unknown	sandy loam	6		cabbage	Brassica oleracea	above-ground	0.2	0.02273	Furr et al. 1978	model	field
As	field-fly ash	9.5	unknown	sandy loam	5.9		cabbage	Brassica oleracea	above-ground	0.3	0.03158	Furr et al. 1978	model	field
As	field-fly ash	8.8	unknown	sandy loam	6		corn	Zea mays	foliage	0.4	0.04545	Furr et al. 1978	model	field
As	field-fly ash	9.5	unknown	sandy loam	5.9		corn	Zea mays	foliage	0.5	0.05263	Furr et al. 1978	model	field
As	field-fly ash	8.8	unknown	sandy loam	6		millet	Echinochloa crusgalli	foliage	0.2	0.02273	Furr et al. 1978	model	field
As	field-fly ash	9.5	unknown	sandy loam	5.9		millet	Echinochloa crusgalli	foliage	0.5	0.05263	Furr et al. 1978	model	field
As	field-fly ash	8.8	unknown	sandy loam	6		orchard grass	Dactylis glomerata	above-ground	0.2	0.02273	Furr et al. 1978	model	field
As	field-fly ash	9.5	unknown	sandy loam	5.9		orchard grass	Dactylis glomerata	above-ground	1	0.10526	Furr et al. 1978	model	field
As	field-fly ash	8.8	unknown	sandy loam	6		sorghum	Sorghum bicolor	foliage	0.1	0.01136	Furr et al. 1978	model	field
As	field-fly ash	9.5	unknown	sandy loam	5.9		sorghum	Sorghum bicolor	foliage	0.5	0.05263	Furr et al. 1978	model	field
As	field-fly ash	8.8	unknown	sandy loam	6		timothy	Phleum praetense	above-ground	0.2	0.02273	Furr et al. 1978	model	field
As	field-fly ash	9.5	unknown	sandy loam	5.9		timothy	Phleum praetense	above-ground	0.4	0.04211	Furr et al. 1978	model	field
As	Na2HAsO4	10		sand	5.6	365	barley	Hordeum vulgare L.	straw	2.5	0.25	Jiang & Singh. 1994	model	salt
As	NaAsO2	10		sand	5.6	365	barley	Hordeum vulgare L.	straw	3	0.3	Jiang & Singh. 1994	model	salt
As	Na2HAsO4	250		sand	5.6	365	barley	Hordeum vulgare L.	straw	14	0.056	Jiang & Singh. 1994	model	salt
As	Na2HAsO4	250		loam	4.9	365	barley	Hordeum vulgare L.	straw	6.5	0.026	Jiang & Singh. 1994	model	salt

As	NaAsO2	250		sand	5.6	365	barley	Hordeum vulgare L.	straw	15	0.06	Jiang & Singh. 1994	model	salt
As	NaAsO2	250		loam	4.9	365	barley	Hordeum vulgare L.	straw	12.5	0.05	Jiang & Singh. 1994	model	salt
As	Na2HAsO4	50		sand	5.6	365	barley	Hordeum vulgare L.	straw	5	0.1	Jiang & Singh. 1994	model	salt
As	Na2HAsO4	50		loam	4.9	365	barley	Hordeum vulgare L.	straw	2	0.04	Jiang & Singh. 1994	model	salt
As	NaAsO2	50		sand	5.6	365	barley	Hordeum vulgare L.	straw	6.5	0.13	Jiang & Singh. 1994	model	salt
As	NaAsO2	50		loam	4.9	365	barley	Hordeum vulgare L.	straw	4	0.08	Jiang & Singh. 1994	model	salt
As	Na2HAsO4	10		sand	5.6	365	ryegrass	Lolium perenne L.	above-grounc	2	0.2	Jiang & Singh. 1994	model	salt
As	Na2HAsO4	10		loam	4.9	365	ryegrass	Lolium perenne L.	above-grounc	3	0.3	Jiang & Singh. 1994	model	salt
As	NaAsO2	10		sand	5.6	365	ryegrass	Lolium perenne L.	above-grounc	5	0.5	Jiang & Singh. 1994	model	salt
As	NaAsO2	10		loam	4.9	365	ryegrass	Lolium perenne L.	above-grounc	1	0.1	Jiang & Singh. 1994	model	salt
As	Na2HAsO4	250		sand	5.6	365	ryegrass	Lolium perenne L.	above-grounc	23	0.092	Jiang & Singh. 1994	model	salt
As	Na2HAsO4	250		loam	4.9	365	ryegrass	Lolium perenne L.	above-grounc	7	0.028	Jiang & Singh. 1994	model	salt
As	NaAsO2	250		sand	5.6	365	ryegrass	Lolium perenne L.	above-grounc	15	0.06	Jiang & Singh. 1994	model	salt
As	NaAsO2	250		loam	4.9	365	ryegrass	Lolium perenne L.	above-grounc	8	0.032	Jiang & Singh. 1994	model	salt
As	Na2HAsO4	50		sand	5.6	365	ryegrass	Lolium perenne L.	above-grounc	7.5	0.15	Jiang & Singh. 1994	model	salt
As	Na2HAsO4	50		loam	4.9	365	ryegrass	Lolium perenne L.	above-grounc	5	0.1	Jiang & Singh. 1994	model	salt
As	NaAsO2	50		sand	5.6	365	ryegrass	Lolium perenne L.	above-grounc	10	0.2	Jiang & Singh. 1994	model	salt
As	NaAsO2	50		loam	4.9	365	ryegrass	Lolium perenne L.	above-grounc	4	0.08	Jiang & Singh. 1994	model	salt
As	PbHAsO4	127		sandy loam			bean	Phaseolus vulgaris	leaves	1.92	0.01512	MacPhee et al. 1960	model	salt
As	PbHAsO4	127		sandy loam		.	pea	Pisum sativum	vine	2.14	0.01685	MacPhee et al. 1960	model	salt
As	arsenate	25	20	clay	4.9		rice	Oryza sativa	aboveground	2.54	0.1016	Onken and Hossner 19!	model	salt
As	arsenite	25	20	silt loam	7.3		rice	Oryza sativa	aboveground	2.69	0.1076	Onken and Hossner 19!	model	salt
As	PbHAsO4	5.32				49	common reed	Phragmites australis	shoot	0.127	0.02387	Otte et al. 1990	model	salt
As	(CH3)2AsO2Na	22.48				49	common reed	Phragmites australis	shoot	0.9737	0.04331	Otte et al. 1990	model	salt
As	PbHAsO4	23.22				49	common reed	Phragmites australis	shoot	0.749	0.03226	Otte et al. 1990	model	salt
As	PbHAsO4	5.09				35	stinging nettle	Urtica dioica	shoot	0.3	0.05894	Otte et al. 1990	model	salt
As	(CH3)2AsO2Na	20.23				35	stinging nettle	Urtica dioica	shoot	4.79	0.23678	Otte et al. 1990	model	salt
As	PbHAsO4	22.48				35	stinging nettle	Urtica dioica	shoot	2.4	0.10676	Otte et al. 1990	model	salt
As	field-mine-waste	52.5				unknown	forbes		whole plant?	1.9	0.03619	Pascoe et al. 1994	model	field
As	field-mine-waste	52.5				unknown	grasses		whole plant?	6.7	0.12762	Pascoe et al. 1994	model	field
As	field soil in pot	10		sandy loam		25	corn	Zea mays	above-grounc	0.037	0.0037	Sadiq. 1986	model	field
As	field soil in pot	11		loamy sand		25	corn	Zea mays	above-grounc	0.020	0.00182	Sadiq. 1986	model	field
As	field soil in pot	12		sandy loam		25	corn	Zea mays	above-grounc	0.080	0.00667	Sadiq. 1986	model	field
As	field soil in pot	12.5		clay loam		25	corn	Zea mays	above-grounc	0.058	0.00464	Sadiq. 1986	model	field
As	field soil in pot	13		clay loam		25	corn	Zea mays	above-grounc	0.055	0.00423	Sadiq. 1986	model	field
As	field soil in pot	14		loamy sand		25	corn	Zea mays	above-grounc	0.060	0.00429	Sadiq. 1986	model	field
As	field soil in pot	15		sandy loam		25	corn	Zea mays	above-grounc	0.010	0.00067	Sadiq. 1986	model	field
As	field soil in pot	18		clay loam		25	corn	Zea mays	above-grounc	0.055	0.00306	Sadiq. 1986	model	field
As	field soil in pot	2		sandy loam		25	corn	Zea mays	above-grounc	0.020	0.01	Sadiq. 1986	model	field
As	field soil in pot	2.5		loamy sand		25	corn	Zea mays	above-grounc	0.023	0.0092	Sadiq. 1986	model	field
As	field soil in pot	23.5		sandy loam		25	corn	Zea mays	above-grounc	0.020	0.00085	Sadiq. 1986	model	field
As	field soil in pot	4.5		loamy sand		25	corn	Zea mays	above-grounc	0.035	0.00778	Sadiq. 1986	model	field
As	field soil in pot	6		loamy sand		25	corn	Zea mays	above-grounc	0.056	0.00933	Sadiq. 1986	model	field
As	field soil in pot	6		loamy sand		25	corn	Zea mays	above-grounc	0.032	0.00533	Sadiq. 1986	model	field
As	field soil in pot	7		sandy loam		25	corn	Zea mays	above-grounc	0.035	0.005	Sadiq. 1986	model	field
As	field soil in pot	7.5		sandy loam		25	corn	Zea mays	above-grounc	0.041	0.00547	Sadiq. 1986	model	field
As	field soil in pot	8		sandy clay		25	corn	Zea mays	above-grounc	0.048	0.006	Sadiq. 1986	model	field
As	field soil in pot	9		loamy sand		25	corn	Zea mays	above-grounc	0.027	0.003	Sadiq. 1986	model	field
As	field soil in pot	9		loamy sand		25	corn	Zea mays	above-grounc	0.028	0.00311	Sadiq. 1986	model	field

As	field-background	1.1	1-2 cm	sand	5.3		dune grass	Ammophilia arenaria	clipping 10cm	0.061	0.05545	Severson, et al. 1992.	model	field
As	field-background	1.1	1-2 cm	sand	5.3		willow	Salix repens	leaves	0.49	0.44545	Severson, et al. 1992.	model	field
As	field	7.63		? (semi-arid)		unknown	various		above-ground	0.6	0.07864	Sharma and Shupe 197	model	field
As	field	10.3		? (semi-arid)		unknown	various		above-ground	3.3	0.32039	Sharma and Shupe 197	model	field
As	field	10.5		? (semi-arid)		unknown	various		above-ground	0.6	0.05714	Sharma and Shupe 197	model	field
As	field	10.8		? (semi-arid)		unknown	various		above-ground	5.6	0.51852	Sharma and Shupe 197	model	field
As	field	12.2		? (semi-arid)		unknown	various		above-ground	2.5	0.20492	Sharma and Shupe 197	model	field
As	field	12.9		? (semi-arid)		unknown	various		above-ground	5.1	0.39535	Sharma and Shupe 197	model	field
As	field	13.6		? (semi-arid)		unknown	various		above-ground	3	0.22059	Sharma and Shupe 197	model	field
As	field	14.5		? (semi-arid)		unknown	various		above-ground	4	0.27586	Sharma and Shupe 197	model	field
As	field	14.8		? (semi-arid)		unknown	various		above-ground	2.3	0.15541	Sharma and Shupe 197	model	field
As	field	15.1		? (semi-arid)		unknown	various		above-ground	4.8	0.31788	Sharma and Shupe 197	model	field
As	field	16.3		? (semi-arid)		unknown	various		above-ground	4.2	0.25767	Sharma and Shupe 197	model	field
As	field	28.3		? (semi-arid)		unknown	various		above-ground	6.4	0.22615	Sharma and Shupe 197	model	field
As	field	30.3		? (semi-arid)		unknown	various		above-ground	6.6	0.21782	Sharma and Shupe 197	model	field
As	field	36		? (semi-arid)		unknown	various		above-ground	12.4	0.34444	Sharma and Shupe 197	model	field
As	field	36.7		? (semi-arid)		unknown	various		above-ground	93.7	2.55313	Sharma and Shupe 197	model	field
As	field	50		? (semi-arid)		unknown	various		above-ground	4.5	0.09	Sharma and Shupe 197	model	field
As	field	57.4		? (semi-arid)		unknown	various		above-ground	5.5	0.09582	Sharma and Shupe 197	model	field
As	field	351		? (semi-arid)		unknown	various		above-ground	46.2	0.13162	Sharma and Shupe 197	model	field
As	Na2HAsO4	25	unknown	clay loam	8	112	Scots pine	Pinus sylvestris		3	0.12	Sheppard et al. 1985	model	salt
As	field	50	unknown	clay loam+w	7.9	112	Scots pine	Pinus sylvestris		2	0.04	Sheppard et al. 1985	model	field
As	Na2HAsO4	50	unknown	clay loam	8	112	Scots pine	Pinus sylvestris		5.5	0.11	Sheppard et al. 1985	model	salt
As	field	150	unknown	clay loam+w	7.8	112	Scots pine	Pinus sylvestris		7	0.04667	Sheppard et al. 1985	model	field
As	Na2HAsO4	200	unknown	clay loam	8	112	Scots pine	Pinus sylvestris		22	0.11	Sheppard et al. 1985	model	salt
As	field	250	unknown	clay loam+w	7.8	112	Scots pine	Pinus sylvestris		11	0.044	Sheppard et al. 1985	model	field
As	field	500	unknown	waste site	7.8	112	Scots pine	Pinus sylvestris		22	0.044	Sheppard et al. 1985	model	field
As	field	2.96	rooting zon	refc			spruce	Picea abies	needles	0.00174	0.00059	Wyttenbach et al. 1997	model	field
As	field	5	rooting zon	refc			spruce	Picea abies	needles	0.012	0.0024	Wyttenbach et al. 1997	model	field
As	field	6	rooting zon	refc			spruce	Picea abies	needles	0.011	0.00183	Wyttenbach et al. 1997	model	field
As	field	8	rooting zon	refc			spruce	Picea abies	needles	0.009	0.00113	Wyttenbach et al. 1997	model	field
As	field	12	rooting zon	refc			spruce	Picea abies	needles	0.005	0.00042	Wyttenbach et al. 1997	model	field
As	field	14	rooting zon	refc			spruce	Picea abies	needles	0.015	0.00107	Wyttenbach et al. 1997	model	field
As	field	14	rooting zon	refc			spruce	Picea abies	needles	0.016	0.00114	Wyttenbach et al. 1997	model	field
As	field	14	rooting zon	refc			spruce	Picea abies	needles	0.024	0.00171	Wyttenbach et al. 1997	model	field
As	field	15	rooting zon	refc			spruce	Picea abies	needles	0.006	0.0004	Wyttenbach et al. 1997	model	field
As	field	17	rooting zon	refc			spruce	Picea abies	needles	0.01	0.00059	Wyttenbach et al. 1997	model	field
As	field	27	rooting zon	refc			spruce	Picea abies	needles	0.02	0.00074	Wyttenbach et al. 1997	model	field
As	field	54	rooting zon	refc			spruce	Picea abies	needles	0.022	0.00041	Wyttenbach et al. 1997	model	field
As	field	108	rooting zon	refc			spruce	Picea abies	needles	0.006	5.6E-05	Wyttenbach et al. 1997	model	field
As	field	79.2			7.5		redtop	Agrostis stolonifera	above-ground	2.5	0.03157	PTI 1994	validation	field
As	field	87.4			6.9		redtop	Agrostis stolonifera	above-ground	2.4	0.02746	PTI 1994	validation	field
As	field	120			6.8		redtop	Agrostis stolonifera	above-ground	2.7	0.0225	PTI 1994	validation	field
As	field	211			7.8		redtop	Agrostis stolonifera	above-ground	2.9	0.01374	PTI 1994	validation	field
As	field	240			6		redtop	Agrostis stolonifera	above-ground	1.7	0.00708	PTI 1994	validation	field
As	field	272			6.7		redtop	Agrostis stolonifera	above-ground	4.5	0.01654	PTI 1994	validation	field
As	field	369			7		redtop	Agrostis stolonifera	above-ground	14.9	0.04038	PTI 1994	validation	field
As	field	417			7		redtop	Agrostis stolonifera	above-ground	1.8	0.00432	PTI 1994	validation	field

As	field	456			7.2		redtop	Agrostis stolonifera	above-ground	3.2	0.00702	PTI 1994	validation	field
As	field	483			5.9		redtop	Agrostis stolonifera	above-ground	2.3	0.00476	PTI 1994	validation	field
As	field	626			6.7		redtop	Agrostis stolonifera	above-ground	2.4	0.00383	PTI 1994	validation	field
As	field	641			5.4		redtop	Agrostis stolonifera	above-ground	24.9	0.03885	PTI 1994	validation	field
As	field	688			4.9		redtop	Agrostis stolonifera	above-ground	16.6	0.02413	PTI 1994	validation	field
As	field	870			6.2		redtop	Agrostis stolonifera	above-ground	8.2	0.00943	PTI 1994	validation	field
As	field	202			4.8		redtop/tufted_h	2 spp.	above-ground	1.85	0.00916	PTI 1994	validation	field
As	field	31.3			6.5		slender_wheat	Agropyron trachycaulu	above-ground	1	0.03195	PTI 1994	validation	field
As	field	160			3.7		tufted_hairgras	Aira or Deschampsia	above-ground	3.2	0.02	PTI 1994	validation	field
As	field	225			5.3		tufted_hairgras	Aira or Deschampsia	above-ground	5.6	0.02489	PTI 1994	validation	field
As	field	303			4.9		tufted_hairgras	Aira or Deschampsia	above-ground	16.1	0.05314	PTI 1994	validation	field
As	field	359			4.4		tufted_hairgras	Aira or Deschampsia	above-ground	8	0.02228	PTI 1994	validation	field
As	field	507			5.8		tufted_hairgras	Aira or Deschampsia	above-ground	2.9	0.00572	PTI 1994	validation	field
As	field	514			6.2		tufted_hairgras	Aira or Deschampsia	above-ground	6.9	0.01342	PTI 1994	validation	field
As	field	1970			6.5		tufted_hairgras	Aira or Deschampsia	above-ground	5.87	0.00298	PTI 1994	validation	field
Cd	field-smelter	2.7	at 5 cm	stony loam	5	unknown	various foliage		leaves	2.3	0.85185	Beyer et al. 1985	model	field
Cd	field-smelter	35	at 5 cm	stony loam	5.9	unknown	various foliage		leaves	8.1	0.23143	Beyer et al. 1985	model	field
Cd	CdCl2	0.54		peaty+sand	3.3	100	sitka-spruce	Picea sitchensis	shoot	5.9	10.9259	Burton et al. 1984.	model	salt
Cd	CdCl2	0.83		peaty+sand	3.3	100	sitka-spruce	Picea sitchensis	shoot	7.0	8.43373	Burton et al. 1984.	model	salt
Cd	CdCl2	1.57		peaty+sand	3.3	100	sitka-spruce	Picea sitchensis	shoot	6.4	4.07643	Burton et al. 1984.	model	salt
Cd	CdCl2	17.33		peaty+sand	3.3	100	sitka-spruce	Picea sitchensis	shoot	25.1	1.44836	Burton et al. 1984.	model	salt
Cd	CdCl2	2.50		peaty+sand	3.3	100	sitka-spruce	Picea sitchensis	shoot	12.9	5.16	Burton et al. 1984.	model	salt
Cd	CdCl2	3.93		peaty+sand	3.3	100	sitka-spruce	Picea sitchensis	shoot	14.4	3.66412	Burton et al. 1984.	model	salt
Cd	CdCl2	8.40		peaty+sand	3.3	100	sitka-spruce	Picea sitchensis	shoot	17.4	2.07143	Burton et al. 1984.	model	salt
Cd	CdCl2	10		silty clay loam		90	American syca	Plantanus occidentalis	leaf	1.5	0.15	Carlson and Bazzaz, 19	model	salt
Cd	CdCl2	100		silty clay loam		90	American syca	Plantanus occidentalis	leaf	2	0.02	Carlson and Bazzaz, 19	model	salt
Cd	CdCl2	25		silty clay loam		90	American syca	Plantanus occidentalis	leaf	2.5	0.1	Carlson and Bazzaz, 19	model	salt
Cd	CdCl2	5		silty clay loam		90	American syca	Plantanus occidentalis	leaf	2	0.4	Carlson and Bazzaz, 19	model	salt
Cd	CdCl2	50		silty clay loam		90	American syca	Plantanus occidentalis	leaf	3.5	0.07	Carlson and Bazzaz, 19	model	salt
Cd	field-background	0.40		silt loam	5.9	10,20,30	red fescue	Festuca rubra L.	clipping	2.5	6.25	Carlson and Rolfe, 1979	model	field
Cd	CdCl2	0.50		silt loam	5.9	10,20,30	red fescue	Festuca rubra L.	clipping	2	4	Carlson and Rolfe, 1979	model	salt
Cd	CdCl2	1.40		silt loam	5.9	10,20,30	red fescue	Festuca rubra L.	clipping	4.5	3.21429	Carlson and Rolfe, 1979	model	salt
Cd	CdCl2	10.40		silt loam	5.9	10,20,30	red fescue	Festuca rubra L.	clipping	7.4	0.71154	Carlson and Rolfe, 1979	model	salt
Cd	CdCl2	50.40		silt loam	5.9	10,20,30	red fescue	Festuca rubra L.	clipping	29.3	0.58135	Carlson and Rolfe, 1979	model	salt
Cd	CdCl2	100.40		silt loam	5.9	10,20,30	red fescue	Festuca rubra L.	clipping	47.3	0.47112	Carlson and Rolfe, 1979	model	salt
Cd	field-background	0.40		silt loam	5.9	10,30	rye grass	Lolium perenne L.	clipping	1.3	3.25	Carlson and Rolfe, 1979	model	field
Cd	CdCl2	0.50		silt loam	5.9	10,30	rye grass	Lolium perenne L.	clipping	4.4	8.8	Carlson and Rolfe, 1979	model	salt
Cd	CdCl2	1.40		silt loam	5.9	10,30	rye grass	Lolium perenne L.	clipping	5.9	4.21429	Carlson and Rolfe, 1979	model	salt
Cd	CdCl2	10.40		silt loam	5.9	10,30	rye grass	Lolium perenne L.	clipping	17.4	1.67308	Carlson and Rolfe, 1979	model	salt
Cd	CdCl2	50.40		silt loam	5.9	10,30	rye grass	Lolium perenne L.	clipping	30.25	0.6002	Carlson and Rolfe, 1979	model	salt
Cd	CdCl2	100.40		silt loam	5.9	10,30	rye grass	Lolium perenne L.	clipping	61	0.60757	Carlson and Rolfe, 1979	model	salt
Cd	field-bckgd	0.124	15-collexn	sand silt?	6.2	14,49	durum wheat	Triticum turgidum	leaf	0.3816	3.07742	Cieslinski et al. 1996	model	field
Cd	field-bckgd	0.124	15-collexn	sand silt?	6.2	14,49	durum wheat	Triticum turgidum	leaf	0.4719	3.80565	Cieslinski et al. 1996	model	field
Cd	field-bckgd	0.124	15-collexn	sand silt?	6.2	14,49	durum wheat	Triticum turgidum	leaf	0.1586	1.27903	Cieslinski et al. 1996	model	field
Cd	field-bckgd	0.124	15-collexn	sand silt?	6.2	14,49	durum wheat	Triticum turgidum	leaf	0.00335	0.02702	Cieslinski et al. 1996	model	field
Cd	field-bckgd	0.323	15-collexn	silt clay?	7.2	14,49	durum wheat	Triticum turgidum	leaf	0.80125	2.48065	Cieslinski et al. 1996	model	field
Cd	field-bckgd	0.323	15-collexn	silt clay?	7.2	14,49	durum wheat	Triticum turgidum	leaf	0.6258	1.93746	Cieslinski et al. 1996	model	field
Cd	field-bckgd	0.323	15-collexn	silt clay?	7.2	14,49	durum wheat	Triticum turgidum	leaf	0.3958	1.22539	Cieslinski et al. 1996	model	field

Cd	field-bckgd	0.323	15-collexn	silt clay?	7.2	14,49	durum wheat	Triticum turgidum	leaf	0.37125	1.14938	Cieslinski et al. 1996	model	field
Cd	field-bckgd	0.124	15-collexn	sand silt?	6.2	14,49	flax	Linum usitatissimum	leaf	1.03185	8.32137	Cieslinski et al. 1996	model	field
Cd	field-bckgd	0.124	15-collexn	sand silt?	6.2	14,49	flax	Linum usitatissimum	leaf	0.84287	6.7973	Cieslinski et al. 1996	model	field
Cd	field-bckgd	0.124	15-collexn	sand silt?	6.2	14,49	flax	Linum usitatissimum	leaf	0.5551	4.47661	Cieslinski et al. 1996	model	field
Cd	field-bckgd	0.323	15-collexn	silt clay?	7.2	14,49	flax	Linum usitatissimum	leaf	1.5935	4.93344	Cieslinski et al. 1996	model	field
Cd	field-bckgd	0.323	15-collexn	silt clay?	7.2	14,49	flax	Linum usitatissimum	leaf	1.617	5.00619	Cieslinski et al. 1996	model	field
Cd	field-bckgd	0.323	15-collexn	sand silt?	6.2	14,49	flax	Linum usitatissimum	leaf	1.87495	5.8048	Cieslinski et al. 1996	model	field
Cd	field	0.27	15		5.7		cabbage	Brassica oleracea	leaf	0.35	1.2963	de Pieri et al. 1997, de F	model	field
Cd	field	0.3	15		5.4		cabbage	Brassica oleracea	leaf	0.4	1.33333	de Pieri et al. 1997, de F	model	field
Cd	field	0.36	15		6		cabbage	Brassica oleracea	leaf	0.9	2.5	de Pieri et al. 1997, de F	model	field
Cd	field	0.46	15		5		cabbage	Brassica oleracea	leaf	0.78	1.69565	de Pieri et al. 1997, de F	model	field
Cd	field	0.97	15		4.7		cabbage	Brassica oleracea	leaf	0.57	0.58763	de Pieri et al. 1997, de F	model	field
Cd	field	0.17	15		5.1		carrot	Daucus carrota	leaf	0.63	3.70588	de Pieri et al. 1997, de F	model	field
Cd	field	0.3	15		6.1		carrot	Daucus carrota	leaf	0.81	2.7	de Pieri et al. 1997, de F	model	field
Cd	field	0.65	15		5.5		carrot	Daucus carrota	leaf	0.39	0.6	de Pieri et al. 1997, de F	model	field
Cd	field	0.96	15		5.3		carrot	Daucus carrota	leaf	0.38	0.39583	de Pieri et al. 1997, de F	model	field
Cd	field	0.22	15		5.5		cauliflower	Brassica oleracea	leaf	0.28	1.27273	de Pieri et al. 1997, de F	model	field
Cd	field	0.24	15		7.2		cauliflower	Brassica oleracea	leaf	0.22	0.91667	de Pieri et al. 1997, de F	model	field
Cd	field	0.34	15		6.2		corn	Zea mays	leaf,stalk	0.325	0.95588	de Pieri et al. 1997, de F	model	field
Cd	field	0.35	15		6.2		corn	Zea mays	leaf,stalk	0.295	0.84286	de Pieri et al. 1997, de F	model	field
Cd	field	0.99	15		4.4		corn	Zea mays	leaf,stalk	0.125	0.12626	de Pieri et al. 1997, de F	model	field
Cd	field	1.09	15		4.8		corn	Zea mays	leaf,stalk	0.12	0.11009	de Pieri et al. 1997, de F	model	field
Cd	field	0.41	15		4.4		lettuce	Latuca sativa	leaf	0.28	0.68293	de Pieri et al. 1997, de F	model	field
Cd	field	1.09	15		5		lettuce	Latuca sativa	leaf	0.39	0.3578	de Pieri et al. 1997, de F	model	field
Cd	field	0.35	15		6.7		turnip	Brassica rappa	leaf	0.98	2.8	de Pieri et al. 1997, de F	model	field
Cd	field	0.53	15		5.1		turnip	Brassica rappa	leaf	1.2	2.26415	de Pieri et al. 1997, de F	model	field
Cd	field-background	0.3	20	sandy	7	95	barley	Hordeum vulgare	straw	0.34	1.13333	Dudka et al. 1996	model	field
Cd	field-flue-dust-ad	3.2	20	sandy	7.2	95	barley	Hordeum vulgare	straw	0.35	0.10938	Dudka et al. 1996	model	field
Cd	field-flue-dust-ad	7.1	20	sandy	6.9	95	barley	Hordeum vulgare	straw	0.5	0.07042	Dudka et al. 1996	model	field
Cd	field-flue-dust-ad	54.4	20	sandy	7.4	95	barley	Hordeum vulgare	straw	2.02	0.03713	Dudka et al. 1996	model	field
Cd	field-flue-dust-ad	106.5	20	sandy	7.4	95	barley	Hordeum vulgare	straw	2.4	0.02254	Dudka et al. 1996	model	field
Cd	field-background	0.3	20	sandy	7		clover	Trifolium pratense	cutting	0.19	0.63333	Dudka et al. 1996	model	field
Cd	field-flue-dust-ad	3.2	20	sandy	7.2		clover	Trifolium pratense	cutting	0.34	0.10625	Dudka et al. 1996	model	field
Cd	field-flue-dust-ad	7.1	20	sandy	6.9		clover	Trifolium pratense	cutting	0.68	0.09577	Dudka et al. 1996	model	field
Cd	field-flue-dust-ad	54.4	20	sandy	7.4		clover	Trifolium pratense	cutting	1.07	0.01967	Dudka et al. 1996	model	field
Cd	field-flue-dust-ad	106.5	20	sandy	7.4		clover	Trifolium pratense	cutting	1.14	0.0107	Dudka et al. 1996	model	field
Cd	field-background	0.3	20	sandy	7		grass	Poa pratensis	cutting	0.24	0.8	Dudka et al. 1996	model	field
Cd	field-flue-dust-ad	3.2	20	sandy	7.2		grass	Poa pratensis	cutting	0.36	0.1125	Dudka et al. 1996	model	field
Cd	field-flue-dust-ad	7.1	20	sandy	6.9		grass	Poa pratensis	cutting	0.66	0.09296	Dudka et al. 1996	model	field
Cd	field-flue-dust-ad	54.4	20	sandy	7.4		grass	Poa pratensis	cutting	1.29	0.02371	Dudka et al. 1996	model	field
Cd	field-flue-dust-ad	106.5	20	sandy	7.4		grass	Poa pratensis	cutting	1.51	0.01418	Dudka et al. 1996	model	field
Cd	CdSO4	10		silty clay loa	.	42	white clover	Trifolium repens	shoot	0.49	0.049	Gildon and Tinker, 1983	model	salt
Cd	CdSO4	100		silty clay loa	.	42	white clover	Trifolium repens	shoot	2.95	0.0295	Gildon and Tinker, 1983	model	salt
Cd	CdSO4	50		silty clay loa	.	42	white clover	Trifolium repens	shoot	1.42	0.0284	Gildon and Tinker, 1983	model	salt
Cd	CdCl2	10		silty clay loa	6.7	117	celery	Apium graveolens	leaf,stalk	12.82	1.282	Haghiri, 1973.	model	salt
Cd	CdCl2	2.5		silty clay loa	6.7	117	celery	Apium graveolens	leaf,stalk	4.8	1.92	Haghiri, 1973.	model	salt
Cd	CdCl2	10		silty clay loa	6.7	112	green pepper	Capsicum frutescens		6.28	0.628	Haghiri, 1973.	model	salt
Cd	CdCl2	2.5		silty clay loa	6.7	112	green pepper	Capsicum frutescens		3.82	1.528	Haghiri, 1973.	model	salt
Cd	CdCl2	10		silty clay loa	6.7	37	lettuce	Latuca sativa	leaf	27.10	2.71	Haghiri, 1973.	model	salt

Cd	CdCl2	2.5		silty clay loa	6.7	37	lettuce	Latuca sativa	leaf	11.50	4.6	Haghiri, 1973.	model	salt
Cd	CdCl2	10		silty clay loa	6.7	26	radish	Raphanus sativus	top	16.13	1.613	Haghiri, 1973.	model	salt
Cd	CdCl2	2.5		silty clay loa	6.7	26	radish	Raphanus sativus	top	10.20	4.08	Haghiri, 1973.	model	salt
Cd	field-background	0.06			999	unknown	grass	Poa spp.	above-ground	0.4	6.66667	Hall et al. 1990	model	field
Cd	field-background	0.06			999	unknown	grass	Bromus japonicus	above-ground	0.15	2.5	Hall et al. 1990	model	field
Cd	field-sludge	2.28			999	unknown	grass	Poa spp.	above-ground	0.85	0.37281	Hall et al. 1990	model	field
Cd	field-sludge	2.28			999	unknown	grass	Bromus japonicus	above-ground	1.7	0.74561	Hall et al. 1990	model	field
Cd	fertilizer	0.253		loam	4.8	.	carrot	Daucus carota	leaf	1.25	4.94071	He and Singh, 1994.	model	field
Cd	fertilizer	0.253		loam	5.2	.	carrot	Daucus carota	leaf	0.855	3.37945	He and Singh, 1994.	model	field
Cd	fertilizer	0.253		loam	5.9	.	carrot	Daucus carota	leaf	0.565	2.2332	He and Singh, 1994.	model	field
Cd	fertilizer	0.263		loam	4.8	.	carrot	Daucus carota	leaf	1.35	5.13308	He and Singh, 1994.	model	field
Cd	fertilizer	0.263		loam	5.2	.	carrot	Daucus carota	leaf	0.925	3.51711	He and Singh, 1994.	model	field
Cd	fertilizer	0.263		loam	5.9	.	carrot	Daucus carota	leaf	0.665	2.52852	He and Singh, 1994.	model	field
Cd	fertilizer	0.037		sand	4.8	.	oat	Avena sativa	straw	0.065	1.75676	He and Singh, 1994.	model	field
Cd	fertilizer	0.037		sand	5.2	.	oat	Avena sativa	straw	0.035	0.94595	He and Singh, 1994.	model	field
Cd	fertilizer	0.037		sand	5.9	.	oat	Avena sativa	straw	0.045	1.21622	He and Singh, 1994.	model	field
Cd	fertilizer	0.047		sand	4.8	.	oat	Avena sativa	straw	0.1	2.12766	He and Singh, 1994.	model	field
Cd	fertilizer	0.047		sand	5.2	.	oat	Avena sativa	straw	0.090	1.91489	He and Singh, 1994.	model	field
Cd	fertilizer	0.047		sand	5.9	.	oat	Avena sativa	straw	0.08	1.70213	He and Singh, 1994.	model	field
Cd	fertilizer	0.253		loam	5	.	oat	Avena sativa	straw	0.09	0.35573	He and Singh, 1994.	model	field
Cd	fertilizer	0.253		loam	5.9	.	oat	Avena sativa	straw	0.093	0.36759	He and Singh, 1994.	model	field
Cd	fertilizer	0.253		loam	6.8	.	oat	Avena sativa	straw	0.147	0.58103	He and Singh, 1994.	model	field
Cd	fertilizer	0.263		loam	5	.	oat	Avena sativa	straw	0.109	0.41445	He and Singh, 1994.	model	field
Cd	fertilizer	0.263		loam	5.9	.	oat	Avena sativa	straw	0.123	0.46768	He and Singh, 1994.	model	field
Cd	fertilizer	0.263		loam	6.8	.	oat	Avena sativa	straw	0.15	0.57034	He and Singh, 1994.	model	field
Cd	fertilizer	0.037		sand	4.8	.	ryegrass	Lolium multiflorum	above-ground	0.11	2.97297	He and Singh, 1994.	model	field
Cd	fertilizer	0.037		sand	5.2	.	ryegrass	Lolium multiflorum	above-ground	0.1	2.7027	He and Singh, 1994.	model	field
Cd	fertilizer	0.037		sand	5.9	.	ryegrass	Lolium multiflorum	above-ground	0.04	1.08108	He and Singh, 1994.	model	field
Cd	fertilizer	0.047		sand	4.8	.	ryegrass	Lolium multiflorum	above-ground	0.16	3.40426	He and Singh, 1994.	model	field
Cd	fertilizer	0.047		sand	5.2	.	ryegrass	Lolium multiflorum	above-ground	0.125	2.65957	He and Singh, 1994.	model	field
Cd	fertilizer	0.047		sand	5.9	.	ryegrass	Lolium multiflorum	above-ground	0.11	2.34043	He and Singh, 1994.	model	field
Cd	fertilizer	0.253		loam	5	.	ryegrass	Lolium multiflorum	above-ground	0.053	0.20949	He and Singh, 1994.	model	field
Cd	fertilizer	0.253		loam	5.9	.	ryegrass	Lolium multiflorum	above-ground	0.215	0.8498	He and Singh, 1994.	model	field
Cd	fertilizer	0.253		loam	6.8	.	ryegrass	Lolium multiflorum	above-ground	0.257	1.01581	He and Singh, 1994.	model	field
Cd	fertilizer	0.263		loam	5	.	ryegrass	Lolium multiflorum	above-ground	0.092	0.34981	He and Singh, 1994.	model	field
Cd	fertilizer	0.263		loam	5.9	.	ryegrass	Lolium multiflorum	above-ground	0.231	0.87833	He and Singh, 1994.	model	field
Cd	fertilizer	0.263		loam	6.8	.	ryegrass	Lolium multiflorum	above-ground	0.381	1.44867	He and Singh, 1994.	model	field
Cd	fertilizer	0.253		loam	5.9	.	spinach	Spinacia oleracea	above-ground	2.9	11.4625	He and Singh, 1994.	model	field
Cd	fertilizer	0.253		loam	6.8	.	spinach	Spinacia oleracea	above-ground	1.6	6.32411	He and Singh, 1994.	model	field
Cd	fertilizer	0.263		loam	5.9	.	spinach	Spinacia oleracea	above-ground	3.1	11.7871	He and Singh, 1994.	model	field
Cd	fertilizer	0.263		loam	6.8	.	spinach	Spinacia oleracea	above-ground	2.35	8.93536	He and Singh, 1994.	model	field
Cd	field soil in pot	10.4	collected,1	sandy loam	6.1	42	soybean	Glycine max	leaf	8.8	0.84615	Heggo, et al. 1990.	model	field
Cd	field soil in pot	11.6	collected,1	sandy loam	5.5	42	soybean	Glycine max	leaf	20.6	1.77586	Heggo, et al. 1990.	model	field
Cd	field soil in pot	14.0	collected,1	sandy loam	5.0	42	soybean	Glycine max	leaf	8.2	0.58571	Heggo, et al. 1990.	model	field
Cd	field soil in pot	24.7	collected,1	sandy loam	6.8	42	soybean	Glycine max	leaf	7.5	0.30364	Heggo, et al. 1990.	model	field
Cd	field soil in pot	35.3	collected,1	sandy loam	6.4	42	soybean	Glycine max	leaf	26.2	0.74221	Heggo, et al. 1990.	model	field
Cd	field soil in pot	38.9	collected,1	sandy loam	6.7	42	soybean	Glycine max	leaf	18.4	0.47301	Heggo, et al. 1990.	model	field
Cd	field soil in pot	9.00	collected,1	sandy loam	7.5	42	soybean	Glycine max	leaf	3.6	0.4	Heggo, et al. 1990.	model	field
Cd	field	0.75	5	unknown gr	999	unknown	fine-leaved grasses		above-ground	0.23	0.30667	Hunter and Johnson 19	model	field

Cd	field	3.1	5	unknown gr	999	unknown	fine-leaved grasses		above-ground	1.1	0.35484	Hunter and Johnson 198	model	field
Cd	field	8.5	5	unknown gr	999	unknown	fine-leaved grasses		above-ground	2	0.23529	Hunter and Johnson 198	model	field
Cd	field	0.75	5	unknown gr	999	unknown	ground cover veg		above-ground	0.4	0.53333	Hunter and Johnson 198	model	field
Cd	field	3.1	5	unknown gr	999	unknown	ground cover veg		above-ground	1.6	0.51613	Hunter and Johnson 198	model	field
Cd	field	8.5	5	unknown gr	999	unknown	ground cover veg		above-ground	3.6	0.42353	Hunter and Johnson 198	model	field
Cd	field-background	2.58		muck	999	.	carrot	Daucus carrota	leaf	1.5	0.5814	Hutchinson, et al. 1974.	model	field
Cd	Cd(NO3)2	320.20		muck	999	.	carrot	Daucus carrota	leaf	15.5	0.04841	Hutchinson, et al. 1974.	model	field
Cd	field-background	2.58		muck	999	.	corn	Zea mays	leaf	0.7	0.27132	Hutchinson, et al. 1974.	model	field
Cd	Cd(NO3)2	320.20		muck	999	.	corn	Zea mays	leaf	10.2	0.03186	Hutchinson, et al. 1974.	model	salt
Cd	field-background	2.58		muck	999	.	lettuce	Latuca sativa	leaf	1.9	0.73643	Hutchinson, et al. 1974.	model	field
Cd	Cd(NO3)2	320.20		muck	999	.	lettuce	Latuca sativa	leaf	38.0	0.11868	Hutchinson, et al. 1974.	model	salt
Cd	field-background	2.58		muck	999	.	oat	Avena sativa	leaf	0.8	0.31008	Hutchinson, et al. 1974.	model	field
Cd	Cd(NO3)2	320.20		muck	999	.	oat	Avena sativa	leaf	6.0	0.01874	Hutchinson, et al. 1974.	model	salt
Cd	field-background	2.58		muck	999	.	onion	Allium cepa	leaf	1.5	0.5814	Hutchinson, et al. 1974.	model	field
Cd	Cd(NO3)2	320.20		muck	999	.	onion	Allium cepa	leaf	127.0	0.39663	Hutchinson, et al. 1974.	model	salt
Cd	field-background	2.58		muck	999	.	parsnip	Pastinaca sativa	leaf	0.9	0.34884	Hutchinson, et al. 1974.	model	field
Cd	Cd(NO3)2	320.20		muck	999	.	parsnip	Pastinaca sativa	leaf	5.1	0.01593	Hutchinson, et al. 1974.	model	salt
Cd	field-background	2.58		muck	999	.	radish	Raphanus sativus	leaf	2.5	0.96899	Hutchinson, et al. 1974.	model	field
Cd	Cd(NO3)2	320.20		muck	999	.	radish	Raphanus sativus	leaf	63.1	0.19706	Hutchinson, et al. 1974.	model	salt
Cd	CdCl2	200		silt loam	5.1	60	broccoli	Brassica oleracea	leaf	268.5	1.3425	John, 1973.	model	salt
Cd	CdCl2	40		silt loam	5.1	60	broccoli	Brassica oleracea	leaf	36.0	0.9	John, 1973.	model	salt
Cd	CdCl2	200		silt loam	5.1	130	carrot	Daucus carota	top	294.4	1.472	John, 1973.	model	salt
Cd	CdCl2	40		silt loam	5.1	130	carrot	Daucus carota	top	79.3	1.9825	John, 1973.	model	salt
Cd	CdCl2	200		silt loam	5.1	70	cauliflower	Brassica oleracea	leaf	198.6	0.993	John, 1973.	model	salt
Cd	CdCl2	40		silt loam	5.1	70	cauliflower	Brassica oleracea	leaf	18.5	0.4625	John, 1973.	model	salt
Cd	CdCl2	200		silt loam	5.1	35	leaf lettuce	Latuca sativa	leaf	667.7	3.3385	John, 1973.	model	salt
Cd	CdCl2	40		silt loam	5.1	35	leaf lettuce	Latuca sativa	leaf	51.1	1.2775	John, 1973.	model	salt
Cd	CdCl2	200		silt loam	5.1	100	oat	Avena sativa	husk,leaf,stal	129.8	0.649	John, 1973.	model	salt
Cd	CdCl2	40		silt loam	5.1	100	oat	Avena sativa	husk,leaf,stal	56.1	1.4025	John, 1973.	model	salt
Cd	CdCl2	200		silt loam	5.1	95	pea	Pisum sativum	vine	116.9	0.5845	John, 1973.	model	salt
Cd	CdCl2	40		silt loam	5.1	95	pea	Pisum sativum	vine	37.2	0.93	John, 1973.	model	salt
Cd	CdCl2	200		silt loam	5.1	45	radish	Raphanus sativus	top	398.0	1.99	John, 1973.	model	salt
Cd	CdCl2	40		silt loam	5.1	45	radish	Raphanus sativus	top	264.7	6.6175	John, 1973.	model	salt
Cd	CdCl2 + CdO	0.5		loamy sand	4.5	ca. 42	radish	Raphanus sativus	shoot	1.3	2.6	Khan and Frankland, 19	model	salt
Cd	CdCl2 + CdO	50.5		loamy sand	4.5	ca. 42	radish	Raphanus sativus	shoot	54	1.06931	Khan and Frankland, 19	model	salt
Cd	CdCl2 + CdO	100.5		loamy sand	4.5	ca. 42	radish	Raphanus sativus	shoot	66	0.65672	Khan and Frankland, 19	model	salt
Cd	field soil in pots	0.55			5.9	42	radish	Raphanus sativus	top	1.6	2.90909	Lagerwerff, 1971.	model	field
Cd	field soil in pots	0.55			7.2	42	radish	Raphanus sativus	top	1.5	2.72727	Lagerwerff, 1971.	model	field
Cd	field soil in pots	2.8			5.9	42	radish	Raphanus sativus	top	2.9	1.03571	Lagerwerff, 1971.	model	field
Cd	field soil in pots	2.8			7.2	42	radish	Raphanus sativus	top	2.8	1	Lagerwerff, 1971.	model	field
Cd	field	0.3	humus laye	sandy loam	2.9	lifetime	Norway spruce	Picea abies	needles	0.3	1	Lamersdorf, et al. 1991.	model	field
Cd	field-background	0.33		sand	4.80	84	black-eyed Su	Rudbeckia hirta	shoot	7.55	22.8788	Miles and Parker, 1979.	model	field
Cd	field-background	2.32		sand	7.82	84	black-eyed Su	Rudbeckia hirta	shoot	7.10	3.06034	Miles and Parker, 1979.	model	field
Cd	CdCl2	10.33		sand	4.80	84	black-eyed Su	Rudbeckia hirta	shoot	371.30	35.9439	Miles and Parker, 1979.	model	salt
Cd	CdCl2	12.32		sand	7.82	84	black-eyed Su	Rudbeckia hirta	shoot	45.34	3.68019	Miles and Parker, 1979.	model	salt
Cd	CdCl2	20.33		sand	4.80	84	black-eyed Su	Rudbeckia hirta	shoot	593.73	29.2046	Miles and Parker, 1979.	model	salt
Cd	field-background	0.33		sand	4.80	84	little bluestem	Andropogon scoparius	shoot	0.47	1.42424	Miles and Parker, 1979.	model	field
Cd	field-background	2.32		sand	7.82	84	little bluestem	Andropogon scoparius	shoot	0.65	0.28017	Miles and Parker, 1979.	model	field
Cd	CdCl2	10.33		sand	4.80	84	little bluestem	Andropogon scoparius	shoot	18.86	1.82575	Miles and Parker, 1979.	model	salt

Cd	CdCl2	12.32		sand	7.82	84	little bluestem	Andropogon scoparius	shoot	2.48	0.2013	Miles and Parker, 1979.	model	salt
Cd	CdCl2	20.33		sand	4.80	84	little bluestem	Andropogon scoparius	shoot	30.50	1.50025	Miles and Parker, 1979.	model	salt
Cd	CdCl2	2.5		loamy sand	6.0	.	corn	Zea mays	shoot	34.5	13.8	Miller et al. 1977	model	salt
Cd	CdCl2	5.0		loamy sand	6.0	.	corn	Zea mays	shoot	77.8	15.56	Miller et al. 1977	model	salt
Cd	CdCl2	1		silt loam	4.5	28	soybean	Glycine max	shoot	8.97	8.97	Miller, et al. 1976.	model	salt
Cd	CdCl2	1		silt loam	6.1	28	soybean	Glycine max	shoot	4.08	4.08	Miller, et al. 1976.	model	salt
Cd	CdCl2	1		silt loam	7.0	28	soybean	Glycine max	shoot	0.80	0.8	Miller, et al. 1976.	model	salt
Cd	CdCl2	1		silt loam	7.9	28	soybean	Glycine max	shoot	2.74	2.74	Miller, et al. 1976.	model	salt
Cd	CdCl2	1		silt loam	5.5	28	soybean	Glycine max	shoot	2.36	2.36	Miller, et al. 1976.	model	salt
Cd	CdCl2	1		silt loam	6.5	28	soybean	Glycine max	shoot	1.44	1.44	Miller, et al. 1976.	model	salt
Cd	CdCl2	1		silty clay loa	6.1	28	soybean	Glycine max	shoot	0.90	0.9	Miller, et al. 1976.	model	salt
Cd	CdCl2	1		loamy sand	5.7	28	soybean	Glycine max	shoot	5.54	5.54	Miller, et al. 1976.	model	salt
Cd	CdCl2	10		silt loam	4.5	28	soybean	Glycine max	shoot	51.4	5.14	Miller, et al. 1976.	model	salt
Cd	CdCl2	10		silt loam	6.1	28	soybean	Glycine max	shoot	26.8	2.68	Miller, et al. 1976.	model	salt
Cd	CdCl2	10		silt loam	7.0	28	soybean	Glycine max	shoot	5.04	0.504	Miller, et al. 1976.	model	salt
Cd	CdCl2	10		silt loam	7.9	28	soybean	Glycine max	shoot	19.9	1.99	Miller, et al. 1976.	model	salt
Cd	CdCl2	10		silt loam	5.5	28	soybean	Glycine max	shoot	15.9	1.59	Miller, et al. 1976.	model	salt
Cd	CdCl2	10		silt loam	6.5	28	soybean	Glycine max	shoot	4.14	0.414	Miller, et al. 1976.	model	salt
Cd	CdCl2	10		silty clay loa	6.1	28	soybean	Glycine max	shoot	4.04	0.404	Miller, et al. 1976.	model	salt
Cd	CdCl2	10		loamy sand	5.7	28	soybean	Glycine max	shoot	64.20	6.42	Miller, et al. 1976.	model	salt
Cd	CdCl2	100		silt loam	6.1	28	soybean	Glycine max	shoot	87.2	0.872	Miller, et al. 1976.	model	salt
Cd	CdCl2	100		silt loam	7.0	28	soybean	Glycine max	shoot	37.9	0.379	Miller, et al. 1976.	model	salt
Cd	CdCl2	100		silt loam	7.9	28	soybean	Glycine max	shoot	67.4	0.674	Miller, et al. 1976.	model	salt
Cd	CdCl2	100		silt loam	5.5	28	soybean	Glycine max	shoot	48.5	0.485	Miller, et al. 1976.	model	salt
Cd	CdCl2	100		silt loam	6.5	28	soybean	Glycine max	shoot	36.40	0.364	Miller, et al. 1976.	model	salt
Cd	CdCl2	100		silty clay loa	6.1	28	soybean	Glycine max	shoot	13.73	0.1373	Miller, et al. 1976.	model	salt
Cd	CdCl2	100		loamy sand	5.7	28	soybean	Glycine max	shoot	38.20	0.382	Miller, et al. 1976.	model	salt
Cd	field-mine-waste	7.8	6 cm	unknown	999	unknown	forbes			3.5	0.44872	Pascoe et al. 1994	model	field
Cd	field-mine-waste	7.8	6 cm	unknown	999	unknown	grasses			0.94	0.12051	Pascoe et al. 1994	model	field
Cd	Cd-salt	10.09		loamy sand	8.4	.	wheat	Triticum aestivum	straw	12.2	1.20912	Sadana and Singh, 1987	model	salt
Cd	Cd-salt	20.09		loamy sand	8.4	.	wheat	Triticum aestivum	straw	21.0	1.0453	Sadana and Singh, 1987	model	salt
Cd	Cd-salt	40.09		loamy sand	8.4	.	wheat	Triticum aestivum	straw	24.9	0.6211	Sadana and Singh, 1987	model	salt
Cd	Cd-salt	80.09		loamy sand	8.4	.	wheat	Triticum aestivum	straw	26.2	0.32713	Sadana and Singh, 1987	model	salt
Cd	Cd(NO3)2	116.0		sandy loam	7.8	30	corn	Zea mays	whole plant	101.9	0.87845	Sadiq, 1985.	model	salt
Cd	Cd(NO3)2	118.0		clay loam	7.8	30	corn	Zea mays	whole plant	116.5	0.98729	Sadiq, 1985.	model	salt
Cd	Cd(NO3)2	125.0		clay sand	7.8	30	corn	Zea mays	whole plant	115.9	0.9272	Sadiq, 1985.	model	salt
Cd	Cd(NO3)2	141.0		loamy sand	7.7	30	corn	Zea mays	whole plant	80.3	0.5695	Sadiq, 1985.	model	salt
Cd	Cd(NO3)2	153.0		sandy clay	7.6	30	corn	Zea mays	whole plant	108.6	0.7098	Sadiq, 1985.	model	salt
Cd	Cd(NO3)2	19.0		sandy loam	7.6	30	corn	Zea mays	whole plant	39.9	2.1	Sadiq, 1985.	model	salt
Cd	Cd(NO3)2	25.0		sandy clay	7.6	30	corn	Zea mays	whole plant	62.2	2.488	Sadiq, 1985.	model	salt
Cd	Cd(NO3)2	26.0		sandy loam	7.8	30	corn	Zea mays	whole plant	31.0	1.19231	Sadiq, 1985.	model	salt
Cd	Cd(NO3)2	33.0		loamy sand	7.8	30	corn	Zea mays	whole plant	27.4	0.8303	Sadiq, 1985.	model	salt
Cd	Cd(NO3)2	33.0		sandy loam	7.3	30	corn	Zea mays	whole plant	61.2	1.85455	Sadiq, 1985.	model	salt
Cd	Cd(NO3)2	37.0		sandy loam	7.4	30	corn	Zea mays	whole plant	37.8	1.02162	Sadiq, 1985.	model	salt
Cd	Cd(NO3)2	46.0		loamy sand	7.4	30	corn	Zea mays	whole plant	68.5	1.48913	Sadiq, 1985.	model	salt
Cd	Cd(NO3)2	46.0		clay loam	7.8	30	corn	Zea mays	whole plant	66.3	1.4413	Sadiq, 1985.	model	salt
Cd	Cd(NO3)2	61.0		clay loam	8.1	30	corn	Zea mays	whole plant	83.4	1.36721	Sadiq, 1985.	model	salt
Cd	Cd(NO3)2	83.0		sandy loam	7.8	30	corn	Zea mays	whole plant	93.7	1.12892	Sadiq, 1985.	model	salt
Cd	Cd(NO3)2	88.0		loamy sand	7.9	30	corn	Zea mays	whole plant	100.6	1.14318	Sadiq, 1985.	model	salt

Cd	CdCl2	0.62		loamy sand	5.1	>30	bush bean	Phaseolis vulgaris	leaves,pod	0.5	0.80645	Sajwan et al. 1996	model	salt
Cd	CdCl2	4.52		loamy sand	5.1	>30	bush bean	Phaseolis vulgaris	leaves,pod	0.68	0.15044	Sajwan et al. 1996	model	salt
Cd	CdCl2	6.66		loamy sand	5.1	>30	bush bean	Phaseolis vulgaris	leaves,pod	1.06	0.15916	Sajwan et al. 1996	model	salt
Cd	field-background	0.12	15	unknown	8.5	many yea	basil	Ocimum basilicum	edible portion	0.16	1.33333	Shariatpanahi and Ande	model	field
Cd	field-wastewater	0.87	15	unknown	8.3	many yea	basil	Ocimum basilicum	edible portion	0.6	0.68966	Shariatpanahi and Ande	model	field
Cd	field-background	0.12	15	unknown	8.5	many yea	garden cress	Lepidium sativum	edible portion	0.1	0.83333	Shariatpanahi and Ande	model	field
Cd	field-wastewater	0.87	15	unknown	8.3	many yea	garden cress	Lepidium sativum	edible portion	0.6	0.68966	Shariatpanahi and Ande	model	field
Cd	field-background	0.12	15	unknown	8.5	many yea	mint	Mentha arllensis	edible portion	0.11	0.91667	Shariatpanahi and Ande	model	field
Cd	field-wastewater	0.87	15	unknown	8.3	many yea	mint	Mentha arllensis	edible portion	0.7	0.8046	Shariatpanahi and Ande	model	field
Cd	field-background	0.12	15	unknown	8.5	many yea	tarragon	Artemisia dracunculus	edible portion	0.14	1.16667	Shariatpanahi and Ande	model	field
Cd	field-wastewater	0.87	15	unknown	8.3	many yea	tarragon	Artemisia dracunculus	edible portion	0.05	0.05747	Shariatpanahi and Ande	model	field
Cd	field	1.67	15 cm	? (semi-arid	999	unknown	various		above-ground	1.7	1.01796	Sharma and Shupe 197	model	field
Cd	field	1.7	15 cm	? (semi-arid	999	unknown	various		above-ground	1.5	0.88235	Sharma and Shupe 197	model	field
Cd	field	1.93	15 cm	? (semi-arid	999	unknown	various		above-ground	1.3	0.67358	Sharma and Shupe 197	model	field
Cd	field	2.13	15 cm	? (semi-arid	999	unknown	various		above-ground	1.4	0.65728	Sharma and Shupe 197	model	field
Cd	field	2.23	15 cm	? (semi-arid	999	unknown	various		above-ground	1.1	0.49327	Sharma and Shupe 197	model	field
Cd	field	2.23	15 cm	? (semi-arid	999	unknown	various		above-ground	1.7	0.76233	Sharma and Shupe 197	model	field
Cd	field	2.37	15 cm	? (semi-arid	999	unknown	various		above-ground	3.4	1.4346	Sharma and Shupe 197	model	field
Cd	field	2.5	15 cm	? (semi-arid	999	unknown	various		above-ground	1.7	0.68	Sharma and Shupe 197	model	field
Cd	field	2.53	15 cm	? (semi-arid	999	unknown	various		above-ground	1.4	0.55336	Sharma and Shupe 197	model	field
Cd	field	2.7	15 cm	? (semi-arid	999	unknown	various		above-ground	1.4	0.51852	Sharma and Shupe 197	model	field
Cd	field	2.77	15 cm	? (semi-arid	999	unknown	various		above-ground	1.1	0.39711	Sharma and Shupe 197	model	field
Cd	field	2.77	15 cm	? (semi-arid	999	unknown	various		above-ground	1.3	0.46931	Sharma and Shupe 197	model	field
Cd	field	3.17	15 cm	? (semi-arid	999	unknown	various		above-ground	0.6	0.18927	Sharma and Shupe 197	model	field
Cd	field	3.57	15 cm	? (semi-arid	999	unknown	various		above-ground	0.5	0.14006	Sharma and Shupe 197	model	field
Cd	field	3.77	15 cm	? (semi-arid	999	unknown	various		above-ground	2	0.5305	Sharma and Shupe 197	model	field
Cd	field	5.47	15 cm	? (semi-arid	999	unknown	various		above-ground	2.9	0.53016	Sharma and Shupe 197	model	field
Cd	field	5.73	15 cm	? (semi-arid	999	unknown	various		above-ground	2.6	0.45375	Sharma and Shupe 197	model	field
Cd	field	5.83	15 cm	? (semi-arid	999	unknown	various		above-ground	5	0.85763	Sharma and Shupe 197	model	field
Cd	CdSO4	100		loam	999	18	bush bean	Phaseolus vulgaris	leaf	6.7	0.067	Wallace et al. 1977	model	salt
Cd	CdSO4	50		loam	999	18	bush bean	Phaseolus vulgaris	leaf	3.0	0.06	Wallace et al. 1977	model	salt
Cd	CdSO4	400		loam	999	24	corn	Zea mays	shoot	1100	2.75	Wallace et al. 1977	model	salt
Cd	CdSO4	200		loam	999	24	corn	Zea mays	shoot	604	3.02	Wallace et al. 1977	model	salt
Cd	field soil in pot	0.48	15cm	loam	5.7	90	cabbage	Brassica oleracea	shoot	0.20	0.41667	Xian. 1989	model	field
Cd	field soil in pot	1.27	15cm	sandy loam	6.4	90	cabbage	Brassica oleracea	shoot	0.75	0.59055	Xian. 1989	model	field
Cd	field soil in pot	10.23	15cm	loam	4.3	90	cabbage	Brassica oleracea	shoot	12.60	1.23167	Xian. 1989	model	field
Cd	field soil in pot	14.83	15cm	loam	5.5	90	cabbage	Brassica oleracea	shoot	12.33	0.83142	Xian. 1989	model	field
Cd	field soil in pot	2.60	15cm	sandy loam	6.6	90	cabbage	Brassica oleracea	shoot	0.92	0.35385	Xian. 1989	model	field
Cd	field soil in pot	4.94	15cm	sandy loam	5.7	90	cabbage	Brassica oleracea	shoot	5.42	1.09717	Xian. 1989	model	field
Cd	field soil in pot	5.96	15cm	loam	7.0	90	cabbage	Brassica oleracea	shoot	1.51	0.25336	Xian. 1989	model	field
Cd	field soil in pot	6.72	15cm	loam	5.2	90	cabbage	Brassica oleracea	shoot	4.50	0.66964	Xian. 1989	model	field
Cd	field	0.48			7.8		redtop	Agrostis stolonifera	above-ground	0.03	0.0625	PTI 1994	validation	field
Cd	field	0.73			7.5		redtop	Agrostis stolonifera	above-ground	0.082	0.11233	PTI 1994	validation	field
Cd	field	1.5			6.8		redtop	Agrostis stolonifera	above-ground	0.069	0.046	PTI 1994	validation	field
Cd	field	2			6.9		redtop	Agrostis stolonifera	above-ground	0.31	0.155	PTI 1994	validation	field
Cd	field	2.2			5.9		redtop	Agrostis stolonifera	above-ground	0.31	0.14091	PTI 1994	validation	field
Cd	field	2.5			7		redtop	Agrostis stolonifera	above-ground	0.46	0.184	PTI 1994	validation	field
Cd	field	2.8			6		redtop	Agrostis stolonifera	above-ground	0.33	0.11786	PTI 1994	validation	field

Cd	field	3.8			7		redtop	Agrostis stolonifera	above-ground	0.53	0.13947	PTI 1994	validation	field
Cd	field	3.8			6.7		redtop	Agrostis stolonifera	above-ground	3.7	0.97368	PTI 1994	validation	field
Cd	field	4.5			7.8		redtop	Agrostis stolonifera	above-ground	0.2	0.04444	PTI 1994	validation	field
Cd	field	6.7			6.2		redtop	Agrostis stolonifera	above-ground	0.37	0.05522	PTI 1994	validation	field
Cd	field	6.8			7.2		redtop	Agrostis stolonifera	above-ground	0.26	0.03824	PTI 1994	validation	field
Cd	field	8.2			4.9		redtop	Agrostis stolonifera	above-ground	1.1	0.13415	PTI 1994	validation	field
Cd	field	9.2			6.7		redtop	Agrostis stolonifera	above-ground	0.46	0.05	PTI 1994	validation	field
Cd	field	10			5.4		redtop	Agrostis stolonifera	above-ground	2.2	0.22	PTI 1994	validation	field
Cd	field	4.6			4.8		redtop/tufted_h	2 spp.	above-ground	0.98	0.21304	PTI 1994	validation	field
Cd	field	0.49			5.9		slender_wheat	Agropyron trachycaulu	above-ground	0.18	0.36735	PTI 1994	validation	field
Cd	field	0.64			6.5		slender_wheat	Agropyron trachycaulu	above-ground	0.1	0.15625	PTI 1994	validation	field
Cd	field	2			3.7		tufted_hairgras	Aira or Deschampsia	above-ground	1.3	0.65	PTI 1994	validation	field
Cd	field	3.6			6.2		tufted_hairgras	Aira or Deschampsia	above-ground	2.4	0.66667	PTI 1994	validation	field
Cd	field	5.2			4.4		tufted_hairgras	Aira or Deschampsia	above-ground	1.5	0.28846	PTI 1994	validation	field
Cd	field	5.2			5.8		tufted_hairgras	Aira or Deschampsia	above-ground	3	0.57692	PTI 1994	validation	field
Cd	field	5.4			4.9		tufted_hairgras	Aira or Deschampsia	above-ground	3.1	0.57407	PTI 1994	validation	field
Cd	field	8.4			6.5		tufted_hairgras	Aira or Deschampsia	above-ground	0.803	0.0956	PTI 1994	validation	field
Cd	field	9.5			5.3		tufted_hairgras	Aira or Deschampsia	above-ground	3	0.31579	PTI 1994	validation	field
Cd	field	26.6			7.1		annual ragwee	Ambrosia artemisiifolia	stem/leaf	11.3	0.42481	PTI 1995	validation	field
Cd	field	25.2			6.6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	44.9	1.78175	PTI 1995	validation	field
Cd	field	33.1			6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	34.2	1.03323	PTI 1995	validation	field
Cd	field	0.77			6.8		annual ragwee	Ambrosia artemisiifolia	stem/leaf	0.36	0.46753	PTI 1995	validation	field
Cd	field	144			6.4		annual ragwee	Ambrosia artemisiifolia	stem/leaf	68.8	0.47778	PTI 1995	validation	field
Cd	field	25.2			6.6		Beggar's ticks	Bidens polylepsis	stem/leaf	81.3	3.22619	PTI 1995	validation	field
Cd	field	33.1			6		Beggar's ticks	Bidens polylepsis	stem/leaf	18.8	0.56798	PTI 1995	validation	field
Cd	field	144			6.4		beggar's ticks	Bidens polylepis	stem/leaf	63.5	0.44097	PTI 1995	validation	field
Cd	field	144			6.4		beggar's ticks	Bidens polylepis	stem/leaf	62.7	0.43542	PTI 1995	validation	field
Cd	field	36			6		beggar's ticks	Bidens polylepis	stem/leaf	37.1	1.03056	PTI 1995	validation	field
Cd	field	69.8			6.1		Bermuda grass	Cynodon dactylon	stem/leaf	2.3	0.03295	PTI 1995	validation	field
Cd	field	3.45			6.5		big bluestem	Andropogon gerardi	stem/leaf	0.03	0.0087	PTI 1995	validation	field
Cd	field	36			6		big bluestem	Andropogon gerardi	stem/leaf	0.56	0.01556	PTI 1995	validation	field
Cd	field	144			6.4		giant ragweed	Abrosia trifida	stem/leaf	29.6	0.20556	PTI 1995	validation	field
Cd	field	36			6		giant ragweed	Ambrosia trifida	stem/leaf	18.1	0.50278	PTI 1995	validation	field
Cd	field	26.6			7.1		Indian grass	Sorghastrum nutans	stem/leaf	0.8	0.03008	PTI 1995	validation	field
Cd	field	69.8			6.1		Indian grass	Sorghastrum nutans	stem/leaf	0.63	0.00903	PTI 1995	validation	field
Cd	field	25.2			6.6		Indian grass	Sorghastrum nutans	stem/leaf	1.3	0.05159	PTI 1995	validation	field
Cd	field	1.295			7		Indian grass	Sorghastrum nutans	stem/leaf	0.18	0.139	PTI 1995	validation	field
Cd	field	3.45			6.5		Indian grass	Sorghastrum nutans	stem/leaf	0.7	0.2029	PTI 1995	validation	field
Cd	field	0.77			6.8		Indian grass	Sorghastrum nutans	stem/leaf	0.05	0.06494	PTI 1995	validation	field
Cd	field	26.6			7.1		switchgrass	Panicum virgatum	stem/leaf	1.5	0.05639	PTI 1995	validation	field
Cd	field	69.8			6.1		switchgrass	Panicum virgatum	stem/leaf	0.9	0.01289	PTI 1995	validation	field
Cd	field	33.1			6		switchgrass	Panicum virgatum	stem/leaf	0.46	0.0139	PTI 1995	validation	field
Cd	field	1.295			7		switchgrass	Panicum virgatum	stem/leaf	0.05	0.03861	PTI 1995	validation	field
Cd	field	3.45			6.5		switchgrass	Panicum virgatum	stem/leaf	0.27	0.07826	PTI 1995	validation	field
Cd	field	0.77			6.8		switchgrass	Panicum virgatum	stem/leaf	0.04	0.05195	PTI 1995	validation	field
Cu	field	1283	avg of 0-3 & 15-20				Angiosperm	Genista aetnensis	shoot	84.3	0.06571	Barghigiani et al. 1988	model	field
Cu	field	1283	avg of 0-3 & 15-20				Angiosperm	Australagus siculus	leaf/flower	105	0.08184	Barghigiani et al. 1988	model	field
Cu	field-dredged ma	15	15.00	sandy loam	5.2		common reed	Phragmites australis	leaves	2.8	0.18667	Beyer, et al. 1990.	model	field

Cu	field-dredged ma	24	15.00	clay loam	6.3		common reed	Phragmites australis	leaves	2.5	0.10417	Beyer, et al. 1990.	model	field
Cu	field-dredged ma	71	15.00	sandy loam	6.3		common reed	Phragmites australis	leaves	6.1	0.08592	Beyer, et al. 1990.	model	field
Cu	field-dredged ma	130	15.00	sandy loam	6.3		common reed	Phragmites australis	leaves	3.9	0.03	Beyer, et al. 1990.	model	field
Cu	field-dredged ma	150	15.00	sandy clay lo	3.6		common reed	Phragmites australis	leaves	4.7	0.03133	Beyer, et al. 1990.	model	field
Cu	Cu-salt	4.83	15.00	peaty gley	3.3	100	sitka-spruce	Picea sitchensis	shoot	11.6	2.40166	Burton et al. 1984.	model	salt
Cu	Cu-salt	5	15.00	peaty gley	3.3	100	sitka-spruce	Picea sitchensis	shoot	16.4	3.28	Burton et al. 1984.	model	salt
Cu	Cu-salt	5.67	15.00	peaty gley	3.3	100	sitka-spruce	Picea sitchensis	shoot	18.1	3.19224	Burton et al. 1984.	model	salt
Cu	Cu-salt	5.75	15.00	peaty gley	3.3	100	sitka-spruce	Picea sitchensis	shoot	51.5	8.95652	Burton et al. 1984.	model	salt
Cu	Cu-salt	9.17	15.00	peaty gley	3.3	100	sitka-spruce	Picea sitchensis	shoot	36	3.92585	Burton et al. 1984.	model	salt
Cu	Cu-salt	16.5	15.00	peaty gley	3.3	100	sitka-spruce	Picea sitchensis	shoot	30.5	1.84848	Burton et al. 1984.	model	salt
Cu	field-background	26	20.00	silty clay loa	4.1		red clover	Trifolium pratense	leaf	44	1.69231	Carter 1983	model	field
Cu	field	41	10.00				radish	Raphanus sativus	leaf	5.9	0.1439	Davies 1992	model	field
Cu	field	22	15		5.7		cabbage	Brassica oleracea	leaf	1.4	0.06364	de Pieri et al. 1996	model	field
Cu	field	23	15		5		cabbage	Brassica oleracea	leaf	1.3	0.05652	de Pieri et al. 1996	model	field
Cu	field	29	15		5.4		cabbage	Brassica oleracea	leaf	1.3	0.04483	de Pieri et al. 1996	model	field
Cu	field	32	15		4.7		cabbage	Brassica oleracea	leaf	1.2	0.0375	de Pieri et al. 1996	model	field
Cu	field	40	15		6		cabbage	Brassica oleracea	leaf	1.4	0.035	de Pieri et al. 1996	model	field
Cu	field	16	15		5.1		carrot	Daucus carrota	leaf	4.6	0.2875	de Pieri et al. 1996	model	field
Cu	field	28	15		6.1		carrot	Daucus carrota	leaf	5.8	0.20714	de Pieri et al. 1996	model	field
Cu	field	58	15		5.5		carrot	Daucus carrota	leaf	5.6	0.09655	de Pieri et al. 1996	model	field
Cu	field	120	15		5.3		carrot	Daucus carrota	leaf	3.5	0.02917	de Pieri et al. 1996	model	field
Cu	field	13	15		5.5		cauliflower	Brassica oleracea	leaf	2.7	0.20769	de Pieri et al. 1996	model	field
Cu	field	17	15		7.2		cauliflower	Brassica oleracea	leaf	2.6	0.15294	de Pieri et al. 1996	model	field
Cu	field	37	15		6.2		corn	Zea mays	leaf,stalk	5.15	0.13919	de Pieri et al. 1996	model	field
Cu	field	42	15		6.2		corn	Zea mays	leaf,stalk	4.1	0.09762	de Pieri et al. 1996	model	field
Cu	field	49	15		4.4		corn	Zea mays	leaf,stalk	2.75	0.05612	de Pieri et al. 1996	model	field
Cu	field	51	15		4.8		corn	Zea mays	leaf,stalk	2.4	0.04706	de Pieri et al. 1996	model	field
Cu	field	27	15		4.4		lettuce	Latuca sativa	leaf	6.7	0.24815	de Pieri et al. 1996	model	field
Cu	field	70	15		5		lettuce	Latuca sativa	leaf	6.9	0.09857	de Pieri et al. 1996	model	field
Cu	field	26	15		5.1		turnip	Brassica rappa	leaf	4.8	0.18462	de Pieri et al. 1996	model	field
Cu	field	29	15		6.7		turnip	Brassica rappa	leaf	5.8	0.2	de Pieri et al. 1996	model	field
Cu	CuSO4	15		sandy loam			onion	Allium cepa	shoot	4.2	0.28	Gildon and Tinker, 1983	model	salt
Cu	CuSO4	30		sandy loam			onion	Allium cepa	shoot	3.6	0.12	Gildon and Tinker, 1983	model	salt
Cu	CuSO4	75		sandy loam			onion	Allium cepa	shoot	7.8	0.104	Gildon and Tinker, 1983	model	salt
Cu	field soil in pot	17.7	collected,1	silt loam	7.5	42	soybean	Glycine max	leaf	12.2	0.68927	Heggo, et al. 1990.	model	field
Cu	field soil in pot	26	collected,1	silt loam	6.8	42	soybean	Glycine max	leaf	13.8	0.53077	Heggo, et al. 1990.	model	field
Cu	field soil in pot	26.7	collected,1	silt loam	5.0	42	soybean	Glycine max	leaf	19.8	0.74157	Heggo, et al. 1990.	model	field
Cu	field soil in pot	33.8	collected,1	silt loam	6.4	42	soybean	Glycine max	leaf	16	0.47337	Heggo, et al. 1990.	model	field
Cu	field soil in pot	39.4	collected,1	silt loam	6.7	42	soybean	Glycine max	leaf	14.5	0.36802	Heggo, et al. 1990.	model	field
Cu	field soil in pot	40.7	collected,1	silt loam	6.1	42	soybean	Glycine max	leaf	17.3	0.42506	Heggo, et al. 1990.	model	field
Cu	field soil in pot	43.7	collected,1	silt loam	5.5	42	soybean	Glycine max	leaf	26.1	0.59725	Heggo, et al. 1990.	model	field
Cu	field	9.3	5	unknown grasslan	unknown		fine-leaved grasses		above-ground	6.6	0.70968	Hunter and Johnson 198	model	field
Cu	field	246	5	unknown grasslan	unknown		fine-leaved grasses		above-ground	26.3	0.10691	Hunter and Johnson 198	model	field
Cu	field	2480	5	unknown grasslan	unknown		fine-leaved grasses		above-ground	153	0.06169	Hunter and Johnson 198	model	field
Cu	field	9.3	5	unknown grasslan	unknown		ground cover veg		above-ground	8	0.86022	Hunter and Johnson 198	model	field
Cu	field	246	5	unknown grasslan	unknown		ground cover veg		above-ground	49.1	0.19959	Hunter and Johnson 198	model	field
Cu	field	2480	5	unknown grasslan	unknown		ground cover veg		above-ground	375	0.15121	Hunter and Johnson 198	model	field
Cu	field-background	68.9		muck			carrot	Daucus carrota	leaf	5	0.07257	Hutchinson, et al. 1974.	model	field
Cu	CuSO4	309.6		muck			carrot	Daucus carrota	leaf	8.3	0.02681	Hutchinson, et al. 1974.	model	salt

Cu	field-background	68.9		muck			corn	Zea mays	leaf	3	0.04354	Hutchinson, et al. 1974.	model	field
Cu	CuSO4	309.6		muck			corn	Zea mays	leaf	2	0.00646	Hutchinson, et al. 1974.	model	salt
Cu	field-background	68.9		muck			lettuce	Latuca sativa	leaf	15	0.21771	Hutchinson, et al. 1974.	model	field
Cu	CuSO4	309.6		muck			lettuce	Latuca sativa	leaf	15.3	0.04942	Hutchinson, et al. 1974.	model	salt
Cu	field-background	68.9		muck			oat	Avena sativa	leaf	2.1	0.03048	Hutchinson, et al. 1974.	model	field
Cu	CuSO4	309.6		muck			oat	Avena sativa	leaf	3.3	0.01066	Hutchinson, et al. 1974.	model	salt
Cu	field-background	68.9		muck			onion	Allium cepa	leaf	6.3	0.09144	Hutchinson, et al. 1974.	model	field
Cu	CuSO4	309.6		muck			onion	Allium cepa	leaf	15	0.04845	Hutchinson, et al. 1974.	model	salt
Cu	field-background	68.9		muck			parsnip	Pastinaca sativa	leaf	6.3	0.09144	Hutchinson, et al. 1974.	model	field
Cu	CuSO4	309.6		muck			parsnip	Pastinaca sativa	leaf	7.7	0.02487	Hutchinson, et al. 1974.	model	salt
Cu	field-background	68.9		muck			radish	Raphanus sativus	leaf	4.9	0.07112	Hutchinson, et al. 1974.	model	field
Cu	CuSO4	309.6		muck			radish	Raphanus sativus	leaf	17.8	0.05749	Hutchinson, et al. 1974.	model	salt
Cu	field-background	5.6		sand	4.80	84	black-eyed Su	Rudbeckia hirta	shoot	10.71	1.9125	Miles and Parker, 1979.	model	field
Cu	field-background	16.9		sand	7.82	84	black-eyed Su	Rudbeckia hirta	shoot	6.4	0.3787	Miles and Parker, 1979.	model	field
Cu	CuSO4	116.9		sand	7.82	84	black-eyed Su	Rudbeckia hirta	shoot	10.2	0.08725	Miles and Parker, 1979.	model	salt
Cu	field-background	5.6		sand	4.80	84	little bluestem	Andropogon scoparius	shoot	3.82	0.68214	Miles and Parker, 1979.	model	field
Cu	field-background	16.9		sand	7.82	84	little bluestem	Andropogon scoparius	shoot	6.72	0.39763	Miles and Parker, 1979.	model	field
Cu	CuSO4	105.6		sand	4.80	84	little bluestem	Andropogon scoparius	shoot	30.66	0.29034	Miles and Parker, 1979.	model	salt
Cu	CuSO4	116.9		sand	7.82	84	little bluestem	Andropogon scoparius	shoot	17.62	0.15073	Miles and Parker, 1979.	model	salt
Cu	field	37	unknown		6.0	.	spruce	Picea abies	needles	2.11	0.05703	Nilsson, 1972.	model	field
Cu	field	48	unknown		3.8	.	spruce	Picea abies	needles	2.64	0.055	Nilsson, 1972.	model	field
Cu	field	2.5	14.00	sand			black oak	Quercus velutina	above ground	7.9	3.16	Parker et al. 1978	model	field
Cu	field	46.2	14.00	sand	6.8		black oak	Quercus velutina	above ground	5.9	0.12771	Parker et al. 1978	model	field
Cu	field	2.5	14.00	sand			gromwell	Lithospermum canesc	above ground	18.5	7.4	Parker et al. 1978	model	field
Cu	field	46.2	14.00	sand	6.8		gromwell	Lithospermum canesc	above ground	14.1	0.30519	Parker et al. 1978	model	field
Cu	field	2.5	14.00	sand			quaking aspen	Populus tremuloides	leaf	7.6	3.04	Parker et al. 1978	model	field
Cu	field	46.2	14.00	sand	6.8		quaking aspen	Populus tremuloides	leaf	8.5	0.18398	Parker et al. 1978	model	field
Cu	field	2.5	14.00	sand			Solomon's sea	Smilacina stellata	above ground	7.2	2.88	Parker et al. 1978	model	field
Cu	field	46.2	14.00	sand	6.8		Solomon's sea	Smilacina stellata	above ground	9.4	0.20346	Parker et al. 1978	model	field
Cu	field-mine-waste	532.2				unknown	forbes			7.2	0.01353	Pascoe et al. 1994	model	field
Cu	field-mine-waste	532.2				unknown	grasses			24.2	0.04547	Pascoe et al. 1994	model	field
Cu	field	32	20		7	70	lettuce	Latuca sativa	above-ground	8.1	0.25313	Sauve et al. 1996	model	field
Cu	field	58	20		7.3	70	lettuce	Latuca sativa	above-ground	9.2	0.15862	Sauve et al. 1996	model	field
Cu	field	60	20		7.4	70	lettuce	Latuca sativa	above-ground	10.1	0.16833	Sauve et al. 1996	model	field
Cu	field	84	20		7.6	70	lettuce	Latuca sativa	above-ground	10.2	0.12143	Sauve et al. 1996	model	field
Cu	field	424	20		7.6	70	lettuce	Latuca sativa	above-ground	12.6	0.02972	Sauve et al. 1996	model	field
Cu	field	488	20		7.2	70	lettuce	Latuca sativa	above-ground	12.1	0.0248	Sauve et al. 1996	model	field
Cu	field	529	20		7.6	70	lettuce	Latuca sativa	above-ground	10.9	0.0206	Sauve et al. 1996	model	field
Cu	field	640	20		7.4	70	lettuce	Latuca sativa	above-ground	17.9	0.02797	Sauve et al. 1996	model	field
Cu	field	32	20		7	42	radish	Raphanus sativus	leaf	15.3	0.47813	Sauve et al. 1996	model	field
Cu	field	58	20		7.3	42	radish	Raphanus sativus	leaf	18.6	0.32069	Sauve et al. 1996	model	field
Cu	field	60	20		7.4	42	radish	Raphanus sativus	leaf	20.5	0.34167	Sauve et al. 1996	model	field
Cu	field	84	20		7.6	42	radish	Raphanus sativus	leaf	34.4	0.40952	Sauve et al. 1996	model	field
Cu	field	424	20		7.6	42	radish	Raphanus sativus	leaf	40	0.09434	Sauve et al. 1996	model	field
Cu	field	488	20		7.2	42	radish	Raphanus sativus	leaf	37.2	0.07623	Sauve et al. 1996	model	field
Cu	field	529	20		7.6	42	radish	Raphanus sativus	leaf	32.3	0.06106	Sauve et al. 1996	model	field
Cu	field	640	20		7.4	42	radish	Raphanus sativus	leaf	82.6	0.12906	Sauve et al. 1996	model	field
Cu	field	32	20		7	42	ryegrass	Lolium perenne	cutting	17	0.53125	Sauve et al. 1996	model	field
Cu	field	58	20		7.3	42	ryegrass	Lolium perenne	cutting	25.7	0.4431	Sauve et al. 1996	model	field

Cu	field	60	20		7.4	42	ryegrass	Lolium perenne	cutting	24.1	0.40167	Sauve et al. 1996	model	field
Cu	field	84	20		7.6	42	ryegrass	Lolium perenne	cutting	25.8	0.30714	Sauve et al. 1996	model	field
Cu	field	424	20		7.6	42	ryegrass	Lolium perenne	cutting	23	0.05425	Sauve et al. 1996	model	field
Cu	field	488	20		7.2	42	ryegrass	Lolium perenne	cutting	31.1	0.06373	Sauve et al. 1996	model	field
Cu	field	529	20		7.6	42	ryegrass	Lolium perenne	cutting	32.3	0.06106	Sauve et al. 1996	model	field
Cu	field	640	20		7.4	42	ryegrass	Lolium perenne	cutting	59.8	0.09344	Sauve et al. 1996	model	field
Cu	field-pot	16	5	clayey sand	4.7	42	cress	Lepidium sativum	cutting	7	0.4375	Schafer et al. 1998	model	field
Cu	field-pot	27	5	clay	7.2	42	cress	Lepidium sativum	cutting	6	0.22222	Schafer et al. 1998	model	field
Cu	field-pot	587	5	clayey sand	7.2	42	cress	Lepidium sativum	cutting	33	0.05622	Schafer et al. 1998	model	field
Cu	field-pot	605	5	clayey sand	7.2	42	cress	Lepidium sativum	cutting	31	0.05124	Schafer et al. 1998	model	field
Cu	field-pot	16	5	clayey sand	4.7	42	phacelia	Phacelia tanacetifolia	cutting	10	0.625	Schafer et al. 1998	model	field
Cu	field-pot	27	5	clay	7.2	42	phacelia	Phacelia tanacetifolia	cutting	9	0.33333	Schafer et al. 1998	model	field
Cu	field-pot	587	5	clayey sand	7.2	42	phacelia	Phacelia tanacetifolia	cutting	17	0.02896	Schafer et al. 1998	model	field
Cu	field-pot	605	5	clayey sand	7.2	42	phacelia	Phacelia tanacetifolia	cutting	18	0.02975	Schafer et al. 1998	model	field
Cu	field-pot	16	5	clayey sand	4.7	42	spinach	Spinacia oleracea	cutting	10	0.625	Schafer et al. 1998	model	field
Cu	field-pot	27	5	clay	7.2	42	spinach	Spinacia oleracea	cutting	7	0.25926	Schafer et al. 1998	model	field
Cu	field-pot	587	5	clayey sand	7.2	42	spinach	Spinacia oleracea	cutting	17	0.02896	Schafer et al. 1998	model	field
Cu	field-pot	605	5	clayey sand	7.2	42	spinach	Spinacia oleracea	cutting	19	0.0314	Schafer et al. 1998	model	field
Cu	field-pot	16	5	clayey sand	4.7	42	stinging nettle	Urtica dioica	cutting	8	0.5	Schafer et al. 1998	model	field
Cu	field-pot	27	5	clay	7.2	42	stinging nettle	Urtica dioica	cutting	6	0.22222	Schafer et al. 1998	model	field
Cu	field-pot	605	5	clayey sand	7.2	42	stinging nettle	Urtica dioica	cutting	63	0.10413	Schafer et al. 1998	model	field
Cu	field-background	1.3	2.00	sand	5.3	.	dune grass	Ammophilia arenaria	clipping	3	2.30769	Severson, et al. 1992.	model	field
Cu	field-background	1.3	2.00	sand	5.3	.	willow	Salix repens	leaf	5.9	4.53846	Severson, et al. 1992.	model	field
Cu	field	26.7	15	range			33 species		above-ground	17.5	0.65543	Sharma and Shupe 197	model	field
Cu	field	55.2	15	range			33 species		above-ground	30.6	0.55435	Sharma and Shupe 197	model	field
Cu	field	76.4	15	range			33 species		above-ground	41.6	0.5445	Sharma and Shupe 197	model	field
Cu	field	79	15	range			33 species		above-ground	26.8	0.33924	Sharma and Shupe 197	model	field
Cu	field	91.9	15	range			33 species		above-ground	45.6	0.49619	Sharma and Shupe 197	model	field
Cu	field	94	15	range			33 species		above-ground	69.2	0.73617	Sharma and Shupe 197	model	field
Cu	field	102	15	range			33 species		above-ground	27.3	0.26765	Sharma and Shupe 197	model	field
Cu	field	107	15	range			33 species		above-ground	47.6	0.44486	Sharma and Shupe 197	model	field
Cu	field	109	15	range			33 species		above-ground	47.9	0.43945	Sharma and Shupe 197	model	field
Cu	field	112	15	range			33 species		above-ground	60.3	0.53839	Sharma and Shupe 197	model	field
Cu	field	114	15	range			33 species		above-ground	43.3	0.37982	Sharma and Shupe 197	model	field
Cu	field	150	15	range			33 species		above-ground	74	0.49333	Sharma and Shupe 197	model	field
Cu	field	150	15	range			33 species		above-ground	49.7	0.33133	Sharma and Shupe 197	model	field
Cu	field	176	15	range			33 species		above-ground	45.1	0.25625	Sharma and Shupe 197	model	field
Cu	field	200	15	range			33 species		above-ground	40.2	0.201	Sharma and Shupe 197	model	field
Cu	field	254	15	range			33 species		above-ground	113.6	0.44724	Sharma and Shupe 197	model	field
Cu	field	511	15	range			33 species		above-ground	379.4	0.74247	Sharma and Shupe 197	model	field
Cu	field	2104	15	range			33 species		above-ground	267.4	0.12709	Sharma and Shupe 197	model	field
Cu	field-background	67		sandy	5.3	34	oat	Avena sativa	shoot	10.7	0.1597	Ylaranta 1996	model	field
Cu	CuCl2	89		sandy	5.3	34	oat	Avena sativa	shoot	11.6	0.13034	Ylaranta 1996	model	salt
Cu	CuCl2	179		sandy	5.3	34	oat	Avena sativa	shoot	14.1	0.07877	Ylaranta 1996	model	salt
Cu	field-background	260		sandy	6	34	oat	Avena sativa	shoot	13.7	0.05269	Ylaranta 1996	model	field
Cu	CuCl2	282		sandy	6	34	oat	Avena sativa	shoot	14.7	0.05213	Ylaranta 1996	model	salt
Cu	CuCl2	372		sandy	6	34	oat	Avena sativa	shoot	13	0.03495	Ylaranta 1996	model	salt
Cu	CuCl2	628		sandy	5.3	34	oat	Avena sativa	shoot	18.7	0.02978	Ylaranta 1996	model	salt
Cu	CuCl2	811		sandy	6	34	oat	Avena sativa	shoot	29.9	0.03687	Ylaranta 1996	model	salt

Cu	field	24.6			6.4		kentucky_bluegrass		above-ground	4.3	0.1748	PTI 1994	validation	field
Cu	field	33.7			6.5		kentucky_bluegrass		above-ground	3.7	0.10979	PTI 1994	validation	field
Cu	field	42.8			7.8		redtop	Agrostis stolonifera	above-ground	13.4	0.31308	PTI 1994	validation	field
Cu	field	216			6.9		redtop	Agrostis stolonifera	above-ground	5.2	0.02407	PTI 1994	validation	field
Cu	field	313			7.5		redtop	Agrostis stolonifera	above-ground	4.65	0.01486	PTI 1994	validation	field
Cu	field	423			6.8		redtop	Agrostis stolonifera	above-ground	4.2	0.00993	PTI 1994	validation	field
Cu	field	1080			5.9		redtop	Agrostis stolonifera	above-ground	9.3	0.00861	PTI 1994	validation	field
Cu	field	1130			6		redtop	Agrostis stolonifera	above-ground	14.9	0.01319	PTI 1994	validation	field
Cu	field	1330			6.7		redtop	Agrostis stolonifera	above-ground	43.2	0.03248	PTI 1994	validation	field
Cu	field	1460			7.8		redtop	Agrostis stolonifera	above-ground	5.6	0.00384	PTI 1994	validation	field
Cu	field	2420			4.9		redtop	Agrostis stolonifera	above-ground	36.1	0.01492	PTI 1994	validation	field
Cu	field	2450			7		redtop	Agrostis stolonifera	above-ground	48.8	0.01992	PTI 1994	validation	field
Cu	field	2720			6.2		redtop	Agrostis stolonifera	above-ground	21.2	0.00779	PTI 1994	validation	field
Cu	field	2890			7.2		redtop	Agrostis stolonifera	above-ground	9.5	0.00329	PTI 1994	validation	field
Cu	field	2890			5.4		redtop	Agrostis stolonifera	above-ground	98.9	0.03422	PTI 1994	validation	field
Cu	field	4090			6.7		redtop	Agrostis stolonifera	above-ground	9	0.0022	PTI 1994	validation	field
Cu	field	4180			7		redtop	Agrostis stolonifera	above-ground	4.6	0.0011	PTI 1994	validation	field
Cu	field	1540			4.8		redtop/tufted_h	2 spp.	above-ground	15.6	0.01013	PTI 1994	validation	field
Cu	field	50.4			6.5		slender_wheat	Agropyron trachycaulu	above-ground	6.1	0.12103	PTI 1994	validation	field
Cu	field	59.3			5.9		slender_wheat	Agropyron trachycaulu	above-ground	8.9	0.15008	PTI 1994	validation	field
Cu	field	329			4.9		tufted_hairgras	Aira or Deschampsia	above-ground	325	0.98784	PTI 1994	validation	field
Cu	field	435			3.7		tufted_hairgras	Aira or Deschampsia	above-ground	106	0.24368	PTI 1994	validation	field
Cu	field	1080			4.4		tufted_hairgras	Aira or Deschampsia	above-ground	102	0.09444	PTI 1994	validation	field
Cu	field	1660			5.3		tufted_hairgras	Aira or Deschampsia	above-ground	101	0.06084	PTI 1994	validation	field
Cu	field	2110			6.2		tufted_hairgras	Aira or Deschampsia	above-ground	42.6	0.02019	PTI 1994	validation	field
Cu	field	3210			6.5		tufted_hairgras	Aira or Deschampsia	above-ground	30.7	0.00956	PTI 1994	validation	field
Cu	field	3480			5.8		tufted_hairgras	Aira or Deschampsia	above-ground	69.2	0.01989	PTI 1994	validation	field
Cu	field	47.6			7.1		annual ragwee	Ambrosia artemisiifolia	stem/leaf	5.9	0.12395	PTI 1995	validation	field
Cu	field	68			6.6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	10.6	0.15588	PTI 1995	validation	field
Cu	field	77.4			6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	7.7	0.09948	PTI 1995	validation	field
Cu	field	20.75			6.8		annual ragwee	Ambrosia artemisiifolia	stem/leaf	8.4	0.40482	PTI 1995	validation	field
Cu	field	186			6.4		annual ragwee	Ambrosia artemisiifolia	stem/leaf	6.2	0.03333	PTI 1995	validation	field
Cu	field	68			6.6		Beggar's ticks	Bidens polylepsis	stem/leaf	8.1	0.11912	PTI 1995	validation	field
Cu	field	77.4			6		Beggar's ticks	Bidens polylepsis	stem/leaf	7	0.09044	PTI 1995	validation	field
Cu	field	186			6.4		beggar's ticks	Bidens polylepis	stem/leaf	9.1	0.04892	PTI 1995	validation	field
Cu	field	186			6.4		beggar's ticks	Bidens polylepis	stem/leaf	9.1	0.04892	PTI 1995	validation	field
Cu	field	63.7			6		beggar's ticks	Bidens polylepis	stem/leaf	6	0.09419	PTI 1995	validation	field
Cu	field	180			6.1		Bermuda grass	Cynodon dactylon	stem/leaf	5.3	0.02944	PTI 1995	validation	field
Cu	field	11			7		big bluestem	Andropogon gerardi	stem/leaf	2.6	0.23636	PTI 1995	validation	field
Cu	field	20.05			6.5		big bluestem	Andropogon gerardi	stem/leaf	2.5	0.12469	PTI 1995	validation	field
Cu	field	63.7			6		big bluestem	Andropogon gerardi	stem/leaf	3.9	0.06122	PTI 1995	validation	field
Cu	field	186			6.4		giant ragweed	Abrosia trifida	stem/leaf	13.6	0.07312	PTI 1995	validation	field
Cu	field	63.7			6		giant ragweed	Ambrosia trifida	stem/leaf	30.7	0.48195	PTI 1995	validation	field
Cu	field	47.6			7.1		Indian grass	Sorghastrum nutans	stem/leaf	2	0.04202	PTI 1995	validation	field
Cu	field	180			6.1		Indian grass	Sorghastrum nutans	stem/leaf	2.4	0.01333	PTI 1995	validation	field
Cu	field	68			6.6		Indian grass	Sorghastrum nutans	stem/leaf	2.9	0.04265	PTI 1995	validation	field
Cu	field	11			7		Indian grass	Sorghastrum nutans	stem/leaf	2	0.18182	PTI 1995	validation	field
Cu	field	20.05			6.5		Indian grass	Sorghastrum nutans	stem/leaf	2.4	0.1197	PTI 1995	validation	field

Cu	field	20.75			6.8		Indian grass	Sorghastrum nutans	stem/leaf	1.7	0.08193	PTI 1995	validation	field
Cu	field	47.6			7.1		switchgrass	Panicum virgatum	stem/leaf	6.5	0.13655	PTI 1995	validation	field
Cu	field	180			6.1		switchgrass	Panicum virgatum	stem/leaf	3.6	0.02	PTI 1995	validation	field
Cu	field	77.4			6		switchgrass	Panicum virgatum	stem/leaf	3.7	0.0478	PTI 1995	validation	field
Cu	field	11			7		switchgrass	Panicum virgatum	stem/leaf	3.3	0.3	PTI 1995	validation	field
Cu	field	20.05			6.5		switchgrass	Panicum virgatum	stem/leaf	4.1	0.20449	PTI 1995	validation	field
Cu	field	20.75			6.8		switchgrass	Panicum virgatum	stem/leaf	1.9	0.09157	PTI 1995	validation	field
Pb	field-dredged ma	22	15.00	sandy loam	5.2		common reed	Phragmites australis	leaves	0.06	0.00273	Beyer, et al. 1990.	model	field
Pb	field-dredged ma	530	15.00	sandy clay l	3.6		common reed	Phragmites australis	leaves	0.06	0.00011	Beyer, et al. 1990.	model	field
Pb	field-dredged ma	92	15.00	sandy loam	6.3		common reed	Phragmites australis	leaves	0.29	0.00315	Beyer, et al. 1990.	model	field
Pb	Pb-salt	141.0	15.00	peaty gley+s	3.3	100	sitka-spruce	Picea sitchensis	shoot	71.7	0.50851	Burton et al. 1984.	model	salt
Pb	Pb-salt	183.4	15.00	peaty gley+s	3.3	100	sitka-spruce	Picea sitchensis	shoot	60.5	0.32988	Burton et al. 1984.	model	salt
Pb	Pb-salt	34.2	15.00	peaty gley+s	3.3	100	sitka-spruce	Picea sitchensis	shoot	19.6	0.5731	Burton et al. 1984.	model	salt
Pb	Pb-salt	40.0	15.00	peaty gley+s	3.3	100	sitka-spruce	Picea sitchensis	shoot	23.0	0.575	Burton et al. 1984.	model	salt
Pb	Pb-salt	435.0	15.00	peaty gley+s	3.3	100	sitka-spruce	Picea sitchensis	shoot	391.6	0.90023	Burton et al. 1984.	model	salt
Pb	Pb-salt	47.9	15.00	peaty gley+s	3.3	100	sitka-spruce	Picea sitchensis	shoot	27.5	0.57411	Burton et al. 1984.	model	salt
Pb	Pb-salt	70.8	15.00	peaty gley+s	3.3	100	sitka-spruce	Picea sitchensis	shoot	41.0	0.5791	Burton et al. 1984.	model	salt
Pb	PbCl2	100	A horizon	silty clay loam		90	American syca	Plantanus occidentalis	leaf	4	0.04	Carlson and Bazzaz, 19	model	salt
Pb	PbCl2	1000	A horizon	silty clay loam		90	American syca	Plantanus occidentalis	leaf	8	0.008	Carlson and Bazzaz, 19	model	salt
Pb	PbCl2	250	A horizon	silty clay loam		90	American syca	Plantanus occidentalis	leaf	6	0.024	Carlson and Bazzaz, 19	model	salt
Pb	PbCl2	50	A horizon	silty clay loam		90	American syca	Plantanus occidentalis	leaf	5	0.1	Carlson and Bazzaz, 19	model	salt
Pb	PbCl2	500	A horizon	silty clay loam		90	American syca	Plantanus occidentalis	leaf	6	0.012	Carlson and Bazzaz, 19	model	salt
Pb	field-background	6.1	50.00	silt loam	5.9	10,20,30	red fescue	Festuca rubra	clippings	30.6667	5.02732	Carlson and Rolfe, 1979	model	field
Pb	PbCl2	16.1	50.00	silt loam	5.9	10,20,30	red fescue	Festuca rubra	clippings	53	3.29193	Carlson and Rolfe, 1979	model	salt
Pb	PbCl2	106.1	50.00	silt loam	5.9	10,20,30	red fescue	Festuca rubra	clippings	124.667	1.17499	Carlson and Rolfe, 1979	model	salt
Pb	PbCl2	1006.1	50.00	silt loam	5.9	10,20,30	red fescue	Festuca rubra	clippings	276.667	0.27499	Carlson and Rolfe, 1979	model	salt
Pb	PbCl2	5006.1	50.00	silt loam	5.9	10,20,30	red fescue	Festuca rubra	clippings	623.333	0.12451	Carlson and Rolfe, 1979	model	salt
Pb	PbCl2	10,006.10	50.00	silt loam	5.9	10,20,30	red fescue	Festuca rubra	clippings	1800	0.17989	Carlson and Rolfe, 1979	model	salt
Pb	field-background	6.1	50.00	silt loam	5.9	10,20,30	rye grass	Lolium perenne	clippings	64.6667	10.6011	Carlson and Rolfe, 1979	model	field
Pb	PbCl2	16.1	50.00	silt loam	5.9	10,20,30	rye grass	Lolium perenne	clippings	96.3333	5.98344	Carlson and Rolfe, 1979	model	salt
Pb	PbCl2	106.1	50.00	silt loam	5.9	10,20,30	rye grass	Lolium perenne	clippings	203.333	1.91643	Carlson and Rolfe, 1979	model	salt
Pb	PbCl2	1006.1	50.00	silt loam	5.9	10,20,30	rye grass	Lolium perenne	clippings	863.333	0.8581	Carlson and Rolfe, 1979	model	salt
Pb	PbCl2	5006.1	50.00	silt loam	5.9	10,20,30	rye grass	Lolium perenne	clippings	2280	0.45544	Carlson and Rolfe, 1979	model	salt
Pb	PbCl2	10,006.10	50.00	silt loam	5.9	10,20,30	rye grass	Lolium perenne	clippings	5390	0.53867	Carlson and Rolfe, 1979	model	salt
Pb	field-background	5		silt loam		60	soybean	Glycine max		5.1	1.02	Cataldo and Wildung 19	model	field
Pb	Pb-salt	7.5		silt loam		60	soybean	Glycine max		24.6	3.28	Cataldo and Wildung 19	model	salt
Pb	field Pb in pot	94	10.00	clay loam	6.8	28,49,70	clover	Trifolium subterraneun	top	26	0.2766	Cox & Rains. 1972	model	field
Pb	field Pb in pot	94	10.00	clay loam	6.8	70	clover	Trifolium subterraneun	top	22	0.23404	Cox & Rains. 1972	model	field
Pb	field Pb in pot	94	10.00	clay loam	6.3	70	clover	Trifolium subterraneun	top	23	0.24468	Cox & Rains. 1972	model	field
Pb	field Pb in pot	94	10.00	clay loam	4.7	70	clover	Trifolium subterraneun	top	31	0.32979	Cox & Rains. 1972	model	field
Pb	field Pb in pot	94	10.00	clay loam	6.8	28,49,70	corn	Zea mays	top	15.3333	0.16312	Cox & Rains. 1972	model	field
Pb	field Pb in pot	94	10.00	clay loam	4.7	70	corn	Zea mays	top	15	0.15957	Cox & Rains. 1972	model	field
Pb	field Pb in pot	94	10.00	clay loam	6.8	70	corn	Zea mays	top	9	0.09574	Cox & Rains. 1972	model	field
Pb	field Pb in pot	94	10.00	clay loam	6.3	70	corn	Zea mays	top	11	0.11702	Cox & Rains. 1972	model	field
Pb	field Pb in pot	94	10.00	clay loam	6.8	70	oat	Avena sativa	top	6	0.06383	Cox & Rains. 1972	model	field
Pb	field Pb in pot	94	10.00	clay loam	6.3	70	oat	Avena sativa	top	8	0.08511	Cox & Rains. 1972	model	field
Pb	field Pb in pot	94	10.00	clay loam	4.7	70	oat	Avena sativa	top	10.0	0.10638	Cox & Rains. 1972	model	field
Pb	field Pb in pot	94	10.00	clay loam	6.8	28,49,70	oat	Avena sativa	top	19	0.20213	Cox & Rains. 1972	model	field

Pb	field Pb in pot	94	10.00	clay loam	6.8	28,49,70	soybean	Glycine max	top	43.6667	0.46454	Cox & Rains. 1972	model	field
Pb	field Pb in pot	94	10.00	clay loam	6.8	70	soybean	Glycine max	top	43	0.45745	Cox & Rains. 1972	model	field
Pb	field Pb in pot	94	10.00	clay loam	6.3	70	soybean	Glycine max	top	52	0.55319	Cox & Rains. 1972	model	field
Pb	field Pb in pot	94	10.00	clay loam	4.7	70	soybean	Glycine max	top	77	0.81915	Cox & Rains. 1972	model	field
Pb	field Pb in pot	94	10.00	clay loam	6.8	28,49,70	wheat	Triticum aestivum	top	19	0.20213	Cox & Rains. 1972	model	field
Pb	field Pb in pot	94	10.00	clay loam	6.3	70	wheat	Triticum aestivum	top	16	0.17021	Cox & Rains. 1972	model	field
Pb	field Pb in pot	94	10.00	clay loam	4.7	70	wheat	Triticum aestivum	top	24	0.25532	Cox & Rains. 1972	model	field
Pb	field Pb in pot	94	10.00	clay loam	6.8	70	wheat	Triticum aestivum	top	9	0.09574	Cox & Rains. 1972	model	field
Pb	field	5.2	15		5.7		cabbage	Brassica oleracea	leaf	0.08	0.01538	de Pieri et al. 1997, de F	model	field
Pb	field	5.6	15		5.4		cabbage	Brassica oleracea	leaf	0.09	0.01607	de Pieri et al. 1997, de F	model	field
Pb	field	11.3	15		5		cabbage	Brassica oleracea	leaf	0.12	0.01062	de Pieri et al. 1997, de F	model	field
Pb	field	15	15		6		cabbage	Brassica oleracea	leaf	0.13	0.00867	de Pieri et al. 1997, de F	model	field
Pb	field	18.2	15		4.7		cabbage	Brassica oleracea	leaf	0.15	0.00824	de Pieri et al. 1997, de F	model	field
Pb	field	5.2	15		5.1		carrot	Daucus carrota	leaf	0.17	0.03269	de Pieri et al. 1997, de F	model	field
Pb	field	6.1	15		6.1		carrot	Daucus carrota	leaf	0.14	0.02295	de Pieri et al. 1997, de F	model	field
Pb	field	15.4	15		5.3		carrot	Daucus carrota	leaf	0.22	0.01429	de Pieri et al. 1997, de F	model	field
Pb	field	18.4	15		5.5		carrot	Daucus carrota	leaf	0.21	0.01141	de Pieri et al. 1997, de F	model	field
Pb	field	5	15		5.5		cauliflower	Brassica oleracea	leaf	0.11	0.022	de Pieri et al. 1997, de F	model	field
Pb	field	6.4	15		7.2		cauliflower	Brassica oleracea	leaf	0.1	0.01563	de Pieri et al. 1997, de F	model	field
Pb	field	13.4	15		6.2		corn	Zea mays	leaf,stalk	0.05	0.00373	de Pieri et al. 1997, de F	model	field
Pb	field	14.4	15		6.2		corn	Zea mays	leaf,stalk	0.07	0.00486	de Pieri et al. 1997, de F	model	field
Pb	field	16.9	15		4.8		corn	Zea mays	leaf,stalk	0.14	0.00828	de Pieri et al. 1997, de F	model	field
Pb	field	22.3	15		4.4		corn	Zea mays	leaf,stalk	0.165	0.0074	de Pieri et al. 1997, de F	model	field
Pb	field	13.7	15		5		lettuce	Latuca sativa	leaf	0.09	0.00657	de Pieri et al. 1997, de F	model	field
Pb	field	21.1	15		4.4		lettuce	Latuca sativa	leaf	0.21	0.00995	de Pieri et al. 1997, de F	model	field
Pb	field	10.9	15		5.1		turnip	Brassica rappa	leaf	0.2	0.01835	de Pieri et al. 1997, de F	model	field
Pb	field	12.1	15		6.7		turnip	Brassica rappa	leaf	0.2	0.01653	de Pieri et al. 1997, de F	model	field
Pb	field-background	6.8	20	sandy	7	95	barley	Hordeum vulgare	straw	7.3	1.07353	Dudka et al. 1996	model	field
Pb	field-flue-dust-ad	146.3	20	sandy	7.2	95	barley	Hordeum vulgare	straw	6.8	0.04648	Dudka et al. 1996	model	field
Pb	field-flue-dust-ad	340	20	sandy	6.9	95	barley	Hordeum vulgare	straw	4.5	0.01324	Dudka et al. 1996	model	field
Pb	field-flue-dust-ad	2202.5	20	sandy	7.4	95	barley	Hordeum vulgare	straw	7.3	0.00331	Dudka et al. 1996	model	field
Pb	field-flue-dust-ad	5452.5	20	sandy	7.4	95	barley	Hordeum vulgare	straw	13	0.00238	Dudka et al. 1996	model	field
Pb	field-background	6.8	20	sandy	7		clover	Trifolium pratense	cutting	1.9	0.27941	Dudka et al. 1996	model	field
Pb	field-flue-dust-ad	146.3	20	sandy	7.2		clover	Trifolium pratense	cutting	2.9	0.01982	Dudka et al. 1996	model	field
Pb	field-flue-dust-ad	340	20	sandy	6.9		clover	Trifolium pratense	cutting	3	0.00882	Dudka et al. 1996	model	field
Pb	field-flue-dust-ad	2202.5	20	sandy	7.4		clover	Trifolium pratense	cutting	4.8	0.00218	Dudka et al. 1996	model	field
Pb	field-flue-dust-ad	5452.5	20	sandy	7.4		clover	Trifolium pratense	cutting	7.8	0.00143	Dudka et al. 1996	model	field
Pb	field-background	6.8	20	sandy	7		grass	Poa pratensis	cutting	1.9	0.27941	Dudka et al. 1996	model	field
Pb	field-flue-dust-ad	146.3	20	sandy	7.2		grass	Poa pratensis	cutting	2.2	0.01504	Dudka et al. 1996	model	field
Pb	field-flue-dust-ad	340	20	sandy	6.9		grass	Poa pratensis	cutting	2.7	0.00794	Dudka et al. 1996	model	field
Pb	field-flue-dust-ad	2202.5	20	sandy	7.4		grass	Poa pratensis	cutting	6.7	0.00304	Dudka et al. 1996	model	field
Pb	field-flue-dust-ad	5452.5	20	sandy	7.4		grass	Poa pratensis	cutting	15.2	0.00279	Dudka et al. 1996	model	field
Pb	field	2500		sandy loam	5.1	28	Chinese musta	Brassica juncea	shoot	129	0.0516	Huang and Cunninghar	model	field
Pb	field	2500		sandy loam	5.1	28	Chinese musta	Brassica juncea	shoot	97	0.0388	Huang and Cunninghar	model	field
Pb	field	2500		sandy loam	5.1	28	Chinese musta	Brassica juncea	shoot	45	0.018	Huang and Cunninghar	model	field
Pb	field	2500		sandy loam	5.1	28	Chinese musta	Brassica juncea	shoot	30	0.012	Huang and Cunninghar	model	field
Pb	field	2500		sandy loam	5.1	28	corn	Zea mays	shoot	225	0.09	Huang and Cunninghar	model	field
Pb	field	2500		sandy loam	5.1	28	penny-grass	Thlaspi rotundifolium	shoot	79	0.0316	Huang and Cunninghar	model	field
Pb	field	2500		sandy loam	5.1	28	penny-grass	Thlaspi caerulescens	shoot	58	0.0232	Huang and Cunninghar	model	field

Pb	field	2500		sandy loam	5.1	28	ragweed	Ambrosia artemisiifolia	shoot	75	0.03	Huang and Cunninghar	model	field
Pb	field	2500		sandy loam	5.1	28	wheat	Triticum aestivum	shoot	120	0.048	Huang and Cunninghar	model	field
Pb	Pb arsenate	342.3		muck		.	carrot	Daucus carrota	leaf	13.5	0.03944	Hutchinson, et al. 1974.	model	salt
Pb	field-background	60.9		muck		.	carrot	Daucus carrota	leaf	13.0	0.21346	Hutchinson, et al. 1974.	model	field
Pb	Pb arsenate	342.3		muck		.	corn	Zea mays	leaf	14.0	0.0409	Hutchinson, et al. 1974.	model	salt
Pb	field-background	60.9		muck		.	corn	Zea mays	leaf	7.6	0.12479	Hutchinson, et al. 1974.	model	field
Pb	Pb arsenate	342.3		muck		.	lettuce	Latuca sativa	leaf	12.5	0.03652	Hutchinson, et al. 1974.	model	salt
Pb	field-background	60.9		muck		.	lettuce	Latuca sativa	leaf	10.2	0.16749	Hutchinson, et al. 1974.	model	field
Pb	Pb arsenate	342.3		muck		.	oat	Avena sativa	leaf	6.5	0.01899	Hutchinson, et al. 1974.	model	salt
Pb	field-background	60.9		muck		.	oat	Avena sativa	leaf	5.7	0.0936	Hutchinson, et al. 1974.	model	field
Pb	Pb arsenate	342.3		muck		.	onion	Allium cepa	leaf	7.5	0.02191	Hutchinson, et al. 1974.	model	salt
Pb	field-background	60.9		muck		.	onion	Allium cepa	leaf	37.9	0.62233	Hutchinson, et al. 1974.	model	field
Pb	Pb arsenate	342.3		muck		.	parsnip	Pastinaca sativa	leaf	12.4	0.03623	Hutchinson, et al. 1974.	model	salt
Pb	field-background	60.9		muck		.	parsnip	Pastinaca sativa	leaf	10.0	0.1642	Hutchinson, et al. 1974.	model	field
Pb	Pb arsenate	342.3		muck		.	radish	Raphanus sativus	leaf	24.1	0.07041	Hutchinson, et al. 1974.	model	salt
Pb	field-background	60.9		muck		.	radish	Raphanus sativus	leaf	17.3	0.28407	Hutchinson, et al. 1974.	model	field
Pb	Pb(NO3)2	1000	Ap horizon	silty clay loa	3.8	30	lettuce	Latuca sativa	leaf	140.6	0.1406	John & VanLaerhoven. 1	model	salt
Pb	PbCl2	1000	Ap horizon	silty clay loa	3.8	30	lettuce	Latuca sativa	leaf	138.9	0.1389	John & VanLaerhoven. 1	model	salt
Pb	PbCO3	1000	Ap horizon	silty clay loa	3.8	30	lettuce	Latuca sativa	leaf	126.0	0.126	John & VanLaerhoven. 1	model	salt
Pb	Pb(NO3)2	1000	Ap horizon	silty clay loa	3.8	21	oat	Avena sativa	top	35.7	0.0357	John & VanLaerhoven. 1	model	salt
Pb	PbCl2	1000	Ap horizon	silty clay loa	3.8	21	oat	Avena sativa	top	37.1	0.0371	John & VanLaerhoven. 1	model	salt
Pb	PbCO3	1000	Ap horizon	silty clay loa	3.8	21	oat	Avena sativa	top	28.6	0.0286	John & VanLaerhoven. 1	model	salt
Pb	field-background	37.1	5 or 20	loamt sand	4.5	ca. 42	radish	Raphanus sativus	shoot	3.7	0.09973	Khan and Frankland, 19	model	field
Pb	PbCl2+PbO	537.1	5 or 20	loamy sand	4.5	ca. 42	radish	Raphanus sativus	shoot	42	0.0782	Khan and Frankland, 19	model	salt
Pb	PbCl2+PbO	1037.1	5 or 20	loamy sand	4.5	ca. 42	radish	Raphanus sativus	shoot	68	0.06557	Khan and Frankland, 19	model	salt
Pb	field	39.8567			7.2	42	radish	Raphanus sativus	top	12.5	0.31362	Lagerwerff, 1971.	model	field
Pb	field	39.8567			5.9	42	radish	Raphanus sativus	top	13.3	0.3337	Lagerwerff, 1971.	model	field
Pb	field	219.945			7.2	42	radish	Raphanus sativus	top	16.8	0.07638	Lagerwerff, 1971.	model	field
Pb	field	219.945			5.9	42	radish	Raphanus sativus	top	18.8	0.08548	Lagerwerff, 1971.	model	field
Pb	field	398.567			7.2	42	radish	Raphanus sativus	top	23.2	0.05821	Lagerwerff, 1971.	model	field
Pb	field	398.567			5.9	42	radish	Raphanus sativus	top	25.1	0.06298	Lagerwerff, 1971.	model	field
Pb	field	200	humus laye	sand,loam	2.9	lifetime	Norway spruce	Picea abies	needles	3	0.015	Lamersdorf, et al. 1991.	model	field
Pb	PbCl2	100		sandy loam	6.1	.	alfalfa	Medicago sativa	top	1.1	0.011	MacLean, et al. 1969.	model	salt
Pb	PbCl2	100		sandy loam	7.5	.	alfalfa	Medicago sativa	top	2.5	0.025	MacLean, et al. 1969.	model	salt
Pb	PbCl2	100		sand	5.7	.	alfalfa	Medicago sativa	top	45.0	0.45	MacLean, et al. 1969.	model	salt
Pb	PbCl2	100		sand	5.2	.	alfalfa	Medicago sativa	top	6.0	0.06	MacLean, et al. 1969.	model	salt
Pb	PbCl2	1000		sandy loam	5.8	.	alfalfa	Medicago sativa	top	18.3	0.0183	MacLean, et al. 1969.	model	salt
Pb	PbCl2	1000		sand	5.0	.	alfalfa	Medicago sativa	top	357.8	0.3578	MacLean, et al. 1969.	model	salt
Pb	PbCl2	1000		sandy loam	7.5	.	alfalfa	Medicago sativa	top	54.8	0.0548	MacLean, et al. 1969.	model	salt
Pb	PbCl2	500		sandy loam	7.5	.	alfalfa	Medicago sativa	top	27.6	0.0552	MacLean, et al. 1969.	model	salt
Pb	PbCl2	500		sand	5.0	.	alfalfa	Medicago sativa	top	45.2	0.0904	MacLean, et al. 1969.	model	salt
Pb	PbCl2	500		sandy loam	6.0	.	alfalfa	Medicago sativa	top	6.8	0.0136	MacLean, et al. 1969.	model	salt
Pb	PbCl2	100		sand	5.7	105	oat	Avena sativa	straw	4.9	0.049	MacLean, et al. 1969.	model	salt
Pb	PbCl2	100		sand	5.3	105	oat	Avena sativa	straw	5.9	0.059	MacLean, et al. 1969.	model	salt
Pb	PbCl2	100		sandy loam	7.6	105	oat	Avena sativa	straw	6.2	0.062	MacLean, et al. 1969.	model	salt
Pb	PbCl2	1000		sandy loam	5.8	105	oat	Avena sativa	straw	15.1	0.0151	MacLean, et al. 1969.	model	salt
Pb	PbCl2	1000		sand	5.2	105	oat	Avena sativa	straw	202.1	0.2021	MacLean, et al. 1969.	model	salt
Pb	PbCl2	1000		sandy loam	7.4	105	oat	Avena sativa	straw	49.6	0.0496	MacLean, et al. 1969.	model	salt
Pb	PbCl2	1000		sand	4.9	105	oat	Avena sativa	straw	86.5	0.0865	MacLean, et al. 1969.	model	salt

Pb	PbCl2	500		sandy loam	7.5	105	oat	Avena sativa	straw	23.6	0.0472	MacLean, et al. 1969.	model	salt
Pb	PbCl2	500		sand	5.1	105	oat	Avena sativa	straw	31.4	0.0628	MacLean, et al. 1969.	model	salt
Pb	PbCl2	500		sandy loam	6.0	105	oat	Avena sativa	straw	4.5	0.009	MacLean, et al. 1969.	model	salt
Pb	PbCl2	500		sand	5.5	105	oat	Avena sativa	straw	51.8	0.1036	MacLean, et al. 1969.	model	salt
Pb	field	12	NA	sandy loam	999	69,142	bromegrass	Bromus enermis		3.25	0.27083	Marten and Hammond,	model	field
Pb	field	59	2.50	sandy loam	999	69,142	bromegrass	Bromus enermis		2.85	0.04831	Marten and Hammond,	model	field
Pb	field	680	2.50	sandy loam	999	69,142	bromegrass	Bromus enermis		8.7	0.01279	Marten and Hammond,	model	field
Pb	field	95	2.50	sandy loam	999	69,142	bromegrass	Bromus enermis		3.45	0.03632	Marten and Hammond,	model	field
Pb	field-background	8.50	14.00	sand	7.82	84	black-eyed Su	Rudbeckia hirta	shoot	37.15	4.37059	Miles and Parker, 1979.	model	field
Pb	field-background	198.00	14.00	sand	7.82	84	black-eyed Su	Rudbeckia hirta	shoot	10.76	0.05434	Miles and Parker, 1979.	model	field
Pb	PbCl2	648.00	14.00	sand	7.82	84	black-eyed Su	Rudbeckia hirta	shoot	51.14	0.07892	Miles and Parker, 1979.	model	salt
Pb	field-background	8.50	14.00	sand	7.82	84	little bluestem	Andropogon scoparius	shoot	10.06	1.18353	Miles and Parker, 1979.	model	field
Pb	field-background	198.00	14.00	sand	7.82	84	little bluestem	Andropogon scoparius	shoot	9.48	0.04788	Miles and Parker, 1979.	model	field
Pb	PbCl2	458.50	14.00	sand	7.82	84	little bluestem	Andropogon scoparius	shoot	259.6	0.56619	Miles and Parker, 1979.	model	salt
Pb	PbCl2	648.00	14.00	sand	7.82	84	little bluestem	Andropogon scoparius	shoot	86.58	0.13361	Miles and Parker, 1979.	model	salt
Pb	field	16	unknown		6.0	.	spruce	Picea abies	needles	4.82	0.30125	Nilsson, 1972.	model	field
Pb	field	18	unknown		3.8	.	spruce	Picea abies	needles	3.02	0.16778	Nilsson, 1972.	model	field
Pb	field	198	14.00	sand	6.8		black oak	Quercus velutina	above ground	12.8	0.06465	Parker et al. 1978	model	field
Pb	field	198	14.00	sand	6.8		gromwell	Lithospermum canesc	above ground	20.2	0.10202	Parker et al. 1978	model	field
Pb	field	198	14.00	sand	6.8		quaking aspen	Populus tremuloides	leaf	30.6	0.15455	Parker et al. 1978	model	field
Pb	field	198	14.00	sand	6.8		Solomon's sea	Smilacina stellata	above ground	20.2	0.10202	Parker et al. 1978	model	field
Pb	PbCl2	160		sand,peat,soil		28	autumn olive	Elaecagnus umbellata	leaf	62.3	0.38938	Rolfe and Bazzaz, 1975.	model	salt
Pb	PbCl2	20		sand,peat,soil		28	autumn olive	Elaecagnus umbellata	leaf	17.3	0.865	Rolfe and Bazzaz, 1975.	model	salt
Pb	PbCl2	320		sand,peat,soil		28	autumn olive	Elaecagnus umbellata	leaf	71.9	0.22469	Rolfe and Bazzaz, 1975.	model	salt
Pb	PbCl2	40		sand,peat,soil		28	autumn olive	Elaecagnus umbellata	leaf	36.7	0.9175	Rolfe and Bazzaz, 1975.	model	salt
Pb	PbCl2	80		sand,peat,soil		28	autumn olive	Elaecagnus umbellata	leaf	49.2	0.615	Rolfe and Bazzaz, 1975.	model	salt
Pb	PbCl2	160		sand,peat,soil		28	loblolly pine	Pinus taeda	leaf	50.6	0.31625	Rolfe and Bazzaz, 1975.	model	salt
Pb	PbCl2	20		sand,peat,soil		28	loblolly pine	Pinus taeda	leaf	14.2	0.71	Rolfe and Bazzaz, 1975.	model	salt
Pb	PbCl2	320		sand,peat,soil		28	loblolly pine	Pinus taeda	leaf	59.8	0.18688	Rolfe and Bazzaz, 1975.	model	salt
Pb	PbCl2	40		sand,peat,soil		28	loblolly pine	Pinus taeda	leaf	30.1	0.7525	Rolfe and Bazzaz, 1975.	model	salt
Pb	PbCl2	80		sand,peat,soil		28	loblolly pine	Pinus taeda	leaf	43.6	0.545	Rolfe and Bazzaz, 1975.	model	salt
Pb	PbCl2	79.6	15.00	silt loam anc	6.1	90	4 tree species		leaf	21	0.26382	Rolfe, 1973.	model	salt
Pb	PbCl2	79.6	15.00	silt loam anc	6.5	90	4 tree species		leaf	13	0.16332	Rolfe, 1973.	model	salt
Pb	PbCl2	154.6	15.00	silt loam anc	6.1	90	4 tree species		leaf	35	0.22639	Rolfe, 1973.	model	salt
Pb	PbCl2	154.6	15.00	silt loam anc	6.5	90	4 tree species		leaf	22	0.1423	Rolfe, 1973.	model	salt
Pb	PbCl2	304.6	15.00	silt loam anc	5.7	90	4 tree species		leaf	58	0.19041	Rolfe, 1973.	model	salt
Pb	PbCl2	304.6	15.00	silt loam anc	6.5	90	4 tree species		leaf	31	0.10177	Rolfe, 1973.	model	salt
Pb	PbCl2	604.6	15.00	silt loam anc	5.7	90	4 tree species		leaf	93	0.15382	Rolfe, 1973.	model	salt
Pb	PbCl2	604.6	15.00	silt loam anc	6.1	90	4 tree species		leaf	40	0.06616	Rolfe, 1973.	model	salt
Pb	Pb added to pot	10.08	15.00	loamy sand	8.4	.	wheat	Triticum aestivum	straw	1.38	0.1369	Sadana and Singh, 1987	model	salt
Pb	Pb added to pot	20.08	15.00	loamy sand	8.4	.	wheat	Triticum aestivum	straw	2.06	0.10259	Sadana and Singh, 1987	model	salt
Pb	Pb added to pot	40.08	15.00	loamy sand	8.4	.	wheat	Triticum aestivum	straw	3.18	0.07934	Sadana and Singh, 1987	model	salt
Pb	Pb added to pot	80.08	15.00	loamy sand	8.4	.	wheat	Triticum aestivum	straw	2.97	0.03709	Sadana and Singh, 1987	model	salt
Pb	PbCl2	333.0		sandy loam	7.6	30	corn	Zea mays	whole plant	17.1	0.05135	Sadiq, 1985.	model	salt
Pb	PbCl2	333.0		sandy clay	7.6	30	corn	Zea mays	whole plant	20.2	0.06066	Sadiq, 1985.	model	salt
Pb	PbCl2	345.0		clay loam	7.8	30	corn	Zea mays	whole plant	20.9	0.06058	Sadiq, 1985.	model	salt
Pb	PbCl2	381.0		loamy sand	7.4	30	corn	Zea mays	whole plant	20.3	0.05328	Sadiq, 1985.	model	salt
Pb	PbCl2	417.0		loamy sand	7.8	30	corn	Zea mays	whole plant	16.8	0.04029	Sadiq, 1985.	model	salt
Pb	PbCl2	440.0		sandy loam	7.8	30	corn	Zea mays	whole plant	19.2	0.04364	Sadiq, 1985.	model	salt

Pb	PbCl2	440.0		sandy loam	7.3	30	corn	Zea mays	whole plant	22.9	0.05205	Sadiq, 1985.	model	salt
Pb	PbCl2	476.0		sandy loam	7.4	30	corn	Zea mays	whole plant	36.5	0.07668	Sadiq, 1985.	model	salt
Pb	PbCl2	512.0		loamy sand	7.9	30	corn	Zea mays	whole plant	20.6	0.04023	Sadiq, 1985.	model	salt
Pb	PbCl2	583.0		clay loam	8.1	30	corn	Zea mays	whole plant	22.4	0.03842	Sadiq, 1985.	model	salt
Pb	PbCl2	619.0		clay sand	7.8	30	corn	Zea mays	whole plant	12.6	0.02036	Sadiq, 1985.	model	salt
Pb	PbCl2	643.0		sandy loam	7.8	30	corn	Zea mays	whole plant	28.0	0.04355	Sadiq, 1985.	model	salt
Pb	PbCl2	667.0		sandy loam	7.8	30	corn	Zea mays	whole plant	17.3	0.02594	Sadiq, 1985.	model	salt
Pb	PbCl2	714.0		sandy clay	7.6	30	corn	Zea mays	whole plant	18.3	0.02563	Sadiq, 1985.	model	salt
Pb	PbCl2	786.0		loamy sand	7.7	30	corn	Zea mays	whole plant	17.1	0.02176	Sadiq, 1985.	model	salt
Pb	PbCl2	924.0		clay loam	7.8	30	corn	Zea mays	whole plant	29.9	0.03236	Sadiq, 1985.	model	salt
Pb	field-background	7.9	2.00	sand	5.3	.	dune grass	Ammophilia arenaria	clipping	2.1	0.26582	Severson, et al. 1992.	model	field
Pb	field-background	7.9	2.00	sand	5.3	.	willow	Salix repens	leaf	2.4	0.3038	Severson, et al. 1992.	model	field
Pb	field-background	0.32	15		8.5	many yea	basil	Ocimum basilicum	edible portion	0.18	0.5625	Shariatpanahi and Ande	model	field
Pb	field-wastewater	2.04	15		8.3	many yea	basil	Ocimum basilicum	edible portion	0.84	0.41176	Shariatpanahi and Ande	model	field
Pb	field-background	0.32	15		8.5	many yea	garden cress	Lepidium sativum	edible portion	0.16	0.5	Shariatpanahi and Ande	model	field
Pb	field-wastewater	2.04	15		8.3	many yea	garden cress	Lepidium sativum	edible portion	0.8	0.39216	Shariatpanahi and Ande	model	field
Pb	field-background	0.32	15		8.5	many yea	mint	Mentha arllensis	edible portion	0.29	0.90625	Shariatpanahi and Ande	model	field
Pb	field-wastewater	2.04	15		8.3	many yea	mint	Mentha arllensis	edible portion	0.78	0.38235	Shariatpanahi and Ande	model	field
Pb	field-background	0.32	15		8.5	many yea	tarragon	Artemisia dracunculus	edible portion	0.15	0.46875	Shariatpanahi and Ande	model	field
Pb	field-wastewater	2.04	15		8.3	many yea	tarragon	Artemisia dracunculus	edible portion	0.68	0.33333	Shariatpanahi and Ande	model	field
Pb	field	16.1	15 cm	? (semi-arid)			various			4.8	0.29814	Sharma and Shupe 197	model	field
Pb	field	25.4	15 cm	? (semi-arid)			various			3.8	0.14961	Sharma and Shupe 197	model	field
Pb	field	34.7	15 cm	? (semi-arid)			various			20.4	0.5879	Sharma and Shupe 197	model	field
Pb	field	61.6	15 cm	? (semi-arid)			various			28.8	0.46753	Sharma and Shupe 197	model	field
Pb	field	78.4	15 cm	? (semi-arid)			various			18.2	0.23214	Sharma and Shupe 197	model	field
Pb	field	82	15 cm	? (semi-arid)			various			42.4	0.51707	Sharma and Shupe 197	model	field
Pb	field	90	15 cm	? (semi-arid)			various			19.7	0.21889	Sharma and Shupe 197	model	field
Pb	field	100.2	15 cm	? (semi-arid)			various			32.2	0.32136	Sharma and Shupe 197	model	field
Pb	field	109.4	15 cm	? (semi-arid)			various			22.5	0.20567	Sharma and Shupe 197	model	field
Pb	field	112.4	15 cm	? (semi-arid)			various			25.2	0.2242	Sharma and Shupe 197	model	field
Pb	field	117.5	15 cm	? (semi-arid)			various			38.4	0.32681	Sharma and Shupe 197	model	field
Pb	field	138.8	15 cm	? (semi-arid)			various			46.1	0.33213	Sharma and Shupe 197	model	field
Pb	field	142.8	15 cm	? (semi-arid)			various			20.2	0.14146	Sharma and Shupe 197	model	field
Pb	field	164	15 cm	? (semi-arid)			various			104.9	0.63963	Sharma and Shupe 197	model	field
Pb	field	175.5	15 cm	? (semi-arid)			various			23.9	0.13618	Sharma and Shupe 197	model	field
Pb	field	199.9	15 cm	? (semi-arid)			various			153.6	0.76838	Sharma and Shupe 197	model	field
Pb	field	689.7	15 cm	? (semi-arid)			various			116.5	0.16891	Sharma and Shupe 197	model	field
Pb	field	768.2	15 cm	? (semi-arid)			various			282.6	0.36787	Sharma and Shupe 197	model	field
Pb	field soil in pot	216.5	15.00	loam	5.5	90	cabbage	Brassica oleracea	shoot	17.0	0.07852	Xian. 1989	model	field
Pb	field soil in pot	238.7	15.00	loam	4.3	90	cabbage	Brassica oleracea	shoot	28.7	0.12023	Xian. 1989	model	field
Pb	field soil in pot	27.2	15.00	sandy loam	6.4	90	cabbage	Brassica oleracea	shoot	3.0	0.11029	Xian. 1989	model	field
Pb	field soil in pot	46.6	15.00	sandy loam	6.6	90	cabbage	Brassica oleracea	shoot	3.3	0.07082	Xian. 1989	model	field
Pb	field soil in pot	52.3	15.00	loam	5.7	90	cabbage	Brassica oleracea	shoot	3.5	0.06692	Xian. 1989	model	field
Pb	field soil in pot	61.6	15.00	sandy loam	5.7	90	cabbage	Brassica oleracea	shoot	8.5	0.13799	Xian. 1989	model	field
Pb	field soil in pot	78.1	15.00	loam	5.2	90	cabbage	Brassica oleracea	shoot	9.6	0.12292	Xian. 1989	model	field
Pb	field soil in pot	91.1	15.00	loam	7.0	90	cabbage	Brassica oleracea	shoot	6.1	0.06696	Xian. 1989	model	field
Pb	field	7.4			6.4		kentucky_bluegrass		above-ground	0.18	0.02432	PTI 1994	validation	field
Pb	field	8.97			6.5		kentucky_bluegrass		above-ground	0.16	0.01784	PTI 1994	validation	field

Pb	field	13		8.3		redtop	Agrostis stolonifera	above-ground	0.16	0.01231	PTI 1994	validation	field
Pb	field	41.4		7.5		redtop	Agrostis stolonifera	above-ground	0.235	0.00568	PTI 1994	validation	field
Pb	field	45.2		7.8		redtop	Agrostis stolonifera	above-ground	0.57	0.01261	PTI 1994	validation	field
Pb	field	53.6		6.9		redtop	Agrostis stolonifera	above-ground	0.54	0.01007	PTI 1994	validation	field
Pb	field	92.4		6.8		redtop	Agrostis stolonifera	above-ground	0.2	0.00216	PTI 1994	validation	field
Pb	field	129		7		redtop	Agrostis stolonifera	above-ground	0.22	0.00171	PTI 1994	validation	field
Pb	field	176		7.8		redtop	Agrostis stolonifera	above-ground	0.21	0.00119	PTI 1994	validation	field
Pb	field	177		7		redtop	Agrostis stolonifera	above-ground	3.6	0.02034	PTI 1994	validation	field
Pb	field	256		4.9		redtop	Agrostis stolonifera	above-ground	4.1	0.01602	PTI 1994	validation	field
Pb	field	262		6.7		redtop	Agrostis stolonifera	above-ground	4.2	0.01603	PTI 1994	validation	field
Pb	field	267		6		redtop	Agrostis stolonifera	above-ground	1.8	0.00674	PTI 1994	validation	field
Pb	field	310		5.4		redtop	Agrostis stolonifera	above-ground	10.8	0.03484	PTI 1994	validation	field
Pb	field	379		5.9		redtop	Agrostis stolonifera	above-ground	0.52	0.00137	PTI 1994	validation	field
Pb	field	379		6.2		redtop	Agrostis stolonifera	above-ground	2.1	0.00554	PTI 1994	validation	field
Pb	field	433		6.7		redtop	Agrostis stolonifera	above-ground	0.28	0.00065	PTI 1994	validation	field
Pb	field	438		7.2		redtop	Agrostis stolonifera	above-ground	0.59	0.00135	PTI 1994	validation	field
Pb	field	609		4.8		redtop/tufted_h	2 spp.	above-ground	2.45	0.00402	PTI 1994	validation	field
Pb	field	26.6		6.5		slender_wheat	Agropyron trachycaulu	above-ground	0.54	0.0203	PTI 1994	validation	field
Pb	field	35		5.9		slender_wheat	Agropyron trachycaulu	above-ground	0.47	0.01343	PTI 1994	validation	field
Pb	field	246		3.7		tufted_hairgras	Aira or Deschampsia	above-ground	4.2	0.01707	PTI 1994	validation	field
Pb	field	455		6.2		tufted_hairgras	Aira or Deschampsia	above-ground	4	0.00879	PTI 1994	validation	field
Pb	field	543		5.8		tufted_hairgras	Aira or Deschampsia	above-ground	1.9	0.0035	PTI 1994	validation	field
Pb	field	560		4.9		tufted_hairgras	Aira or Deschampsia	above-ground	38.2	0.06821	PTI 1994	validation	field
Pb	field	910		5.3		tufted_hairgras	Aira or Deschampsia	above-ground	18.4	0.02022	PTI 1994	validation	field
Pb	field	1110		4.4		tufted_hairgras	Aira or Deschampsia	above-ground	12.1	0.0109	PTI 1994	validation	field
Pb	field	1830		6.5		tufted_hairgras	Aira or Deschampsia	above-ground	3.23	0.00177	PTI 1994	validation	field
Pb	field	83.9		7.1		annual ragwee	Ambrosia artemisiifolia	stem/leaf	9.6	0.11442	PTI 1995	validation	field
Pb	field	261		6.6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	4.1	0.01571	PTI 1995	validation	field
Pb	field	281.5		6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	1.4	0.00497	PTI 1995	validation	field
Pb	field	33.8		6.8		annual ragwee	Ambrosia artemisiifolia	stem/leaf	0.11	0.00325	PTI 1995	validation	field
Pb	field	485		6.4		annual ragwee	Ambrosia artemisiifolia	stem/leaf	5.3	0.01093	PTI 1995	validation	field
Pb	field	261		6.6		Beggar's ticks	Bidens polylepsis	stem/leaf	0.8	0.00307	PTI 1995	validation	field
Pb	field	281.5		6		Beggar's ticks	Bidens polylepsis	stem/leaf	0.37	0.00131	PTI 1995	validation	field
Pb	field	485		6.4		beggar's ticks	Bidens polylepis	stem/leaf	1.1	0.00227	PTI 1995	validation	field
Pb	field	485		6.4		beggar's ticks	Bidens polylepis	stem/leaf	1	0.00206	PTI 1995	validation	field
Pb	field	179		6		beggar's ticks	Bidens polylepis	stem/leaf	0.34	0.0019	PTI 1995	validation	field
Pb	field	435		6.1		Bermuda grass	Cynodon dactylon	stem/leaf	0.86	0.00198	PTI 1995	validation	field
Pb	field	32.05		7		big bluestem	Andropogon gerardi	stem/leaf	0.14	0.00437	PTI 1995	validation	field
Pb	field	63.9		6.5		big bluestem	Andropogon gerardi	stem/leaf	0.13	0.00203	PTI 1995	validation	field
Pb	field	179		6		big bluestem	Andropogon gerardi	stem/leaf	0.49	0.00274	PTI 1995	validation	field
Pb	field	485		6.4		giant ragweed	Abrosia trifida	stem/leaf	0.91	0.00188	PTI 1995	validation	field
Pb	field	179		6		giant ragweed	Ambrosia trifida	stem/leaf	0.55	0.00307	PTI 1995	validation	field
Pb	field	83.9		7.1		Indian grass	Sorghastrum nutans	stem/leaf	2.3	0.02741	PTI 1995	validation	field
Pb	field	435		6.1		Indian grass	Sorghastrum nutans	stem/leaf	0.46	0.00106	PTI 1995	validation	field
Pb	field	261		6.6		Indian grass	Sorghastrum nutans	stem/leaf	0.83	0.00318	PTI 1995	validation	field
Pb	field	32.05		7		Indian grass	Sorghastrum nutans	stem/leaf	0.1	0.00312	PTI 1995	validation	field
Pb	field	63.9		6.5		Indian grass	Sorghastrum nutans	stem/leaf	0.18	0.00282	PTI 1995	validation	field
Pb	field	33.8		6.8		Indian grass	Sorghastrum nutans	stem/leaf	0.07	0.00207	PTI 1995	validation	field
Pb	field	83.9		7.1		switchgrass	Panicum virgatum	stem/leaf	9.4	0.11204	PTI 1995	validation	field

Pb	field	435			6.1		switchgrass	Panicum virgatum	stem/leaf	1.8	0.00414	PTI 1995	validation	field
Pb	field	281.5			6		switchgrass	Panicum virgatum	stem/leaf	0.72	0.00256	PTI 1995	validation	field
Pb	field	32.05			7		switchgrass	Panicum virgatum	stem/leaf	0.29	0.00905	PTI 1995	validation	field
Pb	field	63.9			6.5		switchgrass	Panicum virgatum	stem/leaf	0.41	0.00642	PTI 1995	validation	field
Pb	field	33.8			6.8		switchgrass	Panicum virgatum	stem/leaf	0.2	0.00592	PTI 1995	validation	field
Hg	field	0.3		Ghana			elephant grass	Pennisetum purpureur	above-ground	0.2	0.66667	Amonoo-Neizer et al. 19	model	field
Hg	field	0.4		Ghana			elephant grass	Pennisetum purpureur	above-ground	3.2	8	Amonoo-Neizer et al. 19	model	field
Hg	field	0.6		Ghana			elephant grass	Pennisetum purpureur	above-ground	1.1	1.83333	Amonoo-Neizer et al. 19	model	field
Hg	field	0.6		Ghana			elephant grass	Pennisetum purpureur	above-ground	1	1.66667	Amonoo-Neizer et al. 19	model	field
Hg	field	0.6		Ghana			elephant grass	Pennisetum purpureur	above-ground	3.3	5.5	Amonoo-Neizer et al. 19	model	field
Hg	field	1.1		Ghana			elephant grass	Pennisetum purpureur	above-ground	6.2	5.63636	Amonoo-Neizer et al. 19	model	field
Hg	field	1.2		Ghana			elephant grass	Pennisetum purpureur	above-ground	5.3	4.41667	Amonoo-Neizer et al. 19	model	field
Hg	field	1.3		Ghana			elephant grass	Pennisetum purpureur	above-ground	1	0.76923	Amonoo-Neizer et al. 19	model	field
Hg	field	1.4		Ghana			elephant grass	Pennisetum purpureur	above-ground	2.6	1.85714	Amonoo-Neizer et al. 19	model	field
Hg	field	2.5		Ghana			elephant grass	Pennisetum purpureur	above-ground	1.9	0.76	Amonoo-Neizer et al. 19	model	field
Hg	field	0.3		Ghana			water fern	Ceraptopteris cornuta	above-ground	3.6	12	Amonoo-Neizer et al. 19	model	field
Hg	field	0.4		Ghana			water fern	Ceraptopteris cornuta	above-ground	2.6	6.5	Amonoo-Neizer et al. 19	model	field
Hg	field	0.4		Ghana			water fern	Ceraptopteris cornuta	above-ground	2	5	Amonoo-Neizer et al. 19	model	field
Hg	field	0.6		Ghana			water fern	Ceraptopteris cornuta	above-ground	1.8	3	Amonoo-Neizer et al. 19	model	field
Hg	field	0.6		Ghana			water fern	Ceraptopteris cornuta	above-ground	1.2	2	Amonoo-Neizer et al. 19	model	field
Hg	field	0.6		Ghana			water fern	Ceraptopteris cornuta	above-ground	4.1	6.83333	Amonoo-Neizer et al. 19	model	field
Hg	field	1.1		Ghana			water fern	Ceraptopteris cornuta	above-ground	9.7	8.81818	Amonoo-Neizer et al. 19	model	field
Hg	field	1.2		Ghana			water fern	Ceraptopteris cornuta	above-ground	4.4	3.66667	Amonoo-Neizer et al. 19	model	field
Hg	field	1.2		Ghana			water fern	Ceraptopteris cornuta	above-ground	8	6.66667	Amonoo-Neizer et al. 19	model	field
Hg	field	1.3		Ghana			water fern	Ceraptopteris cornuta	above-ground	1.3	1	Amonoo-Neizer et al. 19	model	field
Hg	field	1.4		Ghana			water fern	Ceraptopteris cornuta	above-ground	2.1	1.5	Amonoo-Neizer et al. 19	model	field
Hg	field	2.5		Ghana			water fern	Ceraptopteris cornuta	above-ground	2.1	0.84	Amonoo-Neizer et al. 19	model	field
Hg	field	0.415	avg of 0-3 & 15-20				Angiosperm	Genista aetnensis	shoot	0.46	1.10843	Barghigiani et al. 1988	model	field
Hg	field	0.415	avg of 0-3 & 15-20				Angiosperm	Australagus siculus	leaf/flower	0.41	0.98795	Barghigiani et al. 1988	model	field
Hg	field	0.415	avg of 0-3 & 15-20				undefined pine	Pinus	needle	0.15	0.36145	Barghigiani et al. 1988	model	field
Hg	field-compost	0.429	20	clay loam	6.50		lettuce	Latuca_sativa	head	0.1393	0.32471	Cappon 1987	model	field
Hg	field-compost	0.429	20	clay loam	6.50		lettuce	Latuca_sativa	leaf	0.0744	0.17343	Cappon 1987	model	field
Hg	field-compost	0.429	20	clay loam	6.50		spinach	Spinacia_oleracea		0.0735	0.17133	Cappon 1987	model	field
Hg	field-compost	0.429	20	clay loam	6.50		Swiss chard	Beta_vulgaris_Cicla		0.0644	0.15012	Cappon 1987	model	field
Hg	field-background	0.017		silt loam		60	soybean	Glycine max		0.2	11.7647	Cataldo and Wildung 19	model	field
Hg	Hg-salt	2.517		silt loam		60	soybean	Glycine max		0.1	0.03973	Cataldo and Wildung 19	model	salt
Hg	field	0.016	Ap	Brown solon	6.4		barley	Hordeum vulgare	straw	0.12	7.5	Dudas and Pawluk 197	model	field
Hg	field	0.023	Ap	Orthic humic	6.5		barley	Hordeum vulgare	straw	0.015	0.65217	Dudas and Pawluk 197	model	field
Hg	field	0.024	Ap	Orthic brown	7.2		barley	Hordeum vulgare	straw	0.021	0.875	Dudas and Pawluk 197	model	field
Hg	field	0.024	Ap	Orthic gray l	6.5		barley	Hordeum vulgare	straw	0.032	1.33333	Dudas and Pawluk 197	model	field
Hg	field	0.027	Ap	Orthic black	6.4		barley	Hordeum vulgare	straw	0.027	1	Dudas and Pawluk 197	model	field
Hg	field	0.028	Ap	Black solone	5.7		barley	Hordeum vulgare	straw	0.028	1	Dudas and Pawluk 197	model	field
Hg	field	0.035	Ap	Orthic humic	6.9		barley	Hordeum vulgare	straw	0.035	1	Dudas and Pawluk 197	model	field
Hg	field	0.037	Ap	humic eluvia	7.4		barley	Hordeum vulgare	straw	0.025	0.67568	Dudas and Pawluk 197	model	field
Hg	field	0.041	Ap	Gray solone	6.2		barley	Hordeum vulgare	straw	0.057	1.39024	Dudas and Pawluk 197	model	field
Hg	field	0.016	Ap	Brown solon	6.4		wheat	Triticum aestivum	straw	0.036	2.25	Dudas and Pawluk 197	model	field
Hg	field	0.023	Ap	Orthic humic	6.5		wheat	Triticum aestivum	straw	0.017	0.73913	Dudas and Pawluk 197	model	field
Hg	field	0.024	Ap	Orthic brown	7.2		wheat	Triticum aestivum	straw	0.018	0.75	Dudas and Pawluk 197	model	field

Hg	field	0.024	Ap		Orthic gray l	6.5		wheat	Triticum aestivum	straw	0.023	0.95833	Dudas and Pawluk 197	model	field
Hg	field	0.027	Ap		Orthic black	6.4		wheat	Triticum aestivum	straw	0.027	1	Dudas and Pawluk 197	model	field
Hg	field	0.028	Ap		Black solone	5.7		wheat	Triticum aestivum	straw	0.028	1	Dudas and Pawluk 197	model	field
Hg	field	0.035	Ap		Orthic humic	6.9		wheat	Triticum aestivum	straw	0.03	0.85714	Dudas and Pawluk 197	model	field
Hg	field	0.037	Ap		humic eluvia	7.4		wheat	Triticum aestivum	straw	0.023	0.62162	Dudas and Pawluk 197	model	field
Hg	field	0.041	Ap		Gray solone	6.2		wheat	Triticum aestivum	straw	0.027	0.65854	Dudas and Pawluk 197	model	field
Hg	methyl mercuric	5.735		10	loamy sand	refc	49	bromegrass	Bromus inermis	above-ground	1.789	0.31194	Hogg et al. 1978	model	salt
Hg	methyl mercuric	5.901		10	loamy sand	refc	49	bromegrass	Bromus inermis	above-ground	2.01	0.34062	Hogg et al. 1978	model	salt
Hg	HgCl2	6.081		10	loamy sand	refc	49	bromegrass	Bromus inermis	above-ground	0.635	0.10442	Hogg et al. 1978	model	salt
Hg	HgCl2	6.1		10	loamy sand	refc	49	bromegrass	Bromus inermis	above-ground	0.559	0.09164	Hogg et al. 1978	model	salt
Hg	phenyl mercuric	6.122		10	loamy sand	refc	49	bromegrass	Bromus inermis	above-ground	0.95	0.15518	Hogg et al. 1978	model	salt
Hg	phenyl mercuric	6.375		10	loamy sand	refc	49	bromegrass	Bromus inermis	above-ground	0.821	0.12878	Hogg et al. 1978	model	salt
Hg	methyl mercuric	6.645		10	loam	refc	49	bromegrass	Bromus inermis	above-ground	1.228	0.1848	Hogg et al. 1978	model	salt
Hg	methyl mercuric	7.014		10	loam	refc	49	bromegrass	Bromus inermis	above-ground	1.369	0.19518	Hogg et al. 1978	model	salt
Hg	HgCl2	7.914		10	loam	refc	49	bromegrass	Bromus inermis	above-ground	0.589	0.07443	Hogg et al. 1978	model	salt
Hg	phenyl mercuric	7.932		10	loam	refc	49	bromegrass	Bromus inermis	above-ground	0.643	0.08106	Hogg et al. 1978	model	salt
Hg	phenyl mercuric	8.152		10	loam	refc	49	bromegrass	Bromus inermis	above-ground	0.853	0.10464	Hogg et al. 1978	model	salt
Hg	HgCl2	8.235		10	loam	refc	49	bromegrass	Bromus inermis	above-ground	0.478	0.05804	Hogg et al. 1978	model	salt
Hg	field	4		5	silt loam	5.1	60	broccoli	Brassica oleracea	leaf	0.078	0.0195	John 1972	model	field
Hg	field	20		5	silt loam	5.1	60	broccoli	Brassica oleracea	leaf	0.029	0.00145	John 1972	model	field
Hg	field	4		5	silt loam	5.1	130	carrot	Daucus carota	top	0.061	0.01525	John 1972	model	field
Hg	field	20		5	silt loam	5.1	130	carrot	Daucus carota	top	0.072	0.0036	John 1972	model	field
Hg	field	4		5	silt loam	5.1	70	cauliflower	Brassica oleracea	leaf	0.068	0.017	John 1972	model	field
Hg	field	20		5	silt loam	5.1	70	cauliflower	Brassica oleracea	leaf	0.061	0.00305	John 1972	model	field
Hg	field	4		5	silt loam	5.1	35	lettuce	Latuca sativa	leaf	0.017	0.00425	John 1972	model	field
Hg	field	20		5	silt loam	5.1	35	lettuce	Latuca sativa	leaf	0.045	0.00225	John 1972	model	field
Hg	field	4		5	silt loam	5.1	100	oat	Avena sativa	leaf	0.193	0.04825	John 1972	model	field
Hg	field	20		5	silt loam	5.1	100	oat	Avena sativa	leaf	0.199	0.00995	John 1972	model	field
Hg	field	4		5	silt loam	5.1	95	pea	Pisum sativum	vine	0.187	0.04675	John 1972	model	field
Hg	field	20		5	silt loam	5.1	95	pea	Pisum sativum	vine	0.085	0.00425	John 1972	model	field
Hg	field	4		5	silt loam	5.1	45	radish	Raphanus sativus	top	0.218	0.0545	John 1972	model	field
Hg	field	20		5	silt loam	5.1	45	radish	Raphanus sativus	top	0.585	0.02925	John 1972	model	field
Hg	field	4		5	silt loam	5.1	55	spinach	Spinacia oleracea	leaf	0.339	0.08475	John 1972	model	field
Hg	field	20		5	silt loam	5.1	55	spinach	Spinacia oleracea	leaf	0.695	0.03475	John 1972	model	field
Hg	field	22.04		5	Ganjam, Ind	5.2		bermuda grass	Cynodon dactylon	shoot	4.83	0.21915	Lenka et al. 1992	model	field
Hg	field	108.5		5	Ganjam, Ind	5.2		bermuda grass	Cynodon dactylon	shoot	10.35	0.09539	Lenka et al. 1992	model	field
Hg	field	327.53		5	Ganjam, Ind	5.2		bermuda grass	Cynodon dactylon	shoot	29.93	0.09138	Lenka et al. 1992	model	field
Hg	field	557.33		5	Ganjam, Ind	5.2		bermuda grass	Cynodon dactylon	shoot	37.33	0.06698	Lenka et al. 1992	model	field
Hg	field	6.55		5	Ganjam, Ind	5.2		finger grass	Chloris barbata	shoot	0.67	0.10229	Lenka et al. 1992	model	field
Hg	field	108.5		5	Ganjam, Ind	5.2		finger grass	Chloris barbata	shoot	5.68	0.05235	Lenka et al. 1992	model	field
Hg	field	327.53		5	Ganjam, Ind	5.2		finger grass	Chloris barbata	shoot	9	0.02748	Lenka et al. 1992	model	field
Hg	field	523.6		5	Ganjam, Ind	5.2		finger grass	Chloris barbata	shoot	11.33	0.02164	Lenka et al. 1992	model	field
Hg	field	7.75		5	Ganjam, Ind	5.2		herb	Croton bonplandianum	shoot	0.38	0.04903	Lenka et al. 1992	model	field
Hg	field	10.27		5	Ganjam, Ind	5.2		herb	Croton bonplandianum	shoot	2.1	0.20448	Lenka et al. 1992	model	field
Hg	field	18.24		5	Ganjam, Ind	5.2		herb	Croton bonplandianum	shoot	1.3	0.07127	Lenka et al. 1992	model	field
Hg	field	59.16		5	Ganjam, Ind	5.2		herb	Croton bonplandianum	shoot	2.5	0.04226	Lenka et al. 1992	model	field
Hg	field	557.33		5	Ganjam, Ind	5.2		herb	Croton bonplandianum	shoot	2.8	0.00502	Lenka et al. 1992	model	field
Hg	field	18.24		5	Ganjam, Ind	5.2		perennial herb	Justicia simplex	shoot	3.67	0.20121	Lenka et al. 1992	model	field
Hg	field	22.04		5	Ganjam, Ind	5.2		perennial herb	Justicia simplex	shoot	5.4	0.24501	Lenka et al. 1992	model	field

Hg	field	59.9	5	Ganjam, Ind	5.2		prickly poppy	Argemone mexicana	shoot	1.47	0.02454	Lenka et al. 1992	model	field
Hg	field	22.04	5	Ganjam, Ind	5.2		puncture-weed	Tribulus terrestris	shoot	8	0.36298	Lenka et al. 1992	model	field
Hg	field	10.27	5	Ganjam, Ind	5.2		sedge	Cyperus rotundus	shoot	3.43	0.33398	Lenka et al. 1992	model	field
Hg	field	59.16	5	Ganjam, Ind	5.2		sedge	Cyperus rotundus	shoot	6.36	0.10751	Lenka et al. 1992	model	field
Hg	field	557.33	5	Ganjam, Ind	5.2		sedge	Cyperus rotundus	shoot	35.49	0.06368	Lenka et al. 1992	model	field
Hg	field	18.24	5	Ganjam, Ind	5.2		unknown	Evolvulus alsinoides	shoot	4	0.2193	Lenka et al. 1992	model	field
Hg	field	22.04	5	Ganjam, Ind	5.2		unknown	Evolvulus alsinoides	shoot	8.56	0.38838	Lenka et al. 1992	model	field
Hg	field-background	0.08	15	loam	7.1	42	alfalfa	Medicago sativa	above-ground	0.16	2	MacLean. 1974	model	field
Hg	phenyl mercuric a	5.08	15	loam	7.1	42	alfalfa	Medicago sativa	above-ground	0.151	0.02972	MacLean. 1974	model	salt
Hg	field-background	0.08	15	loam	7.1	42	carrot	Daucus carota	top	0.193	2.4125	MacLean. 1974	model	field
Hg	phenyl mercuric a	5.08	15	loam	7.1	42	carrot	Daucus carota	top	0.211	0.04154	MacLean. 1974	model	salt
Hg	phenyl mercuric a	5.08	15	loam	7.1	42	corn	Zea mays	vegetative	0.048	0.00945	MacLean. 1974	model	salt
Hg	field-background	0.08	15	loam	7.1	42	lettuce	Latuca sativa	above-ground	0.111	1.3875	MacLean. 1974	model	field
Hg	phenyl mercuric a	5.08	15	loam	7.1	42	lettuce	Latuca sativa	above-ground	0.176	0.03465	MacLean. 1974	model	salt
Hg	field, fungicide	1.640	22.5	loam	.	42	lettuce	Latuca sativa	above-ground	0.173	0.10549	MacLean. 1974	model	field
Hg	field, fungicide	27.543	22.5	clay loam	.	42	lettuce	Latuca sativa	above-ground	0.317	0.01151	MacLean. 1974	model	field
Hg	field, fungicide	7.130	22.5	sand	.	42	lettuce	Latuca sativa	above-ground	0.103	0.01445	MacLean. 1974	model	field
Hg	field-background	0.08	15	loam	7.1	42	oat	Avena sativa	straw	0.197	2.4625	MacLean. 1974	model	field
Hg	phenyl mercuric a	5.08	15	loam	7.1	42	oat	Avena sativa	straw	0.243	0.04783	MacLean. 1974	model	salt
Hg	field-background	0.08	15	loam	7.1	42	potato	Solanum tuberosum	top	0.364	4.55	MacLean. 1974	model	field
Hg	phenyl mercuric a	5.08	15	loam	7.1	42	potato	Solanum tuberosum	top	0.442	0.08701	MacLean. 1974	model	salt
Hg	field-background	0.08	15	loam	7.1	42	soybean	Glycine max	vine	0.250	3.125	MacLean. 1974	model	field
Hg	phenyl mercuric a	5.08	15	loam	7.1	42	soybean	Glycine max	vine	0.444	0.0874	MacLean. 1974	model	salt
Hg	field-background	0.08	15	loam	7.1	42	timothy	Phleum pratense	above-ground	0.143	1.7875	MacLean. 1974	model	field
Hg	phenyl mercuric a	5.08	15	loam	7.1	42	timothy	Phleum pratense	above-ground	0.158	0.0311	MacLean. 1974	model	salt
Hg	field-background	0.08	15	loam	7.1	42	tobacco	Nicotiana tobacum	leaf	0.088	1.1	MacLean. 1974	model	field
Hg	phenyl mercuric a	5.08	15	loam	7.1	42	tobacco	Nicotiana tobacum	leaf	0.106	0.02087	MacLean. 1974	model	salt
Hg	field-background	0.08	15	loam	7.1	42	tomato	Lycopersicon esculent	vine	0.139	1.7375	MacLean. 1974	model	field
Hg	phenyl mercuric a	5.08	15	loam	7.1	42	tomato	Lycopersicon esculent	vine	0.145	0.02854	MacLean. 1974	model	salt
Hg	field-background	0.068	1-2 cm	sand	5.3	.	dune grass	Ammophilia arenaria	clipping 10cm	0.038	0.55882	Severson, et al. 1992.	model	field
Hg	field-background	0.068	1-2 cm	sand	5.3	.	willow	Salix repens	leaves	0.052	0.76471	Severson, et al. 1992.	model	field
Hg	field-background	0.06	15	unknown	8.5	many yea	basil	Ocimum basilicum	edible portion	0.05	0.83333	Shariatpanahi and Ande	model	field
Hg	field-wastewater	0.16	15	unknown	8.3	many yea	basil	Ocimum basilicum	edible portion	0.08	0.5	Shariatpanahi and Ande	model	field
Hg	field-background	0.06	15	unknown	8.5	many yea	garden cress	Lepidium sativum	edible portion	0.04	0.66667	Shariatpanahi and Ande	model	field
Hg	field-wastewater	0.16	15	unknown	8.3	many yea	garden cress	Lepidium sativum	edible portion	0.12	0.75	Shariatpanahi and Ande	model	field
Hg	field-background	0.06	15	unknown	8.5	many yea	mint	Mentha arllensis	edible portion	0.06	1	Shariatpanahi and Ande	model	field
Hg	field-wastewater	0.16	15	unknown	8.3	many yea	mint	Mentha arllensis	edible portion	0.08	0.5	Shariatpanahi and Ande	model	field
Hg	field-background	0.06	15	unknown	8.5	many yea	tarragon	Artemisia dracunculus	edible portion	0.04	0.66667	Shariatpanahi and Ande	model	field
Hg	field-wastewater	0.16	15	unknown	8.3	many yea	tarragon	Artemisia dracunculus	edible portion	0.13	0.8125	Shariatpanahi and Ande	model	field
Hg	field	2.13		Ganjam, India			herb	Croton sparsifloris	stem,leaf	2.625	1.23239	Shaw & Panigrahi. 1986	model	field
Hg	field	610		Ganjam, India			herb	Croton sparsifloris	stem,leaf	14.515	0.0238	Shaw & Panigrahi. 1986	model	field
Hg	field	613.33		Ganjam, India			herb	Croton sparsifloris	stem,leaf	9.425	0.01537	Shaw & Panigrahi. 1986	model	field
Hg	field	660		Ganjam, India			herb	Croton sparsifloris	stem,leaf	19.165	0.02904	Shaw & Panigrahi. 1986	model	field
Hg	field	576.67		Ganjam, India			herb	Croton sparsifloris	stem,leaf	11.315	0.01962	Shaw & Panigrahi. 1986	model	field
Hg	field	202		Ganjam, India			herbaceous vir	Ipomoea digitata	stem,leaf	12.245	0.06062	Shaw & Panigrahi. 1986	model	field
Hg	field	212.28		Ganjam, India			herbaceous vir	Ipomoea digitata	stem,leaf	10.12	0.04767	Shaw & Panigrahi. 1986	model	field
Hg	field	288.67		Ganjam, India			herbaceous vir	Ipomoea digitata	stem,leaf	4.595	0.01592	Shaw & Panigrahi. 1986	model	field
Hg	field	3.87		Ganjam, India			prickly poppy	Argemone mexicana	stem,leaf	3.23	0.83463	Shaw & Panigrahi. 1986	model	field
Hg	field	4.6		Ganjam, India			prickly poppy	Argemone mexicana	stem,leaf	3.7	0.80435	Shaw & Panigrahi. 1986	model	field

Hg	field	5.2		Ganjam, India			prickly poppy	Argemone mexicana	stem,leaf	4.045	0.77788	Shaw & Panigrahi. 1986	model	field
Hg	field	9.2		Ganjam, India			unknown	Jatropha gossypifolia	stem,leaf	2.08	0.22609	Shaw & Panigrahi. 1986	model	field
Hg	field	12.17		Ganjam, India			unknown	Jatropha gossypifolia	stem,leaf	1.85	0.15201	Shaw & Panigrahi. 1986	model	field
Hg	field	82.67		Ganjam, India			unknown	Jatropha gossypifolia	stem,leaf	17.29	0.20914	Shaw & Panigrahi. 1986	model	field
Hg	field	130		Ganjam, India			unknown	Calotropsis procera	stem,leaf	8.58	0.066	Shaw & Panigrahi. 1986	model	field
Hg	field	210		Ganjam, India			unknown	Calotropsis procera	stem,leaf	13.54	0.06448	Shaw & Panigrahi. 1986	model	field
Hg	field	503.33		Ganjam, India			unknown	Jatropha gossypifolia	stem,leaf	13.375	0.02657	Shaw & Panigrahi. 1986	model	field
Hg	field	893.33		Ganjam, India			unknown	Calotropsis procera	stem,leaf	24.765	0.02772	Shaw & Panigrahi. 1986	model	field
Hg	field	0.0108	4-6cm	sedimentary			English plantai	Plantago lanceolata	assume foliag	0.0371	3.43519	Siegel et al. 1981	model	field
Hg	field	0.0113	4-6cm	sedimentary			English plantai	Plantago lanceolata	assume foliag	0.1382	12.2301	Siegel et al. 1981	model	field
Hg	field	0.0108	4-6cm	sedimentary			maple	Acer platanoides	assume foliag	0.0131	1.21296	Siegel et al. 1981	model	field
Hg	field	0.0113	4-6cm	sedimentary			maple	Acer platanoides	assume foliag	0.0796	7.04425	Siegel et al. 1981	model	field
Hg	field	0.0108	4-6cm	sedimentary			red mulberry	Morus rubra	assume foliag	0.0039	0.36111	Siegel et al. 1981	model	field
Hg	field	0.0113	4-6cm	sedimentary			red mulberry	Morus rubra	assume foliag	0.08	7.07965	Siegel et al. 1981	model	field
Hg	field	0.0108	4-6cm	sedimentary			sycamore	Platanus occidentalis	assume foliag	0.0015	0.13889	Siegel et al. 1981	model	field
Hg	field	0.0113	4-6cm	sedimentary			sycamore	Platanus occidentalis	assume foliag	0.0835	7.38938	Siegel et al. 1981	model	field
Hg	field	0.02		near Prince George, Brit Col			English plantai	Plantago lanceolata	leaf or shoot	0.064	3.2	Siegel et al. 1987	model	field
Hg	field	0.1		near Prince George, Brit Col			English plantai	Plantago lanceolata	leaf or shoot	0.16	1.6	Siegel et al. 1987	model	field
Hg	field	0.2		near Prince George, Brit Col			English plantai	Plantago lanceolata	leaf or shoot	0.14	0.7	Siegel et al. 1987	model	field
Hg	field	0.3		near Prince George, Brit Col			English plantai	Plantago lanceolata	leaf or shoot	0.18	0.6	Siegel et al. 1987	model	field
Hg	field	0.02		near Prince George, Brit Col			field horsetail	Equisetum arvense	leaf or shoot	0.05	2.5	Siegel et al. 1987	model	field
Hg	field	0.1		near Prince George, Brit Col			field horsetail	Equisetum arvense	leaf or shoot	0.19	1.9	Siegel et al. 1987	model	field
Hg	field	0.2		near Prince George, Brit Col			field horsetail	Equisetum arvense	leaf or shoot	0.1	0.5	Siegel et al. 1987	model	field
Hg	field	0.3		near Prince George, Brit Col			field horsetail	Equisetum arvense	leaf or shoot	0.075	0.25	Siegel et al. 1987	model	field
Hg	field	0.05			6.6		Beggar's ticks	Bidens polylepsis	stem/leaf	0.02	0.4	PTI 1995	validation	field
Hg	field	0.86			6.4		giant ragweed	Abrosia trifida	stem/leaf	0.03	0.03488	PTI 1995	validation	field
Hg	field	0.08			6		giant ragweed	Ambrosia trifida	stem/leaf	0.02	0.25	PTI 1995	validation	field
Ni	NiCl2	50		Grenville sa	7.6	83 days	alfalfa	Medicago sativa	tops	11.6	0.232	Halstead et al. 1969	model	salt
Ni	NiCl2	50		Granby sand	6.1	83 days	alfalfa	Medicago sativa	tops	5.3	0.106	Halstead et al. 1969	model	salt
Ni	NiCl2	50		Granby sand	6.7	83 days	alfalfa	Medicago sativa	tops	3.8	0.076	Halstead et al. 1969	model	salt
Ni	NiCl2	50		Uplands sar	5.6	83 days	alfalfa	Medicago sativa	tops	78	1.56	Halstead et al. 1969	model	salt
Ni	NiCl2	50		Uplands sar	6.3	83 days	alfalfa	Medicago sativa	tops	43.6	0.872	Halstead et al. 1969	model	salt
Ni	NiCl2	50		Uplands sar	5.3	83 days	alfalfa	Medicago sativa	tops	63.8	1.276	Halstead et al. 1969	model	salt
Ni	NiCl2	50		Uplands sar	6.4	83 days	alfalfa	Medicago sativa	tops	30.5	0.61	Halstead et al. 1969	model	salt
Ni	NiCl2	100		Grenville sa	7.6	83 days	alfalfa	Medicago sativa	tops	15.6	0.156	Halstead et al. 1969	model	salt
Ni	NiCl2	500		Grenville sa	7.5	83 days	alfalfa	Medicago sativa	tops	64.2	0.1284	Halstead et al. 1969	model	salt
Ni	NiCl2	500		Granby sand	5.9	83 days	alfalfa	Medicago sativa	tops	51.5	0.103	Halstead et al. 1969	model	salt
Ni	NiCl2	500		Granby sand	6.4	83 days	alfalfa	Medicago sativa	tops	61.1	0.1222	Halstead et al. 1969	model	salt
Ni	NiCl2	50		Grenville sa	7.6	110 days	oat	Avena sativa	straw	1.7	0.034	Halstead et al. 1969	model	salt
Ni	NiCl2	50		Granby sand	6.1	110 days	oat	Avena sativa	straw	3.3	0.066	Halstead et al. 1969	model	salt
Ni	NiCl2	50		Granby sand	6.7	110 days	oat	Avena sativa	straw	1.1	0.022	Halstead et al. 1969	model	salt
Ni	NiCl2	50		Uplands sar	5.6	110 days	oat	Avena sativa	straw	42.3	0.846	Halstead et al. 1969	model	salt
Ni	NiCl2	50		Uplands sar	6.3	110 days	oat	Avena sativa	straw	11	0.22	Halstead et al. 1969	model	salt
Ni	NiCl2	50		Uplands sar	5.3	110 days	oat	Avena sativa	straw	21.7	0.434	Halstead et al. 1969	model	salt
Ni	NiCl2	50		Uplands sar	6.4	110 days	oat	Avena sativa	straw	14.6	0.292	Halstead et al. 1969	model	salt
Ni	NiCl2	100		Grenville sa	7.6	110 days	oat	Avena sativa	straw	2.2	0.022	Halstead et al. 1969	model	salt
Ni	NiCl2	100		Granby sand	6.1	110 days	oat	Avena sativa	straw	5.2	0.052	Halstead et al. 1969	model	salt

Ni	NiCl2	100		Granby sand	6.6	110 days	oat	Avena sativa	straw	5.2	0.052	Halstead et al. 1969	model	salt
Ni	NiCl2	100		Uplands sar	6.2	110 days	oat	Avena sativa	straw	32.3	0.323	Halstead et al. 1969	model	salt
Ni	NiCl2	100		Uplands sar	5.2	110 days	oat	Avena sativa	straw	45.8	0.458	Halstead et al. 1969	model	salt
Ni	NiCl2	100		Uplands sar	6.4	110 days	oat	Avena sativa	straw	21.1	0.211	Halstead et al. 1969	model	salt
Ni	NiCl2	500		Grenville sai	7.5	110 days	oat	Avena sativa	straw	13.6	0.0272	Halstead et al. 1969	model	salt
Ni	NiCl2	500		Granby sand	5.9	110 days	oat	Avena sativa	straw	25.1	0.0502	Halstead et al. 1969	model	salt
Ni	NiCl2	500		Granby sand	6.4	110 days	oat	Avena sativa	straw	26	0.052	Halstead et al. 1969	model	salt
Ni	field	72	10	grey-wooded	3.4		low sweet blue	Vaccinium angustifoliu	foliage	14	0.19444	Hutchinson & Whitby 19	model	field
Ni	field	72	10	grey-wooded	3.4		wavy hair-gras	Deschampsia flexuosa	foliage	37	0.51389	Hutchinson & Whitby 19	model	field
Ni	NiSO4	30		Seaton loam	4.7	4 weeks	rye grass	Lolium perenne	cutting	50	1.66667	Khalid & Tinsley 1980	model	salt
Ni	NiSO4	90		Seaton loam	4.7	4 weeks	rye grass	Lolium perenne	cutting	154	1.71111	Khalid & Tinsley 1980	model	salt
Ni	NiSO4	180		Seaton loam	4.7	4 weeks	rye grass	Lolium perenne	cutting	321	1.78333	Khalid & Tinsley 1980	model	salt
Ni	NiSO4	270		Seaton loam	4.7	4 weeks	rye grass	Lolium perenne	cutting	470	1.74074	Khalid & Tinsley 1980	model	salt
Ni	field	8500	20	Plain	6.5		banana tree	Musa	leaves	22.1	0.0026	L'Huillier & Edighoffer 19	model	field
Ni	field	8900	20	Hydromorph	5.9		banana tree	Musa	leaves	53.5	0.00601	L'Huillier & Edighoffer 19	model	field
Ni	field	8500	20	Plain	6.5		carrot	Daucus carrota	leaves	41	0.00482	L'Huillier & Edighoffer 19	model	field
Ni	field	8900	20	Hydromorph	5.9		carrot	Daucus carrota	leaves	59.1	0.00664	L'Huillier & Edighoffer 19	model	field
Ni	field	8500	20	Plain	6.5		chinese cabbage		leaves	48.5	0.00571	L'Huillier & Edighoffer 19	model	field
Ni	field	5100	20	Colluvio-allu	6.3		courgette		leaves	11.6	0.00227	L'Huillier & Edighoffer 19	model	field
Ni	field	8500	20	Plain	6.5		courgette		leaves	55.5	0.00653	L'Huillier & Edighoffer 19	model	field
Ni	field	5100	20	Colluvio-allu	6.3		eggplant	Solanum melongena	leaves	19.4	0.0038	L'Huillier & Edighoffer 19	model	field
Ni	field	8500	20	Plain	6.5		eggplant	Solanum melongena	leaves	94	0.01106	L'Huillier & Edighoffer 19	model	field
Ni	field	5100	20	Colluvio-allu	6.3		lemon tree	Citrus aurantifolia	leaves	44	0.00863	L'Huillier & Edighoffer 19	model	field
Ni	field	9100	20	Hydromorph	5.7		lemon tree	Citrus aurantifolia	leaves	82.1	0.00902	L'Huillier & Edighoffer 19	model	field
Ni	field-in-pot	7600	20	Piedmont	5.4	28 days	maize	Zea mays	shoot	4.8	0.00063	L'Huillier & Edighoffer 19	model	field
Ni	field-in-pot	8500	20	Plain	6.4	28 days	maize	Zea mays	shoot	6.6	0.00078	L'Huillier & Edighoffer 19	model	field
Ni	field	5100	20	Colluvio-allu	6.3		mango tree	Mangifera indica	leaves	23.5	0.00461	L'Huillier & Edighoffer 19	model	field
Ni	field	6200	20	Piedmont	5.5		mango tree	Mangifera indica	leaves	25	0.00403	L'Huillier & Edighoffer 19	model	field
Ni	field	5100	20	Colluvio-allu	6.3		pawpaw tree	Asimina triloba	leaves	14.5	0.00284	L'Huillier & Edighoffer 19	model	field
Ni	field	8500	20	Plain	6.5		radish	Raphanus sativus	leaves	85	0.01	L'Huillier & Edighoffer 19	model	field
Ni	field	5100	20	Colluvio-allu	6.3		tomato	Lycopersicon esculent	leaves	13.9	0.00273	L'Huillier & Edighoffer 19	model	field
Ni	field	8500	20	Plain	6.5		tomato	Lycopersicon esculent	leaves	47.5	0.00559	L'Huillier & Edighoffer 19	model	field
Ni	field	9		peat, pumice	7.3	6,10 weel	unknown	Thalaspi goesingense	above ground	4.4	0.48889	Reeves & Baker 1984	model	field
Ni	field	9		peat, pumice	7.3	6 weeks	unknown	Thalaspi goesingense	above ground	95	10.5556	Reeves & Baker 1984	model	field
Ni	field	9		peat, pumice	7.3	10 weeks	unknown	Thalaspi goesingense	above ground	21	2.33333	Reeves & Baker 1984	model	field
Ni	field	14		peat, pumice	7.3	6 weeks	unknown	Thalaspi goesingense	above ground	311	22.2143	Reeves & Baker 1984	model	field
Ni	field	14		peat, pumice	7.3	10 weeks	unknown	Thalaspi goesingense	above ground	171	12.2143	Reeves & Baker 1984	model	field
Ni	field	744		Dun Mounta	6.7	6,10 weel	unknown	Thalaspi goesingense	above ground	1050	1.41129	Reeves & Baker 1984	model	field
Ni	field	744		Dun Mounta	6.7	6,10 weel	unknown	Thalaspi goesingense	above ground	1700	2.28495	Reeves & Baker 1984	model	field
Ni	field	838		Dun Mounta	6.7	6,10 weel	unknown	Thalaspi goesingense	above ground	58	0.06921	Reeves & Baker 1984	model	field
Ni	field	838		Dun Mounta	6.7	6 weeks	unknown	Thalaspi goesingense	above ground	478	0.57041	Reeves & Baker 1984	model	field
Ni	field	838		Dun Mounta	6.7	10 weeks	unknown	Thalaspi goesingense	above ground	180	0.2148	Reeves & Baker 1984	model	field
Ni	field	4710		New Caledo	6.8	6,10 weel	unknown	Thalaspi goesingense	above ground	1300	0.27601	Reeves & Baker 1984	model	field
Ni	field	4710		New Caledo	6.8	6,10 weel	unknown	Thalaspi goesingense	above ground	2310	0.49045	Reeves & Baker 1984	model	field
Ni	field-background	2.2	7.5	Orangeburg	5.1	growing s	bush beans	Phaseolus vulgaris	upper,lowerle	0.79	0.35909	Sajwan et al. 1996	model	field
Ni	NiCl2	6.78	7.5	Orangeburg	5.1	growing s	bush beans	Phaseolus vulgaris	upper,lowerle	0.84	0.12389	Sajwan et al. 1996	model	salt
Ni	NiCl2	11.24	7.5	Orangeburg	5.1	growing s	bush beans	Phaseolus vulgaris	upper,lowerle	3.01	0.26779	Sajwan et al. 1996	model	salt
Ni	NiCl2	50		Loess -deriv	7.3	1 year	lettuce	Latuca sativa	whole plant	6	0.12	Sauerbeck and Hein 19	model	salt
Ni	NiCl2	50		sandy acid (	5.5	1 year	lettuce	Latuca sativa	whole plant	22.5	0.45	Sauerbeck and Hein 19	model	salt

Ni	field	620		nickeliferous	6	Australian shru	Hybanthus floribundus	leafparts+ster	3357	5.41452	Severne 1974	model	field
Ni	field	770		nickeliferous	6	Australian shru	Hybanthus floribundus	leaf+stem	6016	7.81299	Severne 1974	model	field
Ni	field	39.2	10	serpentine outcrops		unknown	Alyssum argentium		95.7	2.44133	Vergnano Gambi et al. 1	model	field
Ni	field	42.6	10	serpentine outcrops		unknown	Alyssum bertolonii		158	3.70892	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops		unknown	Alyssum bertolonii		202	4.3913	Vergnano Gambi et al. 1	model	field
Ni	field	39.2	10	serpentine outcrops		unknown	Ameria denticulata	green leaves	0.2	0.0051	Vergnano Gambi et al. 1	model	field
Ni	field	42.6	10	serpentine outcrops		unknown	Ameria denticulata	green leaves	1.5	0.03521	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops		unknown	Ameria denticulata	green+old lea	1.1	0.02391	Vergnano Gambi et al. 1	model	field
Ni	field	39.2	10	serpentine outcrops		spleenwort	Asplenium cuneifolium		0.7	0.01786	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops		spleenwort	Asplenium cuneifolium		0.4	0.0087	Vergnano Gambi et al. 1	model	field
Ni	field	39.2	10	serpentine outcrops		herb	Centaurea rupestris		0.3	0.00765	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops		herb	Centaurea rupestris		0.2	0.00435	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops		herb	Centaurium erythraea		0.5	0.01087	Vergnano Gambi et al. 1	model	field
Ni	field	39.2	10	serpentine outcrops		mouse-ear chi	Cerastium exile		0.8	0.02041	Vergnano Gambi et al. 1	model	field
Ni	field	42.6	10	serpentine outcrops		mouse-ear chi	Cerastium exile		0.9	0.02113	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops		mouse-ear chi	Cerastium exile		1.2	0.02609	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops		unknown	Ceterach officinarum		1.2	0.02609	Vergnano Gambi et al. 1	model	field
Ni	field	42.6	10	serpentine outcrops		lip-fern	Cheilanthes marantae		0.6	0.01408	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops		lip-fern	Cheilanthes marantae		0.7	0.01522	Vergnano Gambi et al. 1	model	field
Ni	field	42.6	10	serpentine outcrops		unknown	Cistus salvifolius		0.9	0.02113	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops		unknown	Cistus salvifolius		0.5	0.01087	Vergnano Gambi et al. 1	model	field
Ni	field	42.6	10	serpentine outcrops		orchard grass	Dactylis glomerata	leaves	0.4	0.00939	Vergnano Gambi et al. 1	model	field
Ni	field	42.6	10	serpentine outcrops		herb	Dianthus sylvestris		0.5	0.01174	Vergnano Gambi et al. 1	model	field
Ni	field	39.2	10	serpentine outcrops		herb	Dianthus sylvestrus		0.6	0.01531	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops		unknown	Dittrichia viscosa		0.4	0.0087	Vergnano Gambi et al. 1	model	field
Ni	field	39.2	10	serpentine outcrops		variable genus	Euphorbia cyparissias		1.5	0.03827	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops		variable genus	Euphorbia exigua		0.5	0.01087	Vergnano Gambi et al. 1	model	field
Ni	field	42.6	10	serpentine outcrops		variable genus	Euphorbia prostrata		2	0.04695	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops		variable genus	Euphorbia prostrata		0.9	0.01957	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops		fescue	Festuca glauca		0.3	0.00652	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops		bedstraw	Galium lucidum		0.3	0.00652	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops		unknown	Heiracium piloselloides		0.7	0.01522	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops		unknown	Herniaria glabra		0.5	0.01087	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops		annual herb	Jasione montana		0.3	0.00652	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops		unknown	Linum tryginum		0.3	0.00652	Vergnano Gambi et al. 1	model	field
Ni	field	39.2	10	serpentine outcrops		unknown	Minuartia ophiolitica	leaves	0.2	0.0051	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops		unknown	Minuartia ophiolitica	leaves	0.6	0.01304	Vergnano Gambi et al. 1	model	field
Ni	field	42.6	10	serpentine outcrops		plantain	Plantago holosteum	new leaves	2.93	0.06878	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops		plantain	Plantago lanceolata		2.3	0.05	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops		herb or shrub	Potentilla ophiolitica		0.2	0.00435	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops		unknown	Reichardia picroides	leaves	0.4	0.0087	Vergnano Gambi et al. 1	model	field
Ni	field	39.2	10	serpentine outcrops		herb	Rumex scutatus		1.2	0.03061	Vergnano Gambi et al. 1	model	field
Ni	field	42.6	10	serpentine outcrops		burnet-bloodw	Sanguisorba minor	leaves	0.8	0.01878	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops		burnet-bloodw	Sanguisorba minor	leaves	0.5	0.01087	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops		bullrush	Scirpus holoschoemus		0.1	0.00217	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops		unknown	Scorzonera stenophyll	leaves	0.7	0.01522	Vergnano Gambi et al. 1	model	field
Ni	field	42.6	10	serpentine outcrops		stonecrop	Sedum sp.		0.3	0.00704	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops		stonecrop	Sedum sp.		0.2	0.00435	Vergnano Gambi et al. 1	model	field
Ni	field	39.2	10	serpentine outcrops		herb	Senecio erucifolius		1.6	0.04082	Vergnano Gambi et al. 1	model	field

Ni	field	39.2	10	serpentine outcrops			herb	Silene italica	leaves	0.1	0.00255	Vergnano Gambi et al. 1	model	field
Ni	field	42.6	10	serpentine outcrops			herb	Silene italica	leaves	0.6	0.01408	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops			herb	Silene italica	leaves	0.5	0.01087	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops			herb	Stachys serpentini		0.4	0.0087	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops			needle grass	Stipa pulcherrima		0.1	0.00217	Vergnano Gambi et al. 1	model	field
Ni	field	42.6	10	serpentine outcrops			thyme	Thymus ophioliticus	leaves	0.6	0.01408	Vergnano Gambi et al. 1	model	field
Ni	field	46	10	serpentine outcrops			thyme	Thymus ophioliticus	leaves	0.5	0.01087	Vergnano Gambi et al. 1	model	field
Ni	field-background	15		sandy	5.3	34	oat	Avena sativa	shoot	10.9	0.72667	Ylaranta 1996	model	field
Ni	field-background	17		sandy	6	34	oat	Avena sativa	shoot	40.6	2.38824	Ylaranta 1996	model	field
Ni	NiCl2	37		sandy	5.3	34	oat	Avena sativa	shoot	11.9	0.32162	Ylaranta 1996	model	salt
Ni	NiCl2	39		sandy	6	34	oat	Avena sativa	shoot	41.2	1.05641	Ylaranta 1996	model	salt
Ni	NiCl2	127		sandy	5.3	34	oat	Avena sativa	shoot	16.3	0.12835	Ylaranta 1996	model	salt
Ni	NiCl2	129		sandy	6	34	oat	Avena sativa	shoot	47.8	0.37054	Ylaranta 1996	model	salt
Ni	NiCl2	566		sandy	5.3	34	oat	Avena sativa	shoot	20.7	0.03657	Ylaranta 1996	model	salt
Ni	NiCl2	568		sandy	6	34	oat	Avena sativa	shoot	77.8	0.13697	Ylaranta 1996	model	salt
Ni	field	26			7.1		annual ragwee	Ambrosia artemisiifolia	stem/leaf	0.5	0.01923	PTI 1995	validation	field
Ni	field	10.2			6.6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	2.2	0.21569	PTI 1995	validation	field
Ni	field	19.15			6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	1.1	0.05744	PTI 1995	validation	field
Ni	field	39.95			6.8		annual ragwee	Ambrosia artemisiifolia	stem/leaf	0.5	0.01252	PTI 1995	validation	field
Ni	field	27.9			6.4		annual ragwee	Ambrosia artemisiifolia	stem/leaf	1.1	0.03943	PTI 1995	validation	field
Ni	field	10.2			6.6		Beggar's ticks	Bidens polylepsis	stem/leaf	1.3	0.12745	PTI 1995	validation	field
Ni	field	19.15			6		Beggar's ticks	Bidens polylepsis	stem/leaf	1.4	0.07311	PTI 1995	validation	field
Ni	field	27.9			6.4		beggar's ticks	Bidens polylepis	stem/leaf	0.8	0.02867	PTI 1995	validation	field
Ni	field	27.9			6.4		beggar's ticks	Bidens polylepis	stem/leaf	0.9	0.03226	PTI 1995	validation	field
Ni	field	20.2			6		beggar's ticks	Bidens polylepis	stem/leaf	1	0.0495	PTI 1995	validation	field
Ni	field	17.5			6.1		Bermuda grass	Cynodon dactylon	stem/leaf	0.9	0.05143	PTI 1995	validation	field
Ni	field	20.2			6		big bluestem	Andropogon gerardi	stem/leaf	2.2	0.10891	PTI 1995	validation	field
Ni	field	27.9			6.4		giant ragweed	Abrosia trifida	stem/leaf	1.1	0.03943	PTI 1995	validation	field
Ni	field	20.2			6		giant ragweed	Ambrosia trifida	stem/leaf	1.6	0.07921	PTI 1995	validation	field
Ni	field	17.5			6.1		Indian grass	Sorghastrum nutans	stem/leaf	0.3	0.01714	PTI 1995	validation	field
Ni	field	26			7.1		switchgrass	Panicum virgatum	stem/leaf	0.7	0.02692	PTI 1995	validation	field
Ni	field	17.5			6.1		switchgrass	Panicum virgatum	stem/leaf	0.55	0.03143	PTI 1995	validation	field
Ni	field	19.15			6		switchgrass	Panicum virgatum	stem/leaf	1.2	0.06266	PTI 1995	validation	field
Ni	field	10.85			7		switchgrass	Panicum virgatum	stem/leaf	0.3	0.02765	PTI 1995	validation	field
Ni	field	14.1			6.5		switchgrass	Panicum virgatum	stem/leaf	0.6	0.04255	PTI 1995	validation	field
Ni	field	39.95			6.8		switchgrass	Panicum virgatum	stem/leaf	0.4	0.01001	PTI 1995	validation	field
Se	field	0.6	75	clay loam		60,85,11	birdsfoot trefoil	Lotus corniculatus	clipping	0.32	0.53333	Banuelos 1996	model	field
Se	field	0.81		loamy mixed	7.8	85	canola	Brassica napus	shoot	1.31	1.61728	Banuelos 1996	model	field
Se	field	0.47	75	clay loam		75	Indian mustard	Brassica juncea		1.35	2.87234	Banuelos 1996	model	field
Se	field	0.69		loamy mixed	7.8	45-55	Indian mustard	Brassica juncea	shoot	1.1	1.5942	Banuelos 1996	model	field
Se	field	0.66	75	clay loam		115	Kenaf	Hibiscus cannabinus		0.61	0.92424	Banuelos 1996	model	field
Se	field	0.7	75	clay loam		60,85,11	tall fescue	Festuca arundinacea	clipping	0.29	0.41429	Banuelos 1996	model	field
Se	field	0.72		loamy mixed	7.8	100	tall fescue	Festuca arundinacea	shoot	0.94	1.30556	Banuelos 1996	model	field
Se	field	0.4	25	loam		60,105	alfalfa	Medicago sativa	clipping	7.65	19.125	Banuelos et al. 1992	model	field
Se	field	0.4	25	loam		60,105	birdsfoot trefoil	Lotus corniculatus	clipping	3.9	9.75	Banuelos et al. 1992	model	field
Se	field	0.4	25	loam		60	canola	Brassica napus	leaf,stem	30.05	75.125	Banuelos et al. 1992	model	field
Se	field	0.4	25	loam		60,105	tall fescue	Festuca arundicacea	clipping	1.4	3.5	Banuelos et al. 1992	model	field

Se	field	0.4	25	loam		60	wild brown mu	Brassica juncea	whole,stem,le	30.8	77	Banuelos et al. 1992	model	field
Se	field soil in pot	0.72	25	loam	7.70	70	tall fescue	Festuca arundicacea	shoot	0.94	1.30556	Banuelos et al. 1993	model	field
Se	field soil in pot	0.69	25	loam	7.70	70	wild brown mu	Brassica juncea	shoot	1.01	1.46377	Banuelos et al. 1993	model	field
Se	field soil in pot	0.89	25	loam	7.70	90	wild brown mu	Brassica juncea	shoot	1.21	1.35955	Banuelos et al. 1993	model	field
Se	field-dredged ma	0.38	15	sandy loam	5.2	.	common reed	Phragmites australis	leaves	0.12	0.31579	Beyer, et al. 1990.	model	field
Se	field-dredged ma	0.75	15	sandy loam	6.3	.	common reed	Phragmites australis	leaves	0.08	0.10667	Beyer, et al. 1990.	model	field
Se	field-dredged ma	4.8	15	sandy clay l	3.6	.	common reed	Phragmites australis	leaves	0.41	0.08542	Beyer, et al. 1990.	model	field
Se	field-compost	0.336	20	clay loam	6.50		lettuce	Latuca sativa	head	0.057	0.16964	Cappon 1987	model	field
Se	field-compost	0.336	20	clay loam	6.50		lettuce	Latuca sativa	leaf	0.0697	0.20744	Cappon 1987	model	field
Se	field-compost	0.336	20	clay loam	6.50		spinach	Spinacia oleracea		0.0709	0.21101	Cappon 1987	model	field
Se	field-compost	0.336	20	clay loam	6.50		Swiss chard	Beta vulgaris Cicla		0.0402	0.11964	Cappon 1987	model	field
Se	selenate	1	Ap horizon	loamy sand	5.5	42	sorgrass	Sorghum vulgare	clippings	220	220	Carlson et al. 1991	model	salt
Se	selenate	1	Ap horizon	sand	4.9	42	sorgrass	Sorghum vulgare	clippings	627	627	Carlson et al. 1991	model	salt
Se	selenite	1	Ap horizon	sand	4.9	42	sorgrass	Sorghum vulgare	clippings	8.7	8.7	Carlson et al. 1991	model	salt
Se	selenite	1	Ap horizon	sand	5.5	42	sorgrass	Sorghum vulgare	clippings	2.2	2.2	Carlson et al. 1991	model	salt
Se	selenate	2	Ap horizon	sand	4.9	42	sorgrass	Sorghum vulgare	clippings	1153	576.5	Carlson et al. 1991	model	salt
Se	selenate	2	Ap horizon	loamy sand	5.5	42	sorgrass	Sorghum vulgare	clippings	568	284	Carlson et al. 1991	model	salt
Se	selenite	2	Ap horizon	sand	4.9	42	sorgrass	Sorghum vulgare	clippings	19.9	9.95	Carlson et al. 1991	model	salt
Se	selenite	2	Ap horizon	sand	5.5	42	sorgrass	Sorghum vulgare	clippings	3.3	1.65	Carlson et al. 1991	model	salt
Se	selenate	4	Ap horizon	loamy sand	5.5	42	sorgrass	Sorghum vulgare	clippings	778	194.5	Carlson et al. 1991	model	salt
Se	selenite	4	Ap horizon	sand	4.9	42	sorgrass	Sorghum vulgare	clippings	50.7	12.675	Carlson et al. 1991	model	salt
Se	selenite	4	Ap horizon	sand	5.5	42	sorgrass	Sorghum vulgare	clippings	10.3	2.575	Carlson et al. 1991	model	salt
Se	selenate	18		sandy loam		ca 90	orach	Atriplex atacamensis	clipping	95	5.27778	Davis 1972	model	salt
Se	selenate	18		sandy loam		ca 90	orach	Atriplex breweri	clipping	71	3.94444	Davis 1972	model	salt
Se	selenate	18		sandy loam		ca 90	orach	Atriplex canescens	clipping	173	9.61111	Davis 1972	model	salt
Se	selenate	18		sandy loam		ca 90	orach	Atriplex canescens	clipping	204	11.3333	Davis 1972	model	salt
Se	selenate	18		sandy loam		ca 90	orach	Atriplex canescens	clipping	162	9	Davis 1972	model	salt
Se	selenate	18		sandy loam		ca 90	orach	Atriplex halimus	clipping	18	1	Davis 1972	model	salt
Se	selenate	18		sandy loam		ca 90	orach	Atriplex hortensis	clipping	33	1.83333	Davis 1972	model	salt
Se	selenate	18		sandy loam		ca 90	orach	Atriplex hortensis	clipping	18	1	Davis 1972	model	salt
Se	selenate	18		sandy loam		ca 90	orach	Atriplex inflata	clipping	69	3.83333	Davis 1972	model	salt
Se	selenate	18		sandy loam		ca 90	orach	Atriplex lentiformis	clipping	7	0.38889	Davis 1972	model	salt
Se	selenate	18		sandy loam		ca 90	orach	Atriplex leucoclada	clipping	27	1.5	Davis 1972	model	salt
Se	selenate	18		sandy loam		ca 90	orach	Atriplex leucoclada	clipping	14	0.77778	Davis 1972	model	salt
Se	selenate	18		sandy loam		ca 90	orach	Atriplex muelleri	clipping	88	4.88889	Davis 1972	model	salt
Se	selenate	18		sandy loam		ca 90	orach	Atriplex nummularia	clipping	44	2.44444	Davis 1972	model	salt
Se	selenate	18		sandy loam		ca 90	orach	Atriplex nummularia	clipping	77	4.27778	Davis 1972	model	salt
Se	selenate	18		sandy loam		ca 90	orach	Atriplex nummularia	clipping	68	3.77778	Davis 1972	model	salt
Se	selenate	18		sandy loam		ca 90	orach	Atriplex pseudocampa	clipping	27	1.5	Davis 1972	model	salt
Se	selenate	18		sandy loam		ca 90	orach	Atriplex rosea	clipping	11	0.61111	Davis 1972	model	salt
Se	selenate	18		sandy loam		ca 90	orach	Atriplex semibaccata	clipping	31	1.72222	Davis 1972	model	salt
Se	selenate	18		sandy loam		ca 90	orach	Atriplex semibaccata	clipping	61	3.38889	Davis 1972	model	salt
Se	selenate	18		sandy loam		ca 90	orach	Atriplex semibaccata	clipping	19	1.05556	Davis 1972	model	salt
Se	selenate	18		sandy loam		ca 90	orach	Atriplex sp.	clipping	77	4.27778	Davis 1972	model	salt
Se	selenate	18		sandy loam		ca 90	orach	Atriplex vesicaria	clipping	20	1.11111	Davis 1972	model	salt
Se	field-fly ash	1.5		sandy loam	6		alfalfa	Medicago sativa	above-ground	0.07		Furr et al. 1978	model	field
Se	field-fly ash	1.5		sandy loam	6		birdsfoot trefoil	Lotus corniculatus	above-ground	0.09		Furr et al. 1978	model	field
Se	field-fly ash	1.5		sandy loam	6		brome	Bromus	above-ground	0.12		Furr et al. 1978	model	field
Se	field-fly ash	1.5		sandy loam	6		corn	Zea mays	foliage	0.03		Furr et al. 1978	model	field

Se	field-fly ash	1.5		sandy loam	6		millet	Echinochloa crusgalli	foliage	0.04		Furr et al. 1978	model	field
Se	field-fly ash	1.5		sandy loam	6		orchard grass	Dactylis glomerata	above-ground	0.11		Furr et al. 1978	model	field
Se	field-fly ash	1.5		sandy loam	6		sorghum	Sorghum bicolor	foliage	0.03		Furr et al. 1978	model	field
Se	field-fly ash	1.5		sandy loam	6		timothy	Phleum praetense	above-ground	0.08		Furr et al. 1978	model	field
Se	field-fly ash	1.5		sandy loam	6		cabbage	Brassica oleracea	above-ground	0.07		Furr et al. 1978	model	field
Se	field-fly ash	1.7		sandy loam	5.9		alfalfa	Medicago sativa	above-ground	0.13		Furr et al. 1978	model	field
Se	field-fly ash	1.7		sandy loam	5.9		birdsfoot trefoil	Lotus corniculatus	above-ground	0.22		Furr et al. 1978	model	field
Se	field-fly ash	1.7		sandy loam	5.9		brome	Bromus	above-ground	0.28		Furr et al. 1978	model	field
Se	field-fly ash	1.7		sandy loam	5.9		corn	Zea mays	foliage	0.07		Furr et al. 1978	model	field
Se	field-fly ash	1.7		sandy loam	5.9		millet	Echinochloa crusgalli	foliage	0.13		Furr et al. 1978	model	field
Se	field-fly ash	1.7		sandy loam	5.9		orchard grass	Dactylis glomerata	above-ground	0.5		Furr et al. 1978	model	field
Se	field-fly ash	1.7		sandy loam	5.9		sorghum	Sorghum bicolor	foliage	0.04		Furr et al. 1978	model	field
Se	field-fly ash	1.7		sandy loam	5.9		timothy	Phleum praetense	above-ground	0.27		Furr et al. 1978	model	field
Se	field-fly ash	1.7		sandy loam	5.9		cabbage	Brassica oleracea	above-ground	0.2		Furr et al. 1978	model	field
Se	organic	10		loam			alfalfa	Medicago sativa	above-ground	40	4	Hamilton & Beath. 1963	model	salt
Se	selenate	5		loam			alfalfa	Medicago sativa	above-ground	41	8.2	Hamilton & Beath. 1963	model	salt
Se	selenate	10		loam			alkali prince's	Stanleya bipinnata	above-ground	915	91.5	Hamilton & Beath. 1963	model	salt
Se	organic	20		loam			alkali prince's	Stanleya bipinnata	above-ground	724	36.2	Hamilton & Beath. 1963	model	salt
Se	selenite	30		loam			alkali prince's	Stanleya bipinnata	above-ground	540	18	Hamilton & Beath. 1963	model	salt
Se	selenate	10		loam			broom snakew	Gutierrezia sarothrae	above-ground	101	10.1	Hamilton & Beath. 1963	model	salt
Se	organic	20		loam			broom snakew	Gutierrezia sarothrae	above-ground	104	5.2	Hamilton & Beath. 1963	model	salt
Se	selenate	20		loam			broom snakew	Gutierrezia sarothrae	above-ground	112	5.6	Hamilton & Beath. 1963	model	salt
Se	selenate	2		loam			common dand	Taraxacum officinale	above-ground	67	33.5	Hamilton & Beath. 1963	model	salt
Se	organic	20		loam			common dand	Taraxacum officinale	above-ground	89	4.45	Hamilton & Beath. 1963	model	salt
Se	organic	20		loam			common winte	Eurotia lanata	above-ground	114	5.7	Hamilton & Beath. 1963	model	salt
Se	organic	10		loam			common yellov	Oxalis stricta	above-ground	23	2.3	Hamilton & Beath. 1963	model	salt
Se	selenite	30		loam			common yellov	Oxalis stricta	above-ground	36	1.2	Hamilton & Beath. 1963	model	salt
Se	selenate	5		loam			Fremont golde	Haplopappus fremontii	above-ground	657	131.4	Hamilton & Beath. 1963	model	salt
Se	organic	20		loam			goatsbeard	Tragopogon pratensis	above-ground	84	4.2	Hamilton & Beath. 1963	model	salt
Se	selenate	10		loam			Indian ricegras	Oryzopsis hymenoides	above-ground	546	54.6	Hamilton & Beath. 1963	model	salt
Se	organic	20		loam			Indian ricegras	Oryzopsis hymenoides	above-ground	58	2.9	Hamilton & Beath. 1963	model	salt
Se	selenite	20		loam			Indian ricegras	Oryzopsis hymenoides	above-ground	526	26.3	Hamilton & Beath. 1963	model	salt
Se	organic	10		loam			needle-and-thr	Stipa comata	above-ground	30	3	Hamilton & Beath. 1963	model	salt
Se	selenate	5		loam			needle-and-thr	Stipa comata	above-ground	37	7.4	Hamilton & Beath. 1963	model	salt
Se	organic	20		loam			Nuttall goldenw	Machaeranthera grind	above-ground	199	9.95	Hamilton & Beath. 1963	model	salt
Se	selenate	20		loam			Nuttall goldenw	Machaeranthera grind	above-ground	182	9.1	Hamilton & Beath. 1963	model	salt
Se	selenite	20		loam			Nuttall goldenw	Machaeranthera grind	above-ground	116	5.8	Hamilton & Beath. 1963	model	salt
Se	selenite	10		loam			prickly lettuce	Latuca serriola	above-ground	59	5.9	Hamilton & Beath. 1963	model	salt
Se	organic	20		loam			prickly lettuce	Latuca serriola	above-ground	94	4.7	Hamilton & Beath. 1963	model	salt
Se	selenate	5		loam			prickly lettuce	Latuca serriola	above-ground	25	5	Hamilton & Beath. 1963	model	salt
Se	selenate	10		loam			rabbitfoot gras	Polypogon monspelier	above-ground	149	14.9	Hamilton & Beath. 1963	model	salt
Se	organic	20		loam			rabbitfoot gras	Polypogon monspelier	above-ground	80	4	Hamilton & Beath. 1963	model	salt
Se	organic	20		loam			slender wheatg	Agropyron trachycaulu	above-ground	53	2.65	Hamilton & Beath. 1963	model	salt
Se	selenate	20		loam			slender wheatg	Agropyron trachycaulu	above-ground	56	2.8	Hamilton & Beath. 1963	model	salt
Se	selenite	10		loam			summer cypre	Kochia scoparia	above-ground	136	13.6	Hamilton & Beath. 1963	model	salt
Se	organic	20		loam			summer cypre	Kochia scoparia	above-ground	137	6.85	Hamilton & Beath. 1963	model	salt
Se	selenate	20		loam			summer cypre	Kochia scoparia	above-ground	191	9.55	Hamilton & Beath. 1963	model	salt
Se	selenate	10		loam			tansy aster	Machaeranthera ramos	above-ground	3900	390	Hamilton & Beath. 1963	model	salt
Se	selenite	10		loam			tansy aster	Machaeranthera ramos	above-ground	1478	147.8	Hamilton & Beath. 1963	model	salt

Se	K2SeO4	20		loam			tansy aster	Machaeranthera ramos	above-ground	8078	403.9	Hamilton & Beath. 1963	model	salt
Se	organic	20		loam			tansy aster	Machaeranthera ramos	above-ground	720	36	Hamilton & Beath. 1963	model	salt
Se	selenite	20		loam			tansy aster	Machaeranthera ramos	above-ground	2352	117.6	Hamilton & Beath. 1963	model	salt
Se	organic	20		loam			timothy	Phleum pratense	above-ground	39	1.95	Hamilton & Beath. 1963	model	salt
Se	selenate	3		loam			timothy	Phleum pratense	above-ground	33	11	Hamilton & Beath. 1963	model	salt
Se	selenite	10		loam			western aster	Aster occidentalis	above-ground	557	55.7	Hamilton & Beath. 1963	model	salt
Se	organic	20		loam			western aster	Aster occidentalis	above-ground	304	15.2	Hamilton & Beath. 1963	model	salt
Se	selenate	20		loam			western aster	Aster occidentalis	above-ground	1413	70.65	Hamilton & Beath. 1963	model	salt
Se	selenate	10		loam			western wheat	Agropyron smithii	above-ground	298	29.8	Hamilton & Beath. 1963	model	salt
Se	organic	20		loam			western wheat	Agropyron smithii	above-ground	71	3.55	Hamilton & Beath. 1963	model	salt
Se	selenate	5		loam			western wheat	Agropyron smithii	above-ground	154	30.8	Hamilton & Beath. 1963	model	salt
Se	organic	20		loam			white blossom	Mellilotus alba	above-ground	182	9.1	Hamilton & Beath. 1963	model	salt
Se	selenate	20		loam			white blossom	Mellilotus alba	above-ground	226	11.3	Hamilton & Beath. 1963	model	salt
Se	selenite	20		loam			white blossom	Mellilotus alba	above-ground	200	10	Hamilton & Beath. 1963	model	salt
Se	field	0.16		silt clay loam	6.8		red clover	Trifolium pratense		0.20	1.25	Lakin. 1972	model	field
Se	field	0.18		loamy sand	5.9		red clover	Trifolium pratense		0.05	0.27778	Lakin. 1972	model	field
Se	field	0.24		sandy loam	6.5		red clover	Trifolium pratense		0.07	0.29167	Lakin. 1972	model	field
Se	field	0.30		loamy sand	5.8		red clover	Trifolium pratense		0.03	0.1	Lakin. 1972	model	field
Se	field	0.34		sandy loam	6.9		red clover	Trifolium pratense		0.04	0.11765	Lakin. 1972	model	field
Se	field	1.5		muck	7.1		red clover	Trifolium pratense		0.17	0.11333	Lakin. 1972	model	field
Se	field	0.16		silt clay loam	6.8		rye grass	Lolium perenne L.		0.4	2.5	Lakin. 1972	model	field
Se	field	0.18		loamy sand	5.9		rye grass	Lolium perenne L.		0.07	0.38889	Lakin. 1972	model	field
Se	field	0.19		loamy sand	6.8		rye grass	Lolium perenne L.		0.06	0.31579	Lakin. 1972	model	field
Se	field	0.24		sandy loam	6.5		rye grass	Lolium perenne L.		0.2	0.83333	Lakin. 1972	model	field
Se	field	0.30		loamy sand	5.8		rye grass	Lolium perenne L.		0.08	0.26667	Lakin. 1972	model	field
Se	field	0.34		sandy loam	6.9		rye grass	Lolium perenne L.		0.06	0.17647	Lakin. 1972	model	field
Se	field	1.5		muck	7.1		rye grass	Lolium perenne L.		0.24	0.16	Lakin. 1972	model	field
Se	field	0.16		silt clay loam	6.80		white mustard	Brassica hirta		0.5	3.125	Lakin. 1972	model	field
Se	field	0.18		loamy sand	5.9		white mustard	Brassica hirta		0.05	0.27778	Lakin. 1972	model	field
Se	field	0.24		sandy loam	6.5		white mustard	Brassica hirta		0.13	0.54167	Lakin. 1972	model	field
Se	field	0.30		loamy sand	5.8		white mustard	Brassica hirta		0.07	0.23333	Lakin. 1972	model	field
Se	field	0.34		sandy loam	6.9		white mustard	Brassica hirta		0.05	0.14706	Lakin. 1972	model	field
Se	field	1.5		muck	7.1		white mustard	Brassica hirta		0.33	0.22	Lakin. 1972	model	field
Se	field	0.197	unknown	loam	6.00	120, 3 cu	alfalfa	Medicago sativa	crop	0.033	0.16751	Levesque 1974	model	field
Se	field	0.209	unknown	clay	6.30	450, 10 c	alfalfa	Medicago sativa	crop	0.024	0.11483	Levesque 1974	model	field
Se	field	0.321	unknown	loam	6.80	450, 10 c	alfalfa	Medicago sativa	crop	0.034	0.10592	Levesque 1974	model	field
Se	field	0.395	unknown	clay	6.70	120, 3 cu	alfalfa	Medicago sativa	crop	0.053	0.13418	Levesque 1974	model	field
Se	field	0.425	unknown	loam	7.20	120, 3 cu	alfalfa	Medicago sativa	crop	0.082	0.19294	Levesque 1974	model	field
Se	field	0.45	unknown	loam	7.00	120, 3 cu	alfalfa	Medicago sativa	crop	0.072	0.16	Levesque 1974	model	field
Se	field	0.46	unknown	clay	5.20	120, 3 cu	alfalfa	Medicago sativa	crop	0.064	0.13913	Levesque 1974	model	field
Se	field	0.53	unknown	clay	4.50	120, 3 cu	alfalfa	Medicago sativa	crop	0.077	0.14528	Levesque 1974	model	field
Se	field	0.652	unknown	loam	7.10	120, 3 cu	alfalfa	Medicago sativa	crop	0.022	0.03374	Levesque 1974	model	field
Se	field	0.744	unknown	clay	6.30	120, 3 cu	alfalfa	Medicago sativa	crop	0.083	0.11156	Levesque 1974	model	field
Se	selenite, mostly	1.709	unknown	clay	6.30	450, 10 c	alfalfa	Medicago sativa	crop	1.398	0.81802	Levesque 1974	model	salt
Se	selenite, mostly	1.821	unknown	loam	6.80	450, 10 c	alfalfa	Medicago sativa	crop	1.104	0.60626	Levesque 1974	model	salt
Se	field-background	0.04		loamy sand	5.10	>30	bush bean	Phaseolis vulgaris	leaves,pods	0.147	3.675	Sajwan et al. 1995	model	field
Se	selenate	0.19		loamy sand	5.10	>30	bush bean	Phaseolis vulgaris	leaves,pods	43.7	230	Sajwan et al. 1995	model	salt
Se	selenate	0.22		loamy sand	5.10	>30	bush bean	Phaseolis vulgaris	leaves,pods	53.4	242.727	Sajwan et al. 1995	model	salt
Se	field	0.1	2	sand	5.3	.	dune grass	Ammophilia arenaria	clipping	0.045	0.45	Severson, et al. 1992.	model	field

Se	field	0.1	2	sand	5.3	.	willow	Salix repens	leaf	0.032	0.32	Severson, et al. 1992.	model	field
Se	field	1.3	15	range			33 species		above-ground	1.9	1.46154	Sharma and Shupe 197	model	field
Se	Na2SeO3*5H2O	2.55		sand		30	sunflower	Helianthus annuus	whole plant	7.3	2.86275	Singh & Singh. 1978	model	salt
Se	Na2SeO3*5H2O	5.05		sand		30	sunflower	Helianthus annuus	whole plant	12.5	2.47525	Singh & Singh. 1978	model	salt
Se	Na2SeO3*5H2O	10.05		sand		30	sunflower	Helianthus annuus	whole plant	20.4	2.02985	Singh & Singh. 1978	model	salt
Se	Na2SeO3*5H2O	2.55		sand		135	wheat	Triticum aestivum	whole plant	10.2	4	Singh & Singh. 1978	model	salt
Se	Na2SeO3*5H2O	2.55		sand		50	wheat	Triticum aestivum	whole plant	13.5	5.29412	Singh & Singh. 1978	model	salt
Se	Na2SeO3*5H2O	5.05		sand		135	wheat	Triticum aestivum	whole plant	24.5	4.85149	Singh & Singh. 1978	model	salt
Se	Na2SeO3*5H2O	5.05		sand		50	wheat	Triticum aestivum	whole plant	28.2	5.58416	Singh & Singh. 1978	model	salt
Se	Na2SeO3*5H2O	10.05		sand		135	wheat	Triticum aestivum	whole plant	36.8	3.66169	Singh & Singh. 1978	model	salt
Se	Na2SeO3*5H2O	10.05		sand		50	wheat	Triticum aestivum	whole plant	43.7	4.34826	Singh & Singh. 1978	model	salt
Se	field	17.37	15	Kesterson	7.44	240	barley	Hordeum murinum	clipping	6.76	0.38918	van Mantgem et al. 1996	model	field
Se	field	16.1	15	Kesterson	7.74	240	biennial thistle	Cirsium vulgare	clipping	3.19	0.19814	van Mantgem et al. 1996	model	field
Se	field	17.37	15	Kesterson	7.44	240	biennial thistle	Cirsium vulgare	clipping	8.37	0.48187	van Mantgem et al. 1996	model	field
Se	field	21.51	15	Kesterson	7.43	240	biennial thistle	Cirsium vulgare	clipping	32.62	1.5165	van Mantgem et al. 1996	model	field
Se	field	4.43	15	Kesterson	7.95	240	brome grass	Bromus hordeaceus	clipping	4.25	0.95937	van Mantgem et al. 1996	model	field
Se	field	9.84	15	Kesterson	7.82	240	brome grass	Bromus rubens	clipping	13.03	1.32419	van Mantgem et al. 1996	model	field
Se	field	15.9	15	Kesterson	7.44	240	brome grass	Bromus hordeaceus	clipping	16.33	1.02704	van Mantgem et al. 1996	model	field
Se	field	16.1	15	Kesterson	7.74	240	brome grass	Bromus hordeaceus	clipping	9.82	0.60994	van Mantgem et al. 1996	model	field
Se	field	16.1	15	Kesterson	7.74	240	brome grass	Bromus rubens	clipping	6.36	0.39503	van Mantgem et al. 1996	model	field
Se	field	16.83	15	Kesterson	7.46	240	brome grass	Bromus hordeaceus	clipping	12.05	0.71598	van Mantgem et al. 1996	model	field
Se	field	17.37	15	Kesterson	7.44	240	brome grass	Bromus hordeaceus	clipping	9.32	0.53656	van Mantgem et al. 1996	model	field
Se	field	17.37	15	Kesterson	7.44	240	brome grass	Bromus diadrus	clipping	4.18	0.24064	van Mantgem et al. 1996	model	field
Se	field	17.37	15	Kesterson	7.44	240	brome grass	Bromus rubens	clipping	7.09	0.40818	van Mantgem et al. 1996	model	field
Se	field	21.51	15	Kesterson	7.43	240	brome grass	Bromus hordeaceus	clipping	11.04	0.51325	van Mantgem et al. 1996	model	field
Se	field	21.51	15	Kesterson	7.43	240	brome grass	Bromus rubens	clipping	8.6	0.39981	van Mantgem et al. 1996	model	field
Se	field	31.28	15	Kesterson	7.06	240	brome grass	Bromus hordeaceus	clipping	20.54	0.65665	van Mantgem et al. 1996	model	field
Se	field	31.28	15	Kesterson	7.06	240	brome grass	Bromus rubens	clipping	9.52	0.30435	van Mantgem et al. 1996	model	field
Se	field	4.43	15	Kesterson	7.95	240	fescue	Vulpia microstachys	clipping	2.23	0.50339	van Mantgem et al. 1996	model	field
Se	field	4.81	15	Kesterson	7.67	240	fescue	Festuca arundinacea	clipping	6.89	1.43243	van Mantgem et al. 1996	model	field
Se	field	6.18	15	Kesterson	7.75	240	fescue	Festuca arundinacea	clipping	14.81	2.39644	van Mantgem et al. 1996	model	field
Se	field	9.84	15	Kesterson	7.82	240	fescue	Festuca arundinacea	clipping	8.48	0.86179	van Mantgem et al. 1996	model	field
Se	field	16.1	15	Kesterson	7.74	240	fescue	Vulpia microstachys	clipping	3.23	0.20062	van Mantgem et al. 1996	model	field
Se	field	17.37	15	Kesterson	7.44	240	fescue	Vulpia microstachys	clipping	6.98	0.40184	van Mantgem et al. 1996	model	field
Se	field	21.51	15	Kesterson	7.43	240	fescue	Vulpia microstachys	clipping	10.66	0.49558	van Mantgem et al. 1996	model	field
Se	field	4.43	15	Kesterson	7.95	240	herb	Brassica nigra	clipping	11.2	2.52822	van Mantgem et al. 1996	model	field
Se	field	9.84	15	Kesterson	7.82	240	herb	Conyza coulteri	clipping	7.72	0.78455	van Mantgem et al. 1996	model	field
Se	field	21.51	15	Kesterson	7.43	240	herb	Conyza coulteri	clipping	46.86	2.17852	van Mantgem et al. 1996	model	field
Se	field	21.51	15	Kesterson	7.43	240	herb	Sisymbrium irro	clipping	127.02	5.90516	van Mantgem et al. 1996	model	field
Se	field	16.83	15	Kesterson	7.46	240	heronsbill	Erodium moshatum	clipping	16.62	0.98752	van Mantgem et al. 1996	model	field
Se	field	9.84	15	Kesterson	7.82	240	lettuce	Latuca serriola	clipping	19.16	1.94715	van Mantgem et al. 1996	model	field
Se	field	6.18	15	Kesterson	7.75	240	lettuce	Latuca serriola	clipping	5.61	0.90777	van Mantgem et al. 1996	model	field
Se	field	15.9	15	Kesterson	7.44	240	lettuce	Latuca serriola	clipping	13.63	0.85723	van Mantgem et al. 1996	model	field
Se	field	16.83	15	Kesterson	7.46	240	lettuce	Latuca serriola	clipping	27.9	1.65775	van Mantgem et al. 1996	model	field
Se	field	17.37	15	Kesterson	7.44	240	lettuce	Latuca serriola	clipping	12.37	0.71215	van Mantgem et al. 1996	model	field
Se	field	4.43	15	Kesterson	7.95	240	orach	Atriplex patula	clipping	17.17	3.87585	van Mantgem et al. 1996	model	field
Se	field	6.18	15	Kesterson	7.75	240	orach	Atriplex patula	clipping	25.46	4.11974	van Mantgem et al. 1996	model	field
Se	field	15.9	15	Kesterson	7.44	240	orach	Atriplex patula	clipping	24.19	1.52138	van Mantgem et al. 1996	model	field
Se	field	16.83	15	Kesterson	7.46	240	orach	Atriplex patula	clipping	17.81	1.05823	van Mantgem et al. 1996	model	field

Se	field	21.51	15	Kesterson	7.43	240	orach	Atriplex patula	clipping	39.48	1.83543	van Mantgem et al. 1996	model	field
Se	field	9.84	15	Kesterson	7.82	240	perennial herb	Epilobium ciliatum	clipping	23.65	2.40346	van Mantgem et al. 1996	model	field
Se	field	15.9	15	Kesterson	7.44	240	perennial herb	Epilobium ciliatum	clipping	23.85	1.5	van Mantgem et al. 1996	model	field
Se	field	17.37	15	Kesterson	7.44	240	perennial herb	Epilobium ciliatum	clipping	12.43	0.7156	van Mantgem et al. 1996	model	field
Se	field	21.51	15	Kesterson	7.43	240	perennial herb	Epilobium ciliatum	clipping	5.5	0.2557	van Mantgem et al. 1996	model	field
Se	field	4.43	15	Kesterson	7.95	240	rabbitfoot gras	Polypogon monspelien	clipping	8.15	1.83973	van Mantgem et al. 1996	model	field
Se	field	4.81	15	Kesterson	7.67	240	rabbitfoot gras	Polypogon monspelien	clipping	10.75	2.23493	van Mantgem et al. 1996	model	field
Se	field	6.18	15	Kesterson	7.75	240	rabbitfoot gras	Polypogon monspelien	clipping	13.43	2.17314	van Mantgem et al. 1996	model	field
Se	field	9.84	15	Kesterson	7.82	240	rabbitfoot gras	Polypogon monspelien	clipping	19.65	1.99695	van Mantgem et al. 1996	model	field
Se	field	15.9	15	Kesterson	7.44	240	rabbitfoot gras	Polypogon monspelien	clipping	28.37	1.78428	van Mantgem et al. 1996	model	field
Se	field	16.1	15	Kesterson	7.74	240	rabbitfoot gras	Polypogon monspelien	clipping	15.44	0.95901	van Mantgem et al. 1996	model	field
Se	field	16.83	15	Kesterson	7.46	240	rabbitfoot gras	Polypogon monspelien	clipping	48.29	2.86928	van Mantgem et al. 1996	model	field
Se	field	17.37	15	Kesterson	7.44	240	rabbitfoot gras	Polypogon monspelien	clipping	13.87	0.7985	van Mantgem et al. 1996	model	field
Se	field	21.51	15	Kesterson	7.43	240	rabbitfoot gras	Polypogon monspelien	clipping	14.78	0.68712	van Mantgem et al. 1996	model	field
Se	field	31.28	15	Kesterson	7.06	240	rabbitfoot gras	Polypogon monspelien	clipping	29.31	0.93702	van Mantgem et al. 1996	model	field
Se	field	15.9	15	Kesterson	7.44	240	sand spurrey	Spergularia marina	clipping	37.82	2.37862	van Mantgem et al. 1996	model	field
Se	field	16.83	15	Kesterson	7.46	240	sand spurrey	Spergularia marina	clipping	31.29	1.85918	van Mantgem et al. 1996	model	field
Se	field	4.43	15	Kesterson	7.95	240	sour clover	Melilotus indica	clipping	7.51	1.69526	van Mantgem et al. 1996	model	field
Se	field	4.81	15	Kesterson	7.67	240	sour clover	Melilotus indica	clipping	8.84	1.83784	van Mantgem et al. 1996	model	field
Se	field	6.18	15	Kesterson	7.75	240	sour clover	Melilotus indica	clipping	17.74	2.87055	van Mantgem et al. 1996	model	field
Se	field	9.84	15	Kesterson	7.82	240	sour clover	Melilotus indica	clipping	30.13	3.06199	van Mantgem et al. 1996	model	field
Se	field	15.9	15	Kesterson	7.44	240	sour clover	Melilotus indica	clipping	58.15	3.65723	van Mantgem et al. 1996	model	field
Se	field	16.83	15	Kesterson	7.46	240	sour clover	Melilotus indica	clipping	50.69	3.01188	van Mantgem et al. 1996	model	field
Se	field	17.37	15	Kesterson	7.44	240	sour clover	Melilotus indica	clipping	77.64	4.46978	van Mantgem et al. 1996	model	field
Se	field	21.51	15	Kesterson	7.43	240	sour clover	Melilotus indica	clipping	25.01	1.16272	van Mantgem et al. 1996	model	field
Se	field	17.37	15	Kesterson	7.44	240	spiny-leaved s	Sonchus asper	clipping	11.36	0.654	van Mantgem et al. 1996	model	field
Se	field	4.43	15	Kesterson	7.95	240		Frankenia salina	clipping	8.43	1.90293	van Mantgem et al. 1996	model	field
Se	field	6.18	15	Kesterson	7.75	240		Frankenia salina	clipping	14.29	2.3123	van Mantgem et al. 1996	model	field
Se	field	9.84	15	Kesterson	7.82	240		Frankenia salina	clipping	22.27	2.26321	van Mantgem et al. 1996	model	field
Se	field	15.9	15	Kesterson	7.44	240		Frankenia salina	clipping	13.91	0.87484	van Mantgem et al. 1996	model	field
Se	field soil in pot	93	unknown	peat	5.4	105	red clover	Trifolium incarnatum		5.0	0.05376	Williams and Thorton, 1	model	field
Se	field soil in pot	230	unknown	peat	5.7	105	ryegrass	Lolium perenne L.		12.0	0.05217	Williams and Thorton, 1	model	field
Se	field soil in pot	93	unknown	peat	5.4	84	ryegrass	Lolium perenne L.		10.0	0.10753	Williams and Thorton, 1	model	field
Se	field soil in pot	93	unknown	peat	5.4	105	ryegrass	Lolium perenne L.		9.5	0.10215	Williams and Thorton, 1	model	field
Se	field	0.29	15 cm	Davis	7.50		alfalfa	Medicago sativa		0.52	1.7931	Wu et al. 1997	model	field
Se	field	7.79	15 cm	Davis	7.10	35	alfalfa	Medicago sativa	shoot	6.43	0.82542	Wu et al. 1997	model	field
Se	field	0.29	15 cm	Davis	7.50		rabbitfoot gras	Polypogon monspeliensis		0.23	0.7931	Wu et al. 1997	model	field
Se	field	7.79	15 cm	Davis	7.10	35	rabbitfoot gras	Polypogon monspelien	shoot	0.26	0.03338	Wu et al. 1997	model	field
Se	field	14.8	15 cm	Davis	7.50		rabbitfoot gras	Polypogon monspeliensis		10.68	0.72162	Wu et al. 1997	model	field
Se	field	0.29	15 cm	Davis	7.50		sour clover	Melilotus indica		0.94	3.24138	Wu et al. 1997	model	field
Se	field	0.39	15 cm	Davis	7.90		sour clover	Melilotus indica		6	15.3846	Wu et al. 1997	model	field
Se	field	7.79	15 cm	Davis	7.10	35	sour clover	Melilotus indica	shoot	22.02	2.8267	Wu et al. 1997	model	field
Se	field	14.8	15 cm	Davis	7.50		sour clover	Melilotus indica		117.35	7.92905	Wu et al. 1997	model	field
Se	field	0.29	15 cm	Davis	7.50		tall fescue	Festuca aurandinacea	aboveground	0.24	0.82759	Wu et al. 1997	model	field
Se	field	7.79	15 cm	Davis	7.10	35	tall fescue	Festuca aurandinacea	shoot	5.84	0.74968	Wu et al. 1997	model	field
Se	field	14.8	15 cm	Davis	7.50		tall fescue	Festuca aurandinacea		15.53	1.04932	Wu et al. 1997	model	field
Se	field	19.2			6.4		annual ragwee	Ambrosia artemisiifolia	stem/leaf	10	0.52083	PTI 1995	validation	field
Se	field	19.2			6.4		giant ragweed	Abrosia trifida	stem/leaf	10	0.52083	PTI 1995	validation	field

Zn	ZnSO4	1250		sandy loam	7.8	45	barley	Hordeum vulgare	shoot	500	0.4	Aery and Jagetiya 1997	model	salt
Zn	ZnSO4	1250		sandy loam	7.8	45	barley	Hordeum vulgare	shoot	1900	1.52	Aery and Jagetiya 1997	model	salt
Zn	field	74	15.00	clay loam	6.3	.	common reed	Phragmites australis	leaves	5.4	0.07297	Beyer, et al. 1990.	model	field
Zn	field	83	15.00	sandy loam	6.3	.	common reed	Phragmites australis	leaves	10	0.12048	Beyer, et al. 1990.	model	field
Zn	field	120	15.00	sandy loam	5.2	.	common reed	Phragmites australis	leaves	9.4	0.07833	Beyer, et al. 1990.	model	field
Zn	field	200	15.00	sandy clay lo	3.6	.	common reed	Phragmites australis	leaves	21	0.105	Beyer, et al. 1990.	model	field
Zn	field	240	15.00	sandy loam	6.3	.	common reed	Phragmites australis	leaves	11	0.04583	Beyer, et al. 1990.	model	field
Zn	field-background	83	20.00	silty clay loa	4.1		red clover	Trifolium pratense	leaf	104	1.25301	Carter 1983	model	field
Zn	field-background	27		silt loam	5.4	21	barley	Hordeum vulgare	leaf	18.2	0.67407	Chlopecka and Adriano	model	field
Zn	fresh-fluedust	177		silt loam	5.4	21	barley	Hordeum vulgare	leaf	1595	9.0113	Chlopecka and Adriano	model	field
Zn	fresh-fluedust	327		silt loam	5.4	21	barley	Hordeum vulgare	leaf	2547	7.78899	Chlopecka and Adriano	model	field
Zn	fresh-fluedust	627		silt loam	5.4	21	barley	Hordeum vulgare	leaf	3511	5.59968	Chlopecka and Adriano	model	field
Zn	fresh-fluedust	1227		silt loam	5.4	21	barley	Hordeum vulgare	leaf	4381	3.5705	Chlopecka and Adriano	model	field
Zn	fresh-fluedust	2427		silt loam	5.4	21	barley	Hordeum vulgare	leaf	2631	1.08405	Chlopecka and Adriano	model	field
Zn	field-background	27		silt loam	5.4	21	maize	Zea mays	leaf	32.8	1.21481	Chlopecka and Adriano	model	field
Zn	fresh-fluedust	177		silt loam	5.4	21	maize	Zea mays	leaf	1330	7.51412	Chlopecka and Adriano	model	field
Zn	fresh-fluedust	327		silt loam	5.4	21	maize	Zea mays	leaf	2330	7.12538	Chlopecka and Adriano	model	field
Zn	fresh-fluedust	627		silt loam	5.4	21	maize	Zea mays	leaf	3110	4.96013	Chlopecka and Adriano	model	field
Zn	fresh-fluedust	1227		silt loam	5.4	21	maize	Zea mays	leaf	2420	1.97229	Chlopecka and Adriano	model	field
Zn	fresh-fluedust	2427		silt loam	5.4	21	maize	Zea mays	leaf	1550	0.63865	Chlopecka and Adriano	model	field
Zn	field-background	27		silt loam	5.4	21	radish	Hordeum vulgare	leaf	76	2.81481	Chlopecka and Adriano	model	field
Zn	field	547	10.00				radish	Raphanus sativus	leaf	209	0.38208	Davies 1992	model	field
Zn	field	43	15		4.7		cabbage	Brassica oleracea	leaf	56	1.30233	de Pieri et al. 1996	model	field
Zn	field	72	15		5.7		cabbage	Brassica oleracea	leaf	26	0.36111	de Pieri et al. 1996	model	field
Zn	field	79	15		5		cabbage	Brassica oleracea	leaf	63	0.79747	de Pieri et al. 1996	model	field
Zn	field	84	15		5.4		cabbage	Brassica oleracea	leaf	28	0.33333	de Pieri et al. 1996	model	field
Zn	field	91	15		6		cabbage	Brassica oleracea	leaf	23	0.25275	de Pieri et al. 1996	model	field
Zn	field	57	15		5.1		carrot	Daucus carrota	leaf	40	0.70175	de Pieri et al. 1996	model	field
Zn	field	82	15		5.5		carrot	Daucus carrota	leaf	42	0.5122	de Pieri et al. 1996	model	field
Zn	field	85	15		6.1		carrot	Daucus carrota	leaf	34	0.4	de Pieri et al. 1996	model	field
Zn	field	94	15		5.3		carrot	Daucus carrota	leaf	36	0.38298	de Pieri et al. 1996	model	field
Zn	field	70	15		5.5		cauliflower	Brassica oleracea	leaf	46	0.65714	de Pieri et al. 1996	model	field
Zn	field	71	15		7.2		cauliflower	Brassica oleracea	leaf	26	0.3662	de Pieri et al. 1996	model	field
Zn	field	41	15		4.4		corn	Zea mays	leaf,stalk	34	0.82927	de Pieri et al. 1996	model	field
Zn	field	45	15		4.8		corn	Zea mays	leaf,stalk	38.5	0.85556	de Pieri et al. 1996	model	field
Zn	field	96	15		6.2		corn	Zea mays	leaf,stalk	15	0.15625	de Pieri et al. 1996	model	field
Zn	field	106	15		6.2		corn	Zea mays	leaf,stalk	22.5	0.21226	de Pieri et al. 1996	model	field
Zn	field	64	15		4.4		lettuce	Latuca sativa	leaf	72	1.125	de Pieri et al. 1996	model	field
Zn	field	98	15		5		lettuce	Latuca sativa	leaf	76	0.77551	de Pieri et al. 1996	model	field
Zn	field	75	15		5.1		turnip	Brassica rappa	leaf	66	0.88	de Pieri et al. 1996	model	field
Zn	field	107	15		6.7		turnip	Brassica rappa	leaf	32	0.29907	de Pieri et al. 1996	model	field
Zn	ZnSO4	110			7.3	112	legume	Anthyllis	shoot	500	4.54545	Diaz et al. 1996	model	salt
Zn	ZnSO4	110			7.3	112	unknown	Lygeum spartum	shoot	1300	11.8182	Diaz et al. 1996	model	salt
Zn	ZnSO4	1010			7.3	112	unknown	Lygeum spartum	shoot	1700	1.68317	Diaz et al. 1996	model	salt
Zn	ZnSO4	1010			7.3	112	unknown	Lygeum spartum	shoot	800	0.79208	Diaz et al. 1996	model	salt
Zn	field-background	24.7	20	sandy	7	95	barley	Hordeum vulgare	straw	25	1.01215	Dudka et al. 1996	model	field
Zn	field-flue-dust-ad	465	20	sandy	7.2	95	barley	Hordeum vulgare	straw	33	0.07097	Dudka et al. 1996	model	field
Zn	field-flue-dust-ad	1030	20	sandy	6.9	95	barley	Hordeum vulgare	straw	53	0.05146	Dudka et al. 1996	model	field

Zn	field-flue-dust-ad	5900	20	sandy	7.4	95	barley	Hordeum vulgare	straw	66	0.01119	Dudka et al. 1996	model	field
Zn	field-flue-dust-ad	11375	20	sandy	7.4	95	barley	Hordeum vulgare	straw	99	0.0087	Dudka et al. 1996	model	field
Zn	field-background	24.7	20	sandy	7		clover	Trifolium pratense	cutting	31	1.25506	Dudka et al. 1996	model	field
Zn	field-flue-dust-ad	465	20	sandy	7.2		clover	Trifolium pratense	cutting	54	0.11613	Dudka et al. 1996	model	field
Zn	field-flue-dust-ad	1030	20	sandy	6.9		clover	Trifolium pratense	cutting	93	0.09029	Dudka et al. 1996	model	field
Zn	field-flue-dust-ad	5900	20	sandy	7.4		clover	Trifolium pratense	cutting	105	0.0178	Dudka et al. 1996	model	field
Zn	field-flue-dust-ad	11375	20	sandy	7.4		clover	Trifolium pratense	cutting	113	0.00993	Dudka et al. 1996	model	field
Zn	field-background	24.7	20	sandy	7		grass	Poa pratensis	cutting	26	1.05263	Dudka et al. 1996	model	field
Zn	field-flue-dust-ad	465	20	sandy	7.2		grass	Poa pratensis	cutting	55	0.11828	Dudka et al. 1996	model	field
Zn	field-flue-dust-ad	1030	20	sandy	6.9		grass	Poa pratensis	cutting	108	0.10485	Dudka et al. 1996	model	field
Zn	field-flue-dust-ad	5900	20	sandy	7.4		grass	Poa pratensis	cutting	141	0.0239	Dudka et al. 1996	model	field
Zn	field-flue-dust-ad	11375	20	sandy	7.4		grass	Poa pratensis	cutting	159	0.01398	Dudka et al. 1996	model	field
Zn	field	3100			7.7	63	barley	Hordeum vulgare	shoot	630	0.20323	Ebbs and Kochian 1998	model	field
Zn	field	3100			7.7	63	Indian mustard	Brassica juncea	shoot	250	0.08065	Ebbs and Kochian 1998	model	field
Zn	field	3100			7.7	63	oat	Avena sativa	shoot	160	0.05161	Ebbs and Kochian 1998	model	field
Zn	field	11700		loam	7.3	42	grass	Festuca rubra	shoot	100	0.00855	Ebbs et al. 1997	model	field
Zn	field	11700		loam	7.3	42	grass	Agrostis capillaris	shoot	200	0.01709	Ebbs et al. 1997	model	field
Zn	ZnSO4	50		silty clay loam		42	white clover	Trifolium repens	shoot	72	1.44	Gildon and Tinker, 1983	model	salt
Zn	ZnSO4	250		silty clay loam		42	white clover	Trifolium repens	shoot	220	0.88	Gildon and Tinker, 1983	model	salt
Zn	ZnSO4	1000		silty clay loam		42	white clover	Trifolium repens	shoot	1019	1.019	Gildon and Tinker, 1983	model	salt
Zn	field-background	36.84				unknown	grass	Poa spp.		36.98	1.0038	Hall et al. 1990	model	field
Zn	field-background	36.84				unknown	grass	Bromus japonicus		35.43	0.96173	Hall et al. 1990	model	field
Zn	field soil in pot	284	collected,1!	silt loam	5.0	42	soybean	Glycine max	leaf	373	1.31338	Heggo, et al. 1990.	model	field
Zn	field soil in pot	591	collected,1!	silt loam	7.5	42	soybean	Glycine max	leaf	186	0.31472	Heggo, et al. 1990.	model	field
Zn	field soil in pot	647	collected,1!	silt loam	5.5	42	soybean	Glycine max	leaf	937	1.44822	Heggo, et al. 1990.	model	field
Zn	field soil in pot	801	collected,1!	silt loam	6.1	42	soybean	Glycine max	leaf	242	0.30212	Heggo, et al. 1990.	model	field
Zn	field soil in pot	1670	collected,1!	silt loam	6.8	42	soybean	Glycine max	leaf	251	0.1503	Heggo, et al. 1990.	model	field
Zn	field soil in pot	2720	collected,1!	silt loam	6.4	42	soybean	Glycine max	leaf	1020	0.375	Heggo, et al. 1990.	model	field
Zn	field soil in pot	3110	collected,1!	silt loam	6.7	42	soybean	Glycine max	leaf	567	0.18232	Heggo, et al. 1990.	model	field
Zn	field	50	avg 5,10		3.3		low sweet blue	Vaccinium angustifoliu	leaf	40	0.8	Hutchinson and Whitby	model	field
Zn	field	62	avg 5,10		3.4		low sweet blue	Vaccinium angustifoliu	leaf	27	0.43548	Hutchinson and Whitby	model	field
Zn	field	72	avg 5,10		3		low sweet blue	Vaccinium angustifoliu	leaf	19	0.26389	Hutchinson and Whitby	model	field
Zn	field	72	avg 5,10		3.3		low sweet blue	Vaccinium angustifoliu	leaf	24	0.33333	Hutchinson and Whitby	model	field
Zn	field	85	avg 5,10		3		low sweet blue	Vaccinium angustifoliu	leaf	17	0.2	Hutchinson and Whitby	model	field
Zn	field	92	avg 5,10		4.1		low sweet blue	Vaccinium angustifoliu	leaf	38	0.41304	Hutchinson and Whitby	model	field
Zn	field	62	avg 5,10		3.4		red maple	Acer rubrum	leaf	43	0.69355	Hutchinson and Whitby	model	field
Zn	field	72	avg 5,10		3		red maple	Acer rubrum	leaf	35	0.48611	Hutchinson and Whitby	model	field
Zn	field	72	avg 5,10		3.3		red maple	Acer rubrum	leaf	48	0.66667	Hutchinson and Whitby	model	field
Zn	field	85	avg 5,10		3		red maple	Acer rubrum	leaf	19	0.22353	Hutchinson and Whitby	model	field
Zn	field	92	avg 5,10		4.1		red maple	Acer rubrum	leaf	54	0.58696	Hutchinson and Whitby	model	field
Zn	field	50	avg 5,10		3.3		wavy hair-gras	Deschampsia flexuosa	leaf	32	0.64	Hutchinson and Whitby	model	field
Zn	field	62	avg 5,10		3.4		wavy hair-gras	Deschampsia flexuosa	leaf	36	0.58065	Hutchinson and Whitby	model	field
Zn	field	72	avg 5,10		3		wavy hair-gras	Deschampsia flexuosa	leaf	28	0.38889	Hutchinson and Whitby	model	field
Zn	field	72	avg 5,10		3.3		wavy hair-gras	Deschampsia flexuosa	leaf	32	0.44444	Hutchinson and Whitby	model	field
Zn	field	85	avg 5,10		3		wavy hair-gras	Deschampsia flexuosa	leaf	35	0.41176	Hutchinson and Whitby	model	field
Zn	field	92	avg 5,10		4.1		wavy hair-gras	Deschampsia flexuosa	leaf	30	0.32609	Hutchinson and Whitby	model	field
Zn	field-oldsludge	240		sandy loam	6.8	21	radish	Raphanus sativus	leaf	90	0.375	Lorenz et al. 1997	model	field
Zn	field-sludge	247		sandy loam	6.1	21	radish	Raphanus sativus	leaf	213	0.86235	Lorenz et al. 1997	model	field
Zn	field	283		sandy loam	5.8	21	radish	Raphanus sativus	leaf	84	0.29682	Lorenz et al. 1997	model	field

Zn	field-sludge	320		sandy loam	6.3	21	radish	Raphanus sativus	leaf	194	0.60625	Lorenz et al. 1997	model	field
Zn	field-sludge	340		sandy loam	7.6	21	radish	Raphanus sativus	leaf	53	0.15588	Lorenz et al. 1997	model	field
Zn	field	370		sandy loam	7.1	21	radish	Raphanus sativus	leaf	41	0.11081	Lorenz et al. 1997	model	field
Zn	field-background	397		sandy loam	6.4	21	radish	Raphanus sativus	leaf	57	0.14358	Lorenz et al. 1997	model	field
Zn	field	1317		sandy loam	7.8	21	radish	Raphanus sativus	leaf	340	0.25816	Lorenz et al. 1997	model	field
Zn	field	2000		sandy loam	6.7	21	radish	Raphanus sativus	leaf	351	0.1755	Lorenz et al. 1997	model	field
Zn	field	5433		sandy loam	7.7	21	radish	Raphanus sativus	leaf	446	0.08209	Lorenz et al. 1997	model	field
Zn	field-background	99		sand	4.80	84	black-eyed Su	Rudbeckia hirta	shoot	866.67	8.75424	Miles and Parker, 1979.	model	field
Zn	field-background	442.5		sand	7.82	84	black-eyed Su	Rudbeckia hirta	shoot	212	0.4791	Miles and Parker, 1979.	model	field
Zn	field-background	99		sand	4.80	84	little bluestem	Andropogon scoparius	shoot	165.63	1.67303	Miles and Parker, 1979.	model	field
Zn	field-background	442.5		sand	7.82	84	little bluestem	Andropogon scoparius	shoot	102.75	0.2322	Miles and Parker, 1979.	model	field
Zn	field	28	unknown		6.0	.	spruce	Picea abies	needles	118.9	4.24643	Nilsson, 1972.	model	field
Zn	field	41	unknown		3.8	.	spruce	Picea abies	needles	47.1	1.14878	Nilsson, 1972.	model	field
Zn	field	15.8	14.00	sand			black oak	Quercus velutina	above ground	30.5	1.93038	Parker et al. 1978	model	field
Zn	field	1023	14.00	sand	6.8		black oak	Quercus velutina	above ground	63	0.06158	Parker et al. 1978	model	field
Zn	field	15.8	14.00	sand			gromwell	Lithospermum canesc	above ground	26.5	1.67722	Parker et al. 1978	model	field
Zn	field	1023	14.00	sand	6.8		gromwell	Lithospermum canesc	above ground	105.9	0.10352	Parker et al. 1978	model	field
Zn	field	15.8	14.00	sand			quaking aspen	Populus tremuloides	leaf	174.5	11.0443	Parker et al. 1978	model	field
Zn	field	1023	14.00	sand	6.8		quaking aspen	Populus tremuloides	leaf	916	0.89541	Parker et al. 1978	model	field
Zn	field	15.8	14.00	sand			Solomon's sea	Smilacina stellata	above ground	38.5	2.43671	Parker et al. 1978	model	field
Zn	field	1023	14.00	sand	6.8		Solomon's sea	Smilacina stellata	above ground	67.7	0.06618	Parker et al. 1978	model	field
Zn	field-mine-waste	1908.9				unknown	forbes			232	0.12154	Pascoe et al. 1994	model	field
Zn	field-mine-waste	1908.9				unknown	grasses			153.7	0.08052	Pascoe et al. 1994	model	field
Zn	field	133	unknown	peat, pumice	7.3	6, 10 wee	unknown	Thalaspi goesingense	above ground	177	1.33083	Reeves & Baker 1984	model	field
Zn	field	133	unknown	peat, pumice	7.3	6, 10 wee	unknown	Thalaspi goesingense	above ground	147	1.10526	Reeves & Baker 1984	model	field
Zn	field	254	unknown	Dun Mounta	6.7	6, 10 wee	unknown	Thalaspi goesingense	above ground	244	0.96063	Reeves & Baker 1984	model	field
Zn	field	254	unknown	Dun Mounta	6.7	6, 10 wee	unknown	Thalaspi goesingense	above ground	334	1.31496	Reeves & Baker 1984	model	field
Zn	field	416	unknown	New Caledo	6.8	6, 10 wee	unknown	Thalaspi goesingense	above ground	198	0.47596	Reeves & Baker 1984	model	field
Zn	field	416	unknown	New Caledo	6.8	6, 10 wee	unknown	Thalaspi goesingense	above ground	300	0.72115	Reeves & Baker 1984	model	field
Zn	field	1520	unknown	Dun Mounta	6.7	6, 10 wee	unknown	Thalaspi goesingense	above ground	5300	3.48684	Reeves & Baker 1984	model	field
Zn	field	1520	unknown	Dun Mounta	6.7	6, 10 wee	unknown	Thalaspi goesingense	above ground	11200	7.36842	Reeves & Baker 1984	model	field
Zn	field	10800	unknown	peat, pumice	7.3	6, 10 wee	unknown	Thalaspi goesingense	above ground	3290	0.30463	Reeves & Baker 1984	model	field
Zn	field	10800	unknown	peat, pumice	7.3	6, 10 wee	unknown	Thalaspi goesingense	above ground	2030	0.18796	Reeves & Baker 1984	model	field
Zn	field-pot	76	5	clayey sand	4.7	42	cress	Lepidium sativum	cutting	256	3.36842	Schafer et al. 1998	model	field
Zn	field-pot	152	5	clay	7.2	42	cress	Lepidium sativum	cutting	178	1.17105	Schafer et al. 1998	model	field
Zn	field-pot	1700	5	clayey sand	7.2	42	cress	Lepidium sativum	cutting	872	0.51294	Schafer et al. 1998	model	field
Zn	field-pot	1850	5	clayey sand	7.2	42	cress	Lepidium sativum	cutting	857	0.46324	Schafer et al. 1998	model	field
Zn	field-pot	76	5	clayey sand	4.7	42	phacelia	Phacelia tanacetifolia	cutting	111	1.46053	Schafer et al. 1998	model	field
Zn	field-pot	152	5	clay	7.2	42	phacelia	Phacelia tanacetifolia	cutting	53	0.34868	Schafer et al. 1998	model	field
Zn	field-pot	1700	5	clayey sand	7.2	42	phacelia	Phacelia tanacetifolia	cutting	191	0.11235	Schafer et al. 1998	model	field
Zn	field-pot	1850	5	clayey sand	7.2	42	phacelia	Phacelia tanacetifolia	cutting	176	0.09514	Schafer et al. 1998	model	field
Zn	field-pot	76	5	clayey sand	4.7	42	spinach	Spinacia oleracea	cutting	475	6.25	Schafer et al. 1998	model	field
Zn	field-pot	152	5	clay	7.2	42	spinach	Spinacia oleracea	cutting	305	2.00658	Schafer et al. 1998	model	field
Zn	field-pot	1700	5	clayey sand	7.2	42	spinach	Spinacia oleracea	cutting	742	0.43647	Schafer et al. 1998	model	field
Zn	field-pot	1850	5	clayey sand	7.2	42	spinach	Spinacia oleracea	cutting	717	0.38757	Schafer et al. 1998	model	field
Zn	field-pot	76	5	clayey sand	4.7	42	stinging nettle	Urtica dioica	cutting	62	0.81579	Schafer et al. 1998	model	field
Zn	field-pot	152	5	clay	7.2	42	stinging nettle	Urtica dioica	cutting	29	0.19079	Schafer et al. 1998	model	field
Zn	field-pot	1850	5	clayey sand	7.2	42	stinging nettle	Urtica dioica	cutting	56	0.03027	Schafer et al. 1998	model	field
Zn	field-background	7	2.00	sand	5.3	.	dune grass	Ammophilia arenaria	clipping	18	2.57143	Severson, et al. 1992.	model	field

Zn	field-background	7	2.00	sand	5.3	.	willow	Salix repens	leaf	240	34.2857	Severson, et al. 1992.	model	field
Zn	field	55.3	15	range			33 species		above-ground	20.2	0.36528	Sharma and Shupe 197	model	field
Zn	field	80.8	15	range			33 species		above-ground	50.3	0.62252	Sharma and Shupe 197	model	field
Zn	field	88.3	15	range			33 species		above-ground	53.6	0.60702	Sharma and Shupe 197	model	field
Zn	field	93	15	range			33 species		above-ground	109.4	1.17634	Sharma and Shupe 197	model	field
Zn	field	94.6	15	range			33 species		above-ground	36.4	0.38478	Sharma and Shupe 197	model	field
Zn	field	95.3	15	range			33 species		above-ground	34.8	0.36516	Sharma and Shupe 197	model	field
Zn	field	95.9	15	range			33 species		above-ground	56.4	0.58811	Sharma and Shupe 197	model	field
Zn	field	97.1	15	range			33 species		above-ground	51	0.52523	Sharma and Shupe 197	model	field
Zn	field	103	15	range			33 species		above-ground	59.6	0.57864	Sharma and Shupe 197	model	field
Zn	field	120	15	range			33 species		above-ground	52.5	0.4375	Sharma and Shupe 197	model	field
Zn	field	126	15	range			33 species		above-ground	49.5	0.39286	Sharma and Shupe 197	model	field
Zn	field	128	15	range			33 species		above-ground	40.2	0.31406	Sharma and Shupe 197	model	field
Zn	field	149	15	range			33 species		above-ground	48.5	0.3255	Sharma and Shupe 197	model	field
Zn	field	150	15	range			33 species		above-ground	63.8	0.42533	Sharma and Shupe 197	model	field
Zn	field	155	15	range			33 species		above-ground	89.7	0.57871	Sharma and Shupe 197	model	field
Zn	field	195	15	range			33 species		above-ground	77.4	0.39692	Sharma and Shupe 197	model	field
Zn	field	195	15	range			33 species		above-ground	52.9	0.27128	Sharma and Shupe 197	model	field
Zn	field	397	15	range			33 species		above-ground	141.4	0.35617	Sharma and Shupe 197	model	field
Zn	field soil in pot	73.2	15.00	loam	5.7	90	cabbage	Brassica oleracea	shoot	18	0.2459	Xian. 1989	model	field
Zn	field soil in pot	148.1	15.00	sandy loam	6.4	90	cabbage	Brassica oleracea	shoot	18	0.12154	Xian. 1989	model	field
Zn	field soil in pot	236.4	15.00	sandy loam	6.6	90	cabbage	Brassica oleracea	shoot	31	0.13113	Xian. 1989	model	field
Zn	field soil in pot	335	15.00	sandy loam	5.7	90	cabbage	Brassica oleracea	shoot	171	0.51045	Xian. 1989	model	field
Zn	field soil in pot	385.7	15.00	loam	7.0	90	cabbage	Brassica oleracea	shoot	26	0.06741	Xian. 1989	model	field
Zn	field soil in pot	444.5	15.00	loam	5.2	90	cabbage	Brassica oleracea	shoot	148	0.33296	Xian. 1989	model	field
Zn	field soil in pot	498.3	15.00	loam	4.3	90	cabbage	Brassica oleracea	shoot	424	0.85089	Xian. 1989	model	field
Zn	field soil in pot	831.7	15.00	loam	5.5	90	cabbage	Brassica oleracea	shoot	446	0.53625	Xian. 1989	model	field
Zn	field	53			6.5		kentucky_bluegrass		above-ground	40.5	0.76415	PTI 1994	validation	field
Zn	field	69.3			6.4		kentucky_bluegrass		above-ground	43.9	0.63348	PTI 1994	validation	field
Zn	field	45.9			8.3		redtop	Agrostis stolonifera	above-ground	18.6	0.40523	PTI 1994	validation	field
Zn	field	90.4			7.8		redtop	Agrostis stolonifera	above-ground	14	0.15487	PTI 1994	validation	field
Zn	field	159			7.5		redtop	Agrostis stolonifera	above-ground	47.5	0.29874	PTI 1994	validation	field
Zn	field	372			6.8		redtop	Agrostis stolonifera	above-ground	39	0.10484	PTI 1994	validation	field
Zn	field	441			6.9		redtop	Agrostis stolonifera	above-ground	85	0.19274	PTI 1994	validation	field
Zn	field	631			7		redtop	Agrostis stolonifera	above-ground	67	0.10618	PTI 1994	validation	field
Zn	field	696			7		redtop	Agrostis stolonifera	above-ground	138	0.19828	PTI 1994	validation	field
Zn	field	836			4.9		redtop	Agrostis stolonifera	above-ground	160	0.19139	PTI 1994	validation	field
Zn	field	852			6.2		redtop	Agrostis stolonifera	above-ground	183	0.21479	PTI 1994	validation	field
Zn	field	867			5.9		redtop	Agrostis stolonifera	above-ground	232	0.26759	PTI 1994	validation	field
Zn	field	1040			5.4		redtop	Agrostis stolonifera	above-ground	406	0.39038	PTI 1994	validation	field
Zn	field	1190			7.8		redtop	Agrostis stolonifera	above-ground	92.5	0.07773	PTI 1994	validation	field
Zn	field	1260			6		redtop	Agrostis stolonifera	above-ground	161	0.12778	PTI 1994	validation	field
Zn	field	1480			6.7		redtop	Agrostis stolonifera	above-ground	427	0.28851	PTI 1994	validation	field
Zn	field	2270			7.2		redtop	Agrostis stolonifera	above-ground	102	0.04493	PTI 1994	validation	field
Zn	field	2430			6.7		redtop	Agrostis stolonifera	above-ground	155	0.06379	PTI 1994	validation	field
Zn	field	1750			4.8		redtop/tufted_	2 spp.	above-ground	311	0.17771	PTI 1994	validation	field
Zn	field	74.7			6.5		slender_wheat	Agropyron trachycaulu	above-ground	28	0.37483	PTI 1994	validation	field
Zn	field	96			5.9		slender_wheat	Agropyron trachycaulu	above-ground	32.2	0.33542	PTI 1994	validation	field

Zn	field	1020			3.7		tufted_hairgras	Aira or Deschampsia	above-ground	330	0.32353	PTI 1994	validation	field
Zn	field	1440			6.2		tufted_hairgras	Aira or Deschampsia	above-ground	257	0.17847	PTI 1994	validation	field
Zn	field	1940			5.8		tufted_hairgras	Aira or Deschampsia	above-ground	999	0.51495	PTI 1994	validation	field
Zn	field	2260			4.9		tufted_hairgras	Aira or Deschampsia	above-ground	849	0.37566	PTI 1994	validation	field
Zn	field	2320			5.3		tufted_hairgras	Aira or Deschampsia	above-ground	527	0.22716	PTI 1994	validation	field
Zn	field	2700			4.4		tufted_hairgras	Aira or Deschampsia	above-ground	555	0.20556	PTI 1994	validation	field
Zn	field	3260			6.5		tufted_hairgras	Aira or Deschampsia	above-ground	157	0.04816	PTI 1994	validation	field
Zn	field	3210			7.1		annual ragwee	Ambrosia artemisiifolia	stem/leaf	473	0.14735	PTI 1995	validation	field
Zn	field	1530			6.6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	2840	1.85621	PTI 1995	validation	field
Zn	field	2135			6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	1610	0.7541	PTI 1995	validation	field
Zn	field	199			6.8		annual ragwee	Ambrosia artemisiifolia	stem/leaf	52	0.26131	PTI 1995	validation	field
Zn	field	7170			6.4		annual ragwee	Ambrosia artemisiifolia	stem/leaf	827	0.11534	PTI 1995	validation	field
Zn	field	1530			6.6		Beggar's ticks	Bidens polylepsis	stem/leaf	2730	1.78431	PTI 1995	validation	field
Zn	field	2135			6		Beggar's ticks	Bidens polylepsis	stem/leaf	1380	0.64637	PTI 1995	validation	field
Zn	field	7170			6.4		beggar's ticks	Bidens polylepis	stem/leaf	1040	0.14505	PTI 1995	validation	field
Zn	field	7170			6.4		beggar's ticks	Bidens polylepis	stem/leaf	1140	0.159	PTI 1995	validation	field
Zn	field	2270			6		beggar's ticks	Bidens polylepis	stem/leaf	1120	0.49339	PTI 1995	validation	field
Zn	field	3750			6.1		Bermuda grass	Cynodon dactylon	stem/leaf	746	0.19893	PTI 1995	validation	field
Zn	field	183			7		big bluestem	Andropogon gerardi	stem/leaf	35	0.19126	PTI 1995	validation	field
Zn	field	416			6.5		big bluestem	Andropogon gerardi	stem/leaf	70	0.16827	PTI 1995	validation	field
Zn	field	2270			6		big bluestem	Andropogon gerardi	stem/leaf	104	0.04581	PTI 1995	validation	field
Zn	field	7170			6.4		giant ragweed	Abrosia trifida	stem/leaf	833	0.11618	PTI 1995	validation	field
Zn	field	2270			6		giant ragweed	Ambrosia trifida	stem/leaf	1800	0.79295	PTI 1995	validation	field
Zn	field	3210			7.1		Indian grass	Sorghastrum nutans	stem/leaf	321	0.1	PTI 1995	validation	field
Zn	field	3750			6.1		Indian grass	Sorghastrum nutans	stem/leaf	228	0.0608	PTI 1995	validation	field
Zn	field	1530			6.6		Indian grass	Sorghastrum nutans	stem/leaf	449	0.29346	PTI 1995	validation	field
Zn	field	183			7		Indian grass	Sorghastrum nutans	stem/leaf	67	0.36612	PTI 1995	validation	field
Zn	field	416			6.5		Indian grass	Sorghastrum nutans	stem/leaf	75	0.18029	PTI 1995	validation	field
Zn	field	199			6.8		Indian grass	Sorghastrum nutans	stem/leaf	22	0.11055	PTI 1995	validation	field
Zn	field	3210			7.1		switchgrass	Panicum virgatum	stem/leaf	285	0.08879	PTI 1995	validation	field
Zn	field	3750			6.1		switchgrass	Panicum virgatum	stem/leaf	247	0.06587	PTI 1995	validation	field
Zn	field	2135			6		switchgrass	Panicum virgatum	stem/leaf	708	0.33162	PTI 1995	validation	field
Zn	field	183			7		switchgrass	Panicum virgatum	stem/leaf	24	0.13115	PTI 1995	validation	field
Zn	field	416			6.5		switchgrass	Panicum virgatum	stem/leaf	346	0.83173	PTI 1995	validation	field
Zn	field	199			6.8		switchgrass	Panicum virgatum	stem/leaf	15	0.07538	PTI 1995	validation	field
Al	field	16400			7.1		annual ragwee	Ambrosia artemisiifolia	stem/leaf	51	0.00311	PTI 1995	validation	field
Al	field	12200			6.6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	44	0.00361	PTI 1995	validation	field
Al	field	14550			6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	29	0.00199	PTI 1995	validation	field
Al	field	21050			6.8		annual ragwee	Ambrosia artemisiifolia	stem/leaf	77	0.00366	PTI 1995	validation	field
Al	field	16100			6.4		annual ragwee	Ambrosia artemisiifolia	stem/leaf	64	0.00398	PTI 1995	validation	field
Al	field	12200			6.6		Beggar's ticks	Bidens polylepsis	stem/leaf	61	0.005	PTI 1995	validation	field
Al	field	14550			6		Beggar's ticks	Bidens polylepsis	stem/leaf	58	0.00399	PTI 1995	validation	field
Al	field	16100			6.4		beggar's ticks	Bidens polylepis	stem/leaf	60	0.00373	PTI 1995	validation	field
Al	field	16100			6.4		beggar's ticks	Bidens polylepis	stem/leaf	54	0.00335	PTI 1995	validation	field
Al	field	13600			6		beggar's ticks	Bidens polylepis	stem/leaf	38	0.00279	PTI 1995	validation	field
Al	field	14700			6.1		Bermuda grass	Cynodon dactylon	stem/leaf	43	0.00293	PTI 1995	validation	field
Al	field	13750			7		big bluestem	Andropogon gerardi	stem/leaf	15	0.00109	PTI 1995	validation	field
Al	field	16500			6.5		big bluestem	Andropogon gerardi	stem/leaf	11	0.00067	PTI 1995	validation	field

Al	field	13600			6		big bluestem	Andropogon gerardi	stem/leaf	18	0.00132	PTI 1995	validation	field
Al	field	16100			6.4		giant ragweed	Abrosia trifida	stem/leaf	75	0.00466	PTI 1995	validation	field
Al	field	13600			6		giant ragweed	Ambrosia trifida	stem/leaf	63	0.00463	PTI 1995	validation	field
Al	field	16400			7.1		Indian grass	Sorghastrum nutans	stem/leaf	23	0.0014	PTI 1995	validation	field
Al	field	14700			6.1		Indian grass	Sorghastrum nutans	stem/leaf	12	0.00082	PTI 1995	validation	field
Al	field	12200			6.6		Indian grass	Sorghastrum nutans	stem/leaf	19	0.00156	PTI 1995	validation	field
Al	field	13750			7		Indian grass	Sorghastrum nutans	stem/leaf	8	0.00058	PTI 1995	validation	field
Al	field	16500			6.5		Indian grass	Sorghastrum nutans	stem/leaf	12	0.00073	PTI 1995	validation	field
Al	field	21050			6.8		Indian grass	Sorghastrum nutans	stem/leaf	27	0.00128	PTI 1995	validation	field
Al	field	16400			7.1		switchgrass	Panicum virgatum	stem/leaf	160	0.00976	PTI 1995	validation	field
Al	field	14700			6.1		switchgrass	Panicum virgatum	stem/leaf	57.5	0.00391	PTI 1995	validation	field
Al	field	14550			6		switchgrass	Panicum virgatum	stem/leaf	41	0.00282	PTI 1995	validation	field
Al	field	13750			7		switchgrass	Panicum virgatum	stem/leaf	37	0.00269	PTI 1995	validation	field
Al	field	16500			6.5		switchgrass	Panicum virgatum	stem/leaf	38	0.0023	PTI 1995	validation	field
Al	field	21050			6.8		switchgrass	Panicum virgatum	stem/leaf	236	0.01121	PTI 1995	validation	field
Sb	field	4.4			6.6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	0.04	0.00909	PTI 1995	validation	field
Sb	field	4.4			6.6		Beggar's ticks	Bidens polylepsis	stem/leaf	0.05	0.01136	PTI 1995	validation	field
Ba	field	151			7.1		annual ragwee	Ambrosia artemisiifolia	stem/leaf	29.5	0.19536	PTI 1995	validation	field
Ba	field	92.2			6.6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	84.4	0.9154	PTI 1995	validation	field
Ba	field	164			6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	76.7	0.46768	PTI 1995	validation	field
Ba	field	216			6.8		annual ragwee	Ambrosia artemisiifolia	stem/leaf	26.8	0.12407	PTI 1995	validation	field
Ba	field	176			6.4		annual ragwee	Ambrosia artemisiifolia	stem/leaf	53.6	0.30455	PTI 1995	validation	field
Ba	field	92.2			6.6		Beggar's ticks	Bidens polylepsis	stem/leaf	44	0.47722	PTI 1995	validation	field
Ba	field	164			6		Beggar's ticks	Bidens polylepsis	stem/leaf	34.2	0.20854	PTI 1995	validation	field
Ba	field	176			6.4		beggar's ticks	Bidens polylepis	stem/leaf	19.7	0.11193	PTI 1995	validation	field
Ba	field	176			6.4		beggar's ticks	Bidens polylepis	stem/leaf	11.4	0.06477	PTI 1995	validation	field
Ba	field	157			6		beggar's ticks	Bidens polylepis	stem/leaf	32.9	0.20955	PTI 1995	validation	field
Ba	field	160			6.1		Bermuda grass	Cynodon dactylon	stem/leaf	40.2	0.25125	PTI 1995	validation	field
Ba	field	103.6			7		big bluestem	Andropogon gerardi	stem/leaf	13.8	0.1332	PTI 1995	validation	field
Ba	field	119.5			6.5		big bluestem	Andropogon gerardi	stem/leaf	6.6	0.05523	PTI 1995	validation	field
Ba	field	157			6		big bluestem	Andropogon gerardi	stem/leaf	7.8	0.04968	PTI 1995	validation	field
Ba	field	176			6.4		giant ragweed	Abrosia trifida	stem/leaf	36.4	0.20682	PTI 1995	validation	field
Ba	field	157			6		giant ragweed	Ambrosia trifida	stem/leaf	98.6	0.62803	PTI 1995	validation	field
Ba	field	151			7.1		Indian grass	Sorghastrum nutans	stem/leaf	11.9	0.07881	PTI 1995	validation	field
Ba	field	160			6.1		Indian grass	Sorghastrum nutans	stem/leaf	33.4	0.20875	PTI 1995	validation	field
Ba	field	92.2			6.6		Indian grass	Sorghastrum nutans	stem/leaf	21.9	0.23753	PTI 1995	validation	field
Ba	field	103.6			7		Indian grass	Sorghastrum nutans	stem/leaf	25.5	0.24614	PTI 1995	validation	field
Ba	field	119.5			6.5		Indian grass	Sorghastrum nutans	stem/leaf	20.7	0.17322	PTI 1995	validation	field
Ba	field	216			6.8		Indian grass	Sorghastrum nutans	stem/leaf	14.9	0.06898	PTI 1995	validation	field
Ba	field	151			7.1		switchgrass	Panicum virgatum	stem/leaf	6.9	0.0457	PTI 1995	validation	field
Ba	field	160			6.1		switchgrass	Panicum virgatum	stem/leaf	15.4	0.09625	PTI 1995	validation	field
Ba	field	164			6		switchgrass	Panicum virgatum	stem/leaf	14.7	0.08963	PTI 1995	validation	field
Ba	field	103.6			7		switchgrass	Panicum virgatum	stem/leaf	14.4	0.139	PTI 1995	validation	field
Ba	field	119.5			6.5		switchgrass	Panicum virgatum	stem/leaf	15.7	0.13138	PTI 1995	validation	field
Ba	field	216			6.8		switchgrass	Panicum virgatum	stem/leaf	7.7	0.03565	PTI 1995	validation	field
Ca	field	13000			7.1		annual ragwee	Ambrosia artemisiifolia	stem/leaf	13900	1.06923	PTI 1995	validation	field

Ca	field	1790			6.6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	11400	6.36872	PTI 1995	validation	field
Ca	field	3715			6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	11200	3.0148	PTI 1995	validation	field
Ca	field	35770			6.8		annual ragwee	Ambrosia artemisiifolia	stem/leaf	13900	0.38859	PTI 1995	validation	field
Ca	field	8380			6.4		annual ragwee	Ambrosia artemisiifolia	stem/leaf	12200	1.45585	PTI 1995	validation	field
Ca	field	1790			6.6		Beggar's ticks	Bidens polylepsis	stem/leaf	10800	6.03352	PTI 1995	validation	field
Ca	field	3715			6		Beggar's ticks	Bidens polylepsis	stem/leaf	9860	2.6541	PTI 1995	validation	field
Ca	field	8380			6.4		beggar's ticks	Bidens polylepis	stem/leaf	9800	1.16945	PTI 1995	validation	field
Ca	field	8380			6.4		beggar's ticks	Bidens polylepis	stem/leaf	9890	1.18019	PTI 1995	validation	field
Ca	field	4110			6		beggar's ticks	Bidens polylepis	stem/leaf	8880	2.16058	PTI 1995	validation	field
Ca	field	2500			6.1		Bermuda grass	Cynodon dactylon	stem/leaf	4760	1.904	PTI 1995	validation	field
Ca	field	1950			7		big bluestem	Andropogon gerardi	stem/leaf	2320	1.18974	PTI 1995	validation	field
Ca	field	2195			6.5		big bluestem	Andropogon gerardi	stem/leaf	1100	0.50114	PTI 1995	validation	field
Ca	field	4110			6		big bluestem	Andropogon gerardi	stem/leaf	1630	0.39659	PTI 1995	validation	field
Ca	field	8380			6.4		giant ragweed	Abrosia trifida	stem/leaf	38800	4.63007	PTI 1995	validation	field
Ca	field	4110			6		giant ragweed	Ambrosia trifida	stem/leaf	37200	9.05109	PTI 1995	validation	field
Ca	field	13000			7.1		Indian grass	Sorghastrum nutans	stem/leaf	2030	0.15615	PTI 1995	validation	field
Ca	field	2500			6.1		Indian grass	Sorghastrum nutans	stem/leaf	2570	1.028	PTI 1995	validation	field
Ca	field	1790			6.6		Indian grass	Sorghastrum nutans	stem/leaf	1730	0.96648	PTI 1995	validation	field
Ca	field	1950			7		Indian grass	Sorghastrum nutans	stem/leaf	1980	1.01538	PTI 1995	validation	field
Ca	field	2195			6.5		Indian grass	Sorghastrum nutans	stem/leaf	2150	0.9795	PTI 1995	validation	field
Ca	field	35770			6.8		Indian grass	Sorghastrum nutans	stem/leaf	4020	0.11238	PTI 1995	validation	field
Ca	field	13000			7.1		switchgrass	Panicum virgatum	stem/leaf	3590	0.27615	PTI 1995	validation	field
Ca	field	2500			6.1		switchgrass	Panicum virgatum	stem/leaf	4620	1.848	PTI 1995	validation	field
Ca	field	3715			6		switchgrass	Panicum virgatum	stem/leaf	5030	1.35397	PTI 1995	validation	field
Ca	field	1950			7		switchgrass	Panicum virgatum	stem/leaf	2730	1.4	PTI 1995	validation	field
Ca	field	2195			6.5		switchgrass	Panicum virgatum	stem/leaf	3580	1.63098	PTI 1995	validation	field
Ca	field	35770			6.8		switchgrass	Panicum virgatum	stem/leaf	4100	0.11462	PTI 1995	validation	field
Cr	field	27.3			7.1		annual ragwee	Ambrosia artemisiifolia	stem/leaf	1.1	0.04029	PTI 1995	validation	field
Cr	field	21.4			6.6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	1.7	0.07944	PTI 1995	validation	field
Cr	field	26.45			6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	0.7	0.02647	PTI 1995	validation	field
Cr	field	37.3			6.8		annual ragwee	Ambrosia artemisiifolia	stem/leaf	0.8	0.02145	PTI 1995	validation	field
Cr	field	42.9			6.4		annual ragwee	Ambrosia artemisiifolia	stem/leaf	6.5	0.15152	PTI 1995	validation	field
Cr	field	21.4			6.6		Beggar's ticks	Bidens polylepsis	stem/leaf	1.1	0.0514	PTI 1995	validation	field
Cr	field	26.45			6		Beggar's ticks	Bidens polylepsis	stem/leaf	0.9	0.03403	PTI 1995	validation	field
Cr	field	42.9			6.4		beggar's ticks	Bidens polylepis	stem/leaf	2.6	0.06061	PTI 1995	validation	field
Cr	field	42.9			6.4		beggar's ticks	Bidens polylepis	stem/leaf	3.2	0.07459	PTI 1995	validation	field
Cr	field	25.2			6		beggar's ticks	Bidens polylepis	stem/leaf	1.2	0.04762	PTI 1995	validation	field
Cr	field	24.7			6.1		Bermuda grass	Cynodon dactylon	stem/leaf	1.6	0.06478	PTI 1995	validation	field
Cr	field	23.6			7		big bluestem	Andropogon gerardi	stem/leaf	0.6	0.02542	PTI 1995	validation	field
Cr	field	32.8			6.5		big bluestem	Andropogon gerardi	stem/leaf	0.7	0.02134	PTI 1995	validation	field
Cr	field	25.2			6		big bluestem	Andropogon gerardi	stem/leaf	12.1	0.48016	PTI 1995	validation	field
Cr	field	42.9			6.4		giant ragweed	Abrosia trifida	stem/leaf	3.6	0.08392	PTI 1995	validation	field
Cr	field	25.2			6		giant ragweed	Ambrosia trifida	stem/leaf	1.9	0.0754	PTI 1995	validation	field
Cr	field	27.3			7.1		Indian grass	Sorghastrum nutans	stem/leaf	1	0.03663	PTI 1995	validation	field
Cr	field	24.7			6.1		Indian grass	Sorghastrum nutans	stem/leaf	1	0.04049	PTI 1995	validation	field
Cr	field	21.4			6.6		Indian grass	Sorghastrum nutans	stem/leaf	1.6	0.07477	PTI 1995	validation	field
Cr	field	23.6			7		Indian grass	Sorghastrum nutans	stem/leaf	0.5	0.02119	PTI 1995	validation	field
Cr	field	32.8			6.5		Indian grass	Sorghastrum nutans	stem/leaf	0.8	0.02439	PTI 1995	validation	field

Cr	field	37.3		6.8		Indian grass	Sorghastrum nutans	stem/leaf	0.8	0.02145	PTI 1995	validation	field
Cr	field	27.3		7.1		switchgrass	Panicum virgatum	stem/leaf	1.7	0.06227	PTI 1995	validation	field
Cr	field	24.7		6.1		switchgrass	Panicum virgatum	stem/leaf	1.6	0.06478	PTI 1995	validation	field
Cr	field	26.45		6		switchgrass	Panicum virgatum	stem/leaf	1.1	0.04159	PTI 1995	validation	field
Cr	field	23.6		7		switchgrass	Panicum virgatum	stem/leaf	0.9	0.03814	PTI 1995	validation	field
Cr	field	32.8		6.5		switchgrass	Panicum virgatum	stem/leaf	1	0.03049	PTI 1995	validation	field
Cr	field	37.3		6.8		switchgrass	Panicum virgatum	stem/leaf	1.3	0.03485	PTI 1995	validation	field
Co	field	15.6		7.1		annual ragwee	Ambrosia artemisiifolia	stem/leaf	0.11	0.00705	PTI 1995	validation	field
Co	field	8.3		6.6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	0.09	0.01084	PTI 1995	validation	field
Co	field	10.15		6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	0.05	0.00493	PTI 1995	validation	field
Co	field	13.95		6.8		annual ragwee	Ambrosia artemisiifolia	stem/leaf	0.08	0.00573	PTI 1995	validation	field
Co	field	14.9		6.4		annual ragwee	Ambrosia artemisiifolia	stem/leaf	0.12	0.00805	PTI 1995	validation	field
Co	field	8.3		6.6		Beggar's ticks	Bidens polylepsis	stem/leaf	0.37	0.04458	PTI 1995	validation	field
Co	field	10.15		6		Beggar's ticks	Bidens polylepsis	stem/leaf	0.1	0.00985	PTI 1995	validation	field
Co	field	14.9		6.4		beggar's ticks	Bidens polylepis	stem/leaf	0.37	0.02483	PTI 1995	validation	field
Co	field	14.9		6.4		beggar's ticks	Bidens polylepis	stem/leaf	0.36	0.02416	PTI 1995	validation	field
Co	field	9.6		6		beggar's ticks	Bidens polylepis	stem/leaf	0.07	0.00729	PTI 1995	validation	field
Co	field	9.2		6.1		Bermuda grass	Cynodon dactylon	stem/leaf	0.07	0.00761	PTI 1995	validation	field
Co	field	7.55		7		big bluestem	Andropogon gerardi	stem/leaf	0.08	0.0106	PTI 1995	validation	field
Co	field	8.35		6.5		big bluestem	Andropogon gerardi	stem/leaf	0.05	0.00599	PTI 1995	validation	field
Co	field	9.6		6		big bluestem	Andropogon gerardi	stem/leaf	0.16	0.01667	PTI 1995	validation	field
Co	field	14.9		6.4		giant ragweed	Abrosia trifida	stem/leaf	0.37	0.02483	PTI 1995	validation	field
Co	field	9.6		6		giant ragweed	Ambrosia trifida	stem/leaf	0.34	0.03542	PTI 1995	validation	field
Co	field	15.6		7.1		Indian grass	Sorghastrum nutans	stem/leaf	0.03	0.00192	PTI 1995	validation	field
Co	field	9.2		6.1		Indian grass	Sorghastrum nutans	stem/leaf	0.03	0.00326	PTI 1995	validation	field
Co	field	8.3		6.6		Indian grass	Sorghastrum nutans	stem/leaf	0.04	0.00482	PTI 1995	validation	field
Co	field	7.55		7		Indian grass	Sorghastrum nutans	stem/leaf	0.04	0.0053	PTI 1995	validation	field
Co	field	8.35		6.5		Indian grass	Sorghastrum nutans	stem/leaf	0.03	0.00359	PTI 1995	validation	field
Co	field	13.95		6.8		Indian grass	Sorghastrum nutans	stem/leaf	0.05	0.00358	PTI 1995	validation	field
Co	field	15.6		7.1		switchgrass	Panicum virgatum	stem/leaf	0.17	0.0109	PTI 1995	validation	field
Co	field	9.2		6.1		switchgrass	Panicum virgatum	stem/leaf	0.05	0.00543	PTI 1995	validation	field
Co	field	10.15		6		switchgrass	Panicum virgatum	stem/leaf	0.03	0.00296	PTI 1995	validation	field
Co	field	7.55		7		switchgrass	Panicum virgatum	stem/leaf	0.06	0.00795	PTI 1995	validation	field
Co	field	8.35		6.5		switchgrass	Panicum virgatum	stem/leaf	0.14	0.01677	PTI 1995	validation	field
Co	field	13.95		6.8		switchgrass	Panicum virgatum	stem/leaf	0.09	0.00645	PTI 1995	validation	field
Fe	field	26100		7.1		annual ragwee	Ambrosia artemisiifolia	stem/leaf	117	0.00448	PTI 1995	validation	field
Fe	field	15500		6.6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	104	0.00671	PTI 1995	validation	field
Fe	field	20450		6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	54	0.00264	PTI 1995	validation	field
Fe	field	29300		6.8		annual ragwee	Ambrosia artemisiifolia	stem/leaf	84	0.00287	PTI 1995	validation	field
Fe	field	27000		6.4		annual ragwee	Ambrosia artemisiifolia	stem/leaf	377	0.01396	PTI 1995	validation	field
Fe	field	15500		6.6		Beggar's ticks	Bidens polylepsis	stem/leaf	104	0.00671	PTI 1995	validation	field
Fe	field	20450		6		Beggar's ticks	Bidens polylepsis	stem/leaf	82	0.00401	PTI 1995	validation	field
Fe	field	27000		6.4		beggar's ticks	Bidens polylepis	stem/leaf	269	0.00996	PTI 1995	validation	field
Fe	field	27000		6.4		beggar's ticks	Bidens polylepis	stem/leaf	260	0.00963	PTI 1995	validation	field
Fe	field	19300		6		beggar's ticks	Bidens polylepis	stem/leaf	73	0.00378	PTI 1995	validation	field
Fe	field	19800		6.1		Bermuda grass	Cynodon dactylon	stem/leaf	98	0.00495	PTI 1995	validation	field
Fe	field	17350		7		big bluestem	Andropogon gerardi	stem/leaf	40	0.00231	PTI 1995	validation	field

Fe	field	26600			6.5		big bluestem	Andropogon gerardi	stem/leaf	37	0.00139	PTI 1995	validation	field
Fe	field	19300			6		big bluestem	Andropogon gerardi	stem/leaf	1460	0.07565	PTI 1995	validation	field
Fe	field	27000			6.4		giant ragweed	Abrosia trifida	stem/leaf	235	0.0087	PTI 1995	validation	field
Fe	field	19300			6		giant ragweed	Ambrosia trifida	stem/leaf	181	0.00938	PTI 1995	validation	field
Fe	field	26100			7.1		Indian grass	Sorghastrum nutans	stem/leaf	61	0.00234	PTI 1995	validation	field
Fe	field	19800			6.1		Indian grass	Sorghastrum nutans	stem/leaf	50	0.00253	PTI 1995	validation	field
Fe	field	15500			6.6		Indian grass	Sorghastrum nutans	stem/leaf	77.7	0.00501	PTI 1995	validation	field
Fe	field	17350			7		Indian grass	Sorghastrum nutans	stem/leaf	28	0.00161	PTI 1995	validation	field
Fe	field	26600			6.5		Indian grass	Sorghastrum nutans	stem/leaf	40	0.0015	PTI 1995	validation	field
Fe	field	29300			6.8		Indian grass	Sorghastrum nutans	stem/leaf	55	0.00188	PTI 1995	validation	field
Fe	field	26100			7.1		switchgrass	Panicum virgatum	stem/leaf	216	0.00828	PTI 1995	validation	field
Fe	field	19800			6.1		switchgrass	Panicum virgatum	stem/leaf	126	0.00636	PTI 1995	validation	field
Fe	field	20450			6		switchgrass	Panicum virgatum	stem/leaf	80	0.00391	PTI 1995	validation	field
Fe	field	17350			7		switchgrass	Panicum virgatum	stem/leaf	66	0.0038	PTI 1995	validation	field
Fe	field	26600			6.5		switchgrass	Panicum virgatum	stem/leaf	73	0.00274	PTI 1995	validation	field
Fe	field	29300			6.8		switchgrass	Panicum virgatum	stem/leaf	181	0.00618	PTI 1995	validation	field
Mg	field	2850			7.1		annual ragwee	Ambrosia artemisiifolia	stem/leaf	3260	1.14386	PTI 1995	validation	field
Mg	field	1340			6.6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	2670	1.99254	PTI 1995	validation	field
Mg	field	2120			6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	1910	0.90094	PTI 1995	validation	field
Mg	field	3505			6.8		annual ragwee	Ambrosia artemisiifolia	stem/leaf	1890	0.53923	PTI 1995	validation	field
Mg	field	2530			6.4		annual ragwee	Ambrosia artemisiifolia	stem/leaf	2380	0.94071	PTI 1995	validation	field
Mg	field	1340			6.6		Beggar's ticks	Bidens polylepsis	stem/leaf	2760	2.0597	PTI 1995	validation	field
Mg	field	2120			6		Beggar's ticks	Bidens polylepsis	stem/leaf	3710	1.75	PTI 1995	validation	field
Mg	field	2530			6.4		beggar's ticks	Bidens polylepis	stem/leaf	2380	0.94071	PTI 1995	validation	field
Mg	field	2530			6.4		beggar's ticks	Bidens polylepis	stem/leaf	2180	0.86166	PTI 1995	validation	field
Mg	field	2140			6		beggar's ticks	Bidens polylepis	stem/leaf	2290	1.07009	PTI 1995	validation	field
Mg	field	1750			6.1		Bermuda grass	Cynodon dactylon	stem/leaf	1270	0.72571	PTI 1995	validation	field
Mg	field	1420			7		big bluestem	Andropogon gerardi	stem/leaf	773	0.54437	PTI 1995	validation	field
Mg	field	1950			6.5		big bluestem	Andropogon gerardi	stem/leaf	574	0.29436	PTI 1995	validation	field
Mg	field	2140			6		big bluestem	Andropogon gerardi	stem/leaf	515	0.24065	PTI 1995	validation	field
Mg	field	2530			6.4		giant ragweed	Abrosia trifida	stem/leaf	6600	2.6087	PTI 1995	validation	field
Mg	field	2140			6		giant ragweed	Ambrosia trifida	stem/leaf	6410	2.99533	PTI 1995	validation	field
Mg	field	2850			7.1		Indian grass	Sorghastrum nutans	stem/leaf	721	0.25298	PTI 1995	validation	field
Mg	field	1750			6.1		Indian grass	Sorghastrum nutans	stem/leaf	412	0.23543	PTI 1995	validation	field
Mg	field	1340			6.6		Indian grass	Sorghastrum nutans	stem/leaf	342	0.25522	PTI 1995	validation	field
Mg	field	1420			7		Indian grass	Sorghastrum nutans	stem/leaf	889	0.62606	PTI 1995	validation	field
Mg	field	1950			6.5		Indian grass	Sorghastrum nutans	stem/leaf	784	0.40205	PTI 1995	validation	field
Mg	field	3505			6.8		Indian grass	Sorghastrum nutans	stem/leaf	452	0.12896	PTI 1995	validation	field
Mg	field	2850			7.1		switchgrass	Panicum virgatum	stem/leaf	2160	0.75789	PTI 1995	validation	field
Mg	field	1750			6.1		switchgrass	Panicum virgatum	stem/leaf	1010	0.57714	PTI 1995	validation	field
Mg	field	2120			6		switchgrass	Panicum virgatum	stem/leaf	2460	1.16038	PTI 1995	validation	field
Mg	field	1420			7		switchgrass	Panicum virgatum	stem/leaf	1430	1.00704	PTI 1995	validation	field
Mg	field	1950			6.5		switchgrass	Panicum virgatum	stem/leaf	2640	1.35385	PTI 1995	validation	field
Mg	field	3505			6.8		switchgrass	Panicum virgatum	stem/leaf	636	0.18146	PTI 1995	validation	field
Mn	field	486			7.1		annual ragwee	Ambrosia artemisiifolia	stem/leaf	22.9	0.04712	PTI 1995	validation	field
Mn	field	455			6.6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	16	0.03516	PTI 1995	validation	field
Mn	field	583			6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	11.6	0.0199	PTI 1995	validation	field

Mn	field	615			6.4		annual ragwee	Ambrosia artemisiifolia	stem/leaf	22.9	0.03724	PTI 1995	validation	field
Mn	field	455			6.6		Beggar's ticks	Bidens polylepsis	stem/leaf	53.5	0.11758	PTI 1995	validation	field
Mn	field	583			6		Beggar's ticks	Bidens polylepsis	stem/leaf	71.7	0.12298	PTI 1995	validation	field
Mn	field	615			6.4		beggar's ticks	Bidens polylepis	stem/leaf	118	0.19187	PTI 1995	validation	field
Mn	field	615			6.4		beggar's ticks	Bidens polylepis	stem/leaf	144	0.23415	PTI 1995	validation	field
Mn	field	524			6		beggar's ticks	Bidens polylepis	stem/leaf	35.4	0.06756	PTI 1995	validation	field
Mn	field	578			6.1		Bermuda grass	Cynodon dactylon	stem/leaf	45.7	0.07907	PTI 1995	validation	field
Mn	field	219.5			7		big bluestem	Andropogon gerardi	stem/leaf	55.4	0.25239	PTI 1995	validation	field
Mn	field	254			6.5		big bluestem	Andropogon gerardi	stem/leaf	39.5	0.15551	PTI 1995	validation	field
Mn	field	524			6		big bluestem	Andropogon gerardi	stem/leaf	19.4	0.03702	PTI 1995	validation	field
Mn	field	615			6.4		giant ragweed	Abrosia trifida	stem/leaf	74.1	0.12049	PTI 1995	validation	field
Mn	field	524			6		giant ragweed	Ambrosia trifida	stem/leaf	86.9	0.16584	PTI 1995	validation	field
Mn	field	486			7.1		Indian grass	Sorghastrum nutans	stem/leaf	11.2	0.02305	PTI 1995	validation	field
Mn	field	578			6.1		Indian grass	Sorghastrum nutans	stem/leaf	20.6	0.03564	PTI 1995	validation	field
Mn	field	455			6.6		Indian grass	Sorghastrum nutans	stem/leaf	18	0.03956	PTI 1995	validation	field
Mn	field	219.5			7		Indian grass	Sorghastrum nutans	stem/leaf	47.2	0.21503	PTI 1995	validation	field
Mn	field	254			6.5		Indian grass	Sorghastrum nutans	stem/leaf	48.9	0.19252	PTI 1995	validation	field
Mn	field	486			7.1		switchgrass	Panicum virgatum	stem/leaf	38.6	0.07942	PTI 1995	validation	field
Mn	field	578			6.1		switchgrass	Panicum virgatum	stem/leaf	23.8	0.04118	PTI 1995	validation	field
Mn	field	583			6		switchgrass	Panicum virgatum	stem/leaf	50.6	0.08679	PTI 1995	validation	field
Mn	field	219.5			7		switchgrass	Panicum virgatum	stem/leaf	43.6	0.19863	PTI 1995	validation	field
Mn	field	254			6.5		switchgrass	Panicum virgatum	stem/leaf	110	0.43307	PTI 1995	validation	field
Mn	field	1145			6.8		annual ragwee	Ambrosia artemisiifolia	stem/leaf	42.3	0.03694	PTI 1995	validation	field
Mn	field	1145			6.8		Indian grass	Sorghastrum nutans	stem/leaf	38.2	0.03336	PTI 1995	validation	field
Mn	field	1145			6.8		switchgrass	Panicum virgatum	stem/leaf	66.1	0.05773	PTI 1995	validation	field
K	field	1400			7.1		annual ragwee	Ambrosia artemisiifolia	stem/leaf	15700	11.2143	PTI 1995	validation	field
K	field	1410			6.6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	14600	10.3546	PTI 1995	validation	field
K	field	2325			6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	17500	7.52688	PTI 1995	validation	field
K	field	3735			6.8		annual ragwee	Ambrosia artemisiifolia	stem/leaf	16900	4.52477	PTI 1995	validation	field
K	field	1980			6.4		annual ragwee	Ambrosia artemisiifolia	stem/leaf	16100	8.13131	PTI 1995	validation	field
K	field	1410			6.6		Beggar's ticks	Bidens polylepsis	stem/leaf	20400	14.4681	PTI 1995	validation	field
K	field	2325			6		Beggar's ticks	Bidens polylepsis	stem/leaf	11200	4.8172	PTI 1995	validation	field
K	field	1980			6.4		beggar's ticks	Bidens polylepis	stem/leaf	16800	8.48485	PTI 1995	validation	field
K	field	1980			6.4		beggar's ticks	Bidens polylepis	stem/leaf	18300	9.24242	PTI 1995	validation	field
K	field	2320			6		beggar's ticks	Bidens polylepis	stem/leaf	13400	5.77586	PTI 1995	validation	field
K	field	1850			6.1		Bermuda grass	Cynodon dactylon	stem/leaf	9890	5.34595	PTI 1995	validation	field
K	field	1560			7		big bluestem	Andropogon gerardi	stem/leaf	8650	5.54487	PTI 1995	validation	field
K	field	1845			6.5		big bluestem	Andropogon gerardi	stem/leaf	9860	5.34417	PTI 1995	validation	field
K	field	2320			6		big bluestem	Andropogon gerardi	stem/leaf	9650	4.15948	PTI 1995	validation	field
K	field	1980			6.4		giant ragweed	Abrosia trifida	stem/leaf	22300	11.2626	PTI 1995	validation	field
K	field	2320			6		giant ragweed	Ambrosia trifida	stem/leaf	28000	12.069	PTI 1995	validation	field
K	field	1400			7.1		Indian grass	Sorghastrum nutans	stem/leaf	9600	6.85714	PTI 1995	validation	field
K	field	1850			6.1		Indian grass	Sorghastrum nutans	stem/leaf	9740	5.26486	PTI 1995	validation	field
K	field	1410			6.6		Indian grass	Sorghastrum nutans	stem/leaf	10400	7.37589	PTI 1995	validation	field
K	field	1560			7		Indian grass	Sorghastrum nutans	stem/leaf	9020	5.78205	PTI 1995	validation	field
K	field	1845			6.5		Indian grass	Sorghastrum nutans	stem/leaf	9320	5.05149	PTI 1995	validation	field
K	field	3735			6.8		Indian grass	Sorghastrum nutans	stem/leaf	9530	2.55154	PTI 1995	validation	field
K	field	1400			7.1		switchgrass	Panicum virgatum	stem/leaf	4360	3.11429	PTI 1995	validation	field

K	field	1850			6.1		switchgrass	Panicum virgatum	stem/leaf	3070	1.65946	PTI 1995	validation	field
K	field	2325			6		switchgrass	Panicum virgatum	stem/leaf	13100	5.63441	PTI 1995	validation	field
K	field	1560			7		switchgrass	Panicum virgatum	stem/leaf	4180	2.67949	PTI 1995	validation	field
K	field	1845			6.5		switchgrass	Panicum virgatum	stem/leaf	5910	3.20325	PTI 1995	validation	field
K	field	3735			6.8		switchgrass	Panicum virgatum	stem/leaf	4630	1.23963	PTI 1995	validation	field
Ag	field	3			6.6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	0.1	0.03333	PTI 1995	validation	field
Ag	field	3			6.6		Beggar's ticks	Bidens polylepsis	stem/leaf	0.02	0.00667	PTI 1995	validation	field
Ag	field	2.9			6		Beggar's ticks	Bidens polylepsis	stem/leaf	0.06	0.02069	PTI 1995	validation	field
Ag	field	2.1			6		beggar's ticks	Bidens polylepis	stem/leaf	0.03	0.01429	PTI 1995	validation	field
Ag	field	6.9			6.1		Bermuda grass	Cynodon dactylon	stem/leaf	0.07	0.01014	PTI 1995	validation	field
Ag	field	6.9			6.1		Indian grass	Sorghastrum nutans	stem/leaf	0.02	0.0029	PTI 1995	validation	field
Ag	field	3			6.6		Indian grass	Sorghastrum nutans	stem/leaf	0.05	0.01667	PTI 1995	validation	field
Ag	field	1			7.1		switchgrass	Panicum virgatum	stem/leaf	0.04	0.04	PTI 1995	validation	field
Ag	field	6.9			6.1		switchgrass	Panicum virgatum	stem/leaf	0.04	0.0058	PTI 1995	validation	field
Ag	field	2.9			6		switchgrass	Panicum virgatum	stem/leaf	0.04	0.01379	PTI 1995	validation	field
Na	field	148			7.1		annual ragwee	Ambrosia artemisiifolia	stem/leaf	76	0.51351	PTI 1995	validation	field
Na	field	86.2			6.6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	13	0.15081	PTI 1995	validation	field
Na	field	61.4			6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	12	0.19544	PTI 1995	validation	field
Na	field	71.8			6.8		annual ragwee	Ambrosia artemisiifolia	stem/leaf	12	0.16713	PTI 1995	validation	field
Na	field	395			6.4		annual ragwee	Ambrosia artemisiifolia	stem/leaf	10	0.02532	PTI 1995	validation	field
Na	field	86.2			6.6		Beggar's ticks	Bidens polylepsis	stem/leaf	16	0.18561	PTI 1995	validation	field
Na	field	61.4			6		Beggar's ticks	Bidens polylepsis	stem/leaf	20	0.32573	PTI 1995	validation	field
Na	field	395			6.4		beggar's ticks	Bidens polylepis	stem/leaf	30	0.07595	PTI 1995	validation	field
Na	field	395			6.4		beggar's ticks	Bidens polylepis	stem/leaf	23	0.05823	PTI 1995	validation	field
Na	field	57.3			6		beggar's ticks	Bidens polylepis	stem/leaf	13	0.22688	PTI 1995	validation	field
Na	field	49.3			6.1		Bermuda grass	Cynodon dactylon	stem/leaf	136	2.75862	PTI 1995	validation	field
Na	field	57.3			6		big bluestem	Andropogon gerardi	stem/leaf	47	0.82024	PTI 1995	validation	field
Na	field	395			6.4		giant ragweed	Abrosia trifida	stem/leaf	11	0.02785	PTI 1995	validation	field
Na	field	57.3			6		giant ragweed	Ambrosia trifida	stem/leaf	11	0.19197	PTI 1995	validation	field
Na	field	148			7.1		Indian grass	Sorghastrum nutans	stem/leaf	15	0.10135	PTI 1995	validation	field
Na	field	86.2			6.6		Indian grass	Sorghastrum nutans	stem/leaf	10	0.11601	PTI 1995	validation	field
Na	field	148			7.1		switchgrass	Panicum virgatum	stem/leaf	162	1.09459	PTI 1995	validation	field
Na	field	49.3			6.1		switchgrass	Panicum virgatum	stem/leaf	11	0.22312	PTI 1995	validation	field
Na	field	61.4			6		switchgrass	Panicum virgatum	stem/leaf	10	0.16287	PTI 1995	validation	field
Na	field	41.6			7		switchgrass	Panicum virgatum	stem/leaf	21	0.50481	PTI 1995	validation	field
Na	field	71.8			6.8		switchgrass	Panicum virgatum	stem/leaf	19	0.26462	PTI 1995	validation	field
V	field	20.7			7.1		annual ragwee	Ambrosia artemisiifolia	stem/leaf	0.2	0.00966	PTI 1995	validation	field
V	field	28.6			6.6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	0.1	0.0035	PTI 1995	validation	field
V	field	30.85			6		annual ragwee	Ambrosia artemisiifolia	stem/leaf	0.1	0.00324	PTI 1995	validation	field
V	field	39.65			6.8		annual ragwee	Ambrosia artemisiifolia	stem/leaf	0.2	0.00504	PTI 1995	validation	field
V	field	57.9			6.4		annual ragwee	Ambrosia artemisiifolia	stem/leaf	0.2	0.00345	PTI 1995	validation	field
V	field	28.6			6.6		Beggar's ticks	Bidens polylepsis	stem/leaf	0.2	0.00699	PTI 1995	validation	field
V	field	30.85			6		Beggar's ticks	Bidens polylepsis	stem/leaf	0.2	0.00648	PTI 1995	validation	field
V	field	57.9			6.4		beggar's ticks	Bidens polylepis	stem/leaf	0.1	0.00173	PTI 1995	validation	field
V	field	57.9			6.4		beggar's ticks	Bidens polylepis	stem/leaf	0.2	0.00345	PTI 1995	validation	field
V	field	28.4			6		beggar's ticks	Bidens polylepis	stem/leaf	0.2	0.00704	PTI 1995	validation	field

V	field	30.4			6.1		Bermuda grass	Cynodon dactylon	stem/leaf	0.1	0.00329	PTI 1995	validation	field
V	field	28.25			7		big bluestem	Andropogon gerardi	stem/leaf	0.1	0.00354	PTI 1995	validation	field
V	field	57.9			6.4		giant ragweed	Abrosia trifida	stem/leaf	0.2	0.00345	PTI 1995	validation	field
V	field	28.4			6		giant ragweed	Ambrosia trifida	stem/leaf	0.2	0.00704	PTI 1995	validation	field
V	field	41.2			6.5		Indian grass	Sorghastrum nutans	stem/leaf	0.1	0.00243	PTI 1995	validation	field
V	field	20.7			7.1		switchgrass	Panicum virgatum	stem/leaf	0.3	0.01449	PTI 1995	validation	field
V	field	30.4			6.1		switchgrass	Panicum virgatum	stem/leaf	0.15	0.00493	PTI 1995	validation	field
V	field	30.85			6		switchgrass	Panicum virgatum	stem/leaf	0.1	0.00324	PTI 1995	validation	field
V	field	28.25			7		switchgrass	Panicum virgatum	stem/leaf	0.2	0.00708	PTI 1995	validation	field
V	field	41.2			6.5		switchgrass	Panicum virgatum	stem/leaf	0.2	0.00485	PTI 1995	validation	field
V	field	39.65			6.8		switchgrass	Panicum virgatum	stem/leaf	0.4	0.01009	PTI 1995	validation	field

APPENDIX B

PROCEDURE FOR CALCULATION OF PREDICTION LIMITS FOR ESTIMATES GENERATED BY THE SIMPLE REGRESSION MODELS

Prediction limits for estimates generated by the single-variable regression models presented in Table 7 may be calculated using the following equation (Dowdy and Wearden 1983):

$$Prediction\ Limit = \hat{y} \pm t_{\alpha=0.05,\ df=n-2} * RMSE * \sqrt{1 + \frac{1}{n} + \frac{(x^* - \bar{x})^2}{Sxx}}$$

$\hat{y}$	=	ln-transformed concentration of chemical in plant estimated using regression models from Table 7
$t_{\alpha=0.05,\ df=n-2}$	=	t-statistic for 95% one-tailed limits or 90% two-tailed intervals with n-2 degrees of freedom. (Presented in Table B-1).
n	=	Sample size for regression model. (Presented in Table B-1).
RMSE	=	Root mean square error for regression model. (Presented in Table B-1).
x^*	=	ln-transformed soil concentration for which plant concentrations are being estimated. (Site specific).
$\bar{x}$	=	Mean soil concentration from regression model. (Presented in Table B-1).
Sxx	=	Variance of soil concentrations from regression model. $Sxx = \sum x^2 - \sum x /n$. (Presented in Table B-1).

The procedure for calculating an upper 95% prediction limit for an estimate ($\hat{y}_{UPL}$) is as follows:

1. Use regression model from Table 7 and estimate the ln-transformed concentration of chemical in above-ground plant tissue ($\hat{y}$) from the ln-transformed soil concentration of the chemical of concern (x^*).

2. Obtain values for t, n, RMSE, $\bar{x}$, and Sxx from Table B-1.

3. Apply the values from step 2 along with x^* to the equation outlined above and add the product to $\hat{y}$ to generate the upper 95% prediction limit for $\hat{y}$ ($\hat{y}_{UPL}$).

4. $\hat{y}_{UPL}$ as calculated by the above equation is ln-transformed and must be back-transformed. Back-transform $\hat{y}_{UPL}$ as: $e^{\hat{y}UPL}$

A lower 95% prediction limit ($\hat{y}_{LPL}$) can be calculated by subtracting the product from step 3 from $\hat{y}$, then back transforming the result. The 90% prediction interval (PI) is calculated if both the UPL and LPL are calculated. In application, 95% of all estimates are expected to fall below or above the UPL and LPL, respectively, and 90% of all estimates are expected to fall between the UPL and LPL.

Table B-1. Values for estimating upper and lower prediction limits for estimates generated by simple regression models. All models based on the initial model and validation datasets, combined (Table 7) unless otherwise noted

Chemical	n	$\sum x$	$\bar{x}$	$\sum x^2$	Root mean square error (RMSE)	Sxx	t statistic ($\alpha = 0.05$, df = n-2)
As	122	364.6195	2.9887	1446.2161	2.36381	-1077.8786	1.6574
Cd	207	87.0892	0.4207	894.7434	1.24301	-32.3178	1.6522
Cu	180	820.7744	4.5599	4269.1840	1.00253	-3718.8965	1.6534
Pb	189	839.8090	4.4434	4413.3972	1.89162	-3708.2845	1.6530
Hg	145	22.7877	0.1572	1543.3069	1.46466	7.0623	1.6554
Ni	111	508.0807	4.5773	2832.8248	2.10393	-2300.1186	1.6587
Se	158	168.3280	1.0654	688.7361	1.51976	-174.9720	1.6546
Zn	220	1285.8227	5.8446	8143.2584	1.14747	-7478.1676	1.6518

APPENDIX C

SCATTERPLOTS OF BIOACCUMULATION OF CHEMICALS FROM FIELD-CONTAMINATED SITES AND SALTS-AMENDED SOILS

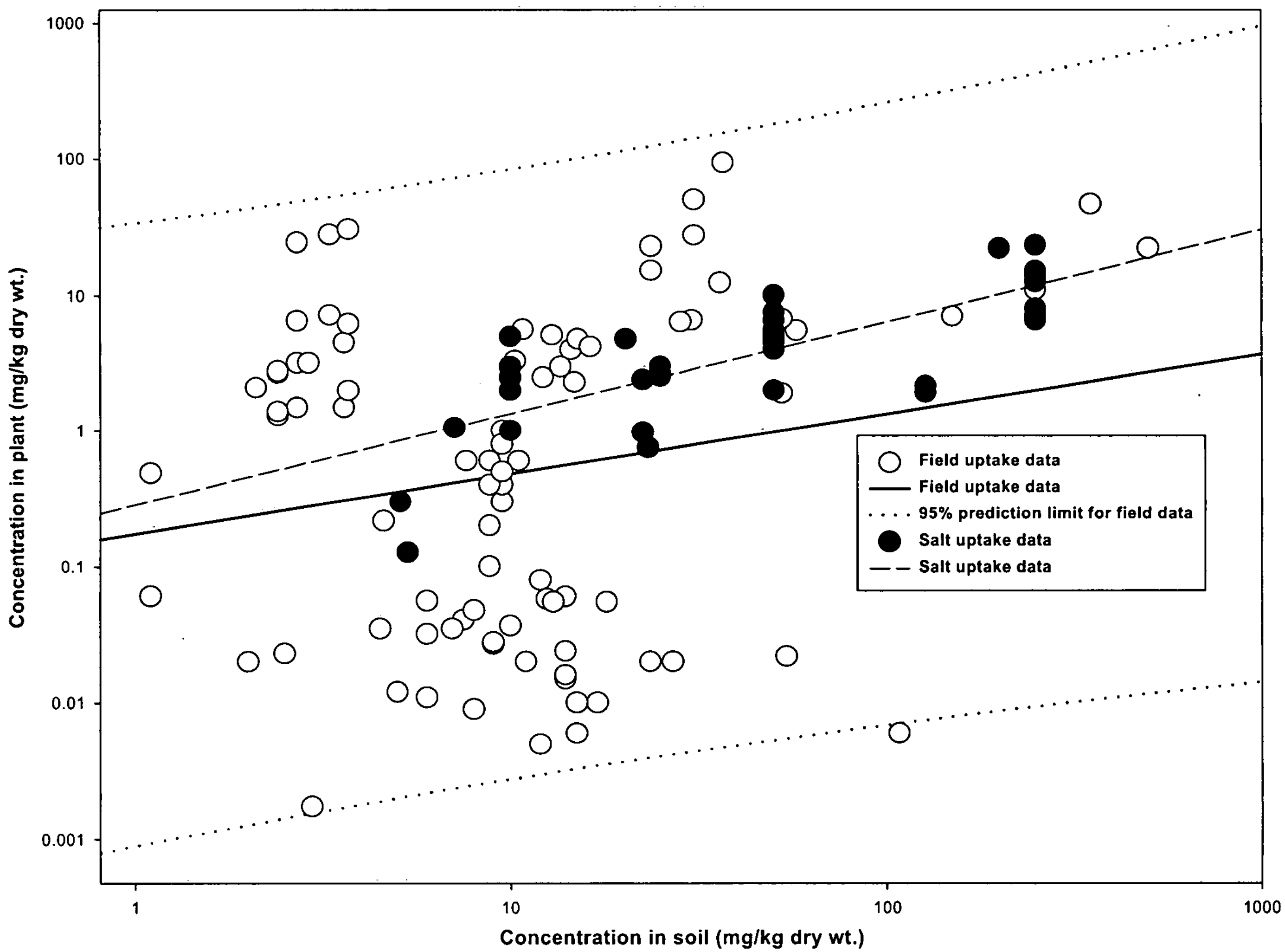

Fig. C.1. Scatterplot of arsenic concentrations in vegetation versus soil, where arsenic was added to soil in salt form or was present in a contaminated field soil. The regression lines for the salt uptake data and field uptake data are presented, as well as the 95% prediction limit for the field uptake data. All data are from published papers or reports.

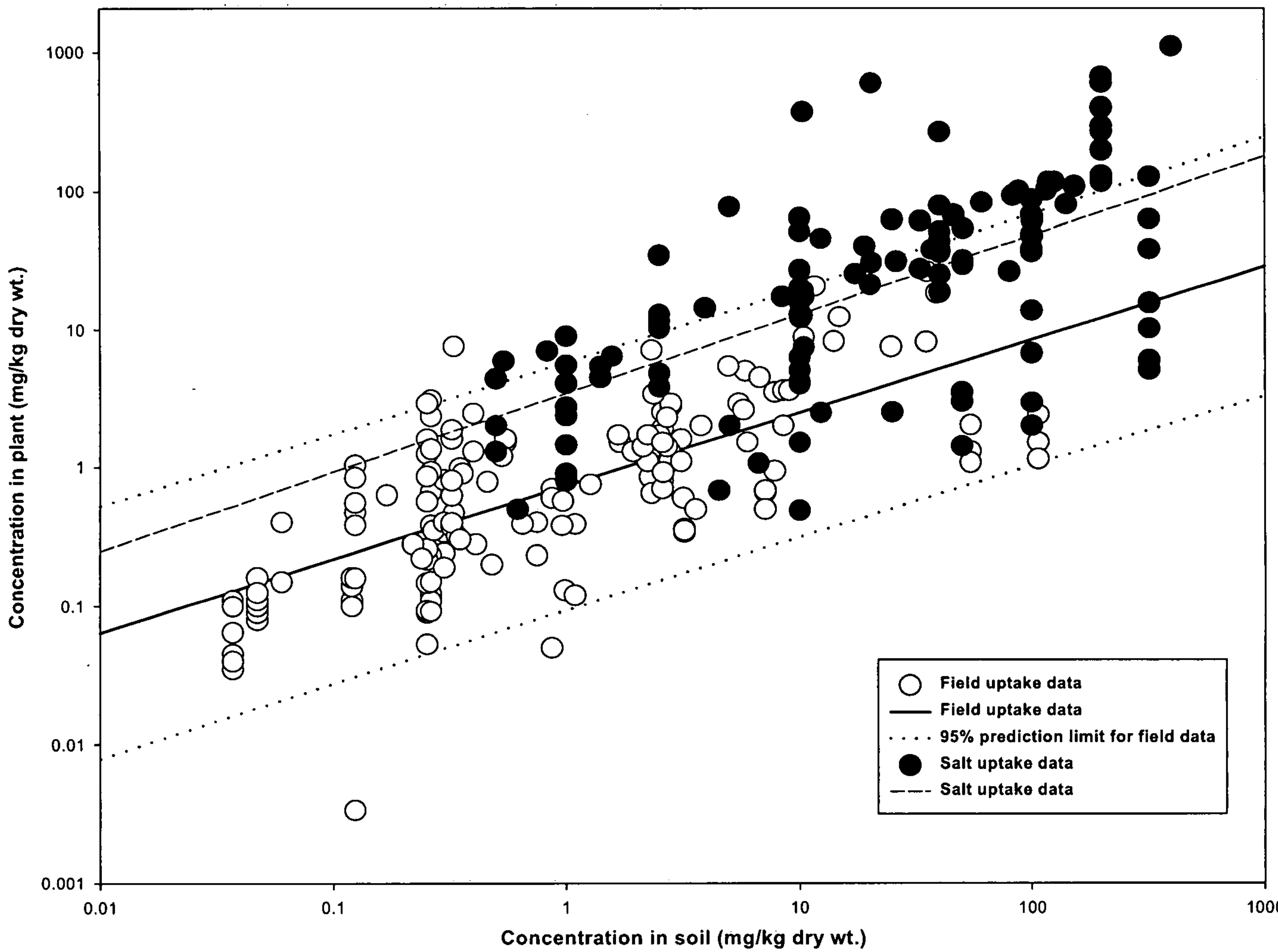

Fig. C.2. Scatterplot of cadmium concentrations in vegetation versus soil, where cadmium was added to soil in salt form or was present in a contaminated field soil. The regression lines for the salt uptake data and field uptake data are presented, as well as the 95% prediction limit for the field uptake data. All data are from published papers or reports.

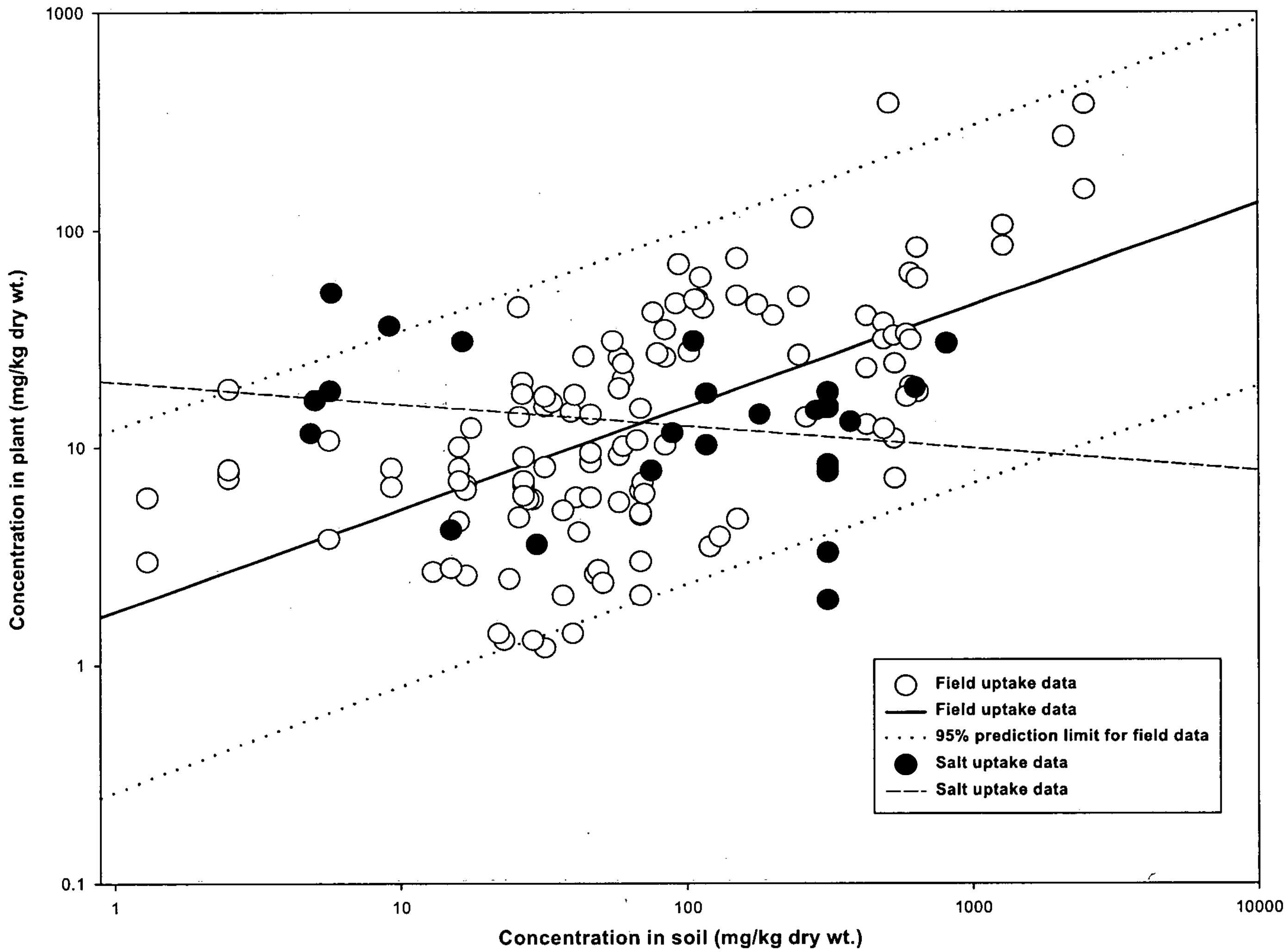

Fig. C.3. Scatterplot of copper concentrations in vegetation versus soil, where copper was added to soil in salt form or was present in a contaminated field soil. The regression lines for the salt uptake data and field uptake data are presented, as well as the 95% prediction limit for the field uptake data. All data are from published papers or reports.

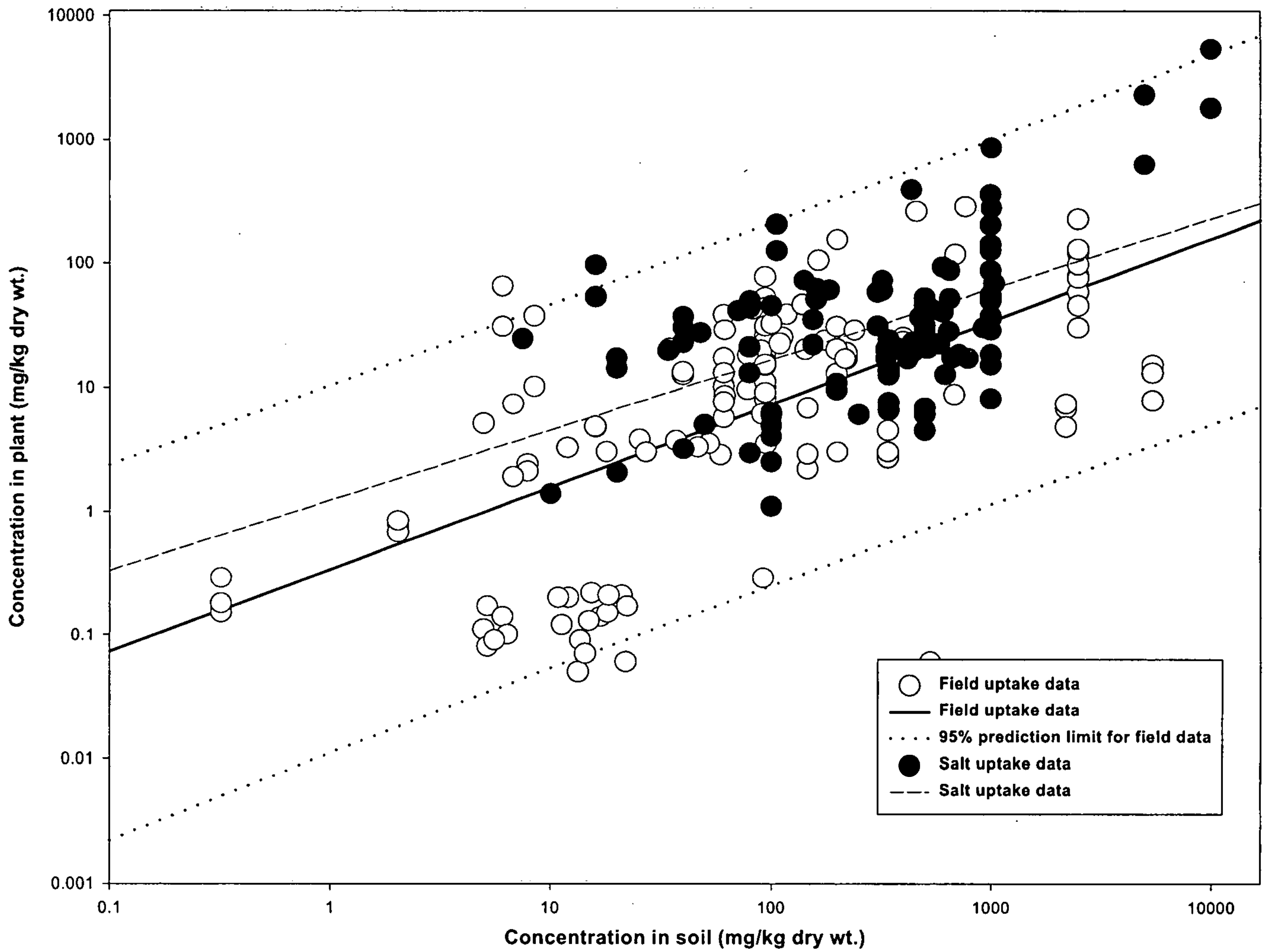

Fig. C.4. Scatterplot of lead concentrations in vegetation versus soil, where lead was added to soil in salt form or was present in a contaminated field soil. The regression lines for the salt uptake data and field uptake data are presented, as well as the 95% prediction limit for the field uptake data. All data are from published papers or reports.

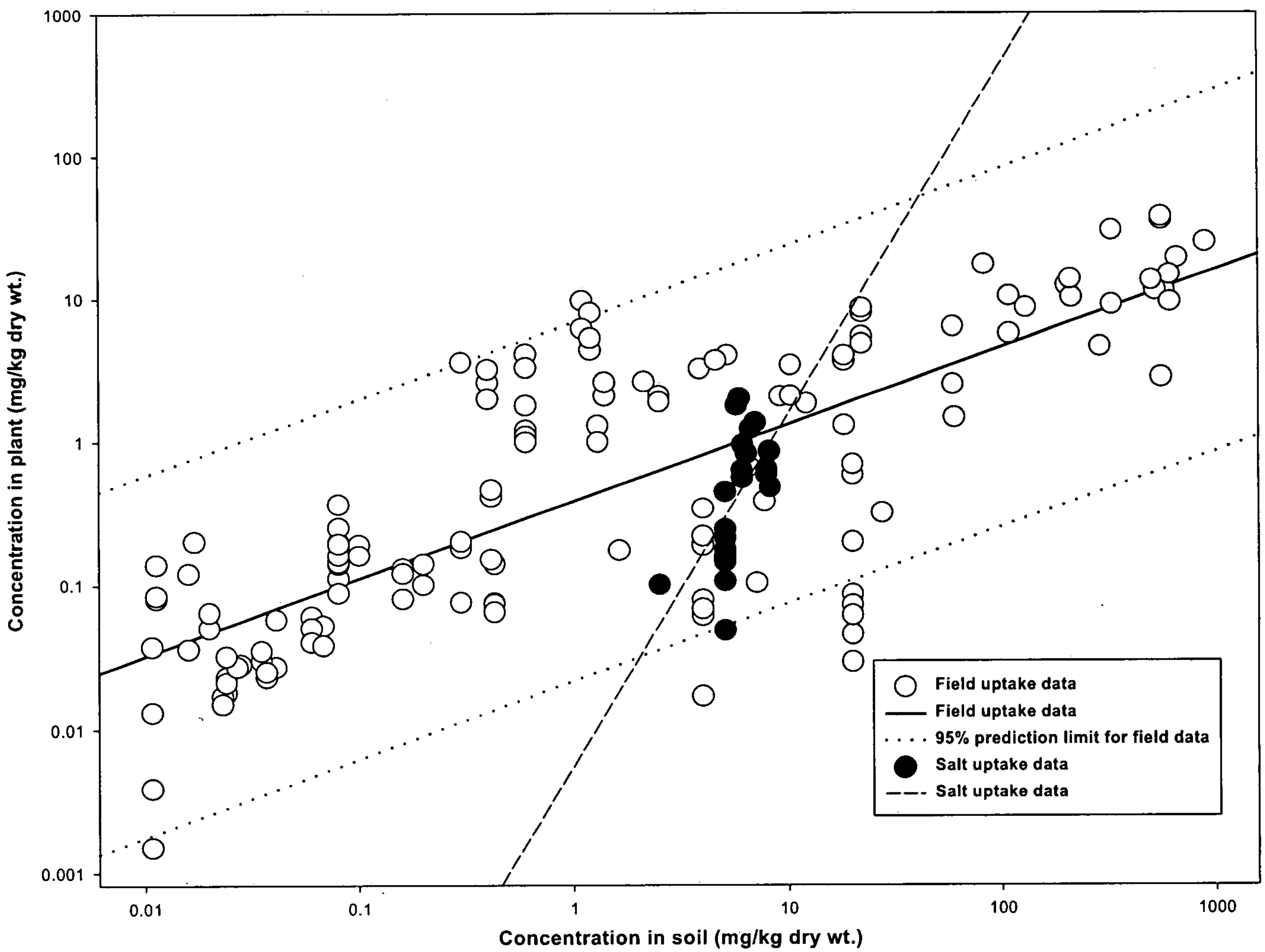

Fig. C.5. Scatterplot of mercury concentrations in vegetation versus soil, where mercury was added to soil in salt form or was present in a contaminated field soil. The regression lines for the salt uptake data and field uptake data are presented, as well as the 95% prediction limit for the field uptake data. All data are from published papers or reports.

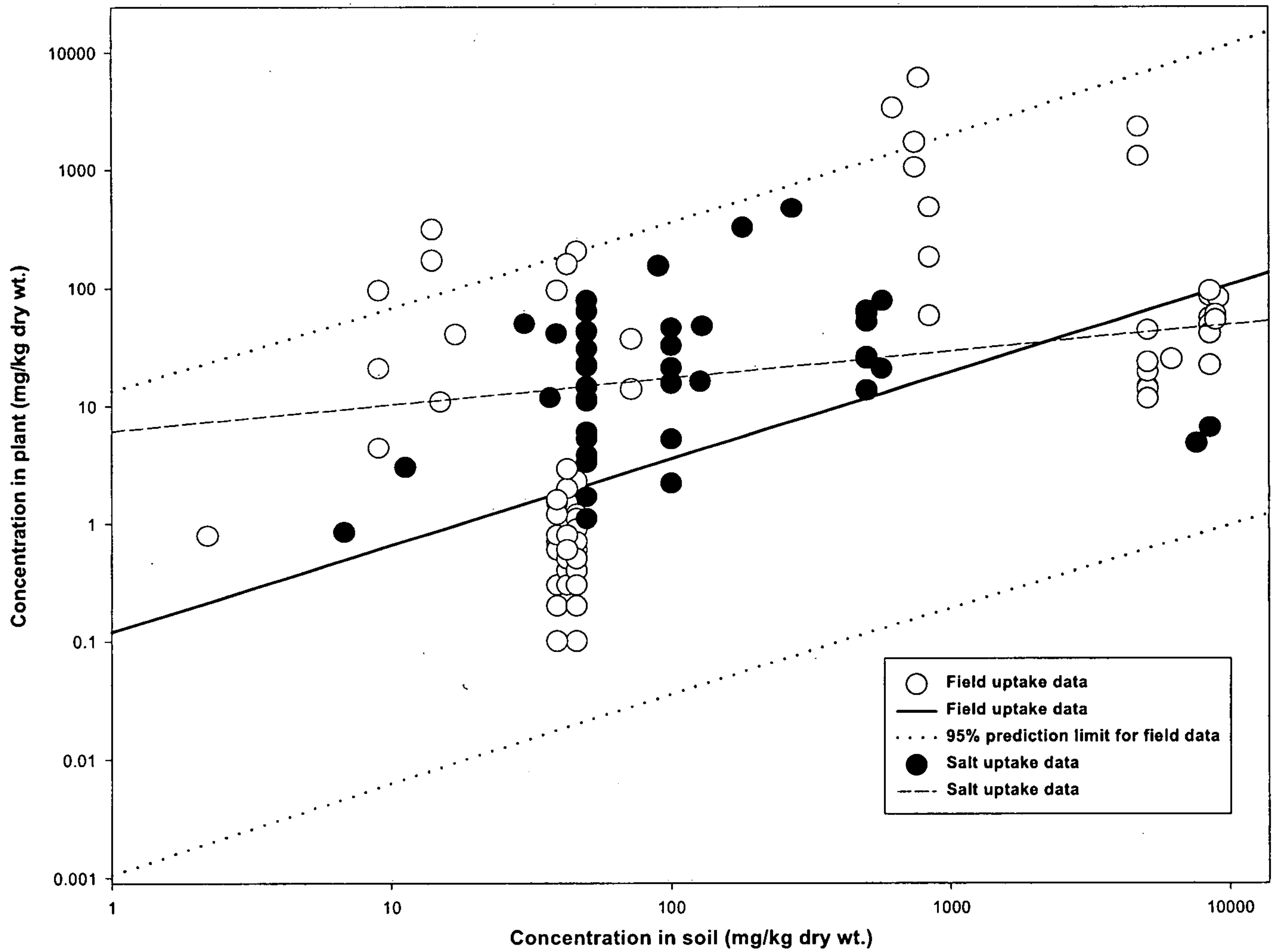

Fig. C.6. Scatterplot of nickel concentrations in vegetation versus soil, where nickel was added to soil in salt form or was present in a contaminated field soil. The regression lines for the salt uptake data and field uptake data are presented, as well as the 95% prediction limit for the field uptake data. All data are from published papers or reports.

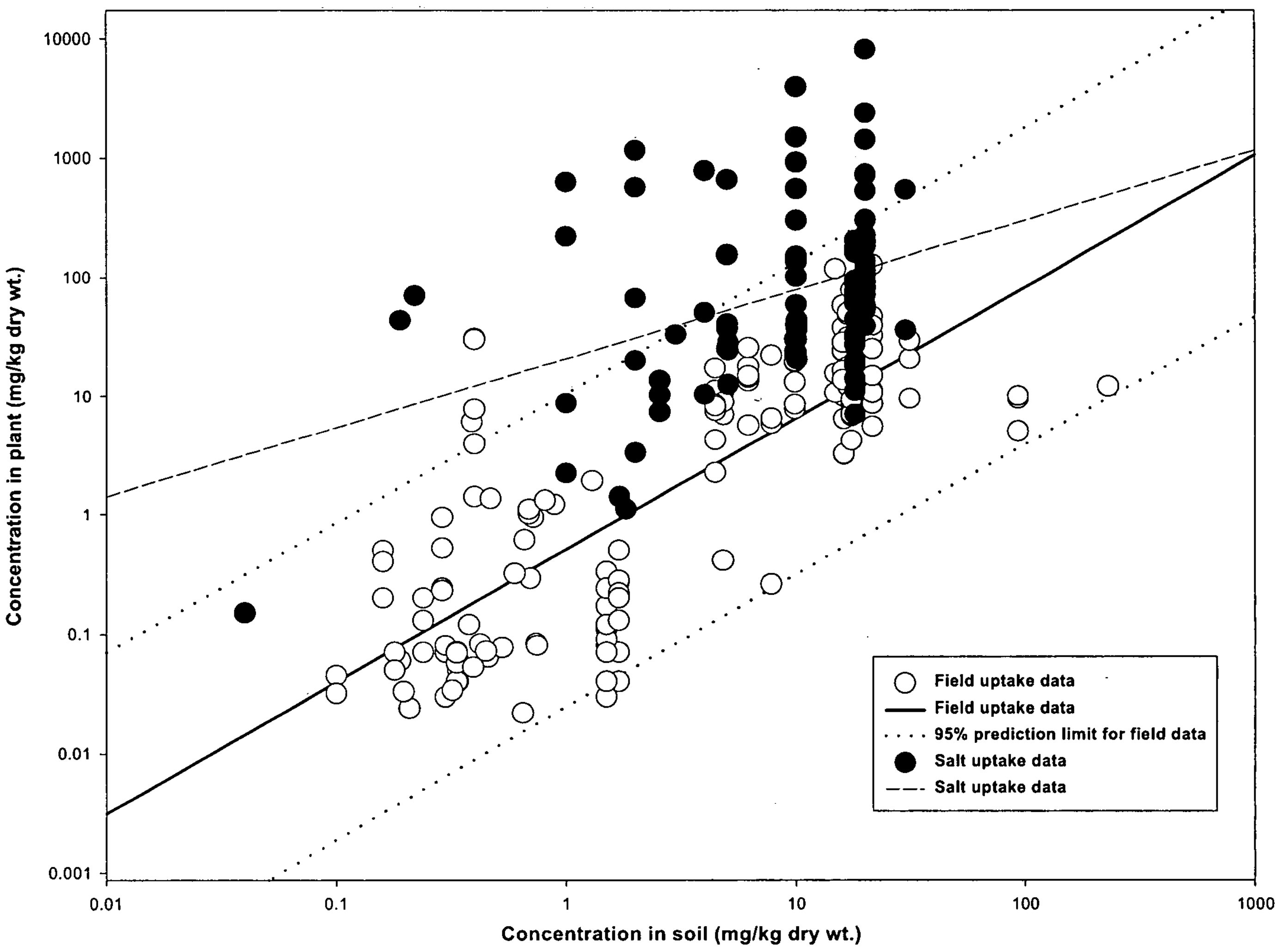

Fig. C.7. Scatterplot of selenium concentrations in vegetation versus soil, where selenium was added to soil in salt form or was present in a contaminated field soil. The regression lines for the salt uptake data and field uptake data are presented, as well as the 95% prediction limit for the field uptake data. All data are from published papers or reports.

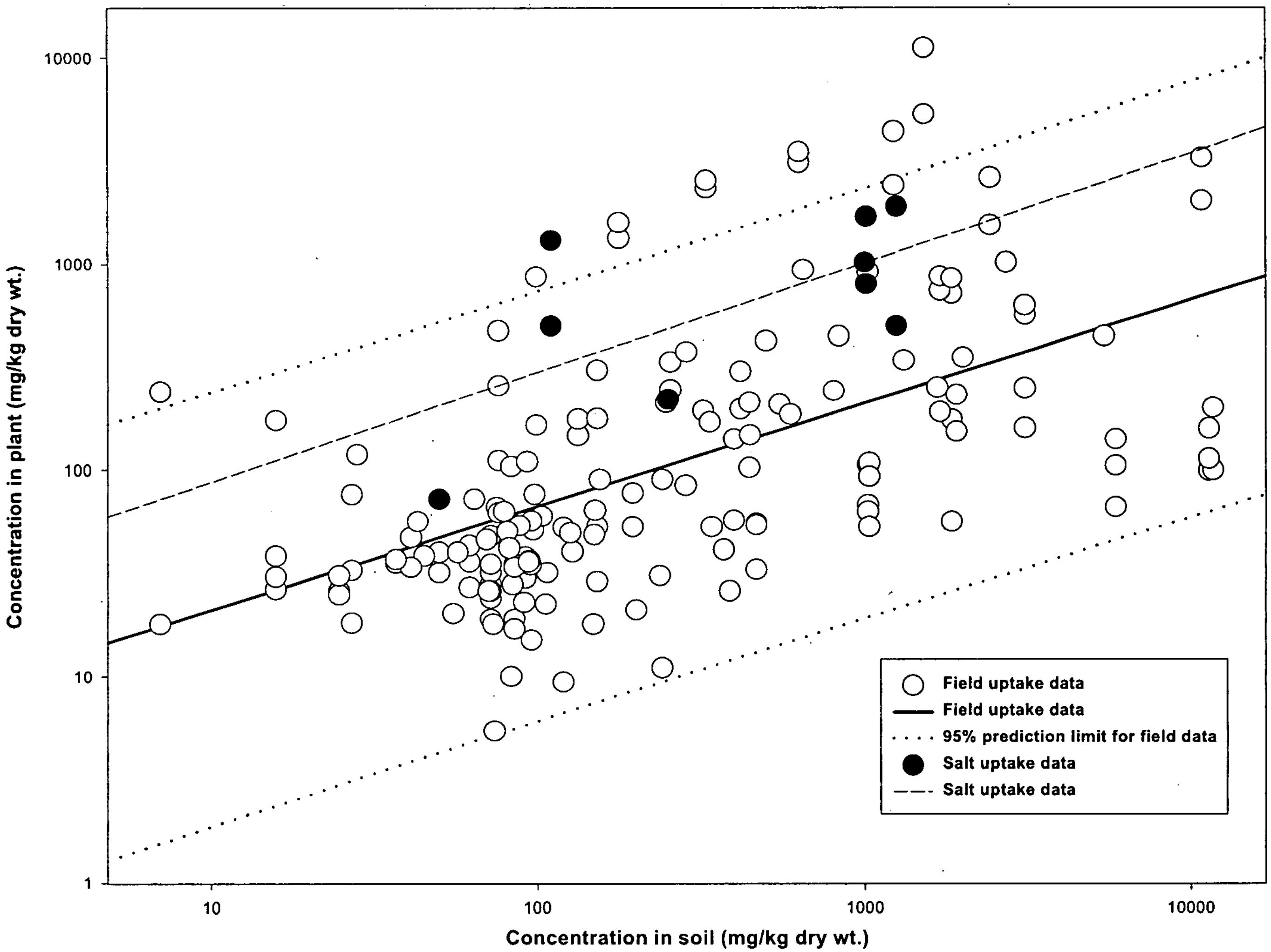

Fig. C.8. Scatterplot of zinc concentrations in vegetation versus soil, where zinc was added to soil in salt form or was present in a contaminated field soil. The regression lines for the salt uptake data and field uptake data are presented, as well as the 95% prediction limit for the field uptake data. All data are from published papers or reports.

APPENDIX D

SUMMARY STATISTICS FOR SOIL-PLANT UPTAKE FACTORS FOR MISCELLANEOUS CHEMICALS FROM THE VALIDATION DATASET

Table D-1. Summary statistics for soil-plant uptake factors following inclusion of validation data

Chemical	N (observns)	Mean	Standard Deviation	Minimum	Median	90th percentile	Maximum	Mean of ln-transformed values	St. dev. of ln-transformed values	Distribution
Aluminum	28	0.0032	0.00245	0.00058	0.00287	0.005	0.0112	-6.003	0.756	lognormal
Antimony	2	0.0102	0.00161	0.00909	0.0102	0.0114	0.0114	-4.589	0.158	either
Barium	28	0.213	0.197	0.03565	0.156	0.477	0.9154	-1.873	0.810	lognormal
Calcium	28	1.930	2.129	0.11238	1.185	6.0335	9.0511	0.125	1.130	lognormal
Chromium	28	0.0653	0.0860	0.02119	0.0410	0.0839	0.4802	-3.046	0.682	neither (lognormal closest)
Cobalt	28	0.0115	0.0104	0.00192	0.00745	0.0248	0.0446	-4.781	0.781	lognormal
Iron	28	0.00762	0.0137	0.00139	0.00425	0.01	0.0756	-5.367	0.833	neither (lognormal closest)
Magnesium	28	0.948	0.74056	0.12896	0.810	2.0597	2.995	-0.358	0.834	lognormal
Manganese	28	0.113	0.0957	0.0199	0.0792	0.234	0.433	-2.511	0.836	lognormal
Potassium	28	6.381	3.304	1.23963	5.590	11.263	14.468	1.706	0.588	either
Silver	10	0.0164	0.0120	0.0029	0.0140	0.0367	0.04	-4.372	0.806	either
Sodium	21	0.390	0.604	0.02532	0.192	0.8202	2.759	-1.593	1.127	lognormal
Vanadium	21	0.00548	0.00308	0.00173	0.00485	0.0097	0.0145	-5.340	0.521	lognormal

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